

UNDERSTANDING ANIMAL WELFARE: SCIENCE, VALUES AND EMERGING STANDARDS

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David Fraser

Animal Welfare Program

Faculty of Agricultural Sciences and W. Maurice Young Centre for Applied Ethics

University of British Columbia

Vancouver

Canada

Introduction

I think that 20 years into the future, we will look back on the few years that have just passed as a kind of turning point when attention to animal welfare and animal welfare standards took on a new level of significance in food production systems. Here are a few highlights:

- In 1999, the European Union passed a directive that will phase out the standard battery cage for laying hens by the year 2012 throughout its (now) 25 member countries. These cages were the dominant technology for egg production in the industrialized countries, and given the wide range of views on animal welfare seen in Europe, it came as a surprise when the EU found the political will to agree to this ban.
- The next year, McDonald's Restaurants in the US announced a set of animal welfare standards that it would require their suppliers to meet, especially in the slaughter and egg industries. These requirements were basic rather than radical -- for example they required more space in the cages, not a ban on cages -- but it was still remarkable to see a major chain restaurant requiring animal welfare standards as a condition for purchasing products.
- In 2001, two other chain restaurants -- Burger King and Wendy's -- announced their own programs of animal welfare standards. At that stage, people in the chain restaurant industry recognized that things would become chaotic if different companies all created their own standards and audit procedures, so they asked their industry association in Washington to create a harmonized set of standards.
- Meanwhile, some of the major supermarkets in the United States were also developing animal welfare standards, and they asked their national association (the Food Marketing Institute in Washington) to create a set of standards for the grocery chains. Then those two groups, representing chain restaurants and grocery distributors, whose member companies account for most food sales in the US and Canada, decided to work together on a single set of standards, and that process is now well advanced.
- Also in 2001, the European Union passed another directive, this one to phase out gestation stalls for sows by the year 2013, again effectively eliminating the predominant form of sow housing of the industrialized countries.
- And in 2002, the (then) 162 member nations of the World Organization for Animal Health (OIE) unanimously agreed to begin developing internationally harmonized animal welfare standards which, among other things, would provide an avenue for resolving international trade disputes related to animal welfare.

My purpose in listing these developments is simply to point out how rapidly things have changed during the past few years. All the events I just described occurred in the space of about

3 years, and they involved quite different developments: political agreements by the European Union, a process of standards and audits from the corporate sector in the US, and an international process led by the OIE, so that now we see infrastructure, formulas and precedents in place that did not exist before.

Every group involved in these developments claims to be basing its actions and standards on science. And yet we recognize intuitively that the motivation for the changes essentially came from cultural developments not purely from scientific discoveries, and that values are inevitably involved in social actions regarding animal welfare. So how should we understand this interplay of science and cultural value-based elements?

Today I thought we could look at:

- some of the cultural origins of the current interest in animal welfare,
- different conceptions of animal welfare that have emerged in the resulting debate,
- some scientific developments that have occurred in response to animal welfare concerns,
- some emerging standards, where we see the science and values interacting,
- and finally some of the benefits, trade-offs and tensions that attention to animal welfare is creating.

Cultural origins

In the creation legend of the Ojibway culture of central Canada, the first people fell to the earth when it was covered in water, and were able to survive only through the cooperation of animals, beginning with the turtle who allowed its shell to form the base of the dry land. And throughout Ojibway legends and conduct, we see this fundamental assumption that human survival is made possible by the assistance and sympathy of animals.

In a typical tomb painting in ancient Egypt, the deceased person was shown successfully passing the tests of the afterlife. In one common scene, the god Anubis, who has the head of a jackal, weighs the heart of the deceased person against a feather from the goddess Maat, who is part falcon. If the heart has enough merit, the person will pass on to the afterlife. If the heart turns out to be too light, it will be thrown to a monster who is part hippopotamus, part lion, and part crocodile. Thus, in ancient Egyptian culture, human destiny was seen as ultimately controlled by beings who spanned the human, animal, and supernatural realms.

In the creation story from the opening passages of the Biblical book of Genesis, God (male) creates a human (also male) in His own likeness, and gives humans the responsibility for ruling over the other species. And later in the story when God flooded the world, it was the wise people who saved the helpless animals from drowning, which is roughly the opposite of how the Ojibway saw the relationship.

