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ARTICLES

Concepts of Animal Health and Welfare in Organic Livestock Systems

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Abstract In 2005, The International Federation of Organic Agricultural Movements (IFOAM) developed four new ethical principles of organic agriculture to guide its future development: the principles of health, ecology, care, and fairness. The key distinctive concept of animal welfare in organic agriculture combines naturalness and human care, and can be linked meaningfully with these principles. In practice, a number of challenges are connected with making organic livestock systems work. These challenges are particularly dominant in immature agro-ecological systems, for example those that are characterized by industrialization and monoculture. Some of the current challenges are partly created by shortages of land and manure, which encourage zero-grazing and other confined systems. Other challenges are created in part by the conditions for farming and the way in which global food distribution systems are organized, e.g., how live animals are transported, how feed is traded and transported all over the globe, and the development of infrastructure and large herds. We find that the overall organic principles should be included when formulating guidelines for practical organic animal farming. This article explores how the special organic conceptions of animal welfare are related to the overall principles of organic agriculture. The aim is to identify potential routes for future development of organic livestock systems in different contexts and with reference to the specific understanding of animal welfare in organic agriculture. We include two contrasting cases represented by organic livestock systems in northwestern Europe and farming systems in tropical low-income countries; we use these cases to explore the widely different challenges of organic livestock systems in different parts of the world.

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Introduction

Organic livestock farming has an explicit goal of improved animal health and welfare compared with non-organic farming. Zander and Hamm (2010) found that among seven additional ethical attributes, consumers in five European countries generally ranked “animal welfare” the highest, in some cases ranking it second to “regional production.” However, there are many different conceptions of what welfare is, and animal welfare is both an evaluative concept (such as argued by Rollin, 1990, among others), as well as a normative concept, which involves both value judgments and ethical concerns. In the investigation of Zander and Hamm (2010) mentioned above, there was, for example, no clear definition of the term “animal welfare.” In organic agriculture, a number of animal welfare issues differ clearly when compared to non-organic farming. This means that not only is there an explicit goal of improved livestock welfare, but—more important—an underlying philosophical and ethical idea and definition of what constitutes good animal welfare.

The first organic principles were based on farming experiences in India, and agro-ecological agriculture developed in tropical countries. The definition formulated by The International Federation of Organic Agricultural Movements (IFOAM; http://www.ifoam.org/growing_organic/definitions/doa/index.html) states:

Organic agriculture is a production system that sustains the health of soils, ecosystems and people. It relies on ecological processes, biodiversity and cycles adapted to local conditions, rather than the use of inputs with adverse effects. Organic agriculture combines tradition, innovation and science to benefit the shared environment and promote fair relationships and good quality of life for all involved.

With this definition as a background, we assume that organic livestock production both in northwestern Europe, for example, as well as in tropical countries, can be carried out in accordance with the principles, although using widely difficult practices.

The idea of organic agriculture includes a concept of naturalness. For the animals, this includes access to outdoor areas and freedom of choice that allows each animal to express its individual preferences (Lund 2002 and 2006; Verhoog et al. 2004; Waiblinger et al. 2004; Verhoog et al. 2007). In addition to considerations regarding the individual animal, organic farming incorporates a systemic view of humans and animals as part of a larger ecological system (Baars et al. 2004; Vaarst et al. 2004; Alrøe et al. 2001), and incorporates climatic, cultural, traditional, and social conditions of the surroundings (Vaarst et al. 2006). On a larger scale, individual animals, livestock farms, and the livestock sector in general are influenced by larger food systems, some of which are global and involve trading of breeding stock, feedstuffs, and animal products (Gura 2008; Steinfeld 2006).

Animal health and welfare is influenced by the ways in which these systems are constructed, and also has the potential to influence these systems. The organic livestock sector also represents a way of farming that can be claimed—as any other sector of organic agriculture—to be based on IFOAM’s four principles of health, ecology, fairness, and care (IFOAM 2005). It therefore is relevant to explore how the underlying idea of animal welfare in organic farming is related to these principles and how the principles are put into practice with regard to the interface between livestock as individuals, herds, parts of farming systems, and parts of food systems.

