DOES ORGANIC FARMING FACE DISTINCTIVE LIVESTOCK WELFARE ISSUES? – A CONCEPTUAL ANALYSIS*

Hugo Fjelsted Alrøe[a], Mette Vaarst[b] and Erik Steen Kristensen[a]

ABSTRACT. The recent development and growth of organic livestock farming and the related development of national and international regulations has fuelled discussions among scientists and philosophers concerning the proper conceptualisation of animal welfare. These discussions on livestock welfare in organic farming draw on the conventional discussions and disputes on animal welfare, which involve issues such as different definitions of welfare (clinical health, absence of suffering, sum of positive and negative experiences, etc.), the possibility for objective measures of animal welfare and the acceptable level of welfare. It seems clear that livestock welfare is a value-laden concept and that animal welfare science cannot be made independent of questions of values and ethics. The question investigated here is whether those values that underpin organic farming, in particular, also affect the interpretation of livestock welfare and, if so, how. While some of the issues raised in connection with organic farming are relatively uncontroversial, others are not. The introduction of organic farming values seems to introduce new criteria for what counts a good animal welfare, as well as a different ethical basis for taking moral decisions on welfare. Organic farming embodies distinctive systemic or communitarian ethical ideas and the organic values are connected to a systemic conception of nature, of agriculture, of the farm and of the animal. The new criteria of welfare are related to concepts such as naturalness, harmony, integrity and care. While the organic values overlap with those involved in the conventional discussion of animal welfare, some of them suggest a need to set new priorities and to re-conceptualise animal welfare – for example, with respect to 'naturalness', in relation to the possibilities for expression of natural behaviour and in relation to animal integrity as a concept for organismic harmony. The organic perspective also seems to suggest a wider range of solutions to welfare problems than changes in farm routines or operations on the animals. The systemic solutions include the choice and reproduction of suitable breeds, changes in the farm structure, and changes in the larger production and consumption system - including consumer perceptions and preferences. But the organic values may also call for sacrifices of individual welfare in a conventional sense in order to advance welfare from the perspective of organic farming. Whether this is good or bad cannot be decided without entering into an inquiry and discussion of the values and ethics involved.

KEY WORDS: animal welfare; integrity; naturalness; organic farming; systemic perspective.

The welfare of livestock is currently the subject of both practical advances and theoretical debate. This article aims to discuss the concept of animal welfare in relation to the principles of organic farming. It examines the question of whether there are livestock welfare issues that are peculiar to organic farming as compared to the rest of agriculture. And the related questions: Are there particular values or ethical ideas that influence how welfare is interpreted in organic farming? Can the reason for the present regulations of organic farming, and the interpretation of animal welfare entailed in them, be found in more basic values and principles? And if so, what do these values and principles imply for the future development and regulation of organic farming? And

* Postprint, 5. March 2001. Published in *J. of Agricultural and Environmental Ethics* **14**: 275 – 299 (2001).
[a] Danish Research Centre for Organic Farming, P.O. Box 50, Research Centre Foulum, DK-8830 Tjele. <http://alroe.dk/hugo>
[b] Department of Animal Health and Welfare, Danish Institute of Agricultural Sciences.

finally, what are the implications if welfare is poorer under organic forms of husbandry as seen from a more conventional interpretation of animal welfare?

The regulations associated with animal welfare in organic farming are currently being evaluated and modified both in Denmark and the EU. This article stems from an analysis of the Danish regulations in relation to the latest EU Council Directive on organic animal husbandry (FØJO, 2000), and an interdisciplinary study on the health and welfare of dairy cattle upon conversion to organic farming (Kristensen and Thamsborg, 2000).[1] The discussion of livestock welfare in relation to the principles of organic farming is, however, of wider international interest.

CONVENTIONAL ISSUES IN LIVESTOCK WELFARE

The general approach to animal welfare in agriculture and agricultural science is changing in connection with changes in the public conceptions of agriculture and animal welfare – changes that are manifest in the animal liberation movement and the ecological movement. Today there is common agreement that animal welfare is a relevant and important issue in agriculture. But there are also different approaches to animal welfare and different conceptions of what animal welfare is, which are connected to the different traditions of animal welfare science and moral philosophy, and to different traditions within moral philosophy (Fraser, 1999; Appleby, 1999).

The approach of conventional agricultural science to livestock welfare is, for example, described in the Danish report “Livestock welfare and animal production” (Ministry of Agriculture and Fisheries, 1995). The introduction to this report briefly describes the development of intensive production systems in animal husbandry, and it is emphasised that: "Both in relation to the animal protection legislation and from a general ethical standpoint, increased consideration needs to be given to the welfare of livestock".[2] The report then provides a description of what is understood by animal welfare and how it is handled in research, a description that can be taken as representative of the conventional approaches to animal welfare:

> The welfare experience or quality of life of animals can be defined as the sum of the positive and negative experiences to which they are exposed during the course of their lives. Welfare thus builds upon an animal’s experience of different situations, rendering exact measurement of the concept impossible. We must, however, assume that such factors as pain, illness, aggressiveness, abnormal behaviour and chronic stress constitute a negative experience for the animal. Conversely, it will experience positively the satiation of its need for rest, sleep, food, nursing, and grooming. The behaviour, behavioural changes, stress reactions, physiological changes and health of an animal can be objectively observed and measured.

---

[1] The authors wish to thank all the experts involved (farmers, advisors, veterinarians, and researchers) in these two studies, which were performed in connection with the Danish Research Centre for Organic Farming in 1999-2000.

[2] The 1991 Danish legislation on animal protection, which provides a general legal foundation for the treatment of animals, states that: **§ 1.** Animals shall be treated responsibly and be protected as far as possible from pain, suffering, fear, lasting injury and significant distress. **§ 2.** Anyone who keeps animals must ensure that they are treated with care; ensuring that they are housed, fed and watered and that their physiological, behavioural and health needs are met in accordance with recognised practical and scientific practice.

> These factors must therefore be the essential elements in an assessment of welfare – singly or preferably in combination. An assessment of the welfare of animals in a given environment can thus best be based on objective measures of their reactions. On the other hand it is an ethical question to judge what level of welfare is acceptable or unacceptable for farm animals.
>
> (Ministry of Agriculture and Fisheries, 1995: 23-24)

This description is cited at length here, because it touches on many of the key issues of the current debate on livestock welfare, issues that are also relevant to welfare in organic farming. Three aspects of handling animal welfare can be identified in the description, the concept of animal welfare (what is welfare?), the assessment (how is welfare measured?), and the ethical question (how well should they fare?). These three aspects of identifying welfare problems are treated in more detail later, together with a fourth aspect concerning the solution of welfare problems.

As mentioned earlier there are many different conceptions of what welfare is. The particular description above focuses on experiences, where others might focus on for example clinical health, needs, or natural living.[3] These different conceptions of welfare will be outlined in a later section and discussed in detail from an organic perspective. But first, in this section, we will look at the relation between the concepts of animal welfare and the scientific ideal of objectivity. The point to be emphasised here is that the desire for scientific objectivity is entangled with the different conceptions of welfare. And this entanglement means that the desire for objectivity may be at the expense of the relevance of the resulting concepts of welfare for society in general, and for the organic movement in particular.

