Veterinarski Glasnik 2021, 75 (2), 145-151
UDC: 636.083
502.131.1:636
https://doi.org/10.2298/VETGL210514007B

Mini Review

FARM ANIMAL WELFARE: A KEY COMPONENT OF THE SUSTAINABILITY OF FARMING SYSTEMS

Donald M. BROOM*

St Catharine's College and Department of Veterinary Medicine, University of Cambridge, Madingley Road, Cambridge, CB3 0ES, U.K.dmb16@cam.ac.uk

Received 14 May 2021; Accepted 24 June 2021
Published online: 19 July 2021

How to cite: Donald M. Broom. Farm animal welfare: a key component of the sustainability of farming systems. Veterinarski Glasnik, 2021. 75 (2), 145-151. https://doi.org/10.2298/VETGL210514007B

Abstract

Consumers of food and other products now demand sustainability of production methods and, for most people, the welfare of production animals is an important component of sustainability. Products are not considered to be of good quality unless the welfare of the production animals is good. This is part of a more general change in knowledge that there are few differences between humans and other animal species, with the conclusion that each individual life should be valued and that causing poor welfare to a farmed animal is morally wrong. All vertebrate animals and some invertebrates are now shown to be sentient, that is they have the capacity to have feelings. There have been major advances in animal welfare science so that housing and management systems that result in poor welfare of the animals are now identified and every producer needs to change their systems and methods to ensure good welfare and avoid all of the worst welfare problems.

Key Words: welfare, sentient, management, sustainability

ATTITUDES TO FARM ANIMALS AND SUSTAINABILITY

The attitudes of people to non-human animals have been changing rapidly. The development of research on sentience has shown that mammals, birds, fish and some invertebrates have sufficient cognitive ability and awareness to have the capacity to

*Corresponding author – e-mail: U.K.dmb16@cam.ac.uk

have feelings and emotions (Broom, 2014). As a consequence, increasing numbers of consumers consider all of these animals as individual sentient beings and do not wish to buy products if the welfare of animals has been poor in the course of production (Tarazona et al., 2020). In many aspects of biology there is more evidence for the similarities between humans and other animals than evidence of differences. There is only one biology, one welfare and one health and these terms mean the same in relation to humans and non-humans (Karesh 2014; García Pinillos et al., 2016; Tarazona et al., 2020; Broom, 2021b). Humans are animals and whenever the term 'animal' is used it includes humans, all other vertebrates and all invertebrates. The concept of humans as being special in some way is not biologically sound.

A related change in thinking is increased concern about the sustainability of systems, including animal and plant production systems (Aland and Madec, 2009). If a production system is profitable and there is a demand for the product, this does not mean there is sufficient reason for the continuation of production (Broom, 2010). Sustainability now has a much wider meaning than it had in early writings on the subject (Broom, 2017a, b). The ethics of the production method are now included and a system can be unsustainable for a range of negative impacts. A definition of sustainability is: a system or procedure is sustainable if it is acceptable now and if its expected future effects are acceptable, in particular in relation to resource availability, consequences of functioning and morality of action (Broom, 2014). The positive effects of food as a source of nutrients are the subject of much thought by consumers selecting foods, but there is also consideration of the sustainability of each food item. Sustainability has many components and, in most analyses of sustainability of food products, consumers look for the negative, that is, for components that make the product or production system unsustainable. Examples of negative components are: adverse effects on human welfare, including health; poor welfare of production or wild animals; animals being killed during production; inefficient usage of land, water and other world resources; harmful environmental effects, such as greenhouse gas production; reduction in carbon sequestration; water pollution; low biodiversity and insufficient conservation; unacceptable genetic modification; not being "fair trade", in that producers in poor countries are not properly rewarded; insufficient job satisfaction for those working in the industry; and damage to rural or other communities (Broom, 2010, 2017b). A scoring system, that takes account of all of the components of sustainability, uses the best available science to score each component and to produce a total sustainability score based on these scores (Broom 2021a). The criteria for sustainability are also used when consumers are evaluating the quality of goods. The concept of quality initially included immediately observable aspects and the consequences of consumption, but for many people the ethics of the production method is now also included. Modern consumers require transparency in commercial and government activities and take account of the ethics of production when they evaluate product quality (Broom, 2010, 2017a, b). Because of the increase in the availability of information about food production, the economy of societies has been

changing and there is now more of a pull society driven by consumers and less of a push society driven by producers (Broom, 2014, 2017a). If producers do not carefully consider all that consumers require, their businesses may not survive.