Lund (2002) emphasized that although organic farming aims to improve animal health and welfare, animal welfare is not explicitly mentioned as a core value of its own; she adds that it might be justified to mention the interests of animals as a core value. This question also was brought up when the four principles were developed in IFOAM in 2003–2005, and there was discussion about whether “good animal welfare” should be included as a separate principle (Luttikholt 2007). In particular, there was a difference of opinion between the marked European and North American focus on animal welfare in contrast with the emphasis on poor people over animals in low-income countries, e.g., in Africa, Asia, and South America. It was decided that good animal welfare was contained in the four principles as part of the more overarching principle of fairness, which concerns both humans and animals, and which features animal welfare in the accompanying explanation. This is a major reason for exploring how the overall organic principles link to organic livestock farming’s particular understanding of how animal welfare involves naturalness and human care as key features (Fig. 1).

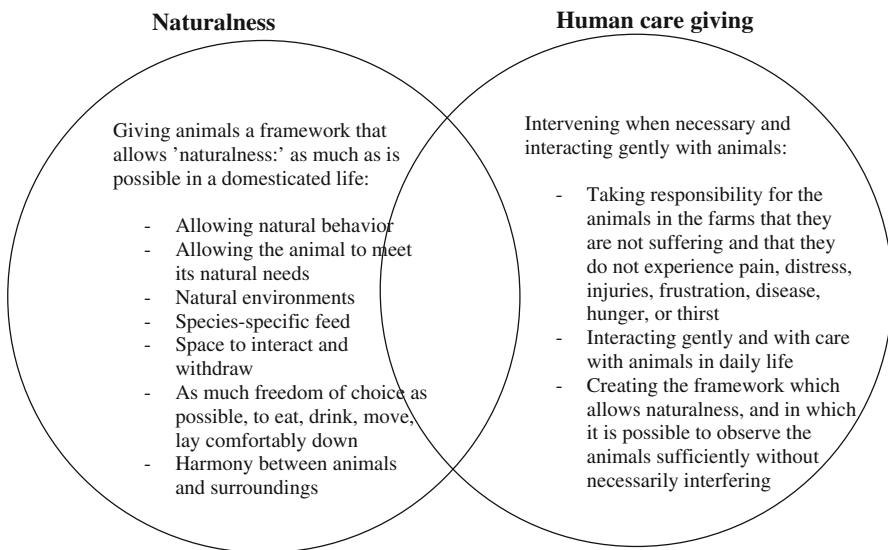


Fig. 1 The interfaces between naturalness and human care and how they together can be viewed to constitute a key concept of animal health and welfare in organic animal farming. In practice, there will be negotiation in each context how to understand this

In the following, we explore and analyze how the concepts of animal health and welfare in organic animals and livestock farming as previously discussed by Alrøe et al. (2001) can meaningfully and constructively be linked to the organic IFOAM principles of health, ecology, fairness, and care; finally, we discuss the potential implications this can have for the future development of organic livestock systems. To understand how the principles can be put into practice on widely different types of livestock farms, we discuss these issues in relation to two contrasting cases represented respectively by organic livestock systems in northwestern Europe and farming systems in tropical low-income countries.

Distinctive Issues of Animal Health and Welfare in Organic Livestock Farming, Including Naturalness and Human Care-Giving

In the early 2000s, the authors of this article participated in a research and fact finding processes in which animal welfare in organic livestock systems was explored and conceptualized. One outcome of this was published in 2001 (Alrøe et al. 2001). In the following the main conclusions from this work will be summarized, as they will be a starting point for the analysis and discussion in this article about how the concepts of animal welfare relate to IFOAM's four principles of organic agriculture.

Animal welfare at an individual level can be understood as three basic concepts: (1) the animal should feel well (referring to its experience, feelings, interests, and preferences), distinguishing between welfare as the satisfaction of preferences, or as pleasure (hedonism), i.e., experienced as pleasant feelings along with the absence of unpleasant feelings; (2) it should function well (meeting its needs and being in good clinical health condition); and, (3) it should lead a natural life through the development and exercise of its natural adaptations, with reference to its innate nature. The concepts of “nature” and “natural” here refer to the idea that a long evolutionary process has led to a harmoniously balanced living organism that is in harmony with its surroundings. The animal's genetic or innate nature has been continuously and slowly changing and adapting through evolution and domestication, but if significant and rapid modifications are made through modern breeding and biotechnology, or through changes in the form of production, this harmony potentially can be broken. Where the term “harmony” is commonly used in connection with organic production, the term “integrity” is a more widely used term in animal welfare and animal ethics in general, with more or less the same meaning.