The approach taken in the description above starts with a conception of welfare. The concept of animal welfare is linked to the quality of life of an animal, which is taken to be the sum of positive and negative experiences. But since experiences cannot be directly measured, it is pragmatically concluded that an assessment of welfare can best be based on elements that can be 'objectively observed and measured': the behaviour and the physiological and clinical state of the animal.

Donald Broom (1996), for example, starts with the goal of making an objective welfare assessment and uses this as a criteria for constructing a scientific definition of welfare:

> The assessment of welfare should be quite separate from any ethical judgement about how animals should be treated but once an assessment is completed it should provide information which can be used to take decisions about the ethics of the situation. The first criterion for a

[3] There is a long, historical, ethical tradition of arguing from the animal's positive and negative experiences, including the classical utilitarianism of Jeremy Bentham and others (see e.g. Fraser and Duncan, 1998). This conception of welfare is advanced by for instance Ian Duncan (1996) and Peter Sandøe (Sandøe *et al.*, 1997; Sandøe *et al.*, 1999). Others, such as Donald Broom (Broom, 1996: 23), emphasise the state of the animal as regards its attempts to cope with its environment. This state can be indicated by physiological and behavioural changes, which are further assumed to be linked to feelings or experiences. Bernard E. Rollin proposes that welfare not only means the control of pain and suffering but also implies consideration of the animal's hereditary nature or 'telos' as he calls it, using a term borrowed from Aristotelian ethics (Rollin, 1996: 10; Fraser, 1999: 176-77). According to Rollin, consideration for the animal's nature implies that it should be able to express its natural forms of behaviour, such as play, natural forms of movement and social interaction. These different conceptions of animal welfare are also of relevance to organic farming, though some gain a different weight and new issues are added.

> useful scientific definition of welfare is that it must refer to a characteristic of the individual animal rather than to something given to the animal by man.
>
> (Broom, 1996: 22)

Such an approach tends to arrive at a conception of welfare that suits the ideals of objectivity and, in effect, limits the concept of welfare to something that is amenable to independent observation and measurement. Thus causing a bias towards, for example, individual animals (or groups of animals) rather than man-animal relations and systemic perspectives, suffering rather than positive experiences and needs rather than natural behaviour.

But neither of these two approaches to animal welfare science makes clear that the choices made on which measures to include in the assessment, are value-laden. Constructing an 'objective' assessment by way of selecting objective measures, does not make the welfare assessment objective in the sense of being independent of values. The individual measures may be made independently of values, but choosing these particular measures to represent animal welfare is a value-laden choice – even if this choice is based only on the availability of objective measures.

Bernard E. Rollin, amongst others, argues against the understanding of animal welfare as something that can be established in an objective, scientific way, independently of values and moral concerns in society:

> But what of animal welfare science *per se*? Is this an area of science where one need not invoke or presuppose value judgements? I think not, and will attempt to show that a variety of valuational notions, including ethical ones, are involved here as well.
> … what counts as worthy of being treated in animals is not only what science deems it to be, but what society considers significant.
>
> (Rollin, 1996: 7-8)[4]

In the following, it will be understood that animal welfare is an 'evaluative concept' (Fraser, 1999: 182-3), which is linked with the quality of life of the animals, and which is comparable with concepts such as food quality and environmental quality. This means that the concept necessarily involves judgements of 'better or worse'. These evaluative judgements can be a part of the assessment procedure itself, such as in the evaluation by way of the measured opinion of a panel of well-informed evaluators that has been suggested by Henrik B. Simonsen (1996). Or they can be a part of the decisions made prior to an 'objective' assessment of welfare – decisions which concern the selection of variables that are taken as indicators of welfare, how these variables are to be measured and how they should be interpreted in welfare terms (Tannenbaum, 1991: 1368; Fraser, 1999: 183). Establishing a practical, operational concept of welfare that can serve as a basis for welfare assessments furthermore involves a 'weighing' or 'summing up' of these selected scientific variables or measures, which cannot be decided by empirical science alone (Sandøe *et al.*, 1996a). Welfare is, however, not just an evaluative concept but also a normative concept like, for example, human welfare and sustainability. The value judgements that are involved in the study of welfare and the solution of welfare

[4] One of the examples given by Rollin is that science ignored pain in animals for most of the twentieth century because the role and value of animals in society was overwhelmingly economic. An essentially ethical concern for livestock, based on consideration of the animal's quality of life, is thus something that has only become widespread since the 1970s (Nash, 1989: 137)

problems are not independent of the motivating ethical concerns and the discourses of moral philosophy (Tannenbaum, 1991; see also Verhoog, 1996).

If one accepts that livestock welfare is a value-laden concept and that animal welfare science cannot be made independent of questions of values and ethics, then there is a separate task in investigating where and how values enter into the process of science (see further in Alrøe and Kristensen, 2000b). Part of this task involves analysing and discussing different meanings of the concept of animal welfare and how it is put into work in the assessment of animal welfare and in the solution of animal welfare problems. With regard to the aim of the present paper, the question is whether those values that underpin organic farming, in particular, also affect the interpretation of livestock welfare and, if so, how.

ORGANIC PRINCIPLES AND APPROACHES TO LIVESTOCK WELFARE

Organic farming incorporates a number of principles and objectives of importance to animal welfare. Textbox I presents a generally accepted description of organic farming and its objectives, which underpin the Danish Action Plan for the development of organic farming. The sources of the description are the Nordic organic organisations, but the description is largely in agreement with the aims and standards of the international organic organisation IFOAM (1998). Behind the objectives lies the fundamental tenet of the organic movement - that humankind is an integral part of nature. The pioneers of this movement focused on *health* and its prerequisites, rather than on illness. This led them to the view that health is associated with a continuous cycle involving the soil, plants, animals and humans (Woodward *et al.*, 1996). This systemic conception of agriculture, which emphasises the interaction between human and nature, is fundamental to an examination of animal welfare in organic farming. Livestock are an element of this interaction, and often an important one. In accordance with this wide interpretation of health, a fundamental principle of organic farming is to promote health and to prevent illness rather than depend on our abilities to cure it.

The penultimate objective listed in Textbox I (the objective to "provide good conditions for all livestock, consistent with their natural behaviour and needs") directly concerns livestock welfare. At the same time, the systemic view that humans and livestock together form part of the agricultural system is central to an understanding of the implications of the organic principles for animal welfare. It is in this light that the final objective in Textbox I, which talks of all living organisms becoming the farmer’s allies, should be understood.

Such general objectives may guide the discussion about livestock welfare in organic farming, but they do not provide a sufficient foundation for development and regulation. And there is no available theoretically underpinned conception of animal welfare that is developed from an ecological standpoint. At a recent European workshop it was therefore concluded that it is important to build a consistent foundation and philosophical definition of animal welfare in organic farming (Thamsborg *et al.*, 2000).

Recently, more research has been dedicated particularly to welfare of livestock in organic production systems, and this research has introduced some new concepts into

Textbox I: What is organic farming?

Organic farming differentiates itself from conventional farming by the targets it sets itself in terms of greater respect for the environment, nature and livestock welfare. For example, the Nordic organic associations have agreed on the following definition of organic farming:

"Organic farming is conceived as a self-sufficient and sustainable agro-ecosystem in equilibrium. The system is based as far as possible on local, renewable resources. Organic farming is based on a holistic vision that encompasses the environmental, economic and social aspects of agricultural production, both from a local and a global perspective. Thus, organic farming perceives nature as an entity which has value in its own right; human beings have a moral responsibility to steer the course of agriculture such that the cultivated landscape makes a positive contribution to the countryside."