These brief glimpses of different cultures underline the role that culture plays in our perception of animals and of the relationship between people and animals. Each culture has what we might call its "animal mythology", not in the negative sense of incorrect or out-dated ideas, but in a positive sense, meaning a set of deeply ingrained beliefs and values regarding animals. These can often be perceived through the art and stories of the culture, and they help to define what people judge to be proper treatment of animals in their day-to-day life.

This mythological view of animals is roughly the opposite of the reductionist view we often see in science. The reductionist view sees animals in terms of parts -- genes, chemicals, and physiological processes -- whereas the mythological view starts with the whole animal and adds higher-order attributes such as symbolic meaning and positive or negative value. But surely modern Western culture -- where scientific thinking is so prevalent and so valued -- could not be said to have an animal mythology, could it? Let's consider three cases.

- Today, the animal that is most valued in the West is, of course, the domestic dog which appears in countless stories as the companion and "best friend" of humans. And in practice, Western culture cherishes dogs to the point that they are treated as members of human families, given distinctive names, rescued from abuse by public institutions, and totally exempted from slaughter for human food.
- Ironically, the animal at the lowest end of the scale has traditionally been the dog's close relative, the wolf which, for much of Western history, has been cast as the arch-enemy of humans -- who in traditional stories connives to eat children and the elderly, and whose death at the end of the story, no matter how gruesome, is always a source of satisfaction. And again, real-life treatment of wolves in the West has fit this negative image, with people for centuries hunting, trapping and poisoning wolves with few scruples.
- The animals kept for production purposes in the West fall between these two extremes. They are depicted as very much a part of human culture, and sometimes a source of great pride, but for the most part they are valued more for their practical usefulness than for other traits. Hence, they are seen as worthy of human care, but in ways that are consistent with their economic value.

Thus, on a farm in Canada for example, a person who is deemed to be perfectly rational might take an aging dog to a veterinarian to prolong its life, then come home and ship a load of 6-month-old pigs for slaughter, taking care not to cause them unnecessary stress, and then set a leg-hold trap to do away with some wolves that keep coming around the farm. Objectively, those different animal species are roughly similar in their level of mental functioning, their capacity for suffering, and probably most other attributes that we might feel make animals worthy of moral concern. The fact that we treat them so differently shows the pervasive influence of the culture's animal mythology.

What we glimpse in these examples is that Western culture *does* have an animal mythology, captured in its stories and art, which involves both empirical beliefs about what animals are like -- faithful friend versus eater of children -- and ethical or evaluative beliefs about how good or how important the animals are, and how they should be treated. But overlying and complicating these traditional beliefs are newer beliefs about the nature of animals, some of them arising from science.

One of the longest-running debates in Western thought centres on what animals are really like: are animals basically like people with a few differences, or are people fundamentally different from other species? In ancient Greece the Pythagoreans emphasized our kinship with animals, and the Stoics emphasized our separateness. In the Bible, the writer of Ecclesiastes emphasized our kinship, and St. Paul our separateness. In medieval Christianity St. Francis versus St. Thomas Aquinas; in the French Enlightenment, Voltaire versus Descartes, in Germany Goethe versus Kant, and the same into modern times.

If we go back to the Biblical creation story, we see how different humans and animals must have seemed in the culture where that story emerged. First, the animals are different in appearance: they have four legs and fur, or wings and feathers, or fins and scales -- nothing like the smooth-skinned biped built to look like God. Second, people had been created separately from the other species, to serve as Stewards of the natural world, not just part of it. Third, in terms of mental and spiritual life, animals were often viewed as intellectually inferior, or as not capable of rational thought, or even as having bodies but no souls. So, those three beliefs -- different appearance, different origin, and different mental life -- reinforced the view that humans are separate from the other species.

Over the centuries, however, these claims to human uniqueness have been chipped away, and the first to fall was the claim of unique appearance. During the rebirth of learning in Europe,

anatomy was one of the frontiers of scientific research, and dissecting theatres sprouted up across Europe. These allowed the paying public to witness the dissection of an animal or, better yet, of a human criminal cut down from the gallows. Through anatomical research, and this remarkably direct form of public education, it came to be recognized by about 1700 that humans -- organ for organ and bone for bone -- are built on the same anatomical template as the other vertebrate animals. Thus the perception of unique appearance became less tenable.

