

Animal welfare: establishing a dialogue between science and society

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Abstract

Farm animal welfare has become an important issue for the European public, especially in the last two decades when a number of crises (eg Bovine Spongiform Encephalopathy and Avian Influenza) have affected farm animal populations. Public concern about this issue led the European Union to fund the Welfare Quality[®] project. This project aimed to develop a protocol for assessing animal welfare on farms and at slaughter plants, to identify the main animal welfare problems, and to address possible welfare improvement strategies. In fulfilling these aims, the Welfare Quality[®] project incorporated inputs from both science and society. This was crucial, as the public perception of what constitutes 'animal welfare' sometimes differs from animal science-based definitions. Furthermore, these differences are often interwoven with broader variations in ethical- and value-based understandings about human/non-human animal relationships. This paper presents the steps that we adopted to establish a dialogue between science and society during the construction of the Welfare Quality[®] assessment protocols. This dialogue involved numerous interactions between animal scientists, social scientists and members of the public. These interactions took several forms, including: meetings, conferences, workshops, websites, newsletters, interviews, focus groups, and citizen and farmers juries. Here, we address four key moments within this dialogue: the development of the initial list of twelve welfare criteria; the consumer focus groups; the development of the Welfare Quality[®] scoring system; and the citizen juries. In particular, we focus on the results of the focus groups and citizen juries. The focus groups were conducted in France, Italy, Sweden, The Netherlands, the United Kingdom, Norway, and Hungary and the citizen juries were carried out in Italy, the United Kingdom, and Norway. Drawing on this research, we highlight the similarities and differences between societal understandings of farm animal welfare and the views of scientific experts. Furthermore, and crucially, we outline how the animal scientists took account of societal opinion when developing their farm animal welfare assessment tools.

Keywords: animal welfare, citizen juries, focus groups, science-society dialogue, welfare assessment, welfare criteria

Introduction

In this paper, we describe how we attempted to establish a dialogue between the scientists of the Welfare Quality[®] project (who were working on developing both a standardised method for assessing farm animal welfare and a scoring system that could classify farms according to their results) and broader 'society' (in this case, key 'stakeholders', and likely end-users of the scoring system, such as representatives of NGOs, farming organisations, retailers and consumer groups, as well as selected members of the public). Before describing the techniques that we adopted for promoting this dialogue and the results that we obtained, we want to give a brief overview of the context in which this dialogue took place.

This is an interesting time in the history of farm animal production and consumption in Europe. Economic growth coupled with rapid scientific advances and technological change in Europe over the last 40 years has had remarkable impacts on farming practices. Confined systems of housing

quickly replaced traditional extensive, outdoor systems of rearing animals, especially in the case of pigs and chickens (for the latter it is now estimated that 95% of European production consists of indoor, confined systems), while 60% of cattle are farmed in intensive systems (Fraser 2008; Miele *et al* 2009). These changes greatly increased the availability of animal foods and they affected daily practices of food consumption and purchase for the majority of European households. Technological innovations in animal farming have raised expectations for both the increased availability of larger quantities of food at lower prices and also for increased food safety and quality (Evans & Miele 2007; Kjarnes *et al* 2007). The rapid growth of meat consumption represents the most striking effect of these changes: since 1970, the consumption of meat has increased from 56 to 89 kg per person per year on average in Europe, 89 to 124 kg in the USA and from 4 to 54 kg in China (Millstone & Lang 2003). However, recent studies of European consumers show that "between one-third and one-quarter of consumers

think that the price, taste and quality of food as well as farming methods, nutrition and safety have deteriorated over time” (Kjaernes 2004). Meat tends to raise more concerns about quality and safety than other foods: the same study reported that fruits and vegetables are considered safer than meat and only one consumer in five believes that ‘burgers’ from fastfood outlets are safe. However, meat safety and nutrition are not the only concerns that European citizens have in relation to animal farming.

In the last two decades a number of crises (including Bovine Spongiform Encephalopathy, foot and mouth disease, Avian Influenza, Salmonella outbreaks etc) affected European farm animal populations and highlighted some of the animal welfare issues in contemporary ‘industrialised’ farming (Bennett 1996; Buller & Morris 2003; Miele & Evans 2010). These crises, widely communicated by the media, increased European citizens’ awareness and concern about farm animal welfare. This heightened level of concern is clearly captured in the results of two recent Eurobarometer surveys (European Commission 2005, 2007), as well as in other studies (Kjaernes & Lavik 2008). Moreover, recent technological innovations in animal farming are blamed as the main causes of such crises. Animal cloning, transgenic animals, genetic modification, and intensive systems of production (that rely on very specialised breeds, feed additives and confined housing) are increasingly perceived as being more risky for the health of both humans and non-human animals. These ‘innovations’ are also increasingly becoming the subject of ethical concerns about how we should treat non-human animals. Many members of the European public believe that the quality of life of farm animals is inherently impoverished in indoor-only intensive systems (Miele & Parisi 2000; Miele & Evans 2010). However, this belief is not necessarily shared within animal science, where different approaches to and definitions of animal welfare coexist (Fraser 2008). Animal welfare is a multi-dimensional concept and there are many aspects of an animal’s life that can contribute to its welfare. This includes: health, ability to express certain behaviours, absence of pain, absence of stress, positive emotions and numerous others. Whilst some of these aspects may be compromised within highly intensive indoor systems, others might be enhanced. As Fraser (1995, 2003) has pointed out, the dimensions of animal welfare deemed to be worthy of consideration may differ between people, as may the respective importance attributed to these dimensions. Furthermore, choices between which overall approach to adopt towards farm animal welfare (eg health-based vs affect- or emotion-based vs ‘natural living’-based) involve ethical- and value-based decisions. Therefore, assessing the welfare of farm animals is a complex and potentially contested issue. As Busch (2011) argues: there are different interpretations, both within animal science and within society at large, about which aspects of an animals’ life count most for that animal.

One objective of the Welfare Quality® project (Blokhuys *et al* 2003) was to propose a comprehensive method to

