Improving farm animal welfare

Science and society working together: the Welfare Quality approach

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Wageningen Academic
Publishers

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Wageningen Academic Publishers
P.O. Box 220
6700 AE Wageningen
The Netherlands
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ISBN: 978-90-8686-216-0
eISBN: 978-90-8686-770-7
DOI: 10.3920/978-90-8686-770-7

Cover illustration: Raymond Nowak

First published, 2013

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The Netherlands, 2013

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Acknowledgements

This book could not have been written without the commitment and efforts of all the scientists, members of the public, farmers, retailers, NGO's and other stakeholders who contributed to the success of the Welfare Quality® project.

The editors would like to specifically acknowledge all the contributors to this book and last but not least the critical role of the European Union and the 6th Framework Programme (contract No. FOOD-CT-2004-506508). This important step forward in animal welfare science would not have been possible without their vision and support. 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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Chapter 1. Introduction

Harry Blokhuis, Bryan Jones, Isabelle Veissier and Mara Miele

In this book we address the complex and often controversial issues surrounding the assessment and improvement of farm animal welfare from production to consumption by addressing a crucial question, i.e. what is a good quality of life for a farmed animal? Based on the approach taken in a large, multi-disciplinary EU funded research project called Welfare Quality®, the book discusses the pressing need for reliable and holistic science based welfare assessments and the importance of establishing a fruitful dialogue between science and society. It then crucially describes the establishment of the Welfare Quality® Principles and Criteria for good welfare, the development of workable welfare assessment and scoring systems for cattle, pigs and chickens as well as practical ways of improving selected aspects of the animals' quality of life. In short, this book synthesises the huge body of work carried out by the largest ever international network of scientists and stakeholders in Welfare Quality® and describes why particular paths were chosen, some of the obstacles encountered and how they were overcome, as well as selected outputs and major achievements. It also clearly sets out what still needs to be done and presents selected strategies and technologies (automation, proxy indicators, targeting of risk factors, etc.) designed to ensure the continued improvement of welfare and its assessment.

It is almost 10 years since the first aims and approaches of the Welfare Quality® project were formulated by a small group of committed scientists in response to the European Commission's call for proposals with the ultimate objective 'of improving animal production methods that take into account consumer demands for high standards of animal welfare, health and food quality'. New knowledge should be generated regarding objective indicators of welfare status and amelioration of welfare problems. The project should link together a wide range of stakeholders and stimulate a science-society dialogue on welfare issues in farming. To address this call we focussed on a multidisciplinary approach and the integration of European strength in the field of animal welfare.

Our research proposal was successful and Welfare Quality® was financed by the Commission under the European 6th Framework Programme for Research and Technological Development (FP6). The full title of the project was 'Integration of animal welfare in the food quality chain: from public concern to improved welfare and transparent quality'. The project itself began in May 2004 and ended in December 2009. By then it had become the largest piece of integrated research work ever carried out on animal welfare in Europe. The partnership involved approximately 200 scientists

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DOI 10.3920/978-90-8686-770-7_1, © Wageningen Academic Publishers 2013

representing 43 institutes and universities in 13 European and 4 Latin American countries (see list of partners in Appendix 1). Collectively, the participants offered a broad range of specialist expertise in several disciplines ranging from the social sciences to numerous branches of biology. Indeed, the Welfare Quality® partnership included many of the leading European experts in farm animal welfare.

A strong management structure was established as early as the proposal writing stage and this helped ensure that the project hit the ground running. A Steering Committee (SC) took ultimate responsibility for the overall management of the project and was supported by a Management Team consisting of the SC and the leaders of each of the four main sub-projects. These two bodies were assisted by a professional project office which developed, in close co-operation with the SC, dedicated and effective management and administration tools for the day to day running of the project. Two advisory bodies were also established to work with the SC and other project participants. The Advisory Committee consisted of an ethicist and representatives from farmer, animal breeding, retail, food service, certification and veterinary organisations. They provided advice on the relevance, timeliness and progress of the work and incoming proposals and on the inclusion of specific issues and strategies. A Scientific Board consisted of international experts whose collective knowledge covered all aspects of the project with a remit to help assess the scientific and technical quality of the work.