Many people have assumed in the past that cows, sheep, pigs and chickens have very limited cognitive ability but those who work with farm animals know that they often work out ways to beat the system imposed on them. For example, sows with a transponder on their collar that operates a feeding station learn how to operate this rapidly. When a sow found a collar that had fallen off another animal, she picked it up and got a free meal for several days before the farmer noticed she was doing so. Behavioural scientists have compared learning ability in domestic animals using mazes. Kilgour (1987) used mazes with a decision point where there are two or more possible directions to take, one being towards a concealed target reached after two further turns. When the numbers of errors were measured, cows, sheep, goats and pigs performed a little less well than 5-year-old children but better than dogs, cats, rats, horses and several other mammals and birds. When speed of learning was compared in the same study, the sequence was very similar but dogs performed as well as the farm ungulates.

In other studies, cows, sheep, pigs and fish learned rapidly to discriminate other individuals of their own species, or to discriminate between humans (Kendrick et al., 1995; Swaney at al., 2001; Mendl et al., 2002; Hagen and Broom, 2003). Does a chicken have a concept of an object when it is not directly detectable? Studies by Vallortigara and colleagues showed that, not only could young domestic chicks go to objects hidden behind screens but that when two or three objects were hidden behind screens, the chicks went to the screen with the larger number of objects (Rugani et al., 2009). Can farm animals remember and use a visual symbol for a resource? Langbein et al. (2004) found that goats could respond by carrying out an action, or operant, in order to get water when they saw one particular picture rather than others. A complex array of concepts in pigs was evident from studies by Held et al. (2000). Pigs were put in a room and allowed to find hidden food. On the next day they were returned to the room and they went immediately to the place where they had found food. If another pig was watching, the pig waited and did not go to the food if that other pig was known from previous experience to be able to steal from it. If the other pig was known not to steal, the food was immediately approached. These pigs must have had a concept of an object in the absence of that object, a concept of a location, and an ability to predict that in the future it might have the food item stolen from it.

The ability to learn what is in a mirror is demonstrated for only a few species, pigs being one of these. Broom et al. (2009) exposed 4-6-week-old pigs to a mirror for the first time in such a way that they could see a food bowl otherwise out of view behind a barrier. The young pigs went behind the mirror to the apparent position of the food bowl. However, when given five hours' experience of a mirror, they responded initially to it as if to another pig but later by looking at the image as they moved. After this experience with the mirror, seven out of eight pigs tested moved away from the mirror

and around the barrier to the food bowl. Location by odour was prevented by fans and the naïve controls had exactly the same olfactory situation. To use information from a mirror and find a food bowl, each pig must have observed features of its surroundings, remembered these and its own actions, deduced relationships among observed and remembered features and acted accordingly.

Emotion, which has long been viewed as necessarily separate from intellectual activity, is now shown to be a facilitator of learning and a consequence of learning. An indication of the possible awareness of own actions and functioning comes from the studies of Hagen and Broom (2004) on young cattle. The heifers were put in a pen with a gate that could be opened by pressing a panel with the nose, thus giving access to food 15m away. They learned to do this and, at the time of solving the problem of how to open the gate, showed an excitement response of increased heart rate and jumping or galloping. This "Eureka" effect was not shown by control animals which were just given access to the reward or by heifers which had learned earlier how to open the gate. Evaluation of welfare can use the link between emotion and motivation or cognition, for example in studies of judgement or cognitive bias (Mendl and Paul, 2008).

