

The Price of Responsibility: Ethics of Animal Husbandry in a Time of Climate Change

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Accepted: 31 May 2010
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Abstract This paper examines the challenges that climate change raises for animal agriculture and discusses the contributions that may come from a virtue ethics based approach. Two scenarios of the future role of animals in farming are set forth and discussed in terms of their ethical implications. The paper argues that when trying to tackle both climate and animal welfare issues in farming, proposals that call for a reorientation of our ethics and technology must first and foremost consider the values that drive current livestock production. This paper sets forth and discusses the broader societal values implicit in livestock production. We suggest that a virtues approach would improve our thinking and practice regarding animal agriculture, facilitating a move from livestock production to animal husbandry. This change in animal agriculture in a time of climate change would stress virtues such as attentiveness, responsibility, competence, and responsiveness as central elements in any mitigation or adaptation program.

Keywords Adaptation · Animal husbandry · Mitigation · Organic farming · Sustainability · Virtue ethics

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Introduction

The global climate is changing. It is getting warmer and more extreme weather events will become more frequent. This means that the living conditions for plants, animals, and humans will change profoundly over the next 50–100 years.¹

The societal debate concerning climate change indicates that there is more than just the correct interpretation of scientific data at stake. Not only are scientific and technical issues eagerly discussed, but also societal, political, and ethical issues related to climate change are being debated by scholars, policy-makers, industry agents, and laypersons alike. Climate change obviously raises a number of technical issues: How quickly can we produce cars with lower petrol consumption? How effectively can we construct improved dyke embankments to protect against flooding? How soon can we develop solar cell technology to a level where it becomes economically competitive? However, climate change also raises issues that cannot be answered solely from a scientific or technological point of view. Although there seems to be an agreement that both adaptation and mitigation² are necessary strategies, there is little agreement on what values should guide us in shaping these strategies, and how we should prioritize between the different problems and challenges. Hence, a core line of reasoning in this paper is the argument that ethical and political questions need to be discussed before we can move onto scientific and technological solutions.

In the UN's International Panel on Climate Change (IPCC) Assessment Report 4 from 2007, animal agriculture³ is regarded as one area that raises a huge range of ethical issues in relation to climate and increasing temperatures (Parry et al. 2007). While ethical issues such as social justice, land use, animal welfare, and food safety,

¹ This can be observed and has been confirmed numerous times. Within the scientific community, there is a large degree of agreement that these changes are largely caused by human emissions of green house gases, especially carbon dioxide and methane (IPCC 2007; Richardson et al. 2009). These issues are still debated though, and the scientific discussion is still reverberating, especially regarding the causal effects of climate change. This discussion has had severe political implications, as the political decisions about the adequate human response to climate change have been tightly linked to climate research. For more on the influence of climate research on the political discussions, and the influence of political discussions of climate change on climate research see Heymann et al. (2009) and Meyer and Lund (2009). In this article, however, we have chosen to follow the most commonly held views among climate scientists and lean on the reports from the International Panel on Climate Change (IPCC 2007), and the synthesis report from the climate change conference in Copenhagen (Richardson et al. 2009). We do not discuss whether climate change is real, or what its possible causes might be. Rather we take the assertion that anthropogenic climate change is a serious problem as our point of departure, and move on from there. For a brief overview of the latest discussions of the credibility of the IPCC reports please see Borenstein (2010).

² "Mitigation" is the commonly used term for strategies that seek to decrease the human impact on greenhouse gas levels, e.g., switching from fossil fuels to alternative energy sources such as wind and sun. "Adaptation" is the commonly used term for the human activities that seek to change societal structures to be ready for the expected climatic conditions in the future, e.g., enhancing dykes above the current need to prepare for future rises in sea levels.

³ Animal agriculture can have many shapes. In this paper we distinguish between livestock production understood as the intensive, conventional, industrialized production of meat, milk, eggs, and other animal products, and animal husbandry understood as producing animal products with an emphasis on sustainability and the virtue ethics approach discussed later in the paper.

are already discussed in relation to industrialized farming, the revelation that around 15% of the total anthropogenic greenhouse gas emissions stems from animal agriculture (Steinfeld et al. 2006; FAO 2009), makes it necessary to revisit these discussions in light of climate change.⁴ The urgency of discussing what values should underlie our food production systems, and especially the global animal production system, is stressed by the dire consequences that are associated with continued uncontrolled emissions:

The scientific evidence today overwhelmingly indicates that allowing the emission of greenhouse gases from human activities to continue unchecked constitutes a significant threat to the well-being and continued development of contemporary society. The knowledge that human activities are influencing the climate gives contemporary society the responsibility to act. It necessitates redefinition of humanity's relationship with the Earth and - for the sake of the well-being of society - it requires management of those human activities that interfere with the climate. (Richardson et al. 2009: 7)

To examine the ethical values at stake when considering how to change animal agriculture, we put forth two possible scenarios and evaluate them from three different ethical perspectives: a utilitarian perspective, an animal rights perspective and an ethics of nature perspective. We then proceed to consider both future scenarios from an environmental virtue ethics point of view. Here, we normatively argue that only by attending to the root concerns will we be able to respond adequately to issues such as justice, responsibility, and compassion. These issues are in turn necessary for developing best strategies for animal husbandry in the wake of looming weather extremes. We further point out that part of our ethical responsibility is to make transparent and discuss the broader societal visions and values embedded in our decisions about food and our relationship with the environment.

In many instances where ethicists have chimed into respond to climate change in relation to food production, the central issue has been food security; namely, how to produce food for an ever growing number of human beings on less arable land under worsening climatic conditions (Garvey 2008). However, a theme that is often overlooked is the one that concerns *the moral shape of our agriculture*. Little concentrated attention has been given to what we eat and how we produce it, as a reflection of the state of our lives in general discussions of agriculture and ethics (notable exceptions include Berry 1996 and 2009; Thompson 2008 and 2001; Singer and Mason 2006), but the theme is remarkably non-existent within the debate of

⁴ The number published in the Steinfield report from 2006 has come under recent criticism from Pitesky et al. (2009). The Steinfield report postulates that around 18% of the collective green house gas emissions can be blamed on animal agriculture. However, Pitesky et al. conclude that the methods used to calculate the contribution of animal agriculture and the transportation sector differ too much from each other to be comparable, and that the impact of animal agriculture is lower than has been estimated. On the other hand, Goodland and Anhang (2009) estimate through life cycle analysis that more than 50% of the total green house gas emissions can be linked to animal agriculture. In this paper, we conservatively estimate 15%, and maintain that such a number warrants our serious attention in a situation where mitigation and adaptation strategies are needed for all areas that contribute significantly to anthropogenic climate change.

agriculture and climate change. Furthermore, it is important not to let the threat of climate change supercede all other discussions of agriculture and ethics. For instance, the welfare problems for billions of animals caused by the efficiency of production systems (Foer 2009) are still important ethical issues that will not disappear because of climate change. Rather, the solutions to the huge contribution of animal agriculture to green house gas emissions should also be seen from an animal welfare perspective—at least if animal welfare is an ethically significant moral consideration, as it appears to be for the public at large in recent decades.