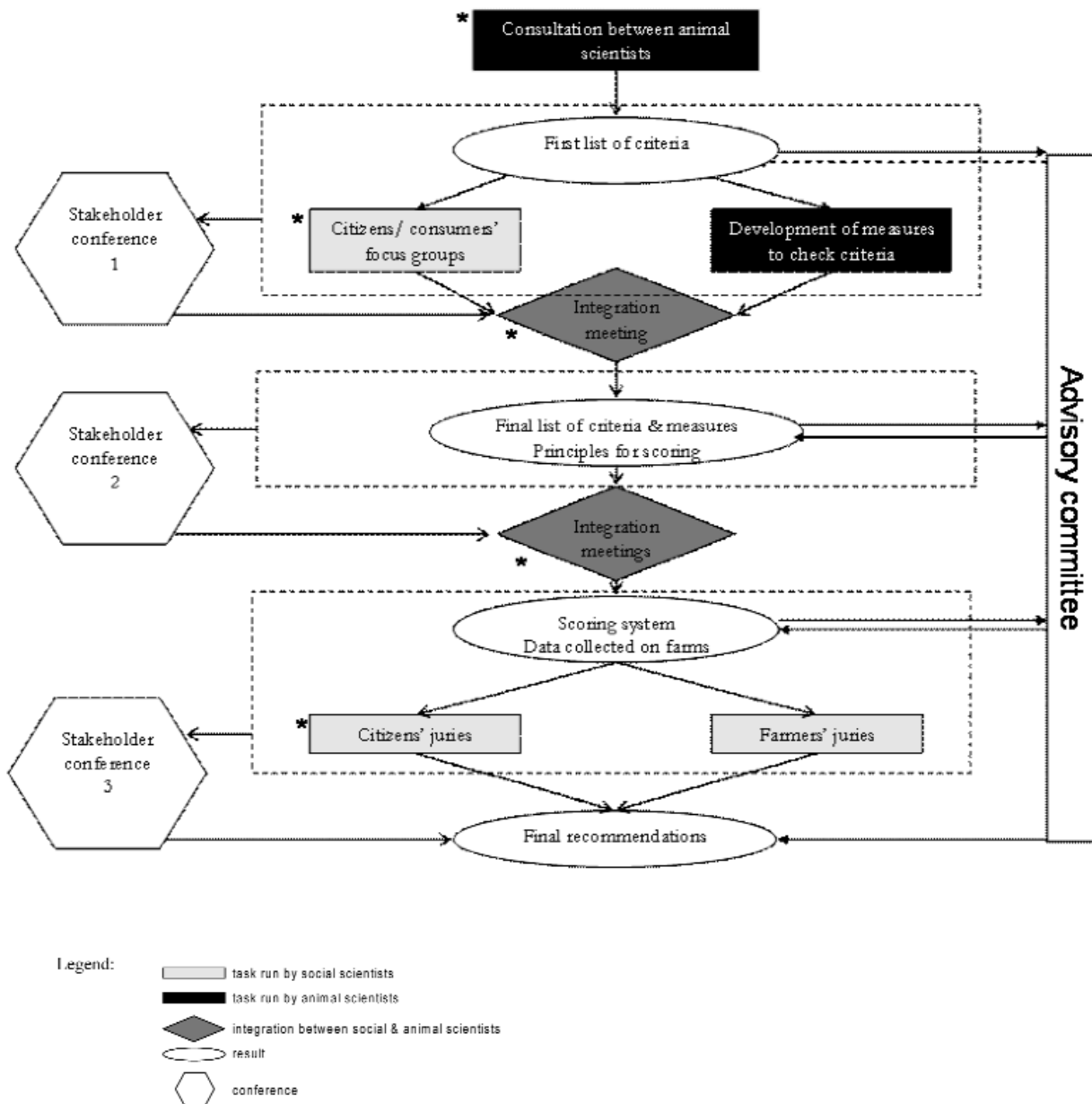
assess animal welfare on farms or at slaughter in order to be able to inform consumers about food products and help producers figure out the level of welfare they provide to their animals. During the project we engaged in an extensive consultation process between science and society in order to develop a method for the assessment of animal welfare that aimed to be both *scientifically sound* (ie it uses indicators of welfare that have been scientifically validated) and ‘*legitimate/desirable*’ because it addresses those aspects of an animal’s quality of life that matter to the public. We adopted a series of techniques to establish a dialogue between scientists and society (see Figure 1).

The project started with a consultation amongst animal scientists to create a list of welfare criteria that combined different scientific perspectives about how to approach farm animal welfare and about which aspects of an animal’s life should be monitored when attempting to gain as full an impression as practically possible about her/his quality of life. This initial list of welfare criteria was then presented to and discussed with members of the public in focus groups in seven European countries (Evans & Miele 2007). Consultation with the stakeholders in the Advisory Committee of the project, as well as interviews with farmers, retailers and certifying bodies in six European countries, paralleled the focus group discussions (Bock & van Leeuwen 2005; Roe & Marsden 2006; Bock & Van Huik 2007; Buller & Roe personal communication 2008). Then, intensive discussions took place in dedicated integration meetings between animal and social scientists about how to accommodate the diverse concerns and welfare priorities indicated by the public in the focus groups with a more scientific approach to and definition of animal welfare.

After the initial list of welfare criteria and measures had been refined to address citizens’ concerns, Welfare Quality® scientists proposed a scoring model for converting raw data on welfare ‘measures’ into meaningful welfare ‘scores’ and for aggregating the results of the welfare scores. This process (like all processes of evaluation) was, by its nature, bound to ethical choices, eg the choice of thresholds between what is considered unacceptable vs acceptable or good, or the decision to allow (or not allow) for good results on some welfare aspects to compensate poor results on other aspects (Veissier *et al* 2011). These evaluative (ethical) decisions regarding scoring were undertaken on the basis of extensive consultations between animal scientists, social scientists and members of the project’s advisory committee. Furthermore, they formed a key topic of discussion during the citizen jury exercises.

Later in the project, when the Welfare Quality® protocol for the assessment of animal welfare on farms had been drafted and trials had been conducted on a number of chicken, pig and cattle farms in different countries, we undertook a further round of more in-depth public consultation exercises in the form of citizen and farmer juries. These juries were conducted in three European countries in order to discuss with members of the lay public the nature of the assessment protocol as it currently stood (both in broad terms of those

Figure 1



Articulating the dialogue between animal and social scientists, and between science and society. Animal scientists created a first list of welfare criteria. This was discussed in focus groups and served as a basis for the development of welfare measures. These two sets of information were then discussed to produce a final list of criteria and measures, from which a scoring system was built by animal scientists. The scoring system was tuned according to the views of other animal and social scientists (during integration meetings) and to the views of stakeholders (represented in the advisory committee). The scoring system and the results from data collected on farms were discussed in citizen and farmer juries. In parallel, large stakeholder conferences were organised at key stages of the project to obtain the views of a broader audience. Finally, recommendations were made based on all the information gathered during the various consultations. * These moments are described in more detail in the present paper.

aspects of animal welfare that it included and left out and in more specific terms relating to how different aspects of welfare were measured; how different aspects of welfare were combined to produce overall welfare scores; and how the scheme might best be implemented to bring about improvements in European farm animal welfare).

During the lifetime of the project, the research results were also presented at three large public events, called 'stakeholder conferences' (Brussels in 2005, Berlin in 2007, Uppsala in 2009). Each meeting was attended by more than 250 people from all over Europe and outside Europe. They were from farmers' associations, retailers, NGOs, scientists,

members of the EU parliament and the EU commission, national policy-makers, scientists and media representatives. Feedback received from these groups during these meetings was also taken into consideration in refining the assessment protocols.

This paper outlines four key events in this broad consultation process, namely; the development of an initial list of twelve welfare criteria; the focus group discussions with members of the public in their role as consumers of animal products; the development of a scoring system; and the citizen juries. In particular, we focus attention on the results from the focus groups and citizen juries and we explain how the outcomes of these consultations affected the design of the Welfare Quality® protocols.