Assessing the welfare of farm animals

Welfare is a term used to refer to any animal, including humans. The welfare of an individual is its state as regards its attempts to cope with its environment and coping means having control of mental and bodily stability (Broom, 1986). Welfare assessment involves direct indicators of the extent of any failure to cope, any difficulty in coping, and signs of good welfare. One method of attempting to cope is to show behavioural or physiological responses that are part of one of the various functional systems, such as regulation of body fluid concentration. A second method is to utilise a behavioural strategy that is additional to those that are normally part of the functional system, in order to minimise risks such as those of predator attack, disease, or other injury. A third method of coping is to use emergency behavioural and physiological responses, which include fleeing, freezing, activation of the hypothalamic-pituitary-adrenal (HPA) axis, and activation of the sympathetic nervous system-adrenal medulla pathways. A fourth coping method is to use the immune system, principally but not entirely in combating invasion by pathogens. A fifth coping method involves cellular responses to tissue damage or tissue invasion, such as the action of the wound-healing system and apoptosis as a defence against tumour cell proliferation. Several of the coping methods are involved in coping with pathology, that is, they contribute to health which health is an important part of welfare. Most aspects of the coping methods involve brain control and, in many cases, feelings are involved. Positive and negative feelings, such as pain fear, anxiety and various aspects of pleasure, are adaptive mechanisms that aid in coping with the environment. Some measures are most relevant to short-term welfare problems, such as those associated with human handling or a brief period of adverse physical conditions, whereas others are more appropriate to long-

term problems. The needs of animals can be investigated by studies of avoidance and positive preferences and also by using direct negative welfare indicators if it appears that needs are not being met or positive welfare indicators if they are met. Measures of welfare are described by Fraser (2008), Broom and Johnson (2019), Broom (2021b).

A major stimulus for farm animal welfare research was the book and later national and international work of Ruth Harrison, starting in the 1960s (Harrison, 1964; Dawkins, 2013). During the last thirty years there has been an enormous increase in the number of animal welfare scientists and in publications about a wide range of farmed and other animals (Broom, 2014).

The consequence of these changes for farmers

The high level of concern about the welfare of farmed animals, as well as the general concern about sustainability, means that every farmer has to be aware of all of the impacts of housing and management practices. For example, plant production methods that result in the deaths of mammals, birds, bees, butterflies and soil animals are condemned by more and more consumers. There are now many consumers who never eat pig meat in case the sows were kept in stalls or tethers or the fattening pigs were not given enough material for rooting and manipulation. Consumers also refuse to buy eggs unless they have a verifiable label saying that the welfare of the hens was good and refuse to buy dairy products unless lameness, mastitis and reproductive disorders were at a very low level in the cows. Consumers have concerns about use of anaesthetics and analgesics during operations like castration, welfare during transport and welfare at slaughter. Farmers can protect their future business prospects by considering the welfare of their animals and other aspects of the sustainability of all systems used.

Competing interests

The author declares that he has no competing interests.

REFERENCES

Aland A., Madec F. (eds) 2009. Sustainable Animal Production. Wageningen Academic Publishers, Wageningen, Netherlands. Van Dijk J. E., Gruys E., Mouwen M. J. 2007. Preface to the second edition. In Color Atlas of Veterinary Pathology (Second Edition), ix. Edinburgh: W.B. Saunders.

Broom D.M. 1986. Indicators of poor welfare, British Veterinary Journal, 142 (6): 524-526. doi.org/10.1016/0007-1935(86)90109-0.

Broom D.M. 2010. Animal welfare: an aspect of care, sustainability, and food quality required by the public. Journal of Veterinary Medical Education, 37: 83–88. https://doi.org/10.3138/jvme.37.1.83

Broom D.M. 2014. Sentience and Animal Welfare. CAB International, Wallingford, UK.

Broom D.M. 2017a. Animal Welfare in the European Union. (pp 75). Brussels: European Parliament Policy Department, Citizen's Rights and Constitutional Affairs. doi: 10-2861/891355.

Broom D.M. 2017b. Components of sustainable animal production and the use of silvopastoral systems. Revista Brasileira Zootecnia, 46: 683-688. doi.org/10.1590/S1806-92902017000800009

Broom D.M. 2021a. A method for assessing sustainability, with beef production as an example. Biological Reviews, https://doi.org/10.1111/brv.12726

Broom D.M. 2021b. Domestic Animal Behaviour and Welfare, 6th edn. CABI, Wallingford, UK (in press).

Broom D.M., Johnson, K.G. 2019. Stress and Animal Welfare: Key Issues in the Biology of Humans and Other Animals, 2nd edn. (pp 230). Cham, Switzerland: Springer Nature.

Broom D.M., Sena, H., Moynihan, K.L. 2009. Pigs learn what a mirror image represents and use it to obtain information. Animal Behaviour, 78: 1037-1041. https://doi.org/10.1016/j.anbehav.2009.07.027

Dawkins M. (ed.) 2013. Harrison, R. Animal Machines, reprint with new commentaries. Wallingford: CABI.