In light of the above, “naturalness” does not limit the welfare of an animal to a question of whether its needs are met. It also involves thoughts of animals being able to live a richer life with the opportunity to express a greater part of their natural behavior (e.g., play and social behavior), to have valuable experiences, and to have access to feed and surroundings that can be considered natural for the species and breed. In reality, it includes taking seriously the “Freedom to perform normal behavior” (one of the so-called “Five Freedoms”; <http://www.fawc.org.uk/freedoms.htm>), although the organic principle goes much further, since “naturalness” is a much wider concept than

“natural behavior,” as discussed above. This is a clear distinction from non-organic, intensive, and industrialized farming systems, where flock animals are individually caged or are unable to move, root, graze or have minimal freedom of choice.

Of course, a domesticated farm life with a huge pressure on productivity is far from “natural,” and the framework for “naturalness” is designed by humans. “Naturalness” in a farming system is not synonymous with “living as in nature.” In nature, there is great risk of suffering, since there is no protection against hunger, thirst, predators and harsh climatic conditions. In an organic livestock farming system, the humans have a clear moral obligation to prevent suffering in accordance with the first basic concept of animal welfare above.

In practice, creating and working within a farming system in which animals are able to fulfill their natural behavior and meet their natural needs often is more labor intensive and demanding regarding supervision and observation of the animals in flocks and sometimes on very large outdoor areas. On the other hand, keeping animals in more extensive ‘natural’ environments may lighten feeding routines, for example, because the animals are grazing or fed in one place *ad libitum*. Because of the aim of letting the animals live as naturally as possible, whilst still surrounded by human care, the organic farmer must intervene whenever necessary to prevent a critical situation from arising, but without intervening unnecessarily. This requires more attention to daily life and sufficient knowledge of epidemiology, disease signs, and natural behavior, as well as signs of responses to inadequate surroundings (Vaarst et al. 2004).

Exploring The Connections Between Animal Welfare and IFOAM’s Organic Principles of Ecology, Care, Health, and Fairness

Linking the Principle of Ecology to Naturalness

In the IFOAM principles for organic agriculture, this principle is briefly explained as follows: “Organic Agriculture should be based on living ecological systems and cycles, work with them, emulate them and help sustain them.” We perceive that this principle is understood in close connection with naturalness, including the animals in ecological systems, and allowing the individual animal to feed, live, and behave to fulfill its natural needs regarding physiology, psychology, anatomy, and in all other ways, being part of the ecological systems where it has developed its role and niche. As such, the principle of ecology refers to the integration of the animals (individually and as herds) into the whole agro-ecosystem and, on a larger scale, into the whole food system in ways allowing all elements to support each other. Segerdahl (2007) proposes that we understand farms as local human/animal cultures, and believes this will help us to decide how we can understand “natural behavior,” for example. Verhoog et al. (2007) link this closely to the concept of integrity, which comprises “the respect for the wholeness, harmony or identity of living entity.” Farmers have to understand the animals’ natural needs in the context of the farming systems, for example feeding ruminants like ruminants and not like

monogastric animals. To be able to fulfill this, breeds must be chosen that are appropriate in relation to each context. This requires a diversity of locally adapted breeds from each species. It can also emphasize the importance of developing diversified farming systems in which each animal species has its role in the entire system.

The Principle of Care Reflects Human Interaction with Animals

Alrøe et al. (2001) combine elements of naturalness with elements of human care to understand the concept of animal welfare in organic agriculture. The IFOAM principle about care is formulated “Organic Agriculture should be managed in a precautionary and responsible manner to protect the health and well-being of current and future generations and the environment.” We perceive that the principle of care expresses the human responsibility to protect, intervene, and interact wisely and with humaneness. Appleby (2005) argues for humaneness in relation to animals as an asset that is very closely linked to the sustainability of agricultural systems. He argues that this interconnectedness between humane treatment of animals and other aspects of sustainable farming (e.g., following the definition above) is not coincidental:

Clustering of animal production facilities into limited geographical areas tends to go hand-in-hand with intensification: with increased farm size, confinement of animals, and less individual attention given to those animals. So although animal treatment is not universally better on small than on large farms, small farms do tend to have some advantages for animal welfare. A move away from concentration of production, and in particular a reduction in building of Concentrated Animal Feeding Operations, therefore, should also result in more humane husbandry (p. 297).