This helped set the stage for the evolutionary thinking of the 1800s which reached its most famous expression in Charles Darwin who claimed that the reason we are built on the same anatomical template as the other species is that we share with them a common origin.

During the 1900s, I think the study of animal behaviour, again coupled with very effective public communication of the research through the media, has led to a further revision of Western views of animals, this one centred on their mental and emotional lives. Some of the pionerring work was done by primatologist Jane Goodall who studied animals -- in her case chimpanzees -- not as sources of data to estimate species averages or norms, but studied them more as "persons" with individuality, unique life histories, and complex social and mental lives. From Jane Goodall we learn, for example, of McGregor, a chimpanzee who contracted polio in adulthood and tried pathetically to re-establish relations with his former friends who would have nothing to do with him when they found him partly paralyzed; and we learn of Flint who at the mature age of eight remained so attached to his aging mother that when she died, he stayed near her death place until he himself died of starvation. Drawing together this and other observations, Roger Fouts in *Next of Kin* describes the chimpanzee as a

highly intelligent, co-operative, and violent primate who nurtures family bonds, adopts orphans, mourns the death of mothers, practises self-medication, struggles for power, and wages war.

Thus, with some species at least, even in our mental lives the gap we perceive between humans and animals has narrowed substantially.

To sum up, Western perceptions of animals have been evolving, slowly over several centuries and perhaps more rapidly over the past 50 years, to include the idea that we and other species share:

- a common anatomical form
- a common evolutionary ancestry
- and, with some species, a complex mental and emotional life.

As this brief history illustrates, although the West has a traditional animal mythology which remains highly influential, there are also new cultural influences, coming partly from science, which are re-shaping Western beliefs about the nature of animals and, in so doing, stimulating renewed ethical concern and debate about the proper treatment of animals.

What is animal welfare?

As beliefs about animals changed, and as people showed more concern about the welfare of animals, a debate emerged over what actually *is* a good life for animals – in other words, what *is* animal welfare? Many different ideas emerged, which can be roughly grouped into three types.

For some people, especially some veterinarians and animal producers, animal welfare is mainly about basic health and functioning of the body. For example, early in the debate over intensive animal production methods, one veterinarian defended intensive methods this way:

My experience has been that ... by-and-large the standard of welfare among animals kept in the so called "intensive" systems is higher. On balance I feel that the animal is better cared for; it is certainly much freer from disease and attack by its mates; it receives much

better attention from the attendants, is sure of shelter and bedding and a reasonable amount of good food and water.

Here the emphasis is on the fairly traditional concerns of veterinarians and animal producers for basic health, safety and necessities.

For other people, including some of the leaders of the humane movement, what is important is not simply the health and functioning of the animal but its psychological state, especially “affective states” -- that is, pleasant or unpleasant states such as pain and suffering on the one hand and pleasure and contentment on the other. As a committee of Christian theologians and thinkers put it:

The welfare of managed animals is dependent upon the degree to which they can adapt without suffering to the environments provided by man.

Here the emphasis is not so much on basic health and safety as on suffering versus pleasure.

And third, some people put the emphasis more specifically on the ability of animals to lead reasonably natural lives. As one influential committee put it in the 1960s:

In principle we disapprove of a degree of confinement of an animal which necessarily frustrates most of the major activities which make up its natural behaviour...

And others added not just natural behaviour but also a reasonably natural environment. In the words of Astrid Lindgren, the famous author of the Pippi Longstocking stories and a driving force behind animal welfare reform in Sweden:

Let [farm animals] see the sun just once, get away from the murderous roar of the fans. Let them get to breathe fresh air for once, instead of manure gas.

Here, then, are three different conceptions of animal welfare, one based on basic health and functioning, one on affective states, and one based on the ability to live a reasonably natural life. Of course, they are not mutually exclusive. They are, rather, different areas of focus or emphasis, and sometimes they go hand in hand. For example, allowing a pig to wallow in mud on a hot day is good for its welfare because it will have less disruption of normal bodily processes caused by heat stress (a basic health criterion), because it can perform its natural cooling behaviour (a natural living criterion), and because it will feel more comfortable (an affective state criterion). However, as we will see, the three views sometimes lead to different conclusions.

