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Animal welfare: an aspect of care, sustainability and food quality required by the public.

Donald M. Broom

ABSTRACT

People feel that they have obligations to the animals that they use and show some degree of care behaviour towards them. In addition to this, the welfare of animals is an aspect of our decisions about whether or not animal usage systems are sustainable. A system that results in poor welfare is unsustainable because it is unacceptable to many people. The quality of animal products is now judged in relation to the ethics of production, including impact on the welfare of the animals, as well as on immediate features and on consequences for consumers. Since genetic selection and management for high productivity may lead to more disease and other aspects of poor welfare, some major changes in animal production systems are demanded by consumers. In teaching animal welfare, a clear definition, that can be related to other concepts like needs, health and stress, is needed. The methodology for the scientific assessment of animal welfare has developed rapidly in recent years and has become a major scientific discipline. No veterinary degree should be accepted unless a full course on the science of animal welfare and relevant aspects of ethics and law has been taught. There should be a national advisory committee on animal welfare science in each country. This should be made up of independent scientists, including veterinarians, who can write impartial reviews of the state of scientific knowledge.

Key words: Animal usage, sustainability, product quality, animal welfare, veterinary teaching, national committee.

THE MORAL BASIS OF ANIMAL USAGE

Humans, and other animals living in social groups throughout much of their lives, will compete with one another but most of their interactions will involve tolerance of others, avoiding harming them, or cooperating with them. If this were not so, social groups would not be stable. As a result of natural selection, moral systems have evolved in humans and other species^{1,2,3,4,5}. People consider that they have obligations to other people and to other animals that they use. As a consequence, they show care behaviour towards individuals. Although the care is most likely to be shown to the persons and animals most frequently encountered, it is addressed to all to some degree. It is widely accepted that each person has a duty of care towards the animals that are kept, whether used as companions, sources of food, means of transport, subjects of experimental studies, or for other purposes. The concern here is the welfare of the living animal. A different ethical concern is whether or not animals should be killed.

SUSTAINABILITY

Although, in some difficult situations, people may think in a short-term way, when decisions are made about whether a system for exploiting resources should be used, a central question is whether or not the system is sustainable. A system or procedure is sustainable if it is acceptable now and if its effects will be acceptable in future, in particular in relation to resource availability, consequences of functioning and morality of action^{6,7}. There are several possible reasons why a system, for example an animal usage system, might not be sustainable. It could be because it involves so much depletion of a resource that this will become unavailable to the system. It could be because a product of the system accumulates to a degree that prevents the functioning of the system.

However, in each of these cases, and in the case of some other aspects of systems, the earliest effect that renders the system unsustainable is one that impinges upon the general public's values in a way the members of the public find unacceptable. Where there is depletion of a resource or accumulation of a product, the level at which this is unacceptable, and hence the point at which the system is unsustainable, is usually

considerably lower than that at which the production system itself fails. Unacceptability is often due to effects on other systems.

A system could be unsustainable because of one of the various harms that result (Table 1). There might be harm to the perpetrator, or to other humans, or to the environment of present or future humans. There might also be harms to other animals.

Table 1 - Reasons for lack of sustainability of a system:

1. resource depletion
 - to level that is unacceptable.
 - to level that prevents system function.
2. product accumulation
 - to level that people detect and find unacceptable.
 - to level that affects other system in an unacceptable way.
 - to level that affects the system itself, perhaps blocking its function.
3. other effect
 - to level that is unacceptable.

In all of the above, the consequences of acts or of system functioning could be unacceptable because of immediate or later:

- [a] harm to the perpetrator : resource loss or poor welfare
 - [b] harm to other humans : resource loss
 - [c] harm to other humans : poor welfare
 - [d] harm to other animals : poor welfare
 - [e] harm to environment including that of other animals.
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No system or procedure is sustainable if a substantial proportion of people find aspects of it now, or of its consequences in the future, morally unacceptable. The people referred to

here are the public everywhere. They may be in a local community, in a nation or in the world as a whole. Hence each of the examples in Table 2 is unsustainable.

Table 2 – Unsustainability – examples of unacceptable harms

1. harm to perpetrator: resource loss or poor welfare
 - [a] system for energy production uses more energy than it produces.
 - [b] machinery for process made of poor quality materials so injury to working person likely.
 - [c] people spreading insecticide on fields likely to be poisoned.

2. harm to others humans : resource loss
 - [a] factory/agricultural system outflow into lake or river – fishing industry lost.
 - [b] heavy metals from industry – reduces farm production.
 - [c] radiation from energy production system – reduces farm production.

