

Is meat eating morally defensible? Contemporary ethical considerations

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Implications

- Despite growing global demand for protein, the ethical justification for meat consumption is increasingly questioned.
- Ensuring human rights to food requires moral deliberation.
- The role of meat in addressing growing global needs for food must be considered in the context of food safety, security, quality, access, and affordability. Animal rights, welfare, climate change, and natural resource conservation must also be addressed.
- Though natural resource scarcity may limit or eliminate production of meat in future, potential for technological innovation and agroecology approaches to offset animal, environmental, and socio-ethical harms offers a justification for retaining some degree of meat production and consumption currently.

Key words: ethics, meat alternatives, meat consumption, meat production, moral deliberation

Introduction

Because of the enormous projected growth in the human population, the United Nations has called for significant increases in global food production to meet anticipated demand (Croney et al., 2018; FAO, 2021). Consumers are increasingly interested in learning about the food they eat, including where and how it is produced. What form that food should take, however, is increasingly the subject of public debate.

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Protein derived from animals has figured prominently in human diets unless constrained by religious or other beliefs. Moreover, demand for animal protein has been demonstrated to increase as people in developing nations begin to experience greater prosperity (Delgado et al. 2003; Croney and Anthony, 2014). This dynamic is unsurprising given scientific findings identifying the consumption of meat as a defining factor in the evolutionary development of the human brain (Burini and Leonard, 2018 and in this issue, Leroy et al., 2023) and the role that high quality, easily digestible protein plays in human growth and development (Klurfeld, 2018). Despite these benefits, in developed areas of the world where food security and access are relatively high, the ethical justification for meat consumption is increasingly challenged, resulting in polarized, highly contentious discussions. Frequently cited ethical concerns relate to the rearing and killing of animals for food, animal quality of life in modern large-scale, intensive systems of production, and the related impacts on the environment and human health (Verbeke and Viaene, 1999; Baltzer, 2004; Bottonaki et al., 2006; Croney and Anthony, 2014; Croney et al., 2018; Godfray, 2018).

For those for whom food security and accessibility are assured, these and other ethical dimensions of food production have become more significant. Accordingly, some members of the public in food-secure nations have shifted to “ethical consumerism”, electing to purchase food products they perceive to be less socially and environmentally harmful (Croney and Anthony, 2014), while avoiding those not aligned with their values (Morgan et al., 2016). Evidence of such purchasing shifts was found by McKendree et al. (2014) who reported that 14% of U.S. consumers surveyed had reduced their consumption of pork by 56% on average because of animal welfare concerns. Siegrist and Hartmann (2019) reported that consumers who were more health conscious and those who perceived there to be high environmental impacts of meat were more likely to choose meat substitutes. Further, a 2020 U.S. Gallup poll reported that 23% of Americans had reduced their consumption of meat, with ethical concerns such as those related to environmental and animal welfare impacts influencing their choices (McCarthy and DeKoster, 2020).

Several companies have taken note, resulting in significant investment and effort towards the development of plant-based alternatives to meat, such as Beyond Beef and Impossible

Meat products. The proliferation and marketing of these protein sources bolstered the arguments against the necessity of eating meat. Simultaneously, public sentiment relating to meat consumption in western countries appears to be increasingly influenced by social pressure exerted through the high volume of media (He J. et al., 2020), social media, scholars (Godfray et al., 2018), NGOs, and others who advocate for reduced or no meat consumption (de Boer et al., 2017). However, recent reports of the poor performance of alternative meat food offerings, and in some cases removal from menus or dis-investment, strongly hint at issues of consumer acceptance (Olsen, 2022).