Within FP6, the Thematic Priority 'Food Quality and Safety' was defined with the primary objective to improve the health and well-being of European citizens through ensuring a higher quality of food. It was becoming increasingly recognised at this time that consumers expected their animal-related products, especially food, to be produced and processed with greater respect for the welfare of the animals (Blokhuis *et al.*, 2003). Thus, their perception of food quality was clearly determined not only by the overall nature and safety of the end product but also by the welfare status of the animals from which the food was produced. In other words, the welfare of farm animals became more and more a part of an overall concept of 'food quality'. Since consumers are the ones who buy the product it was clear that their demands should be the major drivers for change in the whole production chain ('from fork to farm').

The public was concerned not only about the status of animal welfare but also about the relative lack of clear and easily understood information that would allow them to make informed choices about the animal products they buy (Blokhuis *et al.*, 2003). Other very influential drivers of efforts designed to improve welfare included government and industry. Firstly for example, the fact that poor welfare can result in poor animal health was widely accepted and this led policy makers and risk managers to adopt a new approach by integrating animal welfare, animal health and food safety

(Blokhuis *et al.*, 1998, 2008). Secondly, it had also become increasingly recognised that productivity, product quality and profitability are often reduced if the animals' welfare is compromised (Hemsworth and Coleman, 1998; Jones, 1997) thereby pointing to the strong economic as well as ethical and safety reasons for assessing, safeguarding and improving farm animal welfare.

An integrated programme of research was clearly required to help satisfy a number of needs including: to improve animal husbandry and animal welfare from housing to slaughter, to assure European citizens and other stakeholders of the quality of the food products, to provide the related information they demanded regarding the welfare status of farm animals, and to safeguard the sustainability of European agriculture. The Welfare Quality® project addressed this growing societal need of consumers and citizens for a high welfare quality and increased transparency of production. Our collaborative efforts were designed to ensure the clear integration of animal welfare in the food quality chain and involved animal and social scientists, mathematicians, farmers, processors, slaughter house managers, retailers, NGOs, members of the public, etc. In short, the Welfare Quality® project provided an excellent example of science and society working together to improve farm animal welfare.

A reliable system for assessing animal welfare on farm and at slaughterhouses was identified as one of the primary requirements (Blokhuis *et al.*, 2003). Although animal welfare can be a difficult concept to define there was general agreement within the scientific community about the broad terms of what represents good animal welfare. This consensus had been synthesised and elegantly expressed by the UK's Farm Animal Welfare Council in the 'Five Freedoms' (FAWC, 1992). The Welfare Quality® consortium recognised that to be widely accepted a balanced welfare assessment system has to satisfy public, industry, political and scientific concerns. Therefore, Welfare Quality® researchers expanded these earlier approaches to animal welfare definition and assessment and established a holistic concept covering the different domains of animal welfare. In a critical first step, the views of consumers, industry, farmers, legislators and scientists were drawn together to establish four principles which were considered essential to safeguard and improve farm animal welfare: good housing, good feeding, good health and appropriate behaviour. Twelve distinct but complementary criteria for good welfare were then defined within these four principles. These principles and criteria complemented and extended the Five Freedoms and they provided the solid platform that was needed to build the Welfare Quality® assessment system.

Hitherto most of the protocols used by various schemes to monitor animal welfare on farms and at slaughter relied heavily on design- or resource-based measures. In contrast, and as early as the proposal writing stage, the Welfare Quality® team made a

deliberate decision to focus on the state of the animal rather than just the nature and quality of its living conditions, although of course these have a large impact on the actual welfare status of the animal (Blokhuis *et al.*, 2003). Therefore, Welfare Quality® focussed primarily on the development of animal-based measures, which attempt to assess welfare from the animals' point of view. This viewpoint formed the basis for the development of an assessment tool that we believe can play a central, on-going and evolving role in many processes designed to improve farm animal welfare as well as in regulatory efforts in this area.

Reporting the detailed results of the assessment measures to the farmer is a central part of the Welfare Quality® vision. The subsequent provision of scientifically sound knowledge-based advice on appropriate remedial measures for specific welfare problems is an integral component of this feedback process. In this context Welfare Quality® researchers identified a number of practical ways of improving the welfare of pigs, cattle and poultry. Welfare Quality® scientists are continuing to build a Technical Information Resource (TIR) on welfare improvement strategies that have been developed both within and outside the Welfare Quality® project (Chapter 8; Jones and Manteca, 2009).