As we see it, traditional ethical responses to animal welfare issues, most notably, utilitarianism and deontology or rights-based ethics, are insufficient to provide adequate solutions to the moral questions raised by climate change and animal agriculture—or indeed the welfare problems caused by industrialized livestock production. Boldly put, a major concern here is that these responses are formulated as answers to a set of questions that is too narrow with “one size fits all” solutions, whereas animal welfare issues evoked by climate change should be discussed within a broader context. The intersection between animal welfare ethics and climate ethics is complicated by general globalization issues, such as trade and North–South equity, and the fact that food production is also about food security, food safety, individual and population health, and cultural and religious identity and tradition. Thus, given the nature of the animal issue as it relates to climate change, a broadening of the perspective is needed. This perspective requires an inclusive approach and calls for individual responsibility based on recognizing our interconnectedness with others in the food system.

Human–Animal–Climate: A Moral Problem

As history will attest, the West or “the developed world” has been tempted to first approach any new question with a technological answer. The industrialization of agriculture that grew out of concerns for food security after World War 2, was a result of government and industry policies that sought to transform existing infrastructure that employed mechanized and automated technologies to produce abundant and cheap food (Sandøe and Christiansen 2008). Today, we have inherited a system of agriculture that relies on science to reduce costs, and to cultivate uniform agricultural commodities and bend the will of the non-human world to meet human interests for food. This is equally applicable to livestock production. Animal agriculture is, in many ways, merely another industry or enterprise rife with technical and scientific practices and methods with narrow human-centric goals (Foer 2009). Science and technology have been marshaled to inquire and solve problems related to the wholesale aspects of farming; problems such as the optimal feed for the animals, optimal housing conditions, and adequate levels of veterinary care that don’t break the bank. However, if we adopt a “business as usual” mentality and immediately decide that we can only solve the challenges ahead by using technologies such as biotechnological breeding tools or intensive high-tech production systems, we ignore the ethical values associated with animal welfare in general, and we fail to realize that the human-animal-climate-relation cannot be

merely relegated to an industry—at least not without a convincing ethical argument that animals are no more than resources to be used. Since we don't share such a view, we find it important to maintain that the human-animal relation is a moral one that can provide us with the motivation to rethink our approach to animal agriculture in the light of the challenges of climate change. To think and act adequately in the current situation in the context of animal production thus requires us to re-think the basic assumptions about our relationship with nature and animals (Wolf and Gjerris 2009; Röcklinsberg 2009).

We take the perspective that ethics is not something you are done with at some point, but it is a continuous effort to illuminate the moral terrain and to understand our basic values in light of our current challenges (Gjerris 2009). An important part of ethical reflection is clarifying the concepts used when discussing complex matters. Concepts such as “organic” and “sustainability” are widespread and often carry positive connotations, but they are seldom very clear. To avoid unnecessary misunderstandings, the following is our interpretation of these concepts in this article: Organic farming is a system of food production that relies on sustainable practices such as cyclic systems and social awareness. Organic foods differ from conventional agricultural products in terms of how they are grown or raised. With respect to the former, synthetic chemicals, antibiotics, hormones, and genetic engineering are avoided in farming for food consumption. Furthermore, organic farmers seek to create an agro-food-ecosystem that is capable of feeding the world and that works with nature to grow without toxins or chemical fertilizers (Badgley et al. 2006). However, critics of this alternative form of farming have argued that it is unfeasible to feed the world without using toxins, synthetic chemicals, or genetically modified organisms, and that doing so on an organic platform will actually take up more land, be more labor intensive, and will produce less compared to conventional systems (Badgley and Perfecto 2007).

Sustainability is a moral idea that involves equity over time and reflects both intra-generational and inter-generational obligations to the larger human community, and to the nonhuman world. The sustainable model(s) on which we settle will involve particular normative commitments to promote the ability of our agro-food system to continue functioning into the indefinite future, without being forced into decline through depletion of central resources. It will undoubtedly incorporate two key approaches, namely, resource sufficiency or functional integrity. Briefly, the former refers to the capacity to adapt or respond to depletion of the central resources mentioned above, while the latter emphasizes the capacity of systems to reproduce or rejuvenate over time (Thompson and Nardone 1999).

But before the actual (more or less sustainable) scenarios are considered, a further description of the role of animal husbandry in a time of climate change is needed.

Challenges to Animal Husbandry in a Time of Climate Change

Some of the more important consequences of the climate changes that the IPCC (2007) predicts include more extreme weather types, rising sea levels, changes in

temperature, and climate leading to changed living conditions for wildlife and plants and human communities (especially indigenous peoples in rural areas). These scenarios imply changing conditions for agriculture, increased pressure on fresh water infrastructure and increased problems with invasive species. All these challenges mean that there will be increased pressure on the Earth's ability to sustain human life as we know it today. Drastic changes in lifestyle and culture seem to lie ahead. One particular place where (radical) adjustments will need to occur is in farming, including animal agriculture.

In January 2009, Rajendra Pachauri, chair of the United Nations Intergovernmental Panel on Climate Change, IPCC, himself a vegetarian, fueled the climate debate by stating that reduced meat consumption would be as necessary as reduced transports to reduce green house gas emissions, since meat production itself is responsible for about 20% of global greenhouse gas emissions (Steinfeld et al. 2006; FAO 2009—see note 4). Moreover, food security, as well as food safety, will be issues of increased importance due to future climate change. According to the Food and Agriculture Organization of the United Nations:

Rural communities, particularly those living in already fragile environments, face an immediate and ever-growing risk of increased crop failure, loss of livestock, and reduced availability of marine, aquaculture and forest products. (FAO 2009: 1)

According to the report, about one-third of the total greenhouse gas emissions can be traced back to the agricultural and forestry sectors and essential solutions must be found in these areas, not least since they are closely related to land use. Furthermore, food products of animal origin have a greater impact on the climate than vegetables (livestock constitute nearly 80% of all emissions from agriculture (FAO 2008: 112). About 70% of the world's agricultural land is used for livestock production, including grazing and crops for feed (Steinfeld et al. 2006). Increased sustainability in systems for land and manure management as well as water use are needed to mitigate aspects of climate change and adapt to new demands on global food security. Hence, land and farming management practices need to be established that mitigate negative climate change. On a theoretical level, an effective and quick solution would be to refrain from all animal production, and use land for vegetables with a low(er) level of greenhouse gas emissions. The reduction, or even termination, of land use for animal production would furthermore release large areas for more sustainable forms of land use or for GHG sinks, such as wildlife refuges and national parks. There are many good arguments for adopting a vegetarian/vegan diet that we cannot go into here. As a personal choice, it is one of the most obvious to make in this connection and to promote politically. It is, however, in our view, not very realistic that the global population will adopt such a strategy. We have therefore chosen not to use this as a scenario in this article.