Appleby (2005) refers to the following definition of humane given in the Merriam-Webster dictionary (1990, quoted by Appleby 2005): “marked by sympathy or consideration for other human beings or animals.” The concept is thereby closely linked to the idea that animals are in certain senses equal to humans and therefore equally worthy of moral consideration (Singer, 1975), and unlike the Kantian notion that we should treat animals humanely only because “tender feelings towards dumb animals develop humane feelings towards mankind” (Passmore 1975).

This understanding of humaneness links the term nicely to the principle of care, and includes the aspects discussed above. In organic agriculture, the aspects of sustainability (social, economic, environmental, and institutional) are generally important. The issue of humaneness is a part of the concept of sustainability promoted, for example, by “The Alliance for Sustainability,” where sustainability is defined as “ecologically sound, economically viable, socially just and humane” (<http://allianceforsustainability.net/>). In the case of understanding animal welfare in farming systems built on concepts of sustainability, this underlines the care for the animals as individuals as well as parts of livestock systems.

The Principle of Health on the Level of the Individual Animal, the Herd, and the Livestock System

The immediate understanding of the principle of health is rather simple and has been stated throughout the history of organic farming. It is that healthy soil gives healthy plants that feed healthy animals and healthy humans, who then feed the soil (with, among others, manure from healthy animals). IFOAM phrases the principle this way: “Organic Agriculture should sustain and enhance the health of soil, plant, animal, human and planet as one and indivisible.”

It is important to emphasize that health is a concept covering much more than a combination of “absence of disease” and “high performance, production and yield.”

A healthy organism is an organism or a system in homeostasis, meaning that it has the ability to withstand shocks and adjust or react to changing environments. This is supported in health promoting strategies, where the immune system and disease resistance are strengthened generally. It could be achieved by the provision of good quality hay to ruminants, abundant fresh air, and good quality water, or by maintaining a high level of hygiene in the housing and feeding systems. Health promotion can as such be distinguished from disease prevention actions, which are often targeted towards avoidance of certain well-defined disease conditions such as lameness, mastitis, or diarrhea. If focusing on disease, one disease preventive action can potentially have negative side effects on other aspects of the animal’s life because it does not include the idea of homeostasis in the individual whole animal viewed as one organism. An example of this could be provision of limestone dust in the bedding material of dairy cows to keep the claws dry, which then also dries out the skin on the udder and teats of dairy cows, for example, causing skin cracks.

Homeostasis is not only a characteristic of the individual animal, but as much a herd or a livestock farming system. The emphasis on health as the wholeness and integrity of living systems links the principle of health directly to the conception of animal welfare as leading a natural life (according to the distinction by Fraser et al. 1997). To ensure health in animals and livestock systems, the living conditions should actively promote health physically, mentally, and emotionally.

The Principle of Fairness in Relation to Animal Health and Welfare, as well as Livestock Systems in a Globalized World

The IFOAM principle of fairness encompasses both current and future generations of life on Earth, expressed as follows: “Organic Agriculture should build on relationships that ensure fairness with regard to the common environment and life opportunities.” Fairness towards the individual animals implies a fair treatment in all life situations, from birth to death, including transport and handling. The principle demands that animals be provided with the conditions and opportunities of life that accord with their physiology, natural behavior, and well-being (IFOAM, 2005). Humans have a moral obligation to ensure that animals are in situations they can be expected to manage. It also points to the importance of integrity for the animals. This includes that their surroundings should be designed to fit the animals,

e.g., in terms of space, stability in flock composition, and appropriate flock sizes, rather than mutilating animals.