Apart from its considerable output, the many multi-national and multi-disciplinary efforts engendered in the Welfare Quality® project made an immense contribution to the stimulation of a widespread integration of research teams in Europe and beyond. Examples of the various disciplines involved include biology, biochemistry, ethology, psychology, physiology, animal science, animal husbandry, mathematics, ethics, economics and social sciences. Coordinated and collaborative efforts are not only required by the transnational perspective of the animal welfare issues but are also considered essential in order to overcome the fragmentation of research in Europe along national and institutional barriers. The Welfare Quality® project clearly addressed these issues which are central to the concept of the European Research Area (http://ec.europa.eu/research/era/index_en.htm).

There is little point in producing a large amount of potentially valuable information and then leaving it to sit on a shelf. Therefore, the Welfare Quality® team devoted substantial effort to the communication and dissemination of its findings and recommendations to a broad audience. The disseminated material included: a dedicated website; welfare assessment protocols for each of the seven animal groups; three Welfare Quality® stakeholder conferences and their related proceedings; a series of twelve Welfare Quality® reports on various aspects of the project and its findings; several easily understandable fact sheets covering some of the innovative strategies, knowledge and recommendations concerning farm animal welfare that were engendered by the project; a Technical Information Resource for practical welfare

improvement strategies; many popular publications and scientific papers; numerous media interviews and newspaper articles, and the Welfare Quality® DVD (see www.welfarequality.net and www.welfarequalitynetwork.net).

Although the Welfare Quality® project finished at the end of 2009 its legacy continued in the form of two related projects: the European Animal Welfare Platform (EAWP) and the Welfare Quality Network (WQN) (Chapter 10) as well as numerous smaller projects that utilise or further develop Welfare Quality® results. A new initiative – the Coordinated European Animal Welfare Network (EUWelNet) also started near the end of 2012 (Chapter 10).

Rather than serving as an all-encompassing report this book aims to provide a brief but comprehensive overview of the thinking behind the work as well as the efforts of all the scientists, farmers, retailers and other stakeholders who contributed to the success of this very large Welfare Quality® project. It is also intended to ensure that the many important results and recommendations generated in the project are gathered together in one easily accessible source. An interested reader can easily find greater detail and in-depth discussion by following the relevant links and numerous references cited in the following nine chapters.

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Chapter 2. Changes in farming and in stakeholder concern for animal welfare

Mara Miele, Harry Blokhuis, Richard Bennett and Bettina Bock

2.1 Introduction

The present chapter aims to describe and discuss the socio-economic developments and the related scientific advancements that formed the background and context of the Welfare Quality project. This project was clearly a 'child of its time'. In the last decades animal welfare issues have attracted growing public attention and research in this area has grown to become a mature scientific discipline that is capable of addressing the new societal, political and market demands for more animal friendly types of production. This chapter specifically addresses the changes in animal farming that have occurred in the last fifty years as well as the emergence of animal welfare science. It then examines EU policy and legislation on the protection of farm animal welfare and changes in farmers' attitudes and stakeholders' concerns regarding animal welfare in Europe. The final section is dedicated to the analysis of the rise of public concern for farm animal welfare as well as the conditions for the emergence of consumer demand for animal friendly products.

2.2 Changes in animal farming in the post World War II era and the emergence and role of animal welfare science

Livestock production is the world's largest user of land and accounts for almost 40% of the total value of agricultural production. In industrial countries this figure is more than 50% and in developing countries it is rapidly rising from the current 33% (Bruinsma, 2003). Livestock production has achieved this prominence in recent times, with the strong specialisation of animal husbandry for food production predominantly in industrial countries, while in developing countries farmed animals are still used for work (e.g. transport, haulage, ploughing) and other purposes[1] as well as for food. Global meat production has tripled from 47 million tons in 1980 to 139 million tons in 2002 (Steinfeld *et al.*, 2006) and it is expected to double by 2030 (Bruinsma, 2003) due to the rising demand especially in developing countries where people are adopting western diets and styles of consumption (Hendrickson and Miele, 2009).

[1] As 'piggy bank'/saving, and for farm labour- ploughing especially.