A more realistic stance, in our view, would be to assume that animals will continue to be used in farming, thus raising the question of how and to what extent this should be done, if we are to take the challenge of climate change seriously. For one thing, it follows that we are still left with the perennial question of how to ensure the welfare of the animals—and to what degree we are obligated to do so

(Röcklinsberg 2009). We will consider the role of animals in farming with two possible scenarios, which we will examine while we will also consider the shortcomings of traditional ethical argumentation in philosophical animal ethics in a time of climate change. The scenarios we've chosen further serve the goal of highlighting the complexity of ethical issues related to climate change, and our call for a more inclusive approach to ethical thinking. These are not the only two possible scenarios. As mentioned, one could imagine the global adoption of a vegetarian or vegan diet as a strategy. We have, however, limited ourselves to the consideration of the two strategies that we believe to be the most likely in the foreseeable future.

Possible Roles of Animals in Future Farming Systems: Two Scenarios

In this section, we will briefly discuss two possible scenarios for adapting animal agriculture to climate change, and address the ethical considerations that would arise and that would need to be considered. Linked to the FAO's suggested new practices for mitigating global warming (FAO 2009), the following scenarios are such that a society concerned with climate change could decide to follow them in an attempt to lower green house gas emissions from animal agriculture. Hence, through the scenarios we present two different interpretations of what might characterize the responsible and sustainable management of farmed animals, and we evaluate them from three of the main ethical perspectives in the climate change discussion: A utilitarian perspective, an animal rights perspective, and an ethics of nature perspective.

Scenario 1: Increased Intensity

The first scenario takes its point of departure in the FAO statement that:

By far the largest shares of emissions come from more extensive systems, where poor livestock holders often extract marginal livelihoods from dwindling resources and lack the funds to invest in change. Change is a matter of priority and vision, of making short-term expenses (for compensation or creation of alternatives) for long term benefits. (FAO 2008: 114)

We currently farm and slaughter approximately 56 billion terrestrial animals every year at the global level (FAO, n.d.) and the FAO projects that worldwide demand for farm animal production will double by 2050 (FAO 2006, p. 275). Within this scenario we will simply assume that this is an inevitable development, and the task of animal agriculture is therefore to figure out ways to maintain a reliable source of food from animal products, while at the same time reducing green house gas emissions. Intensification, the mode of food production that aims at increasing agricultural yield per unit input, is regarded as being the only way to decrease emissions if production is not only to be maintained, but doubled. At the

same time, it will be necessary to do this while relying on sustainable land management practices that do not deplete resources such as soil and water.⁵

A simple way to reduce green house gas emissions would be to reconsider what species of animals to farm. It is well known that methane gas from ruminants constitutes a large part of total methane emissions, and one option would be to radically reduce ruminant livestock and instead increase the production of broilers, fish, and other aquaculture products (Cederberg et al. 2009; Sonesson et al. 2009; Winther et al. 2009). Although aquaculture and fisheries are widely threatened by climate change in some geographical areas, intensification in other areas and land based fish production could be further developed to provide a greater share of the world's demand for animal protein.

What would such a scenario mean for animal welfare, and more generally, for animal ethics? Intensification does not necessarily imply lower welfare for each single animal. In reality, however, it does very often entail exactly that. According to Foer (2009), higher livestock density, as well as efforts to reduce costs and increase yields per animal are hard to combine with the welfare interests of individual animals. A utilitarian response is well suited to underpin such a production system: theoretically, by reducing our reliance on large ruminants as our source of animal protein, an overall positive outcome can be achieved on an environmental level by exploiting lower emission producing aquaculture and broilers. Limiting the number of ruminants would ostensibly lead to more land for crop production, a reduction in overgrazing and alternative land management options to reduce global food insecurity (FAO 2006). From a utilitarian perspective, these advantages, combined with the advantage of fulfilling the human desire for animal products, would then have to be weighed against the animal welfare problems that the further intensification of animal production would cause—as well as the environmental problems that would still be present, albeit on a smaller scale than if the growth in production had been with other animal species.

From a utilitarian perspective, interests related to the minimization of suffering are given equal consideration. Thus, even the staunchest animal welfare utilitarian would contend that in cases of acute food scarcity, the human need for food should trump an animal's interest regarding, for example, a certain cage size or the freedom to move in less crowded waters, all things considered. While both interests are regarded as basic, the human interest in alleviating hunger or starvation is, on balance, more urgent. In a normal situation, however, well known adherents to utilitarian ethics⁶ argue that basic human needs for food can be met without consuming animal products, as a vegetarian/vegan diet can provide the necessary ingredients for a healthy life. This, however, has to be weighed against the human interest in eating animal products. As to the increase in the quality of life that this might afford humans compared with the loss in life quality due to the welfare problems of animals, there is no easy answer. Different people will evaluate this

⁵ Whether this is at all possible is an open question that we will not discuss here. As the interest lies in the ethical evaluation of the hypothetical scenario, for the sake of argument we simply assume that this is possible, although in reality the claim initially seems rather flawed (Steinfeld et al. 2006).

⁶ Peter Singer (1991) is the most well-known utilitarian defender of respect for animal preferences.

differently. So, even though the utilitarian Peter Singer recommends vegetarianism as the correct utilitarian approach (Singer 1993), there is no doubt that many others would conclude that the enjoyment they get from consuming animal products justifies at least some degree of animal suffering.

A further positive aspect of intensive aquaculture and broiler production, as seen from a utilitarian perspective, would be the increased number of animals. Assuming that these animals would have more positive than negative experiences, the sheer fact that they are alive adds to the overall positive result. This is especially true since there will be a greater number of poultry and fish than ruminants. Moreover, even if a number of the animals concerned have a low welfare, the overall positive outcome would outweigh their negative experiences.⁷

From another ethical standpoint, however, it would be difficult to accept increased intensity in broiler and fish farming based solely on cost-benefit analyses. Adherents to the view that Sandøe and Christiansen (2008) call “respect for nature” would argue that the possibilities for individual animals to perform species-specific behavior would be too restricted in, e.g., an intensive fish industry that curtails “natural” movement over lengthy distances (Lund et al. 2007), and that this would not be balanced by the mere aggregated affective experience. Furthermore, the whole notion of “respecting nature” in this sense would go against using animals as a resource to fulfill human desires, even if the welfare of the animals were taken into consideration. It is simply not the right attitude to show towards something that you have a relationship with that moves beyond the limited notion of consumption or interests.

A related argument against intensive livestock production of any kind is given by animal rights theories, i.e., deontological animal ethics,⁸ which argues that each animal should be respected in itself, as it has intrinsic value. According to this view, commercial animal agriculture ought to be abolished since, contra to animal welfare utilitarianism, any farming that aims at using animals (i.e., “subjects-of-a-life”) for the sake of human preferences in this way is regarded as being the unjustified instrumentalization of individuals.