This very widely stated definition is fleshed out *inter alia* in the standards of the Danish Association for Organic Farming, the Danish equivalent of the British Soil Association. These standards specify the following objectives of organic farming:

- To work as far as possible in closed crop rotations and to use local resources;
- To preserve the natural fertility of the land;
- To avoid all forms of pollution which may arise from agricultural practice;
- To encourage a method of cultivation which takes the greatest possible account of the environment and the countryside;
- To produce foods of optimum nutritional quality;
- To reduce to a minimum the use in farming of non-renewable resources, including fossil fuels;
- To work towards upgrading the quality of urban and food industry waste products in order to be suitable for use as fertilisers in agriculture;
- To provide good conditions for all livestock, consistent with their natural behaviour and needs;
- To do everything possible to ensure that all living organisms the farmer works with, from micro-organisms to plants and animals, become 'allies'.

Ministry of Food, Agriculture and Fisheries (1999)

the discussion of animal welfare. In Denmark an interdisciplinary study on the health and welfare of dairy cattle upon conversion to organic farming has been performed, which included a series of comprehensive interviews with veterinarians, consultants and farmers (Kristensen and Thamsborg, 2000). During this interdisciplinary work the concepts of harmony, naturalness, freedom of choice, and care emerged as central to the understanding of animal welfare in organic farming (Vaarst and Kristensen, 2000; Vaarst *et al.*, 2000b). Harmony was understood as an overall concept for the interplay between the farm and its environment, between the different elements of the farm, and between the animals in the herd. Naturalness concerned the conditions in the production system for expressing natural behaviour and for natural reproduction and growth. Freedom of choice was an element in the expression of natural behaviour, which concerned the individual and dynamic preferences of the animals. Care was understood as the counterpart of naturalness, which expressed the special responsibility that humans have towards captured and domestic animals (contrary to wild animals).

Other concepts that have been pointed out as important in connection with organic farming are animal integrity, which concerns the balanced harmony of an organism as a living whole with interconnected parts (Verhoog, 2000a; Verhoog, 2000b)[5], and animal dignity, which starts with the respect for animals as morally considerable beings and considers welfare aspects from this wider perspective (Röcklinsberg and Lund, 2000).

Generally, the systemic perspective of organic farming implies that a number of concepts, which concern the balance or good function of systems, are used across the different levels of living systems. Harmony and integrity are such systemic concepts, which are used as concepts for the well-functioning of the individual organism, the herd, the farm, and the larger social and ecological systems. Where the term 'integrity' has been widely used in connection with animal welfare, 'harmony' is a concept that has been used mainly within the organic movement. Harmony is usually employed to refer to the larger agricultural and natural systems in organic thought, such as for instance in general statements like: "The principal tenet of organic farming is to work in harmony with nature". And these general ideas on well-functioning living systems are fleshed out and operationalised in the goals and 'standards' of organic farming, for instance in form of rules on closed, circulatory processes and precautionary attitudes towards new technology. The concept of 'naturalness' is closely related to the general systemic concepts. It is based on the idea that natural systems and natural animals are the result of a long evolutionary process, which has led to a more or less harmoniously balanced whole (Verhoog, 1998). And moral consideration of animals implies taking into account their 'characteristic nature', including their natural behaviour.

OVERVIEW OF THE KEY CONCEPTUAL DIFFERENCES RELATING TO ANIMAL WELFARE

As a starting point for the following discussion on animal welfare seen from the perspective of organic farming, the essential conceptual differences will be outlined here. As noted above, there are different aspects of handling animal welfare questions. According to Jensen and Sandøe (1997) it is important to differentiate between the following two aspects:

A: the *assessment of animal welfare* that, if valid, can tell us how good an animal's quality of life is in different environments, and
B: the *ethical decision* as to how good that quality of life ought to be – and (we add) behind this decision, the ethical ideas that the decision is based on.

In turn, A and B must be distinguished from:

C: the *definition and operationalisation of the concept of animal welfare,* as preconditions for the assessment of animal welfare (A), and
D: the *solution of animal welfare problems*, which implies a wider systemic perspective for agricultural practice and research.

Not only B but also both C and D imply value judgements and ethical considerations. As discussed above, the establishment of a concept of animal welfare, which is a

[5] The conception of animal integrity that refers to organismic harmony is not to be confused with the concept of 'genetic integrity', which refers to 'the genome being left intact' (Vorstenbosch, 1993). The idea of genetic integrity has been rightly criticised by Sandøe et al. (1996: 117-118).

precondition of any scientific assessment, implies making a series of choices as to which variables are to be assessed and how these are to be interpreted in welfare terms. These choices are not made on the basis of scientific factors alone.[6] Nor are the methods and lines of development that can be considered as possible solutions to animal welfare problems simply derived from available scientific knowledge – there are different ideas about good welfare and various ways of reaching a given welfare goal.

The most important differences in relation to the definition of animal welfare (C) are briefly explored below, taking Fraser *et al.* (1997) and Fraser (1999) as a starting point. Three basic conceptions of animal welfare are distinguished:

1: the animal should *feel well*, corresponding to the concepts of experience, feeling, interest and preference
2: the animal should *function well*, corresponding to the concepts of need and clinical health
3: the animal should *lead a natural life* through the development and exercise of its natural adaptations, corresponding to the concept of the 'innate nature' of the animal.

With regard to the first conception, Jensen and Sandøe (1997) further differentiate between:

1a: welfare as the *satisfaction of preferences,* whereby the most preferred surroundings result in improved welfare. This implies that measures of welfare are always relative or comparative.
1b: welfare as *pleasure (hedonism),* i.e. conceived as pleasant feelings along with the absence of unpleasant feelings. This implies that in principle, if we can measure feelings in such a way that they can be summed up, then an absolute measure of welfare can be provided with which improvements can be measured.

And in relation to the third conception it is relevant, with regard to organic farming, to make the following distinction:

3a: the animal's genetic or *innate nature* as it has emerged through evolution, domestication, breeding and biotechnology – and which continues to change
3b: the animal's naturalness or *integrity* as an expression of the organismic harmony, which can be broken by significant and fast modifications from the natural ancestral form by way of operation, medication, breeding, and biotechnology, including genetic engineering.

An integrated conceptual model of animal welfare

Fraser *et al.* (1997: 199-201) suggest a conceptual model (see Figure 1), which integrates the three conceptions of livestock welfare (1-3) that are described above. This model provides a common framework for discussing different animal welfare problems

[6] This is contrary to Donald Broom (1996), who distinguishes between four components in a welfare investigation: (1) deciding that there is a problem, (2) making a scientific comparison, including the selection of measurements, (3) making and analysing the measurements, and (4) taking ethical decisions based on the results. Broom says that: "Ethical values are involved in the first and fourth components of the process but only scientific values should be involved in components two and three." (Broom, 1996: 26). We argue that the definition and operationalisation of animal welfare, which is implied in Broom's second component, involves value-laden choices.

with respect to the three conceptions, which is useful for the following discussion of livestock welfare from an organic perspective because it conceptualises the relation between the nature of the animal and its environment. Therefore the model and its interpretation is discussed at some length here. The model describes the essential aspects of the quality of life of an animal as an expression of the relationship between the adaptations incorporated in the animal's nature and the challenges it is faced with in the current circumstances. The adaptations of the animal is acquired mainly as a result of its evolutionary history and perhaps modified by later domestication and breeding. There will usually be a discrepancy between the nature of the farm animals (Circle A) and the conditions they meet in livestock production systems (Circle B), and Figure 1 shows how this discrepancy can lead to three different types of welfare problems, represented by Areas 1, 2 and 3.