3. harm to other humans : poor welfare
 - [a] dioxin released from factory – people become sick, some die.
 - [b] cheap cattle protein fed to other cattle – bovine spongiform encephalopathy in cattle and new variant Creutzfeldt Jacob’s disease in consumers of the meat.
 - [c] work which is too demanding – some workers become injured, depressed or psychotic.

4. harm to other, non-human, animals : poor welfare
 - [a] traditional entertainment for people e.g. bullfight, dog-fight, cock-fight, bear-baiting, throw donkey off church tower.
 - [b] use leg-hold trap for pests or fur-bearing animals.
 - [c] veal production from calves kept in small crates and fed only milk.

5. harm to environment including that of other animals.
 - [a] use of CFCs in refrigerators – ozone layer damage.

[b] use chlorinated hydrocarbon insecticides – birds etc. which are insectivores or top predators killed or unable to reproduce.

[c] produce too much carbon dioxide and other greenhouse gases – global warming.

The consequences of unacceptable practices in manufacturing, animal production or other human activities have become more wide-ranging in the world because of increased efficiency of communication. Adverse effects on people or animals can be reported in the media around the world. Examples of events in this category that led to headline news in world newspapers and television include: people poisoned by insecticide in China, the pollution of a river by manure in Thailand, people catching new-variant Creutzfeldt-Jacob disease by eating beef in the U.K., sheep on an Australian ship dying in large numbers en route to Saudi Arabia, slaughterhouse cruelty and consumer health risk from slaughtered sick cattle in the U.S.A., and chickens killed by inhumane methods during avian influenza control in Indonesia.

As a result of media reports of activities or events that the public find unacceptable, consumers in many countries may refuse to buy animal and other products from the companies or countries involved. There are now many examples of events that led to consumers refusing to buy products. The sales of tuna dropped sharply when it became known that dolphins were being killed in the nets set for tuna. This was a long-term effect and resulted in a permanent change in fishing practices. In the U.K., reporting of the poor welfare of calves kept in small crates for veal production resulted in a drop in the sales of all French products, including unrelated products such as wine. For most consumers, this was temporary but for some it continued until the introduction of European Union legislation banning the production of veal using crate-housing and low iron and fibre diets. The mortality of the sheep on the ship to Saudi Arabia caused a temporary drop in sales of Australian products. Individual retail food companies have been affected, for some consumers permanently, by reports of rainforest destruction for beef production, very low payments to poor coffee farmers in third world countries and cruelty to poultry by suppliers.⁸ A few people respond to information about poor welfare in animals by

becoming vegetarian but a much larger number make some changes to their food purchasing practices.

Consumers drive legislation and retail company codes of practice for animal production . Legislation on animal welfare has developed in the European Union and in many countries because of pressure from voters^{9,10}. The codes of practice of food companies often have international impact. For example, pig producers in Brazil have to comply with the animal welfare standards of United Kingdom markets and egg producers in Thailand have to rear their birds according to the standards of United States markets.

FOOD AND OTHER PRODUCT QUALITY

The concept of the quality of goods that people buy has been changing in recent years. At one time, quality referred only to immediately observable aspects. For an animal food product, this might be its visual qualities and taste. These continue to be important and expectations about taste are tending to become more refined but other factors are now becoming incorporated into what constitutes good quality. Firstly, more of the consequences of consumption are now considered. If a food causes people to become sick, the quality is considered poor. For some consumers, if it makes you more likely to become fat, the quality is considered poor. For others, if food has added nutrients, the quality is considered to be better. Secondly, the ethics of the production method are taken into account. Factors considered by purchasers include: (i) the welfare of the animals used in production, (ii) any impact on the environment, including conservation of wildlife, (iii) ensuring a fair payment for producers, especially in poor countries, and (iv) the preservation of rural communities so that the people there do not go to live in towns.

Consumers of food demand that it be safe, i.e. without damaging levels of toxins or pathogens. Although individual food production companies are expected to be responsible for this aspect of food quality, the public also expects the government to ensure that adequate standards and adequate checking systems exist. To achieve this in the European Union, the European Food Safety Authority (EFSA) has been set up. Part of

the work of the scientists who sit on its Panels and Working Groups is the assessment of risks and benefits. All of these scientists are appointed because of their scientific expertise, they are not representatives of countries or interest groups. The subject area covered by EFSA is wide, reflecting the public concern. One Panel deals with animal disease and animal welfare. The Member States of the E.U., like the U.S.A., have extensive checking schemes for animals before and after slaughter as well as other food products.