To the aforementioned it can be added that the increase in efficiency of animal production since World War 2 has been made possible, to a large degree, by systematic breeding strategies, (Sandøe and Christiansen 2008; Harrison 1964). The developments within biotechnology, e.g., genomics, transgenics, and cloning, could further these developments (Robl et al. 2007; Niemann et al. 2005), thus increasing the efficiency of the animals in the light of the contribution of the animal species to climate change. Basically, even more feed-efficient animals would contribute to reducing the total emissions, although the total climate footprint of the feed would still need to be considered (Sonesson et al. 2009). One can also envisage reduced methane emissions from cattle, just as Canadian researchers have developed a pig that can reduce the emissions of phosphorous into the environment from intensive

⁷ Derek Parfit discusses this seemingly inevitable conclusion in *Reasons and Persons* from 1984 in relation to human welfare. He calls it the repugnant conclusion—a name that obviously can also be used when applying the same logic to animals.

⁸ Tom Regan is the most well known animal rights proponent. See Regan’s *The Case for Animal Rights*. A recent analysis of Animal Rights Theories can be found in Karlsson (2009).

pig farming (Forsberg et al. 2003). Thus, animals could have “double roles,” e.g., serving both as bioreactors, for the production of human proteins (Hunter et al. 2005; Röcklinsberg 2009) and meat for consumption, and as genetically modified organisms that can lower the energy input in other ways.

From a utilitarian perspective, animal welfare and climate proponents could have their cake and eat it too. While protecting the overall welfare of sentient beings, efficient ways of farming through the careful selection of species/breeds dovetails nicely with the aim of doing right by the environment. In a situation in which the climate is getting warmer, and in which each animal contributes to global warming by its mere existence, it becomes necessary to find the most prudent way of using animals, without compromising too much of their welfare.

Intrinsically, environmentalism and animal welfare need not collide under a “respect for nature” view. However, advocates of this approach would have difficulty accepting certain ways of breeding animals, especially if the techniques employed transgress ethical borders of naturalness and integrity, i.e., certain modern molecular biotechnologies. An animal rights view would also see this sort of manipulation of animals as potentially problematic if the modification only serves human interests. Designing animals for human purposes without also promoting animal interests smacks of instrumentalization, and a gross disregard for the ethical value of the animals themselves (Gjerris et al. 2009).

It is interesting to note that the goal of the strategy: To cut down on the emissions of green house gases from animal production, would only be indirectly relevant seen from the utilitarian and the animal rights perspective. Only to the extent that climate change might harm sentient beings more than it benefits them, or to the extent that climate change violates the perceived rights of any subject-of-a-life, would these two perspectives find climate change problematic. The respect for nature perspective would, on the other hand, find the idea of anthropogenic climate change ethically objectionable in itself, as it would be seen as an expression of a skewed relationship between humans, animals, and the rest of nature.

Scenario 2: Organic Farming

According to the second scenario, the best way to mitigate the negative impacts of climate change on food supply is the global conversion of all farmland to organic farming (Edwards and Araya 2009; IFOAM 2009b). This scenario would lead to a reduction in meat and dairy production, necessitating dietary changes in countries with high meat consumption, as the current level of animal production would need to be reduced to meet the goal of reducing green house gas emissions. One of the main reasons for this is that the close links between organic farming and extensive, welfare-oriented animal production would prohibit the intensification otherwise possible within conventional animal production. In the longer run, however, it might be the case that organic animal production would continue, whereas the intensified system would break down due to its unsustainable nature leading to even lower production rates. According to the Executive Director of the United Nations Environment Program (UNEP), “Organic Agriculture can be more conducive to food security than most conventional systems, and...it is more likely to be

sustainable in the long term.” (IFOAM 2009a: 18). Organic farming has a higher resilience to changes in temperature, water supply, and other factors of environmental stress thanks to, among other things, recycling systems and higher biodiversity (Badgley et al. 2006; Niggli et al. 2007; IFOAM 2009a and c). Furthermore, sustainable thinking in organic farming could include, e.g., (closed) cyclic systems that build on the use of the farm’s own resources, and biodiversity and a high number of different species interacting on the farm for farm sustainability and higher soil fertility (Fließbach and Mäder 2006; Granstedt and Kjellenberg 2008). Animal production would need to be adjusted to land capacity, since organic farm animals are kept outdoors to a large extent. The ability to perform species specific behavior reduces stress levels, enables positive experiences, and allows them to contribute to farm management (e.g., pigs preparing fields) and biodiversity (e.g., on grazing land by keeping chickens and ruminants together) (Lund and Röcklinsberg 2001). Over and above the positive environmental effects, organic farming is closely linked to a range of values such as ecology, human and animal health, fairness, and care (www.ifoam.org, Padel et al. 2007).

One central ethical rationale behind organic farming (IFOAM 2010) is a commitment to sustainability in two dimensions: environmental and social (including animals in the social sphere). The domestication of animals for human use *prima facie* obligates us to respect their innate behavioral needs with regard to environment, feed, social and sexual behavior, and affective experiences (Lund et al. 2004; Lund and Olsson 2006). This view of sustainability, encompassing social justice, both in the human sphere and between humans and animals through an implicit contract with animals,” and observances of a Leopoldian style wise use “Land Ethic” found in organic farming, can be traced back to pastoral and agrarian relations with the nonhuman world (Anthony 2009). These latter ethics celebrate the integral role animals play in the development of human moral character and food security. These commitments to sustainability reflect an Aristotelian respect for the essence or telos of animals, which is seen as being essential for their development (Rollin 1995). In line with this, Martha Nussbaum elaborates a capabilities approach to animal ethics, which considers animals as having basic entitlements, for example, being entitled to fair treatment and a dignified existence commensurate with their evolutionarily inherited adaptations or capacities (Nussbaum 2007). Showing this kind of respect by promoting species-specific behavior patterns, coupled with a strict reduction in production animals adjusted to land capacity are key features of organic animal farming. Organic farming thus seems to be a good mitigation/adaptation strategy towards the goals of sustainable, animal welfare-friendly farming, as long as one can accept the decline in consumption of animal protein that will follow.

From a utilitarian perspective, the evaluation of this scenario will rest on some of the same assumptions as when evaluating the first scenario. Initially, the trade-off seems to be that we obtain higher welfare per animal in the second scenario, albeit with a lower number of animals. This should be weighed against the possible welfare loss for (some) humans as a result of dietary changes involving reduced animal protein. To make the picture more complex, one could throw in the potential health gains, both on an individual and societal level, derived from a “greener” diet,

just as the pollution from animal production could be reduced thereby increasing human welfare. As with the first scenario, the utilitarian evaluation will rest on a series of assumptions concerning consequences that are difficult to get clear answers to. Overall, however, we presume that most utilitarians would find the organic farming scenario preferable, since it does not exclude meat consumption, but only reduces it, thus meeting some human desires, while also protecting the welfare of animals to a higher extent than in the first scenario.