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DOI 10.3920/978-90-8686-770-7_2, © Wageningen Academic Publishers 2013

Western Europe (with North America and East Asia) are the regions with the highest industrialisation of animal production, the highest concentration of animals reared for food in the world, and with the highest levels of output per animal unit (Ruttan, 1998). These outcomes reflect the major changes that have taken place in the (Western) European animal production sector during the latter part of the 20th century and, as Hendrickson and Miele (2009) have argued, while these changes contributed to an increased food security in Europe they also affected the welfare of farmed animals and raised public concerns about farming (Blokhuis *et al.,* 1998; Fraser, 2008). The changes in farm structural and enterprise characteristics were heavily influenced by the European Union´s Common Agricultural Policy (Winter *et al.*, 1998) that promoted mechanisation and specialisation of farming. Whereas the overall number of farms fell markedly there was a significant rise in the number of animals per farm (Porcher, 2006). For instance, the average number of laying hens in the Netherlands increased from about 17.7 million in 1976 to 30 million in 1997 even though the number of farms with laying hens decreased over that period from about 13,750 to 2,340 (CBS, 1998; LEI/CBS, 1984). Another example is the number of farms raising meat-producing species such as chickens, pigs and cattle in Denmark where the percentage decrease per year between 1970 and 2000 was 3.1, 3.0 and 2.6 respectively (Fraser, 2005).

Moreover, during this period the level of production per animal increased enormously. Between 1960 and 1995 the milk produced per cow in the Netherlands increased by almost 60% and, due to continuous genetic selection for increased growth rate and better food conversion in broiler chickens, the time required to reach a live weight of 1.8 kg decreased from 91 days in 1954 to only 37 days in 1996 (Vos, 1997). It is now thought that broilers reach a set '5-week slaughter weight' almost half a day sooner each year (P. Cook, Food Animal Initiative, personal communication).

Furthermore, most animals nowadays live in highly specialised farms that concentrate on a specific type of production such as milk, poultry meat or veal. Such specialisation is also apparent within a specific production chain. For instance parent stock that produce hens for egg production are kept on specialised farms, the eggs are then transported to hatcheries where laying hen chicks are hatched, these are then transported to farms that specialise in the rearing of chicks to about 17 weeks, at which time the young hens are transported to the actual egg producing units.

These changes were made possible and were also stimulated by parallel developments in housing systems and management practices as well as related mechanisation and other technological developments.

Housing conditions, especially for pigs and poultry, changed profoundly where low-density systems (often outdoor) were replaced by housing systems (often indoor) characterised by high animal density with minimal living space for the individual and a very barren environment (Blokhuis, 1999). These systems allowed a high degree of mechanisation, such as automatic manure removal, egg collection, climatic control, etc. thereby decreasing the labour requirement. The latter contributed to an enormous decrease in the workforce employed[2] in EU (12 Member States) agriculture which fell from 13.5% to 5.5% between 1970 and 1994 (Grant, 1997).

Thus animal production intensified enormously over the last 50 years or so, especially in developing countries that, since the 90s, produce more meat than developed countries (Fraser, 2008). And global meat production is projected to more than double from 229 mt in 1999-2001 to 465 mt in 2050, while milk output is set to climb from 580 to 1,043 mt (OECD-FAO, 2011).

This intensification not only enables a large increase in production volume but also increased food security/independence in Europe and other industrialised countries, with significant changes in diet (high increase in meat consumption, as shown in Table 2.1). However, the barren housing conditions, high production levels and profound mechanisation also caused growing concern and fierce societal debate regarding the welfare of the animals. The concerns for the quality of life of a rapidly growing number of animals used in food production, firstly voiced by some animal advocates and pioneer scientists but quickly grown into a new social movement, also paralleled the development of a specific area of research that eventually integrated expertise from several disciplines, including veterinary science, biology, physiology, neuroscience, ethology and ethics, and gave birth to what is now known as 'animal welfare science'.

Table 2.1. Changes in meat consumption kg per person per annum in the last 40 years (FAO, 2004.

Region	1961	2002
Europe	56	89
USA	89	124
China	4	54

[2] Even more evident in the crops sector.

2.3 Development of animal welfare science

The scientific study of animal welfare is a relatively young but well established scientific discipline (c.f. Millman *et al.*, 2004). The area has developed over the last four or five decades and continues to expand and diversify to meet new challenges and new opportunities. It is generally accepted that animal welfare is about the animal itself, and the increasing integration of fundamental biological sciences is contributing towards a greater understanding of the link between the animal's biology and its welfare state. Parallel to the basic research there is a rapidly growing area of applied animal welfare research directed towards continued improvement of ways to measure the welfare of farmed animals in practice (on farm, during transport and at slaughter) and to the development of practical strategies designed to enhance welfare.