Materials and methods

Consultation among animal scientists: developing the list of welfare criteria

Seventy-two animal scientists were involved in the development of the Welfare Quality® assessment tool for assessing the welfare of cattle, pigs, and poultry. A core group of these scientists reviewed the scientific literature on definitions of animal welfare, with specific attention to published works where welfare criteria were listed and defined (Bracke *et al* 1999). Drawing on this information, the animal scientists compiled an initial list of welfare concerns/criteria and a list of potential measures for assessing these criteria on farms and at slaughter plants. This list of criteria and their associated measures then served both as the starting point from which animal scientists began to refine existing measures of welfare and develop novel measures where needed. It was also the starting point from which social scientists began public consultation exercises concerning (amongst other issues) how scientific understandings of what constitutes farm animal welfare related to broader societal understandings and expectations about what constitutes farm animal welfare. In particular, and as we shall see shortly, we dedicated a section of the focus group discussions to gaining societal feedback concerning this initial list of animal welfare criteria and measures developed by the animal scientists.

Focus-group discussions

In conjunction with national research teams, we organised 49 focus-group discussions in seven European countries (France, Italy, The Netherlands, Sweden, Norway, Hungary, and the UK). These discussions were designed to firstly gain a better understanding of the *daily food practices* (such as shopping, cooking, eating or preparing meals) through which different types of people experience, and sometimes reflect upon, the quality of life of farm animals. The second objective was to explore any similarities and differences between scientific and ‘popular’ understandings of farm animal welfare.

The focus groups were designed after undertaking a literature review on animal welfare concerns and food consumption practices in Europe. Within each study country, focus group discussions were conducted with: ‘urban mothers’,

‘rural women’, ‘empty nesters’, ‘seniors’, ‘young singles’; and ‘politically active/vegetarian consumers’. Furthermore, each national team had the opportunity to conduct a focus group discussion with a group of particular interest to them (eg the Italian team studied ‘gourmets’ and the Norwegian team studied ‘hunters’). These groups were selected to ensure that people from a wide range of different socio-demographic and lifestyle backgrounds were included in our analysis, which would enable us to explore many different discourses associated with animal welfare and welfare-friendly food products. Each individual focus group was homogenous, made up of people who were likely to share similar food practices and concerns, as we believed that this would help to facilitate discussions.

Each focus group met for approximately two hours and followed a common discussion guide developed by a team of social scientists (Evans & Miele 2007). The discussion guide consisted of two parts. The first part was dedicated to exploring practices of animal food consumption: to understand how people ‘felt’ about eating foods of animal origin; what kind of information people were looking for when buying animal foods; where they would look for such information and who they would trust; whether animal welfare considerations would play a role in their food choices and how these choices were the outcome of a negotiation with other considerations (eg taste, price, health, environment, farmers’ income etc). In particular, we wanted to use the discussions to explore the ways in which everyday, popular understandings and ethical concerns about farm animal welfare are grounded in specific lived practices (such as eating and tasting food, shopping, preparing meals, visiting farms and even reading newspapers, listening to the radio and watching television).

The second part explored the nature of participants’ animal welfare concerns and whether their concerns were reflected in the proposed list of animal welfare criteria developed by the animal scientists. In this paper, we will concentrate on this part of the focus group discussions, since the results were used by the animal scientists to refine their list of welfare criteria and related measures. At the beginning of this part of the focus group discussion the facilitator asked each participant to consider ‘what animal welfare means to them’ and what issues they thought were important when assessing the welfare of animals used in food production. A large whiteboard was used to record the participants’ ideas and to activate more in-depth discussions around each suggestion. The facilitator then asked the participants to try and agree on a ranking of their welfare concerns, according to what they thought were the most relevant for an animal’s quality of life. This whiteboard exercise helped to foreground participants’ own animal welfare concerns (seen in their own terms) and, at least to some small extent, helped to empower them and make them more able to provide constructive feedback in relation to the list of criteria and measures developed by the Welfare Quality® animal scientists. Then, the facilitator presented the list of criteria and potential measures developed by the animal scientists

Table 1 Welfare criteria and potential welfare measures proposed by animal scientists at the beginning of the Welfare Quality® project.

Welfare criteria	Measures on animals (cattle only)	Measures on resource and management (general)
Absence of prolonged hunger	Body condition	Provision of food
Absence of prolonged thirst	Dehydration	Provision of water
Comfort around resting	Difficulties rising or lying, cleanliness of the animal	Housing design (eg space, flooring, bedding and litter)
Thermal comfort	Panting	Air quality
Ease of movement	Slipping and falling (on-farm and during loading)	Duration of transport
Absence of injuries	Injuries on-farm/at slaughter, lameness	Handling strategies, presence of sharp edges, records of injured, treatment procedures
Absence of disease	Mortality and life expectancy, occurrence of diseases, carcass damage	Records of diseases, detection and treatment, culls
Absence of pain induced by management procedures	Routine mutilations (eg dehorning), effectiveness of stunning, meat quality at slaughter	Use of electric prod, stunning method, method of slaughter
Expression of social behaviours	Frequency of allo-grooming and other natural social behaviours	Grouping and regrouping of animals, physical contact with members of the same species
Expression of other behaviours	Abnormal behaviours (eg tongue-rolling) would receive a negative score	Presence of key resources
Good human-animal relationship	Avoidance distance, aggression	Attitudes and skills of farmers, drivers and slaughter-house staff
Negative emotions	Fear (freezing, running away), vocalisation (on-farm and at slaughter), qualitative behaviour assessment	Does the environment foster the ability to avoid aggressive interactions and to make choices?
Positive emotions	Play (in young), qualitative behaviour assessment	Environmental enrichment, does the environment foster the ability to groom, explore, play etc?

The measures relating to animals may be used to assess their actual welfare, whereas those relating to resources or management may be used to analyse causes of good vs poor welfare. The table was presented during focus-group discussions and accompanied by the text: “the table below provides a small illustrative selection of the parameters that researchers intend to use as a starting point for assessing the welfare of cattle. Over the course of the next five years researchers will develop and test a variety of different measures that relate to each of these parameters. Only measures that are deemed to be valid, reliable, repeatable and feasible to collect will be included in the final welfare assessment scheme.

(Table 1) and asked the participants whether it reflected their own concerns and whether they could identify issues that mattered to them but were not included. The results of the discussions in all countries were collated and the similarities and differences between the welfare concerns of the focus group participants and those of the Welfare Quality® animal scientists were highlighted.

Refining the criteria and measures

The conclusions of the focus group discussions were presented at an integration meeting between social and animal scientists and after an animated discussion a modified list of welfare principles, criteria and measures was agreed. The measures (or preliminary ‘protocol’ for welfare assessment) were then applied on 600 farms in Europe. This led into the next phase in the development of the Welfare Quality® assessment scheme, in which a scoring system was developed to convert welfare ‘measures’ into meaningful welfare ‘scores’.

From welfare measures to a scoring system: consultation among animal and social scientists

The animal scientists who designed the measures to assess the welfare of animals on farms and at slaughter plants were also consulted during the construction of the scoring models. In order to assess farms or slaughter plants, the results obtained from individual measures of welfare (which relay ‘factual’ information regarding, for example, % lame animals or mortality) need first to be converted into standardised ‘scores’, which reflect the ‘acceptability’ of these results in terms of animal welfare. This phase in the construction of the scoring model was designed according to the opinion of animal scientists who developed the measures in Welfare Quality®. It was felt that they possessed the most expertise to correctly interpret the data, on account of their knowledge about the significance of specific measures and their knowledge about the likely status of European farms in relation to these measures.