In the understanding of animal health and welfare and the lives of farmed animals, the principle of fairness can to some extent be linked to the issue of “animal rights,” then taking a rights-based approach to the lives of animals, as described by Rollin (1990), for example, who raises the question of human morality to ensure the animal’s well-being, and sees this as a natural extension of social responsibility. However, organic animal agriculture involves animals in the farming system and sees animals as belonging to the wholeness and as “stock” that can be owned by humans. This is far from the animal rights view, discussed by Dogan (2010), for example, who defends animal rights and emphasizes that animals do not belong to humans, but have the right to live and be secure from attacks on their physical existence. Lund and Olsson (2006) emphasize the view on animal agriculture as a form of living together between humans and animals that has evolved over 1000s of years. Lund (2002) and Lund et al. (2004) discusses the “moral contract” between humans and farm animals in organic farming, where farmers agree to a moral obligation to take care of the animals for which they have responsibility, allowing them access to as much naturalness as is possible under farm conditions, and caring for them in all situations. According to this contract, humans are allowed to use animal products and take animals’ lives, but they have the obligation to ensure that the animals in our households live a life in which they are allowed naturalness, and where they are taken care of when needed. Both “naturalness” and “care when needed” are vaguely expressed and seem unavoidably left to negotiation in practice. This negotiation will be based on individual perceptions of “welfare” and ethical choices, e.g., based on what is possible in terms of naturalness, and when a “need” calls for action. It is completely dependent on humans’ knowledge, insight, empathy, and ability to relate to the animals and their needs (Vaarst et al. 2004).

The principle of fairness links the animals and livestock herds to issues of the world food system. The industrialization of livestock farming and the increasing trade and transport within the sector including transport and global trade of live animals that in some cases are moved to environments they can hardly manage (e.g., European breeds transported to tropical areas where they are much more susceptible to disease, heat stress, etc.) is obviously unfair to the animals. Other transport and trade issues are also linked to livestock production and can be strongly linked to the principle of fairness in two ways. First, the transport of feed from tropical areas to the Northern hemisphere’s industrialized livestock farming systems is an important issue of fairness that extends to fairness to the people who could have used their land for food production, the burden of transport fuel etc. Second, the transport of animal products from one continent to the other also opens a larger discussion of fairness in the entire livestock sector, such as keeping animals in Confined Animal Feeding Operations, which may be subsidized and thereby undermine other local non-subsidized animal and livestock systems and markets. Being conscious and reflecting on the implications of this may contribute to a necessary rethinking of global food systems to make them more humane to the animals, in addition to being more resilient and responsible to people (consumers, citizens, and voters—groups

that also include farmers). However, the last of these is beyond the scope of this article.

How Can a Distinct Concept of Animal Health and Welfare for Organic Farming be Understood and Integrated in Two Different Contexts?

Based on this analysis, we conclude that the four organic principles can support a distinct understanding of animal health and welfare in organic agriculture. The individual animal, the organic livestock production system, and the role of humans in organic animal farming can be understood in relation to naturalness, human care, ecology, and health.

However, when one reviews the literature about animal disease patterns for various species, it seems very challenging to reach this well-balanced state in practice. In addition, livestock farming takes place under many different conditions, which requires that a special analysis be made of the potentials and challenges linked to the principles for each context. In the following, we briefly summarize the characteristics of two cases respectively from industrialized European farming and farming in a tropical livestock system.

Northwestern European Livestock Farms

In northwestern Europe, livestock farming—including organic livestock production to some extent—has developed into more specialized and monocultural farming over the last several decades. Taking Denmark as an example, 68% of farms (conventional as well as organic) had cattle, swine, and plant production in 1970, whereas in 2008, only 3% had mixed production. The average dairy herd has increased from 17.3 cows per herd per year in 1975 to 110.9 cows per herd per year in 2008 (Anonymous, 2008). The legislation in Denmark, for example, requires a certain ratio of number of animals to farm area in order to prevent pollution, such as from nitrogen, and the livestock herd provides manure and nutrients to the farm. Livestock products enter the globalized food markets. Animals are generally very high yielding, and relatively few breeds and breeding lines are represented in the population. Within the population, relatively narrow genetic material is being used, and there is a low degree of biodiversity and diversification on the farm level. Production diseases in general are reported to be major challenges on most European organic farms, whether for poultry, pigs, or cattle (Sundrum 2001; Thamsborg et al. 2004; Lund and Algers 2003). Also, most studies cited in Europe refer to specialized and to a varying degree industrialized animal production,¹ where animals are given less access to naturalness, and humans in many cases have less time for specific care-giving actions.

¹ Industrialized in this context is defined as characterized by mass production, rationalized labor organization, a high degree of separation between work and free time for humans involved in the livestock herd, and extended use of technology and automation.