To take account of the ethics of the production method, products must be traceable. If foods can be traced, it is less likely that toxins, other poor quality materials or pathogens will be in them.

If animals can be traced, the sources of animal disease outbreaks are more likely to be found and places where injuries, or other causes of poor welfare, occurred are more likely to be found¹¹. Legislation and industry initiatives ensuring traceability are important.

SUSTAINABILITY AND QUALITY TOPICS

Topics that are considered by consumers purchasing animal products and evaluating what is sustainable and what is good product quality include the following: human health; human diet; the acceptability of genetic modification; animal welfare; environmental effects such as pollution, conservation and carbon footprint; the efficient use of world food resources; fair trade i.e. considering poor producers; and preserving rural communities. These factors are considered briefly here, with the exception of animal welfare which is considered in more detail in the following section.

Some examples of human health issues that affect views of product quality are: *Salmonella* in eggs and meat, *Campylobacter* in chicken carcasses, avian influenza

(H5N1 or H1N1) and bovine spongiform encephalopathy (BSE) in beef products. One consequence has been the development of the risk assessment approach.

Concern about human diet has large effects on animal production. In particular, saturated fats increase risks of heart disease and farm livestock are a major source. As a consequence, fish production is increasing rapidly. The production of fish that consume vegetable matter, rather than predators like salmonids, which have to be fed mainly fish products, is likely to increase the most. Farmed fish production is already larger than open water fish production and will overtake it in weight of fish within a few years.

Genetically modified plants are not accepted in some countries because of ethical concerns, the issue being whether or not living things should be modified in the laboratory as opposed to genetic changes that occur naturally. There is also concern because protein changes can cause allergies. Genetic modifications in animals can: benefit the animals (e.g. confer disease resistance), or help to treat human disease (e.g. a blood clotting factor in a sheep's milk), or develop new products for other purposes, or increase efficiency of animal production. Some people accept none of these and many people do not accept the last two as sufficient justification for genetic modification. A major reason for this is that, in some cases, animal welfare may be poorer as a result of the modification. The conclusion of many people is that any production of genetically modified animals should occur only if it has been demonstrated by scientific studies of animal welfare that the welfare of the animals is not poorer than that of unmodified animals as a consequence.

One major reason why animal production systems may be regarded by the public as unacceptable and hence become unsustainable without some modification, is the welfare of animals that are used in the production system. For example, Members of the European Parliament receive more letters about animal welfare than about any other subject⁷. However there is substantial variation within and between countries in the degree of public concern and most people think about animal welfare issues infrequently, unless their attention is drawn to it by media exposes. There is a point at which the

welfare of the animals becomes so poor that the majority of the public may consider the system to be unacceptable. Hence animal welfare and public attitudes to it must be considered wherever the sustainability of an animal production system is evaluated.

Agriculture generally reduces biodiversity. Where wild or semi-wild areas are cleared for animal production, substantial harm can be done to populations of animals and plants. Hence, some animal production is not considered acceptable and products are not bought because these harms have been done. The creation of significant areas of nature reserve is demanded by the public in most countries and preservation of wildlife can sometimes result in greater income through eco-tourism than would have been possible by farming. The purchase of land to conserve natural resources can often stimulate local economies and lead to a sense of regional pride that would not have existed if low level animal production had continued. A further example of a possible adverse impact of animal production on conservation is the inappropriate use of antimicrobials and other medicines. The numbers of several species of vultures in India have declined by 96.8 to 99.9% in 15 years¹². This is a consequence of poisoning by the painkiller Diclofenac and the Indian Government has recently banned its use¹³.

Another cause of unsustainability is mismanagement of resources and effluents that can result in contamination of water supplies, loss of plant nutrients, greenhouse gas production and increased human disease. The animal producer should pay any costs of pollution and, wherever possible, animal waste should be efficiently recycled.

The inefficient use of world food resources is regarded as unsustainable by many. What can be done to change animal production activities so as to exploit existing resources better? One important use of animals for food production is that some can eat food that humans cannot eat. In this regard, raising grazers will often be more advantageous than raising pigs or poultry, since the latter may compete with humans for food. There is great energy loss if we eat animals that consume food that we could have eaten. There is also an effect on greenhouse gas production because carbon dioxide and other greenhouse gases are emitted in the course of production of animals such as poultry and pigs, for

example because of the combustion of materials in the course of food production and the transport of food and animals. This advantage of using grazers can be weighed against any adverse consequences of methane production by ruminants.