From an animal rights perspective, the second scenario represents an improvement on the first as animal welfare increases. However, from an animal rights perspective this actually misses the main point. The real problem with animal production is not the welfare issue, although this is important enough in itself. As Tom Regan says:

The fundamental moral wrong here is not that animals are kept in stressful close confinement or in isolation, or that their pain and suffering, their needs and preferences are ignored or discounted. All these *are* wrong, of course, but they are not the fundamental wrong. They are symptoms and effects of the deeper, systematic wrong that allows these animals to be viewed and treated as lacking independent value, as resources for us – as, indeed, a renewable resource. Regan 1983, p. 113

From a respect for nature perspective, the second scenario is much preferred to the first. Attempting to adapt production systems to the species-specific behavior of animals and seeking to embed animal production in organic farming practices have a regard for ecological carrying capacity, resource use, etc. will be evaluated as positive. As for the argument that animal production uses up land that could otherwise be left for wild animals so that they could unfold their lives, there are two possible answers. Some will assert that the human task is to step as lightly on the ground as possible, which would include adapting to a diet that puts as little strain on the planet's resources as possible, whilst others would assert that the task is for humans to embed themselves in systems of farming that mimic natural processes as much as possible. Advocates of the first position would prefer scenario 2 to scenario 1, although similar to advocates of the animal rights perspective, they would consider the best solution to be to halt all animal production. Advocates of the other position would find the organic scenario preferable both to scenario 1 and to an abolitionist perspective (we will return to this in the next section).

Again, it is worth noting that of the three perspectives, the only one that regards climate change as being more than just a side effect to take into consideration is the respect for nature perspective. From our point of view, this signifies that the utilitarian and animal rights perspective, discussed in relation to the scenarios, do not offer tools for an inclusive approach to the issue (animal production in a time of climate change), but rather a certain focus on interests or rights, i.e., they handle a very specific part of the human-animal-relation in the light of climate change without actually seeing the whole problem: Climate change and animal welfare are closely intertwined. While calling for an interconnection and intertwining of ethical aspects and perspectives, a further advantage of the virtues approach is its focus on individual responsibility for one's own personal way of living. The core question

becomes: ‘What kind of person do I want to be in relation to animals in a world of climate change?’ This calls for individuals to reflect on their ethical position and choices, which moves beyond balancing interests or focusing on rights.

In the following, we will suggest an approach that facilitates the consideration of our relationship with technology and nature, and provides useful tools when considering the human-animal-climate change issue. This inclusive virtue ethics approach can thus be seen as being based on considerations of more organic forms of farming, sustainability, and respect for nature, as outlined above.

Virtue and Vice in Animal Farming

As portrayed and discussed above, the problem of climate change, as it relates to food and animal welfare, is complex, fluid, and multi-dimensional. It challenges nations around the globe to respond with a strategic and long-term approach. The complexity of the problem is compounded by a persistent and pervasive view of “harm to other” found in most developed countries, that is, concerted moral action related to climate change and the plight of farmed animals suffers from the problem of remoteness. In both cases, the subjects of harm are anonymous and often physically and emotionally distant from the consuming public. The kind of harm induced by our collective action is seemingly amorphous, i.e., unintentional, since there are layers of social, economic, and political barriers that obscure the discharge of duties of justice and compassion. Given the complexity associated with how harm is conceived here, it is hard to see how we might be responsible for mitigating harm directly for either future generations of people or farmed animals. Consumers and producers of animal products certainly have a large collective ecological footprint when it comes to products of animal origin. How might we think about personal responsibility given the nature of animal production and climate change?

Thinking in terms of virtues can provide a solid basis for recontextualizing our relationship with animals in fruitful ways. In the case of our relationship to agriculture, a virtues perspective can help us to discern agriculture’s role in forming both personal character and global citizenship, and provide the basis for evaluating policies and transforming technologies. Systems of intensification, for example, would be justified only if they reinforce our role as stewards of the land and animals.

As indicated above, the standard ways of critiquing the anthropocentrism inherent in industrialized animal production systems typically employ categories from deontological ethics or consequentialism. From our perspective, these approaches are not enough to deal adequately with the welfare of farmed animals, because they only offer band-aid solutions to symptomatic issues and side step the root causes: We need to change our attitudes and actions and the moral shape of our institutions and how they are governed. Only by attending to the root concerns will we be able to respond effectively to the issues of justice and compassion punctuated by climate change.

Furthermore, it seems fair to say that even a reduction in the consumption of animal products, to be realistic, would need to be seen as a gain and not a sacrifice. The idea that people living in affluence today would surrender a life that they envisage as being “good” to accommodate the needs of future generations living in

other locations seems naive. Without entering a long discussion on human nature, it seems more likely that profound changes in what we eat will need to be based on new visions of what constitutes the good life (Gjerris 2010). In other words, the collective “we”, i.e., individual citizens, both as citizens and in their social roles as consumers, governments and industry agents, producers, etc. need to reconsider ideals and virtues if there is to be a change in the consumption of animal products. Otherwise the only realistic scenario will be scenario 1.

Environmental virtue ethics, with its central evaluative concept of excellence of character, as has been discussed lately (see for example, Newton 2002; Sandler and Cafaro 2005), is a promising way of thinking in relation to the question of animal welfare and climate change. It advocates focusing on living well and cultivating character traits that contribute to the development of human beings and the nonhuman world alike. An important tenet of this ethic involves taking ownership for choices that we make, especially in the face of relationships that involve vulnerable or dependent others. Under this view, the self is bound to other living beings both personally and through the various institutions that formalize and facilitate life. We are necessarily embedded within human and biotic communities with an eye to personal responsibility in choices about food. As a consequence, a virtues approach offers both a critical revision of the view of harm mentioned above, and a reorientation of our relationship to the planet (see Sandler and Cafaro 2005).

A virtues approach, as it relates to animals, stresses the role of animals, the climate and the biotic community in the formation of moral character or dispositions to act. It would invoke a critical shift from “livestock production” to a more robust “animal husbandry.” Environmental (and in this case agricultural) virtues are proper dispositions or character traits for human beings to have regarding their interactions and relationships with agriculture, farmed animals, and food, for that matter. The virtuous person, in this case, is disposed to respond to farmed animals in an empathic and responsible way, and to resist the reductionism of sentient beings into mere commodities or mere relative goods. Virtue ethics is not only oriented towards ensuring that human communities flourish, but nonhuman ones as well. It holds promise as a viable ethic here since it has the resources to tackle the fundamental question concerning, “how should we live well with others?” According to Sandler (2007), a central advantage of the language of virtue and vice is its richness and depth in confronting the complexity and diversity of the relationships we have with the natural and built environments relative to, for example, the languages of deontological ethics or consequentialism. A virtue ethics approach does not appeal to a “one size fits all” solution. Rather, it also implies a pluralistic response to challenges involving domesticated species in a time of climate crisis. Here, different virtues may be called on in different contexts, some of which will be presented below.