Although people in most countries continue to eat meat, the idea that vegetarianism is virtuous and morally responsible is being socially normed. The positioning of meat eating as less virtuous is reflected in studies reporting that those who eat meat appear to be less sensitive to animal and environmental concerns (Piazza et al., 2015). Further, it has been suggested that some meat eaters may adopt thinking that relieves them of any associated cognitive dissonance (discomfort created by behaving in ways that are inconsistent with one's stated beliefs or values). In other words, people may develop strategies to reconcile having strong social and emotional bonds with animals, and salient knowledge about their sentience and cognitive capacities, while also eating them (Cronley et al., 2004; Piazza et al., 2015). It is therefore not surprising that especially in the published literature, far fewer individuals and groups attempt to make, or succeed at making, compelling ethical arguments for eating meat. For those who try, their motivation and credibility may be called into question and the visibility of their work (and the related scientific basis for their arguments) may be relatively low. This hints at the current social and ethical challenges of defending meat consumption. Recent advances in biotechnology and cellular biology have added a new wrinkle to the discussion of using animals to produce food, perhaps further weakening the perceived case for continued meat production and consumption.

Given changing consumer preferences and ongoing concerns relating to climate change, environmental pollution, human health, and the eco-preservation of natural resources, including water, the moral case for meat must be revisited. A narrative outline of the scientific arguments for and against meat eating are insufficient to accomplish this goal. This paper therefore examines whether meat eating is ethically defensible using tenets of Campbell's ethics assessment process (Campbell and Hare, 1997; Cronley and Anthony, 2010), while considering the need for viable, sustainable sources of protein in developed and developing nations.

Moral deliberation About Meat Consumption: The Value of Ethical Assessment

Whether or not one should eat meat is inherently an ethical question. While science may help to inform the answers to such questions, science alone is insufficient to address them given

their value-laden nature. Expanding the inquiry into whether meat eating, in general, should continue transforms the question into one that has far-reaching socio-ethical implications for a greater number of diverse stakeholders. Under such circumstances, it is essential to ensure that the broadest group of impacts, interests, and values are accounted for and duly considered. Ethical accounting processes, such as that offered by Campbell and Hare (Campbell and Hare, 1997; Cronley and Anthony, 2010), provide a means by which to incorporate relevant factual information into decision-making about ethical questions. This approach facilitates deliberation rather than debate about the potential courses of action, culminating in an examination of the moral justification for a wider range of options than might otherwise be considered (Cronley and Anthony, 2010). Moral deliberation is particularly important when the relevant scientific information available on the topic of interest is lacking to some degree or is ambiguous. In such instances, the values of the decision-makers may become the primary drivers of the solutions proposed. This creates the risk of unjustly disenfranchising many who might be impacted whose priorities and needs might be overlooked. Ethical accounting therefore facilitates both inclusiveness and transparency in decision-making that has significant social impact. Because the ethical justification for meat consumption holds both personal and societal implications, we examine the merits of the arguments using Campbell's ethics assessment process as outlined by Cronley and Anthony (2010). The process includes: ethical fact finding (review of all relevant scientific or factual information); uncovering of embedded values that may be in conflict; moral imagination (ideation about possible solutions through evaluating the quality of arguments for them and the degree to which each option addresses the social, ethical, scientific, and economic concerns involved); and moral justification and testing of proposed solutions.

Arguments Against Meat Consumption

As previously stated, the ethical arguments against meat eating have been well detailed on the grounds of animal rights welfare (Singer, 1975; Regan, 1983; Francione, 2022), environmental impact, and human health (Gunderson, 2015). Given the extensive reviews that argue for plant-based diets based on these concerns, this paper will not offer a retread of the previously published ideas. Readers are encouraged to examine the original publications to fully appreciate their influence on contemporary moral philosophy and public discourse about animal use. However, to facilitate moral deliberation, each of these areas of concern must be included in ethical accounting, requiring at minimum, a brief synopsis of the moral considerations they highlight.

A fundamental question examined within the areas of animal rights, welfare, environmental impact, and justice is whether eating animals does harm. Regan's (1983) foundational thesis unambiguously concluded that animals meet the conditions for having rights (i.e., they are subjects of lives, they have inherent value and preference autonomy) and therefore

they cannot be used as mere means to an end (in this case, food). Depriving animals of their lives is the ultimate harm. [Singer's \(1975\)](#) seminal work arguing that animals are sentient beings capable of suffering, and that human uses that cause them suffering cannot be justified clearly applies to the rearing and killing of animals for food. The sentience of animals and its relationship to animal welfare is scientifically supported and has been formally recognized by the World Animal Health Organization ([OIE, 2017](#)). Further, while numerous studies on the welfare of farmed animals have attempted to evaluate and identify ways to minimize distress, pain, and suffering they may experience from rearing to death, it is currently impossible to entirely avoid such negative states ([Dawkins, 2016](#); [CAST, 2018](#)). As such, some harm (beyond death) is inevitable.