Animal agriculture is associated with many traditions and ways of life for people. Many human communities exist as they do as a consequence of particular animal production systems. If that production is changed so that the number of farms is greatly reduced in the original areas, or the whole production system is moved away from those areas, there are social and environmental consequences. The destruction of rural communities is thus another factor that is taken into account by those considering whether animal production systems are sustainable. Within the European Union, for example, a central aim of the Common Agricultural Policy was to preserve rural communities and to reduce the number of people who leave country areas and move to large cities, thus increasing their size.. That policy has been successful in minimizing such movement and some United States government agricultural policies have also had this effect. In many other countries, in contrast, cities have become much bigger and rural communities have declined or disappeared. Similar destruction of rural communities has occurred where the number of people employed on farms has been drastically reduced because machinery, often with high energy consumption, has replaced the people. When all of the costs of agriculture on: the welfare agricultural animals, energy usage, conservation, of natural environments, the welfare of human consumers and agricultural workers, rural communities, etc, are properly evaluated, major changes will ensue. Sustainable agriculture is the only way forward.

TEACHING ANIMAL WELFARE

Welfare is a term that refers to animals including man. It requires strict definition if it is to be used effectively and consistently. A clearly defined concept of welfare is needed for use in precise scientific measurements, in legal documents and in public statements or discussion. If animal welfare is to be compared in different situations or evaluated in a

specific situation, it must be assessed in an objective way. “Welfare” refers to a characteristic of the individual animal rather than something given to the animal by man. The welfare of an individual is its state as regards its attempts to cope with its environment¹⁴. This definition refers to a characteristic of the individual at the time, i.e. how well it is faring^{15,16}. The concept refers to the state of the individual on a scale from very good to very poor. This is a measurable state and any measurement should be independent of ethical considerations. When considering how to assess the welfare of an individual, it is necessary to start with knowledge of the biology of the animal and of all of its needs. The feelings of an animal are an extremely important part of its welfare^{17,18}. They are adaptive aspects of an individual's biology which must have evolved to help in survival just as aspects of anatomy, physiology and behaviour have evolved. In the fastest acting urgent coping responses, such as avoidance of predator attack or risk of immediate injury, fear and pain play an important role. In longer time-scale coping procedures, where various risks to the fitness of the individual are involved, positive and negative feelings as well as other brain processes that involve no affect are among the causal factors determining what decisions are taken. In attempts to deal with very long-term problems that may harm the individual, aspects of suffering contribute significantly to how the individual tries to cope. In the organisation of behaviour so as to achieve important objectives, pleasurable feelings and the expectation that these will occur have a substantial influence.

It is important to be aware that needs have a biological basis but this does not mean that degree of naturalness is a part of the definition of welfare. Some events that occur in nature, such as starvation or predation, result in very poor welfare. The needs of individuals will vary according to genotype and will be affected by conditions during development.

Health is that part of the state of the individual which has to do with pathology and attempts to cope with it. This refers to body systems, including those in the brain, which combat pathogens, tissue damage, or physiological disorder. All of this is encompassed

within the broader term welfare so health is an important part of welfare, not something separate.

The word stress should be used for that part of poor welfare that involves failure to cope, i.e the common public use of the word to refer to a deleterious effect on an individual¹⁹. A definition of stress as just a stimulation that could be beneficial, e.g. “eustress”, or as just an event that elicits adrenal cortex activity, is of no scientific or practical value. One indicator of adversity is whether there is an effect on biological fitness. Stress can be defined as an environmental effect on an individual which over-taxes its control systems and reduces its fitness or seems likely to do so^{19,14}. Using this definition, the relationship between stress and welfare is very clear. Firstly, whilst welfare refers to a range in the state of the animal from very good to very poor, whenever there is stress, welfare is poor. Secondly, stress refers only to situations where there is failure to cope but poor welfare refers to the state of the animal, both when there is failure to cope and when the individual is having difficulty in coping.

There has been rapid refinement of concepts in animal welfare science and development of a wide range of sophisticated measurements of welfare. The education of veterinary, animal science and biology students has not kept pace with these developments, so there is an urgent need for animal welfare courses to be designed and taught in universities. Professionals such as veterinarians also need Continuing Veterinary Education courses in animal welfare.