Virtue Ethics and Agriculture in a Time of Climate Change: How Should We Proceed?

In a traditional account of virtue, a good person strikes a mean position between tendencies of excess and deficiency, and aims towards equilibrium after reflecting

on and bringing to bear all the relevant facts in light of the desire to be good at being human. An agricultural virtues approach would challenge individual consumer-citizens to pose the following question, “How should I act to create and maintain a sustainable, humane and just food system in the wake of climate change?”

In the case of climate change and animal ethics, we would like to propose four key elements as an adequate point of departure for developing a framework to respond to the intersection between animal ethics and food related climate change. They include (adapted from Simone Weil (1977)’s work on “attentive love” (see also Anthony 2009):

Attentiveness, which involves being mindful and cognizant of the realities of modern food production and paying heed to the plight of animals and how our actions influence their welfare and the capacity of those who care for them (see also Foer 2009).

Responsibility, which involves acting in ways that minimize the deleterious impacts of our behavior on others (in this case, domesticated animals) from whom we benefit, and on the planet as such. Sandler, for example, offers other virtues such as humility and stewardship that challenge existing normative relationships with the nonhuman world.

Competence, which involves developing certain dispositions and taking the step from knowledge to acknowledgement. E.g., acknowledging the plight of farmed animals and the interplay between farming and pollution and other climate related impacts, so that we may make good choices when the time comes to act, e.g., relating the reality of intensive animal production with the meat on our plates.

Responsiveness, which involves vigilance of the dependency and vulnerability of those in our charge, including farmed animals, the land, and sea, and acting accordingly to rectify deficits and to promote more Earth conscious and animal welfare friendly consumption and dietary habits.

How do these virtues help to reconsider the human-animal-relationship in the current situation of climate change? Briefly, these virtues remind us that some of the basic realities of modern animal agriculture unfairly expose animals and those who produce them to harm (Foer 2009). Food statistics consistently show that in many of the countries in the developed world, a smaller and smaller proportion of the disposable income is spent on food (e.g., in 1950 in the US, this figure was 20.6%, in 2008 it was down to 9.6% (ERS/USDA 2009). The cost to produce food as cheaply as possible in our industrialized food system translates into modern animal agriculture that is heavily dependent upon cheap fossil energy and abundant water, and that produces much waste and contains much systemic inefficiency. The real costs to the environment, the climate, animal welfare, and human health are not visible in the prices of the animal products. These externalized costs are often shouldered by cost cutting-practices that come at the expense of animal welfare, human health, and the environment (Ilea 2009). The virtues of attentiveness and competence remind individual consumers that the situation cannot stay like this

forever, and that modern animal agriculture is unsustainable over the long haul and is a major culprit in anthropogenic climate change, as described above.

The virtues of responsibility and responsiveness challenge us to find solutions that can help mitigate or adapt to a world in which an increase in human population is looming large (United Nations Population Division 2009), and one in which less water and energy and more hunger are certainties. The virtues approach further advocates good husbandry and sustainable farming practices, which minimize animal suffering and our ecological footprint through inspiring producers and consumers to strive for competence and responsiveness in husbandry and in consumption patterns. Coupled with innovative thinking, the virtues approach has an important role to play in overcoming challenges of both animal welfare and climate change by not solely searching for a (quick) technological solution, but rather taking a holistic perspective on the human-animal-climate-relationship (Wolf and Gjerris 2009).

In sum, a virtues approach could revitalize the relationship between humans and animals by creating an opportunity to enter into meaningful relationships built on attentiveness and responsibility, and could transform the perception of farm animals from strange unspeaking commodities to communicative vivid individuals who deserve our moral attention. More importantly, it allows for a comprehensive view of our responsibilities to the environment and to animals, both “resources” from which we benefit. The tendency under the more traditional “humane moralism” that tends to pit citizens against each other as separate stakeholders can also be circumscribed. A virtues approach helps us see that it is a single canvas on which our moral obligations are expressed. Hence, a virtues approach can help facilitate the necessary changes in lifestyle that would lead to a reduced ecological impact on the planet.

Conclusions

The global climate is changing. We face a situation in which more humans will have to be fed on less arable land under more difficult climatic conditions. Part of the problem is the emissions of greenhouse gases from animal production. Around 15% stems from the production of meat and related products. Animal production thus carries a significant responsibility for anthropogenic climate change. At the same time we face a growing number of animal welfare problems due to the ever-increasing hunt for more efficient production methods. Therefore, it seems necessary to rethink our relationship with animals in relation to food production and climate change.

Here we have highlighted two different strategies to adapt to and mitigate climate change. The first implies increasing the efficiency of the production systems through feed improvement, intensified production systems, inclusion of biotechnological tools in breeding strategies, such as genetic modification and cloning, etc., while at the same time focusing on the animal species with the lowest greenhouse gas emissions, such as fish in aquaculture and broilers. In theory, this can be done in a way that, at the same time, includes the consideration of animal welfare, although experience tells us that intensified production usually evolves at the expense of the

animals. Thus, both from an anthropocentric viewpoint, whereby only human interests count, and to some extent from a utilitarian point of view, this strategy is tempting, since it fulfils the human desire for the consumption of meat and other animal products, whilst it can at the same time be ethically justified. However, other ethical perspectives, such as animal rights ethics and adherents of what has been labeled “respect for nature,” find this strategy more problematic as it increases the already widespread instrumentalization of animals, violates their integrity, and continues a perceived movement from “natural” to “unnatural” in the way animals are kept for agricultural purposes.

The second strategy focuses on framing the agricultural animal production system within a broad notion of sustainability including both environmental, animal welfare, socio-economic, and cultural issues. Here the idea that animal husbandry is a personal relationship between the farmer and animals, which are treated with respect in relation to their species-specific behavior, is central. From this point of view, the idea is not to change nature as much as possible to accommodate human desires for animal products, but to change cultural and personal habits to some extent to respect both animals, and to mitigate the impact of animal production on climate change. This strategy would imply a reduction in the consumption of animal products, but would not require the adoption of a vegetarian or vegan diet.