The scientific study of animal welfare

Beginning in the late 1960s, scientists, usually with a background in some combination of animal science, animal behaviour and veterinary medicine, began doing research to understand, assess and improve animal welfare. Looking back on this work we see that the scientists were also guided to different degrees by the three dominant interpretations of animal welfare.

Basic health and functioning

Some scientists used the basic health and functioning of animals – measures of disease, growth, productivity, and so on -- as indicators of animal welfare. To take a simple example, Ragnar Tauson and co-workers in Sweden made major improvements to the design of cages for laying hens by comparing the basic health of birds in cages of different types. They found, for example, that the birds developed foot lesions if the floor was too steeply sloped, and neck lesions if the feed trough was too deep and installed too high for comfortable access. There was often feather damage that could be reduced by using solid side partitions, and overgrown claws that could be prevented by installing abrasive strips. Finally, there was a problem of birds becoming trapped which could be eliminated by improvements to the cage fronts.

Thus, just by focusing on injuries, it was possible to make large improvements in animal welfare, and these results formed the basis of regulations on cage design in Sweden and later in the European Union.

Where we lack that sort of experimental control, it may still be possible to use epidemiology to see what environmental features promote good health and functioning. Many of the animal welfare standards used for broiler chickens put a great deal of emphasis on space allowance. Marian Dawkins and co-workers in the UK recently did a study involving 10 chicken production companies who agreed to house birds at a wide range of stocking densities, while Dawkins and co-workers measured a large number of environmental parameters that varied from company to company, as well as basic health variables such as survival, lameness, growth and aggression.

They found that space allowance did influence the health and functioning of the birds as expected, but the really striking differences were not between different stocking rates but between different companies for reasons other than stocking rate. Taking growth rate as an example, they found that growth rate was most strongly correlated with the number of visits per day by the stockmen, and with the humidity in the barn especially in the first week, whereas the stocking density, along with other variables such as the age of the building and the moisture of the litter, had correlations of a lower level. The authors concluded that stocking density is important, but that in trying to improve bird welfare, the major focus should be on other variables.

Natural living

A very different approach, based on natural living, was used by Alex Stolba and David Wood-Gush in Edinburgh to design improved housing for pigs. They began by turning pigs loose in a hilly, wooded area, and simply observed their behaviour. They found certain characteristic features of the animals' behaviour. The pigs:

- rooted in the soil,
- exercised their neck muscles by levering against fallen logs,
- built nests in secluded areas before giving birth, and
- used dunging areas well removed from their resting areas.

The research also found that there were certain key stimuli in the environment which were important for these behaviours to be performed. The scientists then designed a complex commercial pen which incorporated these key stimuli, with a dunging area in the front, an area where the pigs could root in soil, a log for levering, separate feeding areas, and secluded areas at the back where a sow could be enclosed to farrow. The authors claimed that the animals' welfare was significantly improved by the complex pen. In fact, some aspects of basic health and functioning (such as piglet survival) were not as good in this system as in confinement systems, so some people disagreed with that conclusion.

That is a fairly radical approach, but we can also include simple elements of natural behaviour in normal commercial systems in order to solve specific problems. On many commercial dairy farms, calves are separated from their mothers within the first day after birth, and then fed milk by bucket, usually twice per day because that frequency fits with the normal schedule of work on the farm. With such infrequent meals, intake has to be limited so that the calf does not receive too much milk at one time. Under natural conditions, in contrast, cows stay fairly close to their calves for the first two weeks, and the calves will feed many times per day in smaller meals, and consume much more milk in total. Under these conditions, calves grow much faster than with conventional bucket feeding.

Naturally it is not feasible to leave the calves with the cow on large dairy farms, but we

may still be able to feed them according to a more natural schedule with smaller, frequent meals. This can be done efficiently by feeding the calves from a teat rather than a bucket, and if the teat has a small orifice and low flow rate, calves can be fed *ad libitum* without over-consuming milk. My colleagues in Vancouver have shown that calves fed this way consume considerably more milk than calves fed twice a day by bucket; they also gain much more weight, and retain the extra size advantage after they have been weaned entirely. Sucking on a teat also makes teat-fed calves less likely to suck each others' bodies, so they can be kept in groups with fewer problems.