Animal welfare should be taught to veterinary and animal science students in a separate course because, firstly, the scientific subject is interdisciplinary so integrated lectures are needed; secondly the students need guidance on the interrelations of the ethics and the science, for example to understand deontological and utilitarian approaches; and thirdly it is necessary to separate scientific evaluation from ethical judgment because animal welfare is not an evaluative discipline.

What is the best sequence for animal welfare courses? Most well structured courses on animal welfare include the following^{20,21}

1. An early introduction to some of the problems - year 1 first term.
2. Basic science courses including: sensory, adrenal, brain function, behaviour, immune system function, pathology, animal husbandry systems, the concept of sentience.
3. Animal welfare course:
 - concepts
 - ethics
 - scientific assessment - the wide range of physiological, behavioural, etc. measures of welfare including pain, fear, other positive and negative feelings referring to a range of animals, wild and domestic
 - integration of measures, long/short-term, magnitude of good or poor welfare
 - species housing, handling, transport, disease, mutilations, slaughter topics
 - effects of: genetic selection, human contact
 - possibilities for practical monitoring on-farm or otherwise in situ.
4. Legal and social aspects, animal welfare in relation to sustainability and ideas of product quality.

NATIONAL ANIMAL WELFARE SCIENCE COMMITTEE

Key areas of animal management that affect animal welfare are: the genetic selection of animals; housing and management; transport and handling; stunning and slaughter; and mutilations or operations carried out on the animals. One consequence of heightened sensitivity to animal well being is that producers, consumers and Government agencies are requesting scientific information about animal welfare.

In the United States, the rapidity with which various segments of the animal use industries have moved to address related issues has varied considerably. For example, within the food industry, retailers have been quicker to react than producers, in large part because of consumer pressure that has a direct impact (or potential impact) on their business. Producer organizations have sometimes just asserted that there is no animal welfare problem in their industry with the consequence that many disbelieving consumers are alienated. Useful standards have been set but the disparities in those standards are significant. The animal protection societies have sometimes done a good job in trying to obtain and share information. In making videos of real events they have raised appropriate questions and have aggressively sought answers. On the other hand, some of their activities have been more effective in “slinging mud” than creating constructive dialogue. The government (USDA) provides a good source of information and has promoted a small amount of good quality research. It is important that any scientific study of animal welfare is carried out in an unbiased way and is published whatever its results. The research must be conducted independently of industry and of animal protection societies. No sponsor of research should ever be able to suppress the results because they are not in line with policy or economic interest. No animal welfare scientist should ever accept money for research if publication could be prevented by the sponsor.

One way to address the need for independent scientific review is by the appointment of a national animal welfare committee. This should be made up of an impartial group of scientists, including veterinarians, who can provide unbiased information. Such committees can have a role in guiding legislation and in checking on codes of practice. There is an important role for a national organization which standardizes veterinary education to encourage the teaching of animal welfare science and ethics in veterinary schools, such as the Animal Welfare Policy espoused by the American Veterinary Medical Association (http://www.avma.org/issues/animal_welfare/default.asp). In Europe, no veterinary degree can be awarded unless animal welfare science is taught in the course. In my opinion, this subject area should be part of the validation of veterinary courses in every country. Animal welfare courses should also be required for animal science degrees and animal health technology.

CONCLUSIONS AND RECOMMENDATIONS

1. In relation to animal production throughout the world, there will be increasing demand from consumers for the avoidance of adverse effects on human welfare, animal welfare, the environment, fair trade and maintaining the viability of human communities. All of these aspects are now part of product quality.
2. One suggested approach for increasing the efficiency of production in a socially responsible way is to develop systems where animals consume plant material, rather than using animal feed that could be food for humans. The feeding of animal material to animals, such as farmed fish, is inefficient and may damage the environment.
3. Genetic selection and management for high productivity needs to be evaluated carefully to ensure it does not lead to more disease and other aspects of poor welfare.
4. All aspects of sustainability and product quality in its wider sense, should be part of teaching to veterinary, animal science and biology students.
5. No veterinary degree should be accepted unless a full course has been taught on the science of animal welfare and relevant aspects of ethics and law.
6. There should be a national advisory committee on animal welfare science in each country. This should be made up of independent scientists, including veterinarians, who can write impartial reviews of the state of scientific knowledge.

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Author Information

Donald M. Broom
Centre for Animal Welfare and Anthrozoology,
Department of Veterinary Medicine,
University of Cambridge, U.K.
dmb16@cam.ac.uk