Likewise, scholars focused on environmental impact have linked meat production with degradation of ecosystem quality, including air, soil, and water quality, and depletion of resources, such as water and land ([De Vries and De Boer, 2010](#); [Ernststoff et al., 2019](#)). Relatedly, environmental justice, which aims to ensure that environmental hazards and their health effects do not disproportionately impact communities that are already disadvantaged (for instance as a result of minority or lower socio-economic status) have suggested that meat production and consumption indeed causes such harms ([Gunderson, 2015](#)). Recently, [Chamanara et al. \(2021\)](#) reported that in a study of a major retailer's supply chain in California, communities living near feedlots were predominantly lower income Latinx who experienced high levels of air pollution and significant health problems related to poor air quality, such as asthma and heart disease. Similar arguments are advanced by [Hull et al., \(2023\)](#) who suggested that because of the animal, environmental, and human-health impacts of meat eating, the medical profession may be morally obligated to promote plant-based diets.

Values that are embedded within each of these areas of ethical concern include protecting others from harm, benevolence (doing good), justice, and fairness. However, especially in the case of the animal rights and welfare arguments, a single-dimension problem focus emerges that prioritizes the interests of a rather limited set of stakeholders (animals). This is unsurprising given that the related philosophies were advanced specifically to center animals as subjects of moral concern. Nonetheless, in the context of contemporary global decision-making about food choices, the limited scope of primary stakeholder consideration inherent to such philosophies presents a problem for ethical decision-making. Significant ethical concerns are raised when public discussions about abandoning meat production and consumption do not adequately consider the broadest group of stakeholders, including people with lower income status and others who might be directly impacted. Such concerns are exacerbated when proposed alternatives fail to address valid socio-ethical, scientific, or economic concerns about moving to a solely plant-based diet, or when the solutions offered cannot yet be practically and equitably implemented. Moreover, in presenting the antimeat arguments, animal, environmental, and human interests are often framed

competitively, though all of these must be balanced to achieve just, accessible, sustainable food systems.

Arguments in Defense of Meat

Arguments in support of meat consumption are noticeably scant and are therefore more detailed in this paper. First, the historical and cultural significance of eating meat cannot be overlooked. Meat consumption is closely linked with human co-evolution with animals, and throughout history and across diverse cultures, social gathering has often incorporated the sharing of meat ([Monteiro et al., 2017](#)). Some have even argued that the cooperation required to procure meat and the act of sharing it despite its scarcity in early human evolution contributed to the development of human morality ([Mameli, 2013](#); [DeBacker and Hudders, 2015](#)). However, arguments based on tradition are far less compelling when we consider how knowledge, values, and related beliefs have evolved over time, resulting in reduced social acceptability or abandonment of many other long-held traditions and practices.

Proponents of keeping meat in the diet often point to the historical or anthropological record of meat eating by humans, thus, implying its “naturalness,” and the nutritional benefits associated with meat consumption are often cited in support of it. Though these points are scientifically accurate, alone, they present inadequate moral arguments. First, given the degree to which today's livestock and poultry have been altered through genetic selection and newer developments in genetic engineering ([Crony et al., 2018](#)), “dietary naturalness” arguments for commercially produced meats may be questionable to some. The nutritional value of meat makes for a stronger case ([Klurfeld, 2018](#)) as the current generation of plant-based meat alternatives still lack equal nutrient value with meat, such as vitamin B12, zinc, and protein ([Harnack et al., 2021](#)). However, if new alternative protein sources derived from cell-based technologies can offer the same or equivalent benefits, this argument may be undermined.