Finally, we suggest that a way of looking at the combined problem of animal production and climate change is to expand the classical individualistic traditions of utilitarianism and deontology with a virtues based approach to the relationship between humans and animals as it changes under the threatening shadow of climate change. We suggest looking at the issue through the perspectives of the concepts: Attentiveness, responsibility, competence, and responsiveness. This facilitates a change in the relationship between producers, consumers, and the animals in the farming systems towards a more inclusive relationship, whereby the responsibility of the consumer both for the welfare of the animals that he or she chooses to consume and the impact on climate change, becomes more apparent. Through the focus on virtues and the virtuous person, the change in the relationship between humans and animals, and the necessary changes in dietary habits, can be understood as an opportunity for humans to enter into a more meaningful relationship with animals and nature, instead of as a necessary sacrifice that must be carried out to the detriment of the quality of life, as it is often seen today. Mitigating climate change through changes in dietary habits towards less meat from animals with higher welfare would thus be seen as a choice supporting visions of what the good human (and animal) life is.

Acknowledgments We would like to thank the anonymous reviewers for their helpful comments on an earlier version of this paper.

References

- Anthony, R. (2009). Farming animals and the capabilities approach: Understanding roles and responsibilities through narrative ethics. *Society and Animals*, 17(3), 259–280.

- Badgley, C., Moghtader, H., Quintero, E., Zakem, E., Chappell, J. M., Aviles-Vazquez, K., et al. (2006). Organic agriculture and the global food supply. *Renewable Agriculture and Food Systems*, 22(2), 86–108.
- Badgley, C., & Perfecto, I. (2007). Can organic agriculture feed the world? *Renewable Agriculture and Food Systems*, 22(2), 80–85.
- Berry, W. (1996). *The unsettling of America: Culture and agriculture*. Berkeley, CA: University of California Press.
- Berry, W. (2009). *Bringing it to the table: On farming and food*. Berkeley, CA: Counter point.
- Borenstein, S. (2010). Scientists seek better way to do climate report. *Washington times* 10.02.2010. Accessed 18 February 2010, <http://www.washingtontimes.com/news/2010/feb/10/scientists-seek-better-way-do-climate-report/>.
- Cederberg, C., Sonesson, U., Henriksson, M., Davis, J. & Sund, V. (2009). Greenhouse gas emissions from production of meat, milk and eggs in Sweden 1990 and 2005. *SIK-Rapport 793*. Göteborg: SIK-Institutet för Livsmedel och Bioteknik.
- Edwards, S., & Araya, H. (2009). The Tigray project: Organic agriculture with smallholder farmers in a mountainous environment. *Ecology & Farming*, 2008, 28–30.
- ERS (Economic Research Service)/USDA (United States Department of Agriculture). (2009). *Food expenditure tables*. Accessed 23rd February 2010, http://www.ers.usda.gov/briefing/CPIFoodAndExpenditures/Data/Expenditures_tables/table7.htm.
- FAO. (2006). Livestock a major threat to environment. Accessed 23rd February 2010, <http://www.fao.org/newsroom/eb/news/2006/1000448/index.html>.
- FAO. (2008). FAO statistical database. Accessed 23rd February 2010, <http://faostat.fao.org>.
- FAO. (2009). Climate change and food security. Accessed 18 February 2010, <http://www.fao.org/climatechange>.
- Flietsbach, A., & Mäder, P. (2006). *Productivity, soil fertility and biodiversity in organic agriculture*. Odense, Denmark: Joint Organic Congress.
- Foer, J. S. (2009). *Eating animals*. Little: Brown and Company.
- Forsberg, C. W., Philips, J. P., Golovan, S. P., Fan, M. Z., Meidinger, R. G., Ajakaiye, A., et al. (2003). The enviropig physiology, performance, and contribution to nutrient management advances in a regulated environment: The leading edge of change in the pork industry. *Journal of Animal Science*, 81, E68–E77.
- Garvey, J. (2008). *The ethics of climate change. Right and wrong in a warming world*. London: Continuum.
- Gjerris, M. (2009). This is not a hammer–on ethics and technology. In F. Bedau & E. Parke (Eds.), *Our future with protocells: The social and ethical implications of the creation of living technology*. Boston: MIT Press.
- Gjerris, M. (2010). *I skyggen af vores moralske forfald. Etisk Råd: Vores mad og det globale klima. Etik til en varmere klode*. Denmark: Etisk Råd.
- Gjerris, M., Olsson, I. A. S., Lassen, J., & Sandøe, P. (2009). Ethical perspectives on animal biotechnology. In P. Atkinson, P. Glasner, & M. Lock (Eds.), *Handbook of genetics and society: Mapping the new genomic era* (pp. 382–398). London: Routledge.
- Goodland, R. & Anhang, J. (2009). Livestock and climate change. *WorldWatch* Nov/Dec 2009. Worldwatch Institute. Accessed 23rd February 2010, <http://www.worldwatch.org/node/6294>.
- Granstedt, A. & Kjellenberg. (2008). *Organic and biodynamic cultivation—a possible way of increasing humus capital, improving soil fertility and providing a significant carbon sink in Nordic conditions*. Cultivating the future based on science: 2nd Conference of the International Society of Organic Agriculture Research ISOFAR, Modena, Italy, June 18–20, 2008.
- Harrison, R. (1964). *Animal machines: The new factory farming industry*. London: Stuart.
- Heymann, M., Andersen, H. & Sandøe, P. (2009). What is climate science all about—Philosophical perspectives. In: Gjerris, M., Gamborg, C., Olesen, J. E. & Wolf, J. (Eds.) *Earth on fire. Climate change from a philosophical and ethical perspective* (pp. 69–88). Copenhagen: University of Copenhagen. Available at www.earthonfire.foi.dk. Accessed 23rd February 2010.
- Hunter, C. V., Tiley, L. S. & Sang, H. M. (2005). *TRENDS in molecular medicine* 11(6), 293–298.
- IFOAM. (2009a). Organic agriculture—a guide to climate change & food security. Accessed 10th February 2010, http://www.ifoam.org/growing_organic/1_arguments_for_oa/environmental_benefits/pdfs/IFOAM-CC-Guide-Web-20100210.pdf.