However, it is important to note that this exercise does not involve purely 'scientific' judgements but also implies crucial ethical decisions about the acceptability of different results (eg what level of lameness or mortality is acceptable?). We were fully aware of this issue but we felt that the animal scientists selected were still the best group to consult on this matter, not only on account of their extensive knowledge about animals, but also on account of the fact that they came from various European countries and they represented a diverse range of different cultural and ethical backgrounds. For each criterion, the measures to be used on farms or at slaughter were highlighted and the scientists were asked how to interpret the prevalence of a given problem in terms of welfare. Questions were in the form of: if $x\%$ animals of the herd are affected by a given problem then what score would you attribute on a 0–100 scale, where 0 is extremely low welfare and 100 is perfect welfare?

In the next phase of the construction of the scoring model, a selection of both animal and social scientists within the project were consulted to attribute weights to different welfare scores and to estimate potential trade-offs between scores. We hoped that the results generated would, to an extent, reflect some of the different ethical positions concerning human-animal relationships and farm animal welfare present both within animal science and in the broader public.

Finally, a consultation between social and animal scientists, and members of the Advisory Committee of the project was organised. The Advisory Committee included representatives of producer or breeder groups, retailer groups, certification or standardisation bodies, an animal protection group, the Federation of Veterinarians of Europe, and The European Society for Agricultural Ethics. We discussed alternative sorting models to allocate animal units – farms or slaughter plants – to four different welfare categories: units with 'Excellent', or 'Enhanced', or 'Acceptable' levels of welfare, or the unit is 'Not classified'. These models were applied to the farms visited during the project and the results were used to inform the citizen juries.

Citizen juries

Organisation of the juries

Citizen juries form part of a relatively new set of methodologies that were developed to engage citizens in complex technical, ethical and political decision-making processes that were previously the sole domain of experts. In current times, where technological innovations are creating new uncertainties and giving rise to new ethical challenges, citizen juries (in conjunction with a range of other methods of public consultation) have been viewed as one way to 'open up' technical and scientific issues to wider public scrutiny and hence as a tool to 'democratise democracy' (Callon *et al* 2009). Citizen juries enable ordinary citizens to scrutinise and contribute to complex (and often technical) issues and debates. This is achieved by developing a sustained dialogue between citizens and experts. Citizen juries often take place at regular intervals over the course of

several weeks or months and they often incorporate a range of different forms of citizen-expert interaction, including expert presentations, question and answer sessions, group exercises, homework sessions etc. Over the course of the jury sessions the aim is to ensure that the citizens are sufficiently able to engage with some of the technical issues being discussed but are still able to offer an alternative (perhaps broader or perhaps differently 'situated') approach to the issue at hand than that followed by scientific experts.

The aim of the Welfare Quality® citizen juries was to assess citizens' responses to, and acceptance of, the Welfare Quality® assessment protocols. More specifically, we wanted to examine whether the types of animal welfare information that were being collected and assessed by Welfare Quality® animal scientists addressed the animal welfare concerns of ordinary citizens and we wanted to provide feedback on the most crucial aspects of the protocols to the scientists who were finalising them. We organised three juries, one in the UK, one in Italy and one in Norway. These countries were chosen because they reflect three distinct systems of governance of animal welfare: a market oriented system in UK, a system centred on public regulation with a large role for the state in Norway, and a 'terroir model' oriented towards quality regulation in Italy (Kjarnes *et al* 2009). Each jury contained 10–12 citizens, all of whom were expected to participate in every jury session. We developed a list of recruitment criteria for jury members on the basis of the results of the previous research findings that emerged in the focus group discussions and the consumers' survey (Evans & Miele 2007; Kjarnes *et al* 2009). We decided that each jury should contain: two vegetarians; two consumers on a budget; one health-conscious consumer; one environmentally aware consumer; one halal or kosher eater; one rural woman; one parent with young children; and four 'mainstream' consumers. This was primarily to ensure that a variety of different viewpoints would be expressed during the discussions. All jury members were drawn from the lay public (ie they did not include farmers, animal scientists, veterinarians, animal welfare NGOs). The juries met on a weekly basis (there were four sessions in Norway and Italy and five in the UK). Each session lasted 2 h in the UK and Norway, and 3 h in Italy. Between meetings, the jurors had the opportunity to discuss the content of the juries (eg the topics presented by experts) with their friends and family. This, in turn, enabled them to arrive at the next session with more questions and, possibly, with different, more considered, opinions.

Several experts also participated in the jury sessions, these included Welfare Quality® animal and social scientists, NGO members, representatives from certifying bodies and farmers. Whilst the role of the experts differed from session-to-session, they were often called upon to give short presentations (which were always followed by discussions between jurors and experts), to answer specific questions and to take part in group exercises. All discussions and interactions were led by jurors rather than experts.

Figure 2



Citizen Jury in the UK, Mark Higgin and Adrian Evans organising the white board Post-it notes' exercise.

Figure 3



Citizen Jury in the UK, particular of the white board Post-it notes.

The jury sessions were devised to enable participants to build-up crucial background information about the nature of modern European farming and current farm animal welfare issues, before addressing more specific concerns. Throughout the sessions, we maintained a board where Post-it notes could be placed, this acted as a tool for eliciting jurors' ideas and for monitoring any changes in their opinions over the course of the juries, for example in response to expert presentations, discussions or group exercises (Figures 2 and 3).

Overview of the jury sessions

Session 1 started with a Post-it note exercise exploring participants' understandings of what might constitute a good life for farm animals. Then three experts presented three alternative ethical positions concerning human-animal relations: an *animal rights* perspective was introduced by a member of an NGO advocating veganism; an *animal welfare* perspective was presented by a member of an animal welfare NGO; and finally a more 'instrumental' view of human/non-human animal relationships (which broadly reflects the current *status quo*, in which animals are used for the production of food and other products and in which animal welfare is primarily seen in terms of its relationship to productivity and governed by minimum permissible standards) was presented by a social scientist. After the presentations, jury members were able to question the experts and the presentations were discussed. Finally, a representative from a farming organisation gave a presentation about 'the nature of farming today' in each study country. This presentation included some national data about the number of animals in different production systems (eg how many chickens, pigs and cattle are reared in intensive systems and how many are reared in free-range or organic systems) and outlined the main welfare risks and problems associated with different farming systems, as well as the most likely causes of these problems.

Session 2 introduced animal welfare science, its scope and evolution. The experts included: a university lecturer who gave an historical account of the evolution of animal welfare science; a member of an organic certifying body who explained the principles of organic certification; and an animal scientist from Welfare Quality® who introduced the jury to the Welfare Quality® assessment scheme. This was followed by a discussion and an evaluation exercise, in which jurors compared the approaches to animal welfare adopted by the Organic and Welfare Quality® schemes. The jurors were invited to define the criteria by which they would evaluate and compare the two schemes and then they were asked to use their criteria to carry out the comparison.