Affective states

In other cases, animal welfare research has been based on the affective states of animals. When broiler chickens are shipped for slaughter, the traditional catching method has been for human handlers to walk into the pens, catch a number of birds by the legs, and carry them upside-down to the shipping cages. An alternative is a mechanical chicken harvester, a machine which moves through the pens, catches birds in counter-rotating rubber fingers, and transfers them to the cages by a conveyor belt. When chicken harvesters first appeared, there was concern that they would cause fear and panic among the birds. To test this, Ian Duncan and co-workers monitored birds when they were captured by hand or by machine. Because the concern was over the short-term emotional response of the birds, Duncan used heart rate to gauge the response and found that heart rate returned to normal faster if birds had been captured by the mechanical harvester rather than being caught by hand.

With chickens there is a further test that has been used to assess fear. If a chicken is suddenly flipped onto its back, it will often stay totally immobile for many minutes in a reaction called "tonic immobility", and it can be shown experimentally that chickens that have been deliberately frightened beforehand tend to remain immobile for longer. Here again Duncan found that chickens that had been loaded by hand remained immobile for much longer than those that had been loaded by machine, and the machine loaded birds behaved much the same as gently handled controls. Both lines of evidence indicated that the birds were actually *less* upset when moved by the machine, probably because a mechanical device does not trigger any form of predator recognition. On this basis, animal welfare advocates began actively supporting the use of mechanical harvesters, and some of the largest poultry facilities in North America are now using this technology.

As a final example, when a piglet has become separated from its mother and litter-mates, it typically gives a very characteristic pattern of calls that attract the mother and help to bring the animals together. My colleague Dan Weary showed experimentally that piglets that are in greater need of the sow – for example because they are cold or hungry – give more calls, and especially more high-pitched, tonal calls. When pig producers wean pigs, they usually remove them from the sow suddenly and put them in an unfamiliar pen where the piglets may give these calls for hours or days as they adjust to their new circumstances. If the calls indicate how distressed the piglets are, they should provide a way of identifying environments that reduce the level of distress. For example, results show that when piglets are put into a new pen, the presence of several familiar litter-mates is almost as effective as the presence of the mother in reducing the level of calling. Thus, when piglets have to be removed from the mother, keeping them with their litter-mates should help to reduce separation distress.

In the above examples, we see three different views of animal welfare, each of which has stimulated valuable research. But notice what the research has *not* done. In the 1960s and 70s, I think many people expected science to find ways to measure and quantify animal welfare in a value-free manner, much like measuring viscosity or basal metabolic rate. Instead, we see that

different scientists have taken on the different value-based views of animal welfare to different degrees, and created some quite different approaches to assessing and improving animal welfare. Where the different approaches agree, there is no problem, but where they disagree there may be no value-free way to resolve the difference.

Emerging animal welfare standards

Now let us look at how the different views of animal welfare, and the different science that they have stimulated, interact in the formulation of animal welfare standards. Laying hens provide a good example.

Over the years there have been dozens of scientific studies of laying hens looking at the effects of different space allowance per bird on basic health and functioning variables such as survival, rate of lay, feed efficiency, and feather cover. The studies show fairly consistently that these basic variables are impaired when space allowance drops below about 450 square centimetres per bird. On that basis 450 square centimetres has become a common standard for caged layers which applied in the European Union until it was increased in 2003, and it forms the basis of the new standards in the US. But obviously that standard is not based on natural living criteria (because the birds are still not able to carry out much of their normal behaviour), nor on affective state criteria (because the cages are likely to frustrate some of the birds' motivation, for example to find a secluded nesting area to lay).

Quite a different standard was recently approved by the European Union. Hens can be trained to perform a simple task, such as pecking on a key, for a reward such as food. They will also learn to perform similar responses for other rewards such as additional space in their cages. Results show that when hens have only 450 square centimeters per bird, they will work hard to obtain extra space; only when the cage reaches about 750 square centimeters per bird do they show little interest in enlarging the cage further. In a similar way it can be shown that hens are motivated to obtain:

- a perch for resting,
- a nest box where they can retreat to lay eggs, and
- litter for dust bathing and feather care.

And because the birds are so motivated to obtain these resources, people have assumed that the birds will be frustrated if these features are not available. On this basis, the European Union approved an "enriched cage" containing 750 square centimeters, together with a perch, litter and nest-box, to replace the standard battery cage in 2012.