- IFOAM. (2009b). The contribution of organic agriculture to climate change adaptation in Africa. Accessed 10th February 2010, http://www.ifoam.org/growing_organic/1_arguments_for_oa/environmental_benefits/pdfs/IFOAM-CC-Adaptation-Web_20100210.pdf.
- IFOAM. (2009c). The contribution of organic agriculture to climate change mitigation. Accessed 10 February 2010, http://www.ifoam.org/growing_organic/1_arguments_for_oa/environmental_benefits/pdfs/IFOAM-CC-Mitigation-Web.pdf.
- IFOAM. (2010). The principles of organic agriculture. Accessed 28 May 2010, http://www.ifoam.org/about_ifoam/principles/index.html.
- Ilea, R. C. (2009). Intensive livestock farming: Global trends, increased environmental concerns, and ethical solutions. *Journal of Agricultural and Environmental Ethics*, 22(2), 153–167.
- Karlsson, F. (2009). *A critical assessment of justification and prioritizations in animal-rights theories*. Uppsala Studies in Social Ethics 38, Acta Universitatis Upsaliensis.
- Lund, V., Anthony, R., & Röcklinsberg, H. (2004). The ethical contract as a tool in organic animal husbandry. *Journal of Agricultural and Environmental Ethics*, 17(1), 23–49.
- Lund, V., Mejdell, C., Röcklinsberg, H., Anthony, R., & Håstein, T. (2007). Expanding the moral circle: Farmed fish as objects of moral concern. *Disease of Aquatic Organisms*, 75, 109–118.
- Lund, V., & Olsson, I. A. S. (2006). Animal agriculture: Symbiosis, culture, or ethical conflict? *Journal of Agricultural and Environmental Ethics*, 19, 47–56.
- Lund, V., & Röcklinsberg, H. (2001). Outlining a conception of animal welfare for organic farming systems. *Journal of Agricultural and Environmental Ethics*, 14(4), 391–424.
- Meyer, G. & Lund, A. B. (2009). The climate debate's debating climate. In: Gjerris, M., Gamborg, C., Olesen, J. E. & Wolf, J. (Eds.) *Earth on fire. Climate change from a philosophical and ethical perspective*. (pp. 135–162). Copenhagen: University of Copenhagen. Available at www.earthonfire.foi.dk. Accessed 28 May 2010.
- Newton, L. (2002). *Ethics and sustainability: Sustainable development and the moral life*. Upper Saddle River, NJ: Prentice Hall.
- Niemann, H., Kues, W., & Carnwath, J. W. (2005). Transgenic farm animals: Present and future. *Revue scientifique et technique (International Office of Epizootics)*, 24(1), 285–298.
- Niggli, U., Earley, J. & Ogorzalek, K. (2007). *Organic agriculture and the environmental stability of food supply*. International Conference on Organic Agriculture and Food Security, Rome, Italy, May 3–5, 2007. Accessed 28 May 2010, <ftp://ftp.fao.org/paia/organicag/ofs/OFS-2007-3.pdf>.
- Nussbaum, M. C. (2007). *Frontiers of justice. Disability, nationality, species membership*. Belknap, Cambridge: Harvard University Press.
- Padel, S., Röcklinsberg, H., Verhoog, H., Alrøe, H. F., de Wit, J., Kjeldsen, C., et al. (2007). *Balancing and integrating basic values in the development of organic regulations and standards: Proposal for a procedure using case studies of conflicting areas. EEC2092/91 (Organic) Revision (SSPE-CT-2004–502397): Project report D 2.3*. Aberystwyth: University of Wales, Aberystwyth (UWA) and Danish Research Centre for Organic Farming (DARCOF). Tjele.
- Parfitt, D. (1984). *Reasons and persons*. Oxford: Oxford University Press.
- Parry, M. L., Canziani, O. F., Palutikof, J. P., van der Linden, P. J., & Hanson, C. E. (2007). *Climate change 2007*. Cambridge: Cambridge University Press.
- Pitesky, M. E., Stackhouse, K. R., & Mitloehner, F. M. (2009). Clearing the air: Livestock's contribution to climate change. In D. Sparks (Ed.), *Advances in agronomy* (Vol. 103, pp. 1–40). Burlington: Academic Press.
- Regan, T. (1983). *The case for animal rights*. Los Angeles: University of California Press.
- Richardson, K., Steffen, W., Schnellhuber, H. J., Alcamo, J., Barker, T., Kammen, D. M., Leemans, R., Liverman, D., Munasinghe, M., Osman-Elasha, B., Stern, N. & Wæver, O. (2009). Synthesis report from “Climate change: Global risks challenges and decisions”. Copenhagen 2009, 10–12 March. University of Copenhagen & The International Alliance of Research Universities. Accessed 18th February 2010, <http://www.climatecongress.ku.dk/pdf/synthesisreport>.
- Robl, J. M., Wang, Z., Kasinathan, P., & Kuroiwa, Y. (2007). Transgenic animal production and animal biotechnology. *Theriogenology*, 67, 127–133.
- Röcklinsberg, H. (2009). Animal ethics in a time of climate change. In K. Millar, P. H. West, & B. Nerlich (Eds.), *Ethical futures: bioscience and food horizons* (pp. 92–96). Wageningen: Wageningen Academic Pb.
- Rollin, B. E. (1995). *Farm animal welfare: Social, bioethical, and research issues*. Ames, IA: Iowa State University Press.

- Sandler, R. (2007). *Character and environment: A virtue-oriented approach to environmental ethics*. New York: Columbia University Press.
- Sandler, R., & Cafaro, P. (Eds.). (2005). *Environmental virtue ethics*. Lanham: Rowman & Littlefield.
- Sandøe, P., & Christiansen, S. B. (2008). *Ethics of animal use*. Oxford: Blackwell publishing.
- Singer, P. (1991). *Animal liberation* (2nd ed.). London: Thorsons.
- Singer, P. (1993). *Practical ethics* (2nd ed.). Cambridge: Cambridge University Press.
- Singer, P., & Mason, J. (2006). *The ethics of what we eat: Why our food choices matter*. New York: Rodale Inc.-Holtzbrinck Publishers.
- Sonesson, U., Berglund, M., Cederberg, C. (2009). *Utsläpp av växthusgaser vid production av kycklingkött. Underlag till klimatcertifiering*. Klimatmärkningen, Rapport: 6.
- Steinfeld, H., Gerber, P., Wasenaar, T., Castel, V., Rosales, M. & de Haan, C. (2006). *Livestock's long shadow: Environmental issues and options*. Food and Agriculture Organisation of the United Nations.
- Thompson, P. B. (2001). Reshaping conventional agriculture: A North American perspective. *Journal of Agricultural and Environmental Ethics*, 14(2), 217–229.
- Thompson, P. B. (2008). *The ethics of intensification: Agricultural development and cultural change*. Dordrecht: Springer.
- Thompson, P. B., & Nardone, A. (1999). Sustainable livestock production: Methodological and ethical challenges. *Livestock Production Science*, 61, 111–119.
- United Nations Intergovernmental Panel on Climate Change (IPCC). (2007). *Climate change 2007, the physical science basis*. Cambridge: Cambridge University Press.
- United Nations Population Division. (2009). *World population to exceed 9 billion by 2050* (pp. 92–96). United Nations Population Division. Accessed 10 February 2010, <http://www.un.org/esa/population/publications/wpp2008/pressrelease.pdf>.
- Weil, S. (1977). *The Simone Weil reader*, edited by Panichas GA. Wakefield, RI: Moyer Bell.
- Winther, U., Ziegler, F., Hognes, S. E., Emanuelsson, A., Sund, V., & Ellingsen, H. (2009). *Carbon footprint and energy use of Norwegian seafood products. Report no SFH80 A096068*. Trondheim: SINTEF Fisheries and Aquaculture.
- Wolf, J., & Gjerris, M. (2009). A religious perspective on climate change. *Studia Theologica -Nordic Journal of Theology*, 63(2), 119–139.