Session 3 was dedicated to illustrating and discussing the measures used by Welfare Quality® scientists to assess animal welfare. Firstly, we elicited jurors' spontaneous responses to the four animal welfare principles developed by the Welfare Quality® project. This was achieved by writing the headings 'good feeding', 'good housing', 'good health' and 'appropriate behaviour' on the white board and

asking the jurors what these headings meant to them, what welfare issues they might cover and how one might go about measuring these issues. Then, a Welfare Quality® animal scientist outlined how these four principles were defined within the project and illustrated the types of measures that were used to assess animal welfare within each of the four categories. This was followed by a discussion of the merits and limitations of the Welfare Quality® approach, much of which focused on the pros and cons of adopting an '*output-based approach*' that relies prevalently on observations of animals (Keeling 2009).

Session 4 focused on the scoring of farms and slaughter plants. The session presented two ethical dilemmas within the scoring system, namely; the 'ethics of calibration' (how we go from raw data to a meaningful welfare score) and 'the ethics of combination' (how it is possible to combine scores for different welfare criteria). Each dilemma was introduced by a social scientist from Welfare Quality®, then exercises were undertaken in which jurors evaluated and discussed different ways of resolving that dilemma and finally the way Welfare Quality® dealt with the dilemma was presented and discussed. For the first exercise, the jury had to discuss how to set the threshold between acceptable/unacceptable levels of welfare, using the example of one measure, the incidence of lameness in the 90 dairy cattle farms examined in an earlier phase of the project. The jury was asked to discuss the merits of two means of setting the threshold a) expert opinion of what is good vs bad and b) 'benchmarking' to the actual incidence of lameness. For the second exercise, the jury was given a table of criteria scores and asked to propose a method for combining these scores. The jurors were then invited to discuss the rules of combination that they used to generate their results (eg did they simply take an average score, did they go with the lowest score, or did they choose a more complex way of combining welfare scores).

The implementation of the Welfare Quality® scheme was discussed at the end of session 4 in Norway and Italy and in a separate fifth session in the UK. The results of this part will not be presented here.

Results

First list of welfare criteria

The outcome of the first consultation among the animal scientists at the beginning of the project was a preliminary list of 12 criteria to be taken into account when assessing animal welfare, these included; the absence of prolonged hunger; the absence of prolonged thirst; comfort around resting; thermal comfort; ease of movement; absence of injuries; absence of disease; absence of pain induced by management procedures; expression of social behaviours; expression of other behaviours; good human-animal relationships; the absence of negative emotions; and the presence of positive emotions. In the very first list compiled within Welfare Quality® hunger and thirst on the one hand and all elements related to physical comfort

Table 2 Spontaneous concerns for animal welfare expressed by focus group participants.

Spontaneous concerns	FR	IT	NL	UK	SW	NO	HU
Outdoor access, free range, extensive production, possibility to choose between indoors and outdoors, space, natural space	X	X	X	X	X	X	X
Natural feed, no artificial growth stimulants, long lifespan, time for normal growth	X	X	X	X	X	X	X
Humane slaughter	X	X	X	X	X		
Transport (limited or avoided)	X	X	X	X	X	X	
Respect, care, physical comfort and security		X		X	X	X	
Good hygiene	X	X	X				X
Good quality of life		X		X		X	
Small scale production		X			X	X	
Breeding, genetic modification				X			
Products with someone 'accountable for' (farmer, veterinarian)		X				X	
No mutilations, no pain			X		X		
Natural light, fresh air		X	X				
Distractions (playing)			X				
Animals as individuals (name)						X	
Natural reproduction		X					
No routine use of medicines				X			
Wildness						X	
Company, love, happiness		X			X		

FR: France; IT: Italy; NL: The Netherlands; UK: United Kingdom; SW: Sweden; NO: Norway; HU: Hungary.

(comfort around resting, thermal comfort, ease of movement) on the other hand were considered together. However, because these factors corresponded to separate aspects of welfare they were split and published as such [Botreau *et al* 2007]. To avoid confusion we present here the list published by Botreau *et al*).

The scientists also proposed several measures to assess each of these criteria both on farms and at slaughter (Table 1).

Focus group discussions

The welfare concerns expressed spontaneously by focus group participants are listed in Table 2. Some animal welfare issues were expressed by participants in most countries, eg 'extensive production', 'outdoor access', 'sufficient space', 'natural feed with no artificial growth stimulants', and 'a long lifespan' were associated with good animal welfare in all countries. 'Limited transport', 'humane slaughter', 'respect and care', 'physical comfort and security', and 'a good quality of life', were mentioned in five or six of the seven countries studied. 'Good hygiene' and 'small-scale production' were mentioned in three countries. 'Products with someone accountable for' (eg farmers or veterinarians), 'absence of pain and mutilations', 'natural light and fresh air', 'company', 'love', and 'happiness' were mentioned in two countries. Finally, 'breeding', 'genetic modification', 'possibility of play', 'animals recognised as individuals', 'natural reproduction',

'no routine use of medicines', and 'wildness' were each mentioned in only one country.

The list of 12 animal welfare criteria developed by Welfare Quality® scientists received a great deal of support. All the welfare criteria proposed by the scientists were considered to be important and appropriate by the majority of participants in all study countries. Some variations were nevertheless noticed between countries. Most enthusiasm was observed in Italy, by contrast a number of French participants felt that some of the proposed criteria (eg positive and negative emotions) were more appropriate for assessing human rather than animal welfare. Furthermore, some concerns were raised about the lack of specification regarding the quality of feed within the Welfare Quality® measures (eg participants wondered why there was no mention of access to natural pasture or of feed that was free from genetically modified organisms). Participants were also concerned that the measures did not cover the use of xenobiotics (such as growth promoters and antibiotics).

By comparing the welfare criteria proposed by Welfare Quality® (Table 1) and that spontaneously proposed by participants (Table 2), we can detect further (perhaps more implicit) differences between scientific and societal approaches to, and understandings of, farm animal welfare. Firstly, focus group participants believed that *low intensity farming systems could provide better animal welfare than*

high intensity industrialised systems that rely on confined housing. This was due to concerns about space, freedom, the difficulty of farmers fulfilling their roles as animal carers in 'industrial' contexts, the problems of extreme breeds (especially in relation to broiler chickens and dairy cows) and the over-use of medication, as in the case of the routine use of antibiotics. In contrast, the Welfare Quality® scheme does not make *a priori* judgements about the welfare credentials of different farming systems but, rather, sees this as an empirical question to be investigated.

Secondly, focus group-participants consistently pointed to *the importance of providing natural environments for farm animals*. Whilst certain elements of this naturalistic view appeared to show nostalgia for some idealised version of past farming practices (where farm animals are imagined as living happily in green fields, meadows and mountains), other elements reflected a more nuanced appreciation of the advantages and disadvantages of outdoor living, the importance of allowing animals to perform natural/instinctual behaviours, and the benefits of having animals that are 'fit for their environments'. In contrast, Welfare Quality® scientists are far more critical and reserved in their embrace of the 'natural', as they are perhaps more aware of the welfare risks (eg predation, disease) that 'natural' environments can pose.