Though the case against meat heavily emphasizes the negative environmental and ecological problems created by meat production, there are important and inadequately examined rationales to support meat consumption in these same domains. For example, proponents of regenerative agriculture ([Rowntree et al., 2020](#)) have argued that there are significant global limits to arable land for growing crops for protein purposes. This presents very real challenges for those who reside in geographic regions with little to no arable land, which constrains adoption of a primarily or purely plant-based diet. Few philosophical arguments in favor of eliminating meat from human diets engage this concern or offer practical, affordable solutions for those impacted. Further, in many such regions (and in other parts of the world), there is an availability of grasslands that support grazing ruminants. Through the use of regenerative grazing practices, there are significant eco-benefits derived, including improvements to soil health, promoting greater CO₂ sequestration, reduction of greenhouse gases, restoration of biodiversity, and production of high-quality protein for human

consumption (see [Spratt et al., 2021](#) and elsewhere in this issue, [Thompson et al., 2023](#)).

Relatedly, an argument for meat eating that connects both to ecological and animal welfare considerations is that a diet that includes some consumption of grazing animals may cause less harm relative to total numbers of animals killed than one that is vegan ([Davis, 2003](#)). Davis argued that the intensive cropping systems required to produce vegan diets potentially lead to the death of 1.8 billion field-dwelling animals. Because pasture-forage production systems that support grazing animals require less harvesting with equipment such as tractors that kill field animals, Davis speculated that less use of such equipment would cause fewer field animal deaths. Even after considering the number of ruminant animals that might be killed for human consumption in a hybrid plant per ruminant diet, Davis estimated that it would still be fewer (1.42 billion) than those lost due to vegan diets. Consequently, he concluded that based on [Regan's \(1983\)](#) Least Harm Principle, people may be morally obligated to consume at least some meat to reduce the overall harm done to animals.

Given the vast amount of arable land that would be necessary to support vegan diets for all humans, it could be argued that such a diet is neither practical nor ecologically sustainable, further supporting a partially meat-based diet as ethically defensible. However, to date, few philosophers, and others in favor of vegetarian and vegan diets have seriously engaged this point or [Davis' \(2003\)](#) arguments. [Archer \(2011\)](#) later attempted a similar argument as Davis based on estimated animal field deaths in Australian cropping systems. However, Archer's claims were challenged by [Fischer and Lamey \(2018\)](#), who questioned the basis for his (2011) calculations. They also rejected [Davis' \(2003\)](#) arguments despite noting that he might have *underestimated* field animal deaths. They concluded that deriving robust estimates of field deaths is difficult due to the variety of animals affected and suggested this challenge as a plausible reason for the lack of engagement on this topic. Nonetheless, they raised the argument that technological innovation might be able to significantly reduce the deaths of field animals and that such pursuits are critical to ensuring humane food choices. Interestingly, an identical argument can be made for those seeking to support meat consumption while also being mindful of the need to mitigate harm caused to animals. Though one might argue that the morally salient difference is *intention* to kill, the effect on the animals themselves is ultimately what matters if indeed animal welfare, sentience, and protection from harm are high priorities in deliberations about the morality of meat consumption.

[Thompson \(2021\)](#) states that there has been a failure by philosophers engaged in animal ethics to provide guidance to the animal agriculture community that could facilitate improvements to farm animal welfare. He refers to this failure as the “vanishing ethics of animal husbandry”, and claims that a “structural narcissism” has descended on the philosophers who have dominated discussions about livestock and poultry production. Instead of answering the more difficult questions posed by modern animal husbandry practices, they instead

offer “oversimplified and rhetorical overstatements” of the practices used in livestock and poultry production. Thompson sees this abandonment by animal ethicists as a missed opportunity to contribute to practical solutions.

Building on [Thompson's \(2021\)](#) observations, in philosophical debates about the merits of meat consumption, the effects of shifting primarily to plant-based protein sources on local communities and ecosystems, especially in developing countries, are often inadequately explored. In Bolivia, for instance, where quinoa (and llamas) are major agricultural commodities, [Jacobsen \(2011\)](#) reported that the rapid growth in demand for the plant resulted in intensive cultivation practices in parts of the country that led to land degradation in some areas, loss of grazing areas for llamas, and shifts in