Seen from an agro-ecological point of view, these farming systems are relatively vulnerable and immature in terms of sustainability, and they are highly dependent on infrastructure and transport, and thereby fossil fuels. Factors like transport of live animals, bio-security challenges, high yields, and big flocks can present risks for animal welfare, e.g., restrictions on performing natural behavior, and risks of infectious diseases, which is partly connected to unstable immune functions in open groups of animals. These challenges need to be discussed with regard to whether they allow this type of herd to be considered as living up to the organic concepts of animal health and welfare as well as the livestock-related issues of the basic organic principles in northwestern and some North American livestock farms.

Tropical Organic Livestock Systems

The role of livestock in many tropical countries is to contribute to the ecological and environmental sustainability of these systems, e.g., in nutrient recycling (Hermansen 2003; Powell et al. 2004). Tropical smallholder livestock keepers represent about 20% of the world population (McDermott et al. 2010), and livestock play a significant role in household food and income (Funes-Monzote 2008; Descheemaeker et al. 2010), serving cultural and traditional purposes, as well as supplying the household members and local communities with products like meat, milk, eggs, skin, and bones (Wilson 2009; Powell et al. 2004; Devendra and Thomas 2002), and finally providing draft power (Powell et al. 2004; Descheemaeker et al. 2010). In the farming system, the integration of livestock can give longterm benefits in terms of compost and utilization of marginal areas, in this way helping to prevent land degradation and erosion and contributing to resilient and robust, diversified, and intensified agro-ecological systems (Funes-Monzote 2008; Pretty 2006; Halberg et al. 2009; Vaarst 2010). Dixon and co-authors (2001) stated that generally, the diversified farming systems play a major role in reducing poverty, and well-balanced organic farms are generally based on diversification. However, dilemmas and pressure on the livestock farm exist, such as the aim of letting animals range freely outdoors, where their manure is needed for compost or other redistribution of nutrients, and at the same time, land is very scarce and must provide food for many people. In many such farming systems, the change from traditional farming to organic/agro-ecological farming has led to keeping animals indoors to a much higher degree because of newly gained awareness of the value of manure (Muwanga et al. 2010). Araya and Edwards (2006) and Edwards et al. (2010) give a illustrative example of one of the major dilemmas in organic or agro-ecological livestock production in the tropics, namely that a severe land degradation problem in arid areas in Ethiopia was solved mainly by creating zero-grazing systems for the small ruminants in the area. This conflict between “ecology” (preserving soil quality by not letting animals roam and at the same time, produce sufficient amounts of manure to improve soil quality), and on the other hand animal welfare, including naturalness, allowing animals to carry out their natural behavior, and having access to water and foraged feed in accordance with their needs.

Another major challenge, pointed out by Vaarst et al. (2006) and Muwanga et al. (2010), relates to larger flocks of animals, e.g., ruminants in pastoralist communities

or scavenging village poultry. These animals can carry out their natural behavior and (depending on the surroundings) can get sufficient amounts of feed in accordance with their natural needs. Nevertheless, these systems often have been proven to be risky with regard to infectious and endemic diseases for which vaccination is needed (e.g., Newcastle disease in free ranging poultry), or where heavy medication is often used to prevent disease outbreaks (e.g., tick-borne diseases in cattle). Rubaire-Akiiki et al. (2006) concluded that endemic stability in dairy cattle regarding most tick-borne diseases could be well managed by hand picking of ticks. This is possible in smallholder herds but is less possible in pastoralist herds with hundreds of cattle.

Final Discussion: Future Development of Organic Livestock Systems

The organic principles described and discussed above give guidance on what can be considered a balanced agro-ecosystem. If a high degree of harmony and integration is built into the system, it is likely that animals have or can take a special role, for which they can be valued. In a mature, diversified agro-ecosystem, the animals' natural behavior is expected to be fulfilled when they are let out on outdoor areas. Based on a questionnaire administered to Swedish organic farmers, Lund et al. (2004) concluded that particularly the so-called "pioneers," (who had converted to organic farming early), perceived natural behavior as a key issue in animal welfare, whereas this was less true among the so-called "entrepreneurs," who also were more skeptical of the organic standards. This suggests that not only the possibilities for performing natural behavior in organic livestock farming, but also the perceptions of the farmers, are changed with changed practices and inspirations connected with these changes. In contrast, animal welfare in accordance with the principles described above seems much more difficult to practice on farms that are more mono-cultural and industrialized and do not fully live up to the organic principles in other ways. For example, naturalness is difficult to introduce in large confined systems, and human care is also difficult to insist on in systems with a high ratio of animals to people.