Thirdly, focus group participants' spontaneous animal welfare concerns *centred on the positive aspects of animals' lives* (eg freedom to move, social contact, and sexual reproduction), whereas the criteria indicated by the animal scientists tended to focus on animal suffering. This was not because focus group participants failed to acknowledge the priority of addressing animal suffering before ensuring positive aspects of animal welfare, rather it was because many participants believed that animal suffering should no longer exist in the farms of a 'civilised' Europe and that a new European standard for animal welfare should deal with the positive aspects of animals' lives.

Fourthly, focus group participants tended to adopt a *holistic approach to animal welfare* and they were not willing to break welfare down into, what they consider to be, artificial component parts. Furthermore, many rejected the idea that it is possible to rank welfare concerns, as they were all deemed to be equally important and intimately connected. In contrast, the Welfare Quality® approach to assessing farm animal welfare, like most scientific-based methods, seeks to identify separate components of farm animal welfare, which are then weighted, ranked and recombined.

Finally, focus group participants' understandings of what counts as good animal welfare were *far less circumscribed than scientific understandings* and participants inextricably linked issues of animal welfare with issues of environmental sustainability, food quality/taste and human health. For example, the use of genetically modified animal feeds was discussed by participants as an animal welfare concern (whereas most animal scientists would contend that this was primarily an issue relating to human health).

Refining the criteria and measures

The discrepancies between the views of scientists and those of focus group participants were discussed between animal and social scientists from the project.

The animal scientists discussed extensively whether the monitoring system should be based on measures taken from the animals' environment (eg housing, feeding, etc) or directly from the animals themselves (eg health, behaviour, etc). A point that seems to reconcile all views is the notion that animals should not suffer. Hence, it appeared more appropriate to develop animal-based measures, which attempt to assess welfare from the animals' point of view. Nevertheless, in parallel to animal-based measures, the Welfare Quality® project also developed a series of environment-based measures, which could be used to help to diagnose the causes of poor welfare and to advise farmers on ways to improve the welfare of their animals (Table 1, right column). Some environment-based measures were also introduced in the assessment system, when they were considered to be of prime importance for the animal (as viewed by scientists or by citizens) and their effect on animals could not be easily detected. This was the case for 'the possibility to move around', which is to be assessed through resource-based measures, including 'space allowance' and the 'absence of tethering'.

It was also recognised by the animal scientists that natural environments generally offer more freedom to animals and more opportunity to express a wide range of behaviours. The access to pasture (for ruminants) or to an outdoor range (for poultry) were then added as measures for the criterion 'expression of other behaviours'.

The Welfare Quality® scientists agreed that the absence of suffering is a prerequisite for animal welfare and that good welfare also includes positive states. Hence, the negative and the positive sides of the welfare spectrum do not have the same importance but both need to be considered. Some of the welfare criteria include only the negative side of the welfare spectrum; eg absence of injuries, diseases, or pain cannot go beyond a neutral point corresponding to 'no problem observed'. Other criteria can cover both sides, eg expressions of behaviour or human-animal relationships, but this was not expressed clearly in the first list of welfare criteria. More attention was then given to appropriately describing the positive and negative aspects of a criterion when relevant (Veissier & Evans 2007). Some criteria were also rephrased, for example, although 'positive emotions' and 'negative emotions' were initially split into two separate criteria, such large interactions were observed between them, that it was decided to group them under one criterion, called 'positive emotional state'. In the Welfare Quality® scheme, there was also a risk that, due to difficulties in identifying appropriate and reliable measures, indicators of positive emotional states might be omitted from the final scheme. However, due in part to the high relevance of positive aspects of animal welfare for European citizens, it was decided to investigate in more detail some promising qualitative measures of positive emotion, which previously

had not been used by scientists proposing tools for the on farm assessment of animal welfare, namely Qualitative Behavioural Assessment (Wemelsfelder 2009).

The holistic view of animal welfare expressed by the focus group participants was probably the most difficult issue to address. However, it does not contradict the view that animal welfare is a multi-dimensional concept, nor does it devalue any of the 12 proposed criteria. The holistic view of animal welfare requires that all dimensions of welfare are taken together and that an animal unit can only be found to be welfare-friendly if all principles are fulfilled (eg good health cannot fully compensate for behavioural deprivation). This view has been taken into account in the Welfare Quality® assessment system, firstly by developing a way of assessing welfare that aims to cover all the different aspects of welfare and secondly by developing a method of aggregation in which great caution has been taken to limit compensations between different welfare principles (Botreau *et al* 2008).

Finally, regarding the fact that members of the public tend to group animal welfare with other considerations (eg taste, healthiness, environmental sustainability etc), it was decided that it would be better to address this issue while proposing future implementation strategies for the Welfare Quality® results.

Developing the scoring model

After the initial list of welfare criteria and measures had been refined to address citizens' concerns, the animal scientists proposed a scoring model for aggregating the results of the welfare measures. This scoring model is briefly described by Veissier *et al* (2011) and in greater detail in the Cattle, Pig and Chicken Welfare Quality® protocols (Welfare Quality® 2009a,b,c). In this section, we will focus specifically on how the views of experts were used to adjust the scoring model and how public opinion concerning farm animal welfare was taken into account.

Firstly, the measures taken on the farm (or at slaughter) were grouped together under the different welfare criteria to which they related. The results obtained by a farm for the various measures of a given criterion were then converted into a score on a 0–100 value scale, which reflected the compliance of the farm to the criterion (with 0, no compliance and 100, full compliance). For instance, the incidence of different severities of lameness and other injuries on a given farm was to be converted into a score between 0 and 100 reflecting the absence of injuries on that farm. When asked to do such conversion, experts tended to score more severely when a criterion contained only the negative side of the welfare spectrum (eg injuries) than when a criterion contained both sides (eg expression of social behaviour, which can include both aggressive and 'affiliative' interactions).

Secondly, the criteria were grouped into four principles: 'good feeding' (criteria 1–2); 'good housing' (criteria 3–5); 'good health' (criteria 6–8); and 'appropriate behaviour' (criteria 9–12). Then, a process of expert consultation (including both social and animal scientists) was launched

in order to establish procedures for aggregating the criterion scores into principle scores. Both social and animal scientists consulted at this stage allowed only limited compensation between scores. For instance, when asked to combine a low score for absence of hunger and a high one for absence of thirst, the resulting score they gave for the principle 'good feeding' was rather low. This type of reasoning was in line with the holistic approach, highlighted from focus groups discussions. Therefore, the Welfare Quality® scoring system uses equations that only allow limited compensation between criterion scores.

Finally, animal and social scientists, together with members of the project's Advisory Committee, discussed ways in which scores on the four welfare principles could be converted into meaningful categories. This involved setting cut-off points or 'aspiration values' which defined different welfare categories: a score of 20 for the category 'acceptable'; 55 for 'enhanced'; and 80 for 'excellent'. In addition, they discussed the rules to allocate a farm or a slaughter plant to a given category, depending on how many scores it obtained above the aspiration values for different principles. When making these final crucially important decisions regarding how to allocate farms or slaughter plants to different welfare categories, a compromise was reached between what really counts for animals — as viewed by scientists — and results that can realistically be achieved in practice (Botreau *et al* 2009).