Blokhuis *et al.* (2008) illustrated the development of animal welfare science with the dramatic increase in the total numbers of publications on animal welfare and animal wellbeing. They reported that a literature search in Web of Science in 2007 generated over 35,000 'hits', and 46% of the publications could be attributed to authors with an address in Europe, 38% were from North America, 10% from Asia, 3% from Australia and New Zealand and 3% from South America. An enormous output such as this reflects the importance of animal welfare globally and the leadership of European research.

The brief overview of animal welfare science in the context of the food chain that follows is mainly derived from the paper published by Blokhuis *et al.* in 2008[3]. That paper identified four main influential areas representing the contributions made respectively by research related to the animals themselves, their housing and husbandry, the role of societal concerns and animal welfare policy.

The origin of farm animal welfare science dates back to the 1960's (Brambell Committee, 1965; Harrison, 1964). Since that time the distinction between animal protection (*what people are allowed to do to animals*) and animal welfare (*probing the animal's own experience of its situation*) has grown and it is now accepted that animal welfare science is largely about the assessment of the animal's own experience. The two most widely quoted definitions (Broom, 1996; Duncan, 1993) state that animal welfare concerns an animal's ability to cope with its environment and, because the concept is only applied to sentient animals, animal welfare focuses on how animals feel. Thus, fundamental research in this area usually reflects the need to get '*inside the mind*' of the animal.

[3] This section draws on the significant contribution of Linda Keeling to this previously published paper.

The dominant research disciplines in this area are the behavioural and physiological sciences. For instance, the way the body responds to stressful stimulation is a key area, with clear and important consequences for productivity, product quality and profitability (Jones, 1997; Jones and Boissy, 2011; Gregory, 1998). The work often involves studies of animals' responses to exposure to acute and chronic stressors, especially the functioning of the Hypothalamic Pituitary Adrenal (HPA) axis (Mormède *et al.*, 2007), although the concept of allostasis is being increasingly used in the context of animal welfare (Korte *et al.*, 2007). However, the way in which an animal perceives the nature and intensity of a situation also affects its behavioural and physiological responses (Jones, 1997; Paul *et al.*, 2005). Cognition refers to the mental abilities of animals; in particular their perception, reasoning and development of expectations. Consequently, cognitive ability and processing are major determinants of animals' reactions to different situations, not least the extent to which they are capable of experiencing suffering. The emerging areas of cognition and animal emotions are therefore increasingly important in animal welfare science (Boissy *et al.*, 2007; Forkman *et al.*, 2007; Jones and Boissy, 2011).

Of course there are many other approaches where the animal and its responses are the focus of attention. The cross-disciplinary and multidisciplinary approaches that are being increasingly adopted to address these advanced biological questions and the enhancement of animal welfare merit special mention. Examples of such collaborative ventures include the combination of a number of scientific disciplines with societal, ethical, economic and industry perspectives in international projects such as Welfare Quality®, the European Animal Welfare Platform, DIALREL, EUWelNet, etc.

There is also a considerable body of work and a wealth of knowledge regarding animal housing and husbandry. Early studies concentrated on comparing the effects on welfare of keeping animals in different housing systems under controlled conditions. This work produced useful results but it did not (and probably could not) reflect the wide range of housing systems found in practice. Therefore, research in animal welfare where the effects of housing and husbandry conditions are addressed frequently adopts an epidemiological approach that involves examination of animal physiology, behaviour, health and production under commercial conditions (e.g. Gunnarsson *et al.*, 1999; Moinard *et al.*, 2003). The importance of good stockmanship and good management has again come to the fore. For example, in the case of broiler chickens, it has been shown that environmental conditions in the house (humidity and ambient temperature in particular) are decisive factors (at least under the densities studied: 30-46 kg/m^2) that govern the birds' health and mortality (Dawkins *et al.*, 2004). Since these environmental factors are determined by management practices there is a rapidly growing trend in animal welfare science towards developing decision support systems for farmers that can be used to reduce risks to welfare and to identify