Fraser D. 2008. Understanding Animal Welfare: the Science in its Cultural Context. Wiley Blackwell, Chichester, UK.

García Pinillos R., Appleby M., Manteca X., Scott-Park F., Smith C., Velarde A. 2016. One welfare - a platform for improving human and animal welfare. Veterinary Record, 179: 412–413. https://doi.org/10.1136/vr.i5470

Hagen K., Broom D. M. 2003. Cattle discrimination between familiar herd members in a learning experiment. Applied Animal Behaviour Science, 82: 13-28. https://doi.org/10.1016/S0168-1591(03)00053-4

Hagen K., Broom D.M. 2004. Emotional reactions to learning in cattle. Applied Animal Behaviour Science, 85: 203-213. https://doi.org/10.1016/j.applanim.2003.11.007

Harrison R. 1964, Animal Machines. London: Vincent Stuart.

Held S., Mendl M., Devereux C., Byrne R.W. 2000. Social tactics of pigs in a competitive foraging task: the 'informed forager' paradigm. Animal Behaviour, 59: 569-576. https://doi.org/10.1006/anbe.1999.1322

Karesh W.B. (Ed.) 2014. One Health. O.I.E. Scientific and Technical Review, 38. (O.I.E, Paris).

Kendrick K.M., Atkins K., Hinton M.R., Borad K.D., Fabre-Nys C., Keverne B. 1995. Facial and vocal discrimination in sheep. Animal Behaviour, 49: 1665-1676. https://doi.org/10.1016/0003-3472(95)90088-8

Kilgour R. 1987. Learning and the training of farm animals. In: The Veterinary Clinics of North America, Vol. 3, No. 2, Farm Animal Behavior, ed. E.O. Price, Philadelphia

Langbein J., Nürnberg G., Manteuffel G. 2004. Visual discrimination learning in dwarf goats and associated changes in heart rate and heart rate variability. Physiology and Behavior, 82: 601-609. https://doi.org/10.1016/j.physbeh.2004.05.007

Mendl M., Paul E.S. 2008. Do animals live in the present? Current evidence and implications for welfare. Applied Animal Behaviour Science, 113:357-382, https://doi.org/10.1016/j.applanim.2008.01.013

Mendl M., Randle K., Pope S. 2002. Young female pigs can discriminate individual differences in odours from conspecific urine. Animal Behaviour, 64: 97-101. https://doi.org/10.1006/anbe.2002.3040

Rugani R., Fontanari L., Simoni E., Regolin L., Vallortigara G. 2009. Arithmetic in newborn chicks. Proceedings of the Royal Society B, 276: 2451-2460. https://doi.org/10.1098/rspb.2009.0044

Swaney W., Kendal J., Capon H., Brown C., Laland K.N. 2001. Familiarity facilitates social learning of foraging behaviour in the guppy. Animal Behaviour, 62: 591–598. https://doi.org/10.1006/anbe.2001.1788

Tarazona A.M., Ceballos M.C., Broom D.M. 2020. Human relationships with domestic and other animals: one health, one welfare, one biology. Animals, 10: 43, 23. https://doi.org/10.3390/ani10010043

DOBROBIT ŽIVOTINJA: KLJUČNA KOMPONENTA ODRŽIVOSTI POLJOPRIVREDNE PROIZVODNJE

Donald M. BROOM

Kratak sadržaj

Potrošači danas zahtevaju održivu proizvodnju, a za većinu ljudi dobrobit farmskih životinja je važna komponenta održivosti. Proizvod se smatra kvalitetnim samo ako se poštuje dobrobit životinja. Ovo je deo opšte promene u svesti o tome da su male razlike između ljudi i životinja, što dovodi do zaključka da svaki život treba da se ceni i da su loši uslovi držanja životinja na farmama moralno neprihvatljivi. Pokazalo se da svi kičmenjaci i neki beskičmenjaci imaju osećanja. Zabeležen je veliki napredak u nauci o dobrobiti životinja, tako da su sistemi za smeštaj i upravljanje, koji ne ispunjavaju odgovarajuće uslove za dobrobit životinja, sada identifikovani i svaki proizvođač treba da promeni svoje sisteme i metode kako bi obezbedio dobrobit i izbegao moguće probleme.

Ključne reči: dobrobit, osećanja, upravljanje, održivost