Results from the citizen juries

Session 1

Of the three ethical perspectives presented, the 'animal welfare' perspective received the largest support from jurors in all countries. Rearing farm animals for food was considered legitimate, but jurors felt that the living conditions of farm animals should be improved and an 'ethics of care' (Tronto 1993) towards farm animals seemed to inform their thinking on this matter. Many of the jurors thought that the overview of the nature of farming today was by far the most interesting presentation and some were quite shocked and surprised by the information that they had received. All of the Italian jurors and the vast majority of UK jurors admitted that they were not aware of the sheer extent of the intensification of contemporary animal farming, for example the Italian jurors were unaware that more than 95% of chickens are kept in indoor systems in Italy. Many jurors were also shocked to learn about certain issues, including; the short lifespan of animals, such as broiler chickens (often only 35 days); the number of chickens per m² (up to 17); the number of chickens housed in one shed (up to 20,000 in intensive systems); and the specific welfare problems associated with each system. Most jurors were also surprised to learn that welfare problems exist in free-range and organic systems as well as in conventional indoor systems. Furthermore, jurors were confused, and in some cases shocked, to learn that free-range and organic systems, even though they might offer better *opportunities* for welfare, do not automatically deliver better welfare *outcomes*.

Session 2

Most jurors in the three countries expressed a favourable impression of both organic and Welfare Quality® assessment schemes, however the majority of jurors indicated a preference for the organic scheme. The main advantage identified in the organic scheme was the prescriptive character of the organic standard and the explicit attempt to define the conditions for achieving higher animal welfare. For example, jurors praised many of the principles of organic agriculture, such as specifying that animals must have outdoor access; that the breeds adopted should be suitable for the environment in which the animals will live; that the feed should be organic and non-GMO; and that the use of antibiotics should be restricted. However, jurors also acknowledged the value of adopting an outcome-based approach to assessing farm animal welfare (as used in the Welfare Quality® assessment tool) and many felt that the two approaches (organic and Welfare Quality®) could be used to complement each other — the organic standard as a checklist of what can be done to improve animal welfare and the Welfare Quality® assessment tool as a means of gauging the success of different farming environments and practices in achieving high animal welfare standards.

Session 3

Many jurors appreciated the Welfare Quality® scheme for its ‘outcome-based approach’ (ie for considering how animals experience the situations in which they live rather than just focusing on the situations themselves) and they thought that this was very useful in relation to the welfare criteria of positive and negative emotions. However, this outcome-based approach was not considered to be appropriate for welfare criteria, such as ‘hunger’ and ‘thirst’, as jurors felt that outcome-based measures, such as body scores, were blunt indicators that were only capable of detecting prolonged periods of hunger rather than shorter episodes. Jurors also felt that the criteria good feeding, should reflect the ‘quality’ of animal feed in a more direct way (eg whether the feed was natural, if it was genetically modified etc). Moreover, as already foreseen in the focus group discussions, the Welfare Quality® assessment scheme was criticised because it did not address some of the jurors’ concerns, such as access to natural pasture and the use of xenobiotics. Jurors also felt that it did not address some of the risk factors for welfare, such as the suitability of different breeds and farming environments. Many jurors thought that the Welfare Quality® assessment scheme would be suitable for intensive, indoor systems of production, as the scheme would be good at identifying instances of very poor welfare. However, they were less convinced that the scheme could be used as a means of detecting and rewarding the very highest levels of animal welfare (which, for example, many jurors believed were present on organic farms).

Session 4

The juries were sceptical about the idea of ‘benchmarking’ welfare scores to the current incidences of welfare problems in European farms and many favoured the stricter option of setting thresholds in accordance with expert scientific

opinion about what levels of occurrence of a given condition (such as lameness) were acceptable/unacceptable. They nevertheless recognised that these thresholds should be set at realistically achievable levels. The jurors also favoured strict rules for the combination of welfare scores, in particular many jurors believed that there should be no compensation for very low welfare scores (ie if a farm scored below 20 in any criterion, jurors believed that it should be allocated to the ‘not classified’ group, irrespective of how highly it scored on any of the other criteria). Moreover, most jurors stated that the classification ‘excellent welfare’ should only be used in relation to extensive systems with outdoor access.

Final recommendations regarding the use and future development of the Welfare Quality® protocols

The outcome of the jury exercises highlighted the need to clarify exactly what the Welfare Quality® protocols contain (and why) and the conditions in which they should (or could) be used.

The Welfare Quality® protocols are by definition non-prescriptive. This makes them applicable across various different contexts. However, the Welfare Quality® team was aware that it would be dangerous to abandon all prescriptive rules, such as minimal requirements imposed by European directives to protect animals. It was therefore decided to make clear in the final Welfare Quality® recommendations that systems which have been proved to induce poor welfare should not be reintroduced because on some circumstances they might obtain good results according to the Welfare Quality® protocols. The Welfare Quality® scientists believed that such circumstances can hardly be met and they were strongly opposed to the idea of taking the risk of permitting poor farming/slaughter conditions, until it was proven (by some assessment scheme, either Welfare Quality® or another) that these conditions were detrimental. The Welfare Quality® protocols aim at describing and assessing the welfare of animals. As such they do not make *a priori* judgements on the conditions or environments in which animals are farmed or slaughtered. Specifications on the environment (eg number of drinkers, amount of space, access to the outdoors or to pasture) are taken into account in the Welfare Quality® protocols *only* when direct animal-based measures are not appropriate. This is the case when an animal-based measure is not sensitive enough (eg the absence of signs of dehydration as an indicator of the absence of thirst), when it requires too much time to record (eg time spent grazing), or when an environmental measure is overwhelmingly determining the welfare outcomes (as in the case of tethering cows). Current certification schemes are largely based on prescriptions regarding the way animals should be housed, fed, transported, etc (Buller & Roe personal communication 2008). Still, whether these provisions always result in good levels of animal welfare is unsure. The Welfare Quality® protocols could thus be used to check whether practices that are recommended as having animal welfare benefits are really beneficial *to animals*.

Like jurors, scientists had no doubt that the provision of adequate food and water to animals is a key factor in providing good care. They agreed that it would make little sense to measure *the absence* of thirst by *only* using animal-based measures (eg looking for *the absence* of signs of dehydration with the skin pinch test), as such measures are only really relevant in extreme situations when animals have not drunk for a long period or when they have lost body fluids (eg because of prolonged diarrhoea). Taking these factors into consideration, within the Welfare Quality® assessment scheme, the absence of thirst will be assessed on farms by checking that animals have access to sufficient and clean water points (ie via the use of resource-based measures). However, in certain situations, such as animals arriving at slaughterhouses after potentially long transit periods with difficult access to water, it was decided to check for signs of dehydration.

Although appropriate feed is essential, Welfare Quality® scientists contended that correct feeding is not only a matter of what is provided to animals, but also depends on the animals themselves. Some animals have higher nutritional requirements (eg dairy cows around the peak of lactation) and may be undernourished, despite apparently being fed considerable amounts of food. Some animals may also have difficulties gaining access to food, because they are dominated by others. Therefore, Welfare Quality® animal scientists believed that it was essential to check that all animals had been fed appropriately and they believed that the best way to achieve this was by observing their body condition (ie their fatness vs leanness).