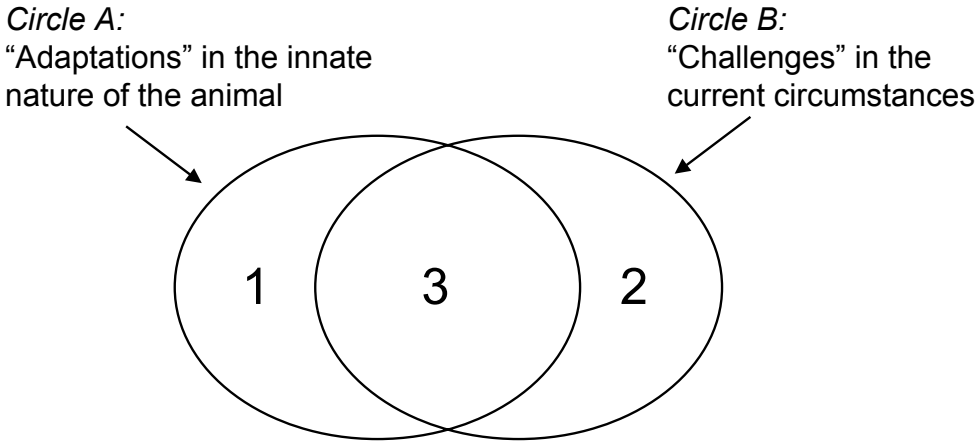

Figure 1: Conceptual model of three types of welfare problems that can arise when the inherent adaptations in the nature of the animal (Circle A) are unsuited to the challenges of the conditions to which it is exposed (Circle B). Area 1 represents those aspects of the animal's nature that have no functional role in the prevailing conditions; Area 2 represents challenges that surpass the animal's adaptations; and Area 3 represents challenges that are more or less corresponds to the adaptations that the animal possesses (figure adapted from Fraser et al., 1997: 200).

Area 1 represents those aspects of the animal's adaptations that have no function in relation to the given conditions. Here, problems can arise in relation to its needs and motivations and the expression of natural behaviour. Jensen and Toates (1993: 162) define a need as a condition that, if not satisfied, will cause suffering to the animal. This suffering may be manifested in the form of behavioural disturbances, increased risk of illness or hormonal changes that indicate stress. The animal's behavioural and physiological needs are thus expressed, even if they cannot be satisfied in the present circumstances. An example of a physiological need might be the intake of feed and water. Behavioural needs that remain unsatisfied, such as a calf's need to suckle and a farrowing sow's need to build a nest, can also lead to distress and be expressed in the form of abnormal and stereotypical behaviour. Natural behaviour further encompasses activity that is not manifested if the environment does not allow it. The lack of

opportunity to express natural behaviour can thus constitute welfare problems in the form of the absence of the positive experiences linked with that behaviour.

Area 2 represents challenges in the production system for which the animal lacks corresponding adaptations, and which it therefore does not attempt to avoid. Such disparities can result in problems with its biological function, such as respiratory diseases caused by poor air quality in housing systems, stomach ulcers caused by lack of fibre in the diet, etc. But disparities of this type are, as already noted, not necessarily felt or experienced by the animal before the biological function is impaired, and in such cases the welfare problem is not initially manifested in the form of changes in behaviour.

Finally, Area 3 represents accord between the nature of the animal and prevailing conditions. Here the animal is, to a certain degree, capable of meeting the challenges to which it is exposed, by way of adapting and learning. Under these circumstances a positive quality of life is possible, in which the animal expresses its natural behaviour. Any negative experiences feed into the reactions and learning processes that are part of that behaviour. Nevertheless, welfare problems can also arise here, on the border to Area 2, as the animal approaches the limits of its adaptive ability and is therefore no longer able to cope with its negative experiences through behaviour. The immediate implication is that the negative experiences can constitute a welfare problem in itself. And second that the changes in biological function that result from reaching the limits of adaptation can undermine the welfare of the animal.

LIVESTOCK WELFARE FROM AN ORGANIC PERSPECTIVE

The question now arises as to whether there is anything distinct in organic farming's conception of animal welfare, regarding the points raised above. Given a certain definition and operationalisation of animal welfare, the actual assessment of welfare (A) is no different for animals in organic farms.[7] On the other hand, the ethical decision (B) as to 'how good an animal's quality of life ought to be' can be a distinctive feature of organic farming, considering that livestock welfare is one of the explicit objectives of organic farming. Improved animal welfare can thus constitute one of the certified 'organic qualities', alongside such factors as the protection of environment and nature,

[7] An anonymous referee pointed out that the conceptions and principles of organic farming may suggest distinctive assessment methods. In some parts of the organic movement a more qualitative phenomenological (goetheanistic) method is used for assessing the 'nature' of the animals concerned. And in the study of welfare problems in organic farms the farmers sometimes take part in the research in order to utilise their experiential or tacit knowledge about the animals. See also Simonsen's (1996) evaluation by measured opinion, mentioned above. This is a very interesting issue, which probably concerns the philosophy of science and learning as much as it concerns animal welfare, and which deserves a detailed treatment in a separate paper. Alrøe and Kristensen (2000b) investigates science as a learning process and the systemic interactions between agricultural science and its subject area, and this might provide some background for such a treatment. We do not state that the assessment cannot or should not be value-laden and phenomenological – such an approach is probably highly relevant for the farmer's own learning and management of animal welfare as an expert on his/her own farm, and maybe as an element in the direct contact between consumers and producers in organic farming. What we do state, is that a scientific assessment can only be isolated from value judgements by way of a definition and operationalisation of animal welfare, which, in turn, involves value judgements.

which influence consumer choice of organic products. This is not unique for organic products; it is analogous to for example the consumer's choice of quality-marked conventional pork and beef, which guarantees particular concern for animal welfare. But the ethical decision is not necessarily a consumer decision. It can also be a societal decision to promote certain production systems that are considered to offer improved animal welfare.

Such differences concerning ethical decisions on the aimed *level* of welfare do not, however, imply distinct conceptions of animal welfare – they rather presume a common conception of welfare and shared ethical ideas. There can, however, also be different ethical ideas behind the ethical decisions on animal welfare. And in addition to the basic principles and objectives of organic farming, which have been described above, there are indications that organic farming embodies a distinct philosophical stance with regard to ethical theory.

The deontological and consequentialist traditions in ethics are both 'individualistic' – they focus on the moral relevance of individuals (see also Appleby, 1999; Goodpaster, 1979). The objective of organic farming to make living organisms its allies incorporates the idea that livestock and man together are part of a wider ecological or biotic community. An idea that has been put forward by Aldo Leopold in his 'land ethic' (see e.g. Callicott, 1980). Such a community-based view can form the basis for a less individualistic and more systemic ethics, in line with the so-called 'communitarian ethics' that is founded on care and ethical responsibility (Fraser, 1999: 178ff; Midgley, 1983).[8]

A systemic view of ethics is particularly relevant for organic farming in relation to concepts such as sustainability, in the sense of functional integrity,[9] and the principle of precaution. But the systemic view of ethics can also have a bearing on animal welfare, and thus form a part of the development of a consistent philosophical foundation for welfare in organic farming. The concept of 'harmony', mentioned above, can thus be interpreted as a concept of balance and well-functioning that can apply to the individual animal as well as to the health and integrity of the wider system, such as the herd, farm,

[8] The communitarian ethics can be, and has been, accused of being 'fascist' from an individualistic libertarian point of view. But unlike a position that takes 'communitarian ethics' or the 'land ethic' as a substitute for the predominant individualistic ethics, the systemic ethic is an explicitly self-reflective ethics, which includes both individualistic and systemic consideration as two different paths of extending moral considerability (see further in Alrøe and Kristensen, 2000a). The individualistic path of ethical extension is the well known historical extension from oneself to fellows, persons, humans and sentient beings, and perhaps further to living beings, and all things. The systemic path of extension goes from oneself to the family, the local biotic or ecological community, and the global ecological community. Such a model of ethics does of course not resolve the conflict between systemic and individualistic moral conceptions, but at least it recognises the value in both positions and thus points to dialogue and some middle road, or inclusive position.

[9] See Paul Thompson (e.g. 1996, 1997) for a description of two philosophically distinct meanings of sustainability, resource sufficiency and functional integrity. Resource sufficiency implies an instrumental relation to nature, with a focus on the foreseeable use of resources, food production and food distribution. Functional integrity implies a view of agriculture as a complex system of production practices, social values and ecological relations. The functional integrity of the system depends on the reproduction of the crucial elements, such as soil fertility, crops, livestock, nature and human institutions.

and ecosystem.[10] A key question for the development of such a philosophical foundation, which builds on both the traditional individualistic approach to ethics and on a systemic approach, is the balance between consideration of the individual and consideration of the system or the community. This balance is implicit in every ethical discussion of animal welfare, but the holistic vision of organic farming forces the question to forefront.

We should not expect that the basic theories of ethics, be they deontological, consequentialist or systemic, are able to provide answers to the practical ethical questions of animal welfare. But the different theories do provide particular perspectives for what is taken as problematic and how to address these issues, and in this respect ethical differences can be very important.

The definition of animal welfare

The definition of animal welfare (C) is a difficult issue, on which the principles of organic farming might suggest a special interpretation. Organic farming emphasises the incorporation and use of natural processes, as expressed in its systemic, cyclical conception of production and its description as a sustainable agro-ecosystem (see Textbox I). From this viewpoint, and from the objective to "provide good conditions for all livestock, consistent with their natural behaviour and needs", there is a special link to the concept of animal welfare as the leading of a natural life (3). Relating this to Figure 1, animal welfare can be interpreted as achieving the greatest possible accord between the innate nature of the animal (3a) and the conditions provided. The fact that the natural behaviour of livestock is explicitly mentioned in the objectives of organic farming implies that the interpretation of welfare is not limited to the satisfaction of the animal's physiological and behavioural needs (2). It also includes a wider range of experiences – and thus, presumably, a wider range of feelings (1) – as a consequence of the wider opportunity for expression of natural behaviour. The leading of a natural life does not imply the best welfare in terms of the sum of positive and negative experiences (Simonsen, 1996), but it does comply with the consideration of positive experiences or positive feelings as an important aspect of animal welfare (Verhoog, 2000a)

The emphasis on positive welfare is in opposition to the interpretation that only suffering or negative feelings, which are caused by limitations on behaviour, influence welfare (e.g. Jensen and Toates, 1993: 177). The conception of welfare as the absence of poor welfare is based on a focus on illness, which contrasts with the focus on health encouraged by the ecological movement. The focus on suffering and negative feelings is also linked to the choices made when the concept of animal welfare is interpreted in research terms - that is, the selection and weighting of objective measurements of development and changes in behaviour and of physiological and clinical condition. The indications of suffering seem more appropriate for scientific measurement than the indications of joy.

Given a broad definition (C) of animal welfare – a definition that is not limited to animal function (2), but includes feelings (1) or natural life (3), or both – it is possible to

[10] On the concept of 'ecosystem health' see e.g. Constanza *et al.* (1992) and the critical account by Lehman (2000).

hold the ethical view (B) that livestock welfare should not be limited to ensuring that needs are satisfied. Rather, it should ensure that an animal lives a richer life with the opportunity to express a greater part of its natural behaviour (e.g. play and social behaviour). It is in this context that organic farming's emphasis on the naturalness of the production system becomes clear, for example as it is expressed in the requirement for access to open-air and grazing areas. This broader approach to animal welfare is of course not limited to organic farming; it is also expressed in parts of mainstream agriculture such as the production of free-range pigs. And organic farming also shows a range of compromises in relation to the expression of natural behaviour, such as the widespread use of artificial insemination and the separation of calves from their mothers at a young age (Vaarst *et al.*, 2000a).

A broader understanding of animal welfare can also provide part of the explanation for people's resistance to the industrialised, intensive production of pigs and poultry, despite the fact that the production systems conform to welfare standards that are based on animal needs and clinical health (see also Simonsen, 1996). Within organic farming's systemic perspective, the consumer's interpretation of animal welfare is an important factor - even where it is inconsistent with the accepted scientific view. Consumers and producers are part of a common organic agricultural system that is sustained by the consumers' experience or knowledge of the agricultural practice and production processes – the organic qualities – besides the conventional inherent qualities of the products. An inconsistency between the scientific and the popular understanding of animal welfare is also a challenge to science, whether it is to be resolved through explanation and promotion of the scientific view or though renewed examination of the scientific conception.

A conception of welfare as the leading of a natural life (3) does not necessarily conflict with a conception focused on quality of life in form of experiences or interests (1). It can thus be in perfect accord with welfare defined as the satisfaction of preferences (1a), to the extent that the animal in fact prefers systems that allows it the expression of natural behaviour. This approach to animal welfare can thus also support concepts such as 'freedom of choice' as a means of addressing the fact that animals have individual and changing preferences which we cannot completely know (see e.g. Munksgaard and Jensen, 1996). Animal preferences are however not always advantageous to their needs and health. For example, if offered a free choice between different feeds, an animal may prefer feed that does not meet its needs. The risk of such 'wrong choices' will be greater the further the production system is from the natural conditions or the conditions that the animal is adapted to (refer to Area 2 in Figure 1, where the animal is exposed to challenges in the system that lie outside its innate adaptations).

On the other hand, there may be a contradiction between welfare conceived as a natural life (3) and as the sum of positive and negative feelings (1b), insofar as a life rich in the expression of natural behaviour does not necessarily result in a greater sum of hedonistic welfare. If, for example, the animal's preference is to express natural combative behaviour, this can cause considerable suffering. This question should be qualified by consideration of the fact that experiences cannot be measured directly and that no method for the summation of pleasure and pain is available (refer to the discussion above). However, this does not remove the obvious contradiction that an

increase in the animal's opportunity for expressing natural behaviour (3) can give rise to welfare problems related to its physiological needs and clinical health (2). For example, the Danish rule that organically raised calves must be put out to grass at three months of age has led to recorded problems relating to illness and protection from the elements (Vaarst *et al.*, 2000a).[11] Therefore, a broader interpretation of animal welfare that lays more weight on natural behaviour can also imply greater importance for the concept of 'care'. Care is an expression of human responsibility for the welfare of animals that are subjugated for man's purposes (refer also to the animal protection legislation, quoted above, and to Fraser, 1999). In production systems where management and control are left to a greater degree to the natural processes and animals are allowed the opportunity for more natural behaviour, care and management can become problematic with regard to animal welfare conceived as the absence of suffering and illness (Vaarst and Kristensen, 2000).

The question of an animal's naturalness or integrity (3b), as a concept for the organismic harmony of the animal, might also be a distinct feature in organic farming's conception of animal welfare, even though it is not at present stated explicitly in the basic principles and standards. But section 5.5 on mutilations in IFOAM's basic standards does state that "The animals distinctive characteristics should be respected"; section 5.4 on breeds and breeding states that "Breeding goals should not be in opposition to the animals' natural behaviour and should be directed toward good health"; and – as a more specific rule – genetic engineering is not allowed in organic farming. Taking respect for animal integrity as a distinct feature of organic farming can also be supported by the general emphasis on health, harmony, and reliance on natural processes. Animal integrity can thus be seen as a concept of health that goes beyond the clinical view of health as the absence of illness. The concept of integrity is linked to the view that one should beware of changing an animal's characteristic features, particularly in rapid or drastic steps, because of the particular difficulty in predicting and measuring the consequences for its welfare in a broad sense (as also noted by Sandøe *et al.*, 1996b: 119-20). This is particularly important in relation to the breeding strategies, and the technologies employed to change the innate (genetic) nature of the animals, because of the far-reaching consequences. But the concept of integrity can be used broadly in relation to interference with an animal's anatomy (e.g. dehorning or castration), physiology (e.g. the use of hormones) and reproduction, as well as to changes to the animal's genetic nature through breeding strategies and genetic engineering.

As a radical example relating to the naturalness and integrity of livestock, Sandøe *et al.* (1999: 321-22) describe an experimental breed of blind hens which displayed both improved production results and significantly fewer welfare problems than sighted hens, as measured against the normal standards in animal welfare research. Many would consider there to be an animal welfare problem in the breeding of blind hens or blind pigs, even if this problem cannot be established from the conceptions of animal welfare as functioning well (2), preference satisfaction (1a) or pleasure (1b). But in light of

[11] As pointed out by a second anonymous referee, this example may not be the best. The problems may be due to that the situation for the calf is not natural enough: 'Real' natural behaviour would mean that the calf goes with the cow and drinks milk until 8-11 months of age. Compare with the welfare situation for beef calves that go with their mother – here the welfare of the calf is not a big problem.

other concepts of animal welfare, such as leading a natural life (3), and the animals' naturalness or integrity (3b), these kinds of modifications are problematic.

The solution of animal welfare problems

With the example of the blind hens in mind, a last question arises: does organic farming hold a particular perspective with respect to the solving of animal welfare problems (D)? Organic farming's declared holistic ethos means that the solution of welfare problems, with their concomitant ethical considerations, must necessarily be discussed from a very broad perspective that takes the whole agricultural system into consideration. The systemic view of animal welfare is illustrated in Figure 2, which shows the interplay between animal welfare at the individual level and the agricultural system, with an indication of some essential elements at each level. At the individual level, animal welfare is shown as the relationship between the innate nature of the animal and the conditions to which it is exposed (in accordance with Figure 1); whilst the agricultural system incorporates the nature of the animals, the farm structure, and the larger production and consumption system.

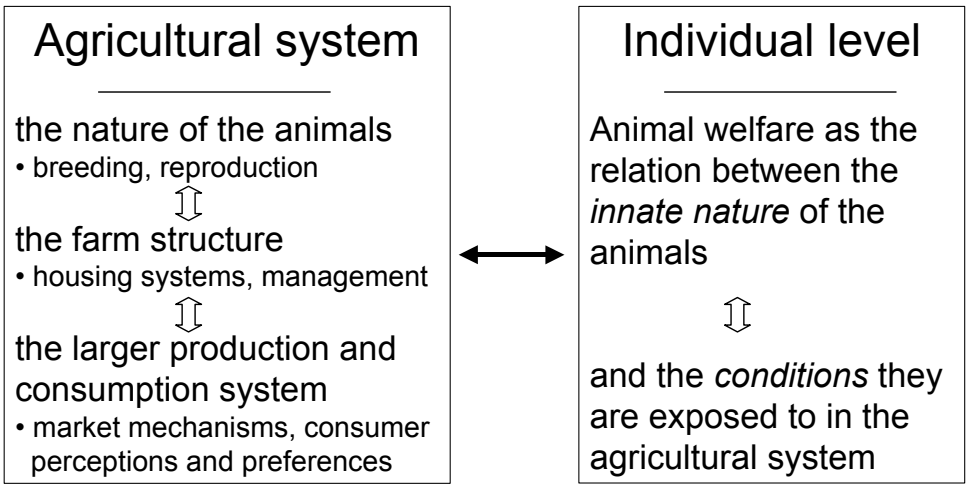

Figure 2: A systemic view of animal welfare showing the interplay between animal welfare at the individual level and the agricultural system.

Solutions to livestock welfare problems can thus be sought either at the individual level or through changes in the agricultural system. If solutions are sought at the individual level, without including the wider perspective, welfare improvements must be made within the given farming system and with the livestock currently in the system. This might for example involve changes to farm routines and care, or operations performed on the animals (e.g. dehorning or beak trimming). The systemic perspective offers a wider range of approaches to solving welfare problems. The previous discussion emphasised how the welfare of the individual animal depends on the relationship between its innate nature (3a) and the given conditions. The conditions are largely dictated by the farming system. The choice of housing system and production strategy thus constitutes an important approach to the prevention and solution of welfare

problems (Enevoldsen and Gröhn, 1996), even though, as already noted, the management and care of animals also plays a central role for their welfare in a given system.

Changes of the innate nature of the animals through the choice of breed and breeding strategy is another important factor of animal welfare in a systemic perspective. This has become very clear in association with the ongoing development of technological breeding methods (including genetic engineering); but even the more traditional breeding strategies can produce animals whose nature and constitution has a decisive negative impact on their welfare. This is, for example, well documented in relation to the breeding of broilers that are, to some degree, incapable of walking normally (Sandøe *et al.*, 1999). And in the use of certain (highly productive) breeds for organic egg production whose tendencies to feather pecking and cannibalism make them unsuited to the free-range production systems of organic farming (Sørensen, 1996). Breeding can, of course, also be used to improve livestock welfare by making the animals better adapted to the conditions prevalent in the production system, such as for example the breeding of polled cattle as an alternative to dehorning. But from the perspective of organic farming, breeding for better welfare must include respect for the integrity of the animals (3b).

The choices of breed, breeding strategy, and reproduction strategy are important aspects for the prevention and solution of livestock welfare problems within the perspective of organic farming. The latest EU Council Directive on organic livestock production emphasises the prevention of welfare problems through the selection of breeds and breeding stock (EU, 1999). Organic farming's objective to be a self-sufficient and sustainable agro-ecosystem (see Textbox I) further highlights the fundamental importance of the breeding, reproduction, and growth of livestock that are suited to organic production. As mentioned above, there can be a conflict between individualistic and systemic ethics (B), and this conflict becomes clear when the systemic considerations are included in the solution of welfare problems. The above-mentioned EU directive also emphasises the use of rearing and farming methods that promote resistibility and strengthens the animal's natural immune defence. Moreover, it states a number of restrictions on the use of medicine, including increased holdback times and requirements for renewed conversion in case of repeated treatments. These restrictions are not based on an individualistic view of animal health and welfare. On the contrary, they can lead to inferior welfare for the individual animal, because of insufficient treatment. Such rules can only be understood from a systemic view of the solution of welfare problems, comparable to the restrictions on use of pesticides and artificial fertilisers in organic plant production. This kind of restrictions on the technical options for intervention generally compels the use of strategies for solving problems in production by way of more fundamental changes of the production system.

From the systemic point of view, it is also possible to seek solutions to animal welfare problems within the production and consumer system in its broadest sense, since the farming system, farm management, the breeding of production animals and the relationship between consumer and production system interact with the welfare of individual animals in many ways. Organic egg production in Denmark, for example, faces the problem that today's consumers have the perception of organic eggs being

brown, whereas in fact the breeds with the least tendency to feather pecking and cannibalism lay white eggs. Changing this consumer perception can thus be part of the solution of an animal welfare problem. On the other hand, the consumer's ethical decision to pay more for products that are certified to be produced with greater concern for animal welfare, can be a deciding factor in developments towards improved welfare in livestock production. As can the societal decisions on improving animal welfare that are manifested in general laws and regulations.

However, the improvement of animal welfare need not rely only on market mechanisms and legislation. In the history of organic farming the direct relation between consumer and producer and their shared vision of agriculture has been the primary force in the development of organic production. Certification and regulations are means to ensure that shared vision in today's organic agriculture, where the direct contact between consumers and producers has become rarer. And the certification and regulation system of organic farming has become more and more complex in the last decades, but detailed regulation regarding production and housing systems, etc., cannot in itself secure and improve livestock welfare, since care and farm management play a decisive role. So perhaps organic farming should highlight its own historically distinctive relation between consumers and producers, and use this as a constructive force in the development of animal welfare in organic farming. This could, in turn, constitute a separate and more direct, experiential form of assessment besides the scientific assessments of livestock welfare.

CONCLUSION

The analysis in the present paper has shown that there are a number of animal welfare issues that are distinctive to organic farming. The most obvious one is the ethical decision as to how good a quality of life the animals are entitled to, which can be different from conventional farming because organic farming has improved livestock welfare as an explicit objective. But more important in the present context is the underlying philosophical and ethical ideas and the related question of the definition of what constitutes good animal welfare. Overall, organic farming incorporates a systemic view of human and livestock as part of a larger ecological system. This view is a distinct feature that can influence animal welfare by way of emphasising the system's harmony and integrity. The definition of animal welfare in organic farming can be taken to incorporate greater opportunity for expression of natural behaviour, including access to out-door areas and freedom of choice as a means of addressing an animal's individual preferences. This, on the other hand, can be in conflict with a more conventional conception of animal welfare as the absence of suffering. The 'naturalness' and integrity of the animals can also be a distinctive livestock welfare issue in organic farming. In this context the breeding and reproduction of suitable livestock breeds within organic production systems and the choice of breeding strategies and technologies are central issues in solving welfare problems.

In conclusion, one can imagine a forward-looking vision for the development of organic farming in relation to animal welfare. Rather than involving more detailed regulation, this vision would focus on the distinctive features of organic farming: increased opportunity for the expression of natural behaviour, animal integrity, and harmony in

the structure and function of the farming system, and build on increased communication and contact between consumer and producer. However, even within the organic movement there are clearly differing values, ethical ideas, and interpretations of animal welfare and a fuller clarification of these issues would be a useful tool in the development of livestock welfare in organic farming. There is no value-free yardstick for saying whether livestock welfare in organic farming is better or worse than in conventional agriculture,[12] or for saying whether some aspects of organic farming systems lead to better or worse welfare – such questions necessarily entail discussions, inquiries, and decisions concerning the values and ethics involved.

REFERENCES

Alrøe, H.F. and Kristensen, E.S. (2000a) Towards a systemic ethic. In search of an ethical basis for sustainability and precaution. *Submitted to Environmental Ethics.*

Alrøe, H.F. and Kristensen, E.S. (2000b) Towards a systemic research methodology in agriculture: Rethinking the role of values in science. *Submitted to Agriculture and Human Values.*

Appleby, M.C. (1999) Tower of Babel: Variation in ethical approaches, concepts of welfare and attitudes to genetic manipulation. *Animal Welfare* **8**:381-390.

Broom, D.M. (1996) Animal welfare defined in terms of attempts to cope with the environment. *Acta Agric.Scand.Sect.A.Anim.Sci.* **Suppl. 27**:22-28.

Callicott, J.B. (1980) Animal liberation. A triangular affair. *Environmental Ethics* **2**:311-338.

Constanza, R., Norton, B.G., and Haskell, B.D. (eds.) (1992) *Ecosystem health. New goals for environmental management*. Island Press, Washington D.C.

Duncan, I.J.H. (1996) Animal welfare defined in terms of feelings. *Acta Agric.Scand.Sect.A.Anim.Sci.* **Suppl. 27**:29-35.

Enevoldsen, C. and Gröhn, Y.T. (1996) A methodology for assessment of the health-production complex in diary herds to promote welfare. *Acta Agric.Scand.Sect.A.Anim.Sci.* **Suppl. 27**:86-90.

EU (1999) Council Directive no. 1804/1999 of 19th July 1999. *Official Journal of the European Communities* **222**:1-28.

Fraser, D. (1999) Animal ethics and animal welfare science: bridging the two cultures. *Applied Animal Behaviour Science* **65**:171-189.

Fraser, D. and Duncan, I.J.H. (1998) "Pleasures", "pains" and animal welfare: Toward a natural history of affect. *Animal Welfare* **7**:383-396.

Fraser, D., Weary, D.M., Pajor, E.A., and Milligan, B.N. (1997) A scientific conception of animal welfare that reflects ethical concerns. *Animal Welfare* **6**:187-205.

FØJO (2000) *Analyse af det økologiske regelsæt vedr. husdyrsundhed og husdyrvelfærd*. {Analysis of the organic regulations of livestock health and welfare}. Forskningscenter for Økologisk Jordbrug.

Goodpaster, K.E. (1979) From egoism to environmentalism. In: *Ethics and problems of the 21st century,* p. 21-35. (Edited by Goodpaster, K. E. and Sayre, K. M.). University of Notre Dame Press, Notre Dame, Indiana.

IFOAM (1998) *Basic standards for organic production and processing*, International Federation for Organic Agriculture Movements, Mar del Plata, Argentina. [Excerpts on-line at http://www.ifoam.org].

[12] This point was emphasised by a third anonymous referee.

Jensen, K.K. and Sandøe, P. (1997) Animal welfare: relative or absolute? *Applied Animal Behaviour Science* **54**:33-37.
Jensen, P. and Toates, F.M. (1993) Who needs "behavioural needs"? Motivational aspects of the needs of animals. *Applied Animal Behaviour Science* **37**:161-181.
Kristensen, E.S. and Thamsborg, S.M. (eds.) (2000) *Sundhed, dyrevelfærd og medicinanvendelse ved omlægning til økologisk mælkeproduktion* {Health, animal welfare and the use of medicine upon conversion to organic milk production}. FØJO-rapport nr. 6, Forskningscenter for Økologisk Jordbrug, Foulum.
Lehman, H. (2000) Ecosystem health as a moral requirement. *Journal of Agricultural and Environmental Ethics* **12**:305-317.
Midgley, M. (1983) *Animals and why they matter*. University of Georgia Press, Athens, USA.
Ministry of Agriculture and Fisheries (1995) *Husdyrvelfærd og husdyrproduktion. En rapport om forskning i velfærd for husdyr* [Animal welfare and animal production. A report on research in the welfare of livestock] Forskningssekretariatet, Landbrugs- og Fiskeriministeriet, København.
Ministry of Food, Agriculture and Fisheries (1999)) *Aktionsplan II - Økologi i udvikling* [Action Plan II – Developments in Organic Farming] Strukturdirektoratet, Ministeriet for Fødevarer, Landbrug og Fiskeri, København. [English summary on-line at http://www.dffe.dk/publikationer/index.htm]
Munksgaard, L. and Jensen, M.B. (1996) The use of "open field" tests in the assessment of welfare of cattle. *Acta Agric.Scand.Sect.A.Anim.Sci.* **Suppl. 27**:82-85.
Nash, R.F. (1989) *The rights of nature. A history of environmental ethics*. The University of Wisconsin Press, Madison, Wisconsin.
Röcklinsberg, H. and Lund, V. (2000) Is well-being all that matters in animal ethics? Some comments on the relation between welfare and dignity in animal ethics in relation to organic farming. In: *Two Systems - One World*, Proc. of EurSafe 2000 Congress on Agricultural and Food Ethics, p. 227-229. (Edited by Robinson, P.). Centre for Bioethics and Risk Assessment, The Royal Veterinary and Agricultural University, Copenhagen. [Online at http://www.husdyr.kvl.dk/htm/psa/eursafe.htm].
Rollin, B.E. (1996) Ideology, "value-free science", and animal welfare. *Acta Agric.Scand.Sect.A.Anim.Sci.* **Suppl. 27**:5-10.
Sandøe, P., Hagelsø, M., and Jeppesen, L.L. (1996a) Concluding remarks and perspectives. *Acta Agric.Scand.Sect.A.Anim.Sci.* **Suppl. 27**:109-115.
Sandøe, P., Holtug, N., and Simonsen, H.B. (1996b) Ethical limits to domestication. *Journal of Agricultural and Environmental Ethics* **9(2)**:114-122.
Sandøe, P., Munksgaard, L., Bådsgård, N.P., and Jensen, K.H. (1997) How to manage the management factor - assessing animal welfare at the farm level. In: *Livestock farming systems. More than food production. Proc. of the 4th int. symp. on livestock farming systems. EAAP Publication No. 89,* p. 221-230. (Edited by Sørensen, J. T.). Waageningen Pers, Waageningen, The Netherlands.
Sandøe, P., Nielsen, B.L., Christensen, L.G., and Sørensen, P. (1999) Staying good while playing God - The ethics of breeding farm animals. *Animal Welfare* **8**:313-328.
Simonsen, H.B. (1996) Assessment of animal welfare by a holistic approach: behaviour, health and measured opinion. *Acta Agric.Scand.Sect.A.Anim.Sci.* **Suppl. 27**:91-96.
Sørensen, P. (1996) Avlsmateriale til økologisk fjerkræproduktion. In: *Økologisk ægproduktion* {Breading material for organic poultry production. In: Organic egg-production}, p. 81-90. SH Beretning nr. 729. Statens Husdyrbrugsforsøg, Foulum.

Tannenbaum, J. (1991) Ethics and animal welfare: The inextricable connection. *J.Am.Vet.Med.Assoc.* **198(8)**:1360-1376.

Thamsborg, S.M., Hovi, M., and Baars, T. (2000) What to do about amimal welfare in organic farming? A report on the Animal Welfare Discussion at the 2nd NAHWOA Workshop. In: *The diversity of livestock systems and definition of animal welfare.*, Proc. of The 2nd NAHWOA Workshop, Córdoba, Spain, 8-11 January 2000, p. 161-165. [Online at http://www.veeru.reading,ac,uk/organic/proceedings.htm].

Thompson, P.B. (1996) Sustainability as a norm. *Society for Philosophy & Technology* **2(2)**:75-93.

Thompson, P.B. (1997) The varieties of sustainability in livestock farming. In: *Livestock farming systems. More than food production. Proc. of the 4th int. symp. on livestock farming systems. EAAP Publication No. 89,* p. 5-15. (Edited by Sørensen, J. T.). Waageningen Pers, Waageningen, The Netherlands.

Vaarst, M. and Kristensen, E.S. (2000) Muligheder for forbedringer {Options for improvement}. In: *Sundhed, dyrevelfærd og medicinanvendelse ved omlægning til økologisk mælkeproduktion,* p. 135-144. (Edited by Kristensen, E. S. and Thamsborg, S. M.). FØJO-rapport nr. 6. Forskningscenter for Økologisk Jordbrug, Foulum.

Vaarst, M., Alban, L., Bak, M., and Mogensen, L. (2000a) Sundhed og velfærd hos kalve og opdræt {Health and welfare amongst calves and heifers}. In: *Sundhed, dyrevelfærd og medicinanvendelse ved omlægning til økologisk mælkeproduktion,* p. 93-107. (Edited by Kristensen, E. S. and Thamsborg, S. M.). FØJO-rapport nr. 6. Forskningscenter for Økologisk Jordbrug, Foulum.

Vaarst, M., Alrøe, H.F., Lund, V., Baars, T., and Verhoog, H. (2000b) Identifying animal welfare in the context of organic farming. In: *Two Systems - One World*, Proc. of EurSafe 2000 Congress on Agricultural and Food Ethics, p. 29-30. (Edited by Robinson, P.). Centre for Bioethics and Risk Assessment, The Royal Veterinary and Agricultural University, Copenhagen. [Online at http://www.husdyr.kvl.dk/htm/psa/eursafe.htm].

Verhoog, H. (1996) Genetic modification of animals: Should science and ethics be integrated? *The Monist* **79(2)**:247-263.

Verhoog, H. (1998) Morality and the 'Naturalness' of transgenic animals. *Animal Issues* **2(2)**:1-16.

Verhoog, H. (2000a) Defining positive welfare and animal integrity. In: *The diversity of livestock systems and definition of animal welfare*, Proc. of The 2nd NAHWOA Workshop, Córdoba, Spain, 8-11 January 2000, p. 108-119. [Online at http://www.veeru.reading.ac.uk/organic/proceedings.htm].

Verhoog, H. (2000b) Animal integrity: aesthetic or moral value? In: *Two Systems - One World*, Proc. of EurSafe 2000 Congress on Agricultural and Food Ethics, p. 269-272. (Edited by Robinson, P.). Centre for Bioethics and Risk Assessment, The Royal Veterinary and Agricultural University, Copenhagen. [Online at http://www.husdyr.kvl.dk/htm/psa/eursafe.htm].

Vorstenbosch, J. (1993) The concept of integrity. Its significance for the ethical discussion on biotechnology and animals. *Livest.Prod.Sci.* **36**:109-112.

Woodward, L., Flemming, D., and Vogtman, H. (1996) Reflections on the past, outlook for the future. In: *Fundamentals of organic agriculture*, Proc. of The 11th IFOAM International Scientific Conference, August 11-15, 1996, Vol. 1, p. 259-270. (Edited by Østergaard, Troels V.). IFOAM, Copenhagen, Denmark.