In tropical systems, the immature agro-ecosystems are represented e.g., by traditional farming systems such as so-called slash-and-burn; the farmers may have animals, but they are not integrated into any strategy for improving soil quality. Another challenge may be related to the production of certified organic products for export, if the producers are unaware of the organic principles and only see it as an opportunity to sell products. Systems for certifying organic products have been developed mainly in northwestern Europe and the USA, and focus to a great extent on the commodity aspect of organic farming systems. This can push a development towards monocultural production systems such as enormous cotton fields or coffee plantations. This can give the farmers opportunities for income-generating activities; introduction of certified organic production has been shown to have great potential benefits for poor farmers, such as in the Swedish-African EPOPA program.² Walaga (2009) emphasized the importance of certifying the whole farm,

² <http://www.grolink.se/epopa/Publications/Epopa-end-book.pdf>.

not only the crop that is being exported. This may stimulate an integration of the organic concept into the whole farm, viewing it as an opportunity for changing to a more productive and well-balanced farm, rather than niche production for export to privileged consumers in the Northern hemisphere.

As illustrated above, several factors influence the creation of healthy, fair livestock food systems with meaningful consideration of ecology and care aspects. Hence, the challenges become very complex. In order to create systems that meet the animals' needs, much knowledge and the ability to reflect and innovate is required. A practical example of this is given for organic calves, where the farmer needs knowledge about natural behavior and epidemiology as well as ethology to design systems and act in these systems in ways that are appropriate to the animals that he or she has taken into the household (Vaarst et al. 2001 and 2004). Farming in accordance with the principles is not ensured through setting up standards, as we have seen in the EU (Sundrum et al. 2006; Vaarst et al. 2008). Merrigan et al. (2010) identify four discrete standards to be adopted within the organic program of the USA, but also conclude that it is challenging because the organic livestock sector is still underdeveloped and the infrastructure poor. Future recommendations on the development of the organic livestock sector towards the fulfillment of the principles should include standards, which continuously stimulate this development, but should not rely on standards alone.

Organic agriculture is a farming system built on ethical choices and values. This should obviously include farmers and other actors in the organic sector as the most important partners in it, in order to link it to daily practice and priorities. According to Hendrickson and James (2005), group and self identity are prime movers for behavior, such as moral behavior, and one's sense of self will have an effect on behavior. They analyze how the increasing pressure of industrialized agriculture seriously constrains decision-making abilities among farmers, for example because of economic pressure, and consequently also influences farmers' self-perceptions. They explain how this changing environment can lead to what they define as "erosion of farmer ethics." This will have severe structural and practical consequences for the way the farm is designed, organized, and managed, including the animals. European action research projects demonstrated how emphasizing farmer ownership in decision-making, empowerment, knowledge exchange, and common learning can mediate significant change on the farm level (Anonymous 2010; Vaarst 2007; Ivemeyer et al. 2010; Vaarst et al. 2010; Bennedsgaard et al. 2010). On the sector level, the constant debate in combination with addressing and involving relevant actors such as decision makers, citizens, and politicians, can stimulate further development of livestock systems with high animal welfare in accordance with the basic organic principles, even in situations where the agricultural sector is under great pressure, e.g., economical pressure to produce more for less money.

Conclusions

Organic farming has a distinctive view on animal health and welfare that it is possible to live up to, especially on diversified, well-integrated farms that to a large

degree already live up to the basic principles of organic farming. This distinctive understanding of animal health and welfare involves increased opportunity for the animals to live more natural lives and to count on sufficient human care. The organic concepts of animal health and welfare can be understood very well within the framework of the four principles for organic production: ecology, care, health, and fairness. Different types of challenges exist in different organic livestock systems, e.g., for industrialized versus tropical smallholder production systems. The challenges for a well-balanced organic livestock food system are very complex. In particular, joining livestock farming in practice with the fairness principle points to challenges that are very difficult to handle, e.g., issues of losing biodiversity with regard to breeds used in organic systems, including trading of breeds, livestock, and semen, or trading of feedstuffs and food worldwide.

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