Like jurors, the Welfare Quality® scientists consulted to interpret results in terms of welfare (ie to convert ‘measures’ into welfare ‘scores’) reasoned with absolute thresholds. These thresholds were later refined according to the results obtained by the farms observed in the project. Jurors were more severe in their final judgement of farms than actually proposed in the Welfare Quality® protocols. According to the jurors, a farm that scores below 20 on one principle is not acceptable, even if it scores much more highly on the other three principles. This point of view was shared by most scientists consulted during the construction of the Welfare Quality® protocols. However, the Welfare Quality® assessment results from farms tested during the project suggested that such a rule would result in half of all European farms being considered ‘unacceptable’; an outcome that would certainly discourage most producers from adopting the assessment. Therefore, in its final recommendations, Welfare Quality® proposes to use less strict rules in combining welfare scores (ie a farm that scores between 10 and 20 on only one principle can still be acceptable overall) but to revise these rules when sufficient progress has been made (ie a farm that scores below 20 on one [or more] principle falls in the ‘not classified’ category). Scientists were more reluctant than jurors to consider the notion that excellent welfare can only be met in extensive conditions. ‘Extensive’ may mean very different things to different people: for some people ‘extensive farming’

means that animals have outdoor access, while for others it means ‘producing less per production unit’, this unit being the animal, a piece of land, or a human worker. In the latter case, animals are also generally kept outdoors, at least for some time of the day or the year, but this access is accompanied by other characteristics (less intensive feeding regimens, slow growth etc). The resulting welfare may be very different in relation to different definitions of ‘extensive farming’: in the first case (mere outdoor access), an improvement is expected because animals will have more space and more opportunities to express behaviours compared to animals kept indoors; in the second case (limited productivity) feed restrictions at some times of the year may, on the contrary, reduce welfare. Therefore, Welfare Quality® partners argued that an extensive system cannot be considered *a priori* as providing higher welfare to animals and it was necessary to check the results obtained by such a system on the animals (ie using the Welfare Quality® protocols). It may turn out that some conditions that are generally considered positive to animals (by laypeople or scientists) do not score well with the Welfare Quality® protocols. If this happens, a thorough analysis will be necessary: it might be that some key elements are missing in the Welfare Quality® protocols, leading to misinterpretations, or alternatively it might imply that the conditions that were judged positively actually turn out to limit welfare.

Discussion

In developing the Welfare Quality® protocols two main controversies emerged between the public (a sample of which was convened in the focus groups and citizen juries) and the animal scientists. The first one related to the characterisation of animal welfare: for the public animal welfare meant that animals could experience positive emotions, while for the scientists animal welfare meant primarily the absence of suffering. The second one related to the conditions for achieving high welfare: a normative, *a priori* definition of the environment in which farm animals should live prevailed in the public (eg outdoor living, not confined housing) while the scientists proposed a non-normative, outcome-based evaluation of different systems, with no *a priori* judgement of what level of welfare a system can achieve.

These controversies were played out in the public spaces of the focus group discussions and the citizen juries. Following Callon (Callon *et al* 2009) we call these spaces hybrid forums (here we use the term hybrid forums in a broad sense, Callon *et al* characterise hybrid forums in a more articulated way):

forums because they are open spaces where groups can come together to discuss technical options involving the collective; hybrid because the groups involved and the spokespersons claiming to represent them are heterogeneous, including scientific experts,[...] NGOs and laypersons who consider themselves involved.

In the case presented here they were also hybrid because the questions asked and the problems addressed were not confined to the animal scientists’ domain and framing but they addressed a variety of issues, ranging from ethics to nutrition, from human health to environmental sustainability.

We believe that these hybrid forums are a productive response to the increasing uncertainties engendered by technoscience, in this case animal production, because they promote an approach to problems based on collective learning and experimentation. The dialogue established in these forums created some important effects. For the participants in the focus group discussions and, especially, for the participants in the citizen juries, the conversation with the scientists was considered most valuable for providing information on the characteristics of modern animal farming practices, for the characterisation of welfare risks in each system of production and for the information about the tools that can be used for assessing the quality of life of farm animals. Many of the participants appreciated the opportunity of learning about the lives of farm animals and praised the elements of animal advocacy in the animal scientists' work. Furthermore, the emerging perception that animal scientists were also 'animal advocates' enhanced participants' trust in their accounts of what is important for animals.

The controversies that arose between the views of citizens and those of the scientists developing the Welfare Quality® protocols for assessing welfare also helped to refine these protocols. First, for the scientists, the input from the participants in the focus group discussions had a direct effect in promoting the identification of ways to measure positive emotions (eg the Qualitative Behaviour Assessment). Second, recommendations for the implementation of the Welfare Quality® protocols were drawn partly from results from the citizen juries. For instance, it has been made clear that the implementation of assessment protocols, such as the ones developed in Welfare Quality®, should not replace prescriptive norms, and that systems which are known to pose a high risk to animal welfare (eg battery cages for hens) should not be used. Other, more welfare-friendly systems, should nevertheless be assessed, especially because the welfare of animals depends not only on the system but also on the stockmanship and the animals themselves (eg their breed). This was summarised as: "ban the bad systems and assess the good ones". Third, and again partly as a response to public consultation, the Welfare Quality® project recommends the adoption of stricter rules for allocating farms to higher classes of welfare in the future. Finally, the input from the citizen juries will certainly have an impact on the way the Welfare Quality® protocols are explained to a broader audience.

The controversies highlighted during the focus groups and citizen juries were also present within the scientific community. For instance, the decision by scientists to develop Welfare Quality® protocols essentially from measures taken on animals (outcome-based measures) rather than by checking whether the environment or the management of the animals was in accordance with actual recommendations (prescriptive approach) was taken only after extensive discussion between scientists (some of which were advocating the former approach and some of which were advocating the latter). Similarly, most scientists (if not all) favoured strict rules to allocate farms to welfare categories. The unanimity rule, whereby a farm or a

slaughter plant would be considered acceptable only if it scores acceptable (ie above 20) for all principles received large agreement. It was only after this was found to be non-realistic at present that this rule was abandoned, at least for the moment. Nevertheless, the feedback received from focus groups and citizen juries greatly helped in formulating these controversies and taking them into account when formulating the recommendations for future development and implementation of the protocols.

This dialogue also showed that technical, ethical and political decisions are highly interwoven, and the borders between these domains are porous and subject to constant challenges. One big challenge remaining concerns the definition of animal welfare. This consultation showed that it will not be easy to reach a consensus on what animal welfare is and how it should be achieved/improved. Different sensibilities and preferred options remain both within animal science and in the public. However, this experience showed that an agreement might be achieved on how to give an account of the quality of life experienced by farm animals and how dialogue can increase trust and respect, even if ideological differences remain.

The interactions between animal and social scientists have been of prime importance within the Welfare Quality® project. The hope is that the outputs of Welfare Quality® will be more robust and will 'travel' well across Europe, and further afield, thanks to these interactions because the project has brought together insights from animal science, which offers a powerful tool to measure animals' physiology, behaviour and emotions, and insights about the values of the various constituents of the public and their expectations about an assessment protocol that should provide information on the welfare of farm animals.

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