Finally, some alternative production programs, such as the United Kingdom's Freedom Foods program, are based more on a natural living approach. For example, many of these standards prohibit all use of cages, and require that chickens have regular access to the outdoors and natural light in addition to perches, nest-boxes and litter.

Thus we are beginning to see three quite different standards:

- one, like the EU standard in the 1990s and those now being required by certain chain restaurants in the United States, is based on 450 square centimeters, with good access to food and water;
- another, typified by the EU enriched cage, requires 750 square centimeters, plus a nest-box, perch, and litter;
- and a third, typical of alternative production programs, requires 1200 square centimetres or more, and access to the outdoors and natural light.

All these standards are claimed to protect the welfare of animals, and all are claimed to be based on science, but they set quite different requirements at least partly because they are based on

different degrees of emphasis on basic health and functioning, affective states and natural living criteria.

Benefits, trade-offs and tensions

Turning now briefly to some of the benefits, trade-offs and tensions created by the new focus on animal welfare in food production.

The first and obvious point is that attention to animal welfare and animal welfare standards can have significant benefits in animal production. As just a few examples we see:

- better health, survival and productivity when animals are given adequate space, shelter, and access to food and water,
- better product quality when pre-slaughter handling is improved to the point of reducing stress and injury,
- reduced stress if animals are handled in a way that avoids causing fear, with positive effects on growth and ease of handling, and
- less harmful behaviour such as aggression when the environment and diet meet the animals' needs.

These benefits are very basic, and it may seem surprising that problems of this sort were not solved long ago in commercial animal production. However, when the old field of animal husbandry became the new field of animal science, although there were definite gains in established scientific fields like nutrition, genetics and infectious diseases, some aspects of basic animal husbandry were rather neglected. In a sense, the study of animal welfare is applying science to some basic husbandry issues that have not received the systematic attention they deserve.

However, some trade-offs also occur when we apply animal welfare standards:

- One is a potential increase in housing costs in cases where standards require more space, or at least an adaptation cost if standards require that one type of housing be replaced by another. In theory these costs should be quite small because housing is generally a small fraction of total production cost. However, in very competitive situations with low profit margins, any increase in cost could require that producers be protected against competing producers who are not obliged to follow the same standards.
- Second, even where animal welfare standards increase production, they may still reduce profit. For example, economic studies show that if we crowd laying hens to the point of reducing their individual survival and rate of lay, this can still produce more eggs in total and produce greater profit under certain market conditions. Thus, even when standards lead to improved health and productivity, producers may still need to be protected from unfair competition.
- And third, especially where we see bans on confinement systems such as cages for hens and individual stalls for pregnant sows, there may be a conflict between giving animals greater freedom and other important goals. In many cases, restrictive housing helped to solve traditional problems: cages for hens helped prevent disease transmission; stalls for sows kept the animals from competing over food. These benefits are important for both animal welfare and productivity. If we eliminate the confinement, we need to have alternative methods available to achieve the benefits that the confinement provided.

An obvious sub-text of these comments is that a focus on animal welfare standards produces substantial scope for tensions attention to

- Obviously, as we have seen, there are potential tensions between cultures because the level and type of concern about animal welfare is influenced by cultural values.

- There are also tensions within a culture, for example between traditionalists who continue to see animals as principally for human use, and reformers who see animals very differently.
- We also see tensions between animal welfare scientists. For example, some who favour basic health measures conclude that the welfare of sows is good in gestation stalls, whereas some who favour other measures conclude the opposite, each claiming to have science on their side.
- And of course, we have lots of potential for conflicts between different animal welfare standards which claim to assure a high level of animal welfare but set very different requirements.

Some questions for discussion

I would like to end by asking whether and where you see animal welfare considerations relevant to FAO activities. For example:

1. Are there programs of FAO that would benefit from incorporating animal welfare components?
2. Are there projects where an animal welfare approach would help solve practical problems of animal health and production?
3. Should FAO play a role in international harmonization of standards?
4. Is there a need to include a developing country perspective in the creation of animal welfare standards?
5. Finally, at an operational level, what steps should FAO take to deal with these issues, and who will participate?

Here I look to your guidance and simply offer whatever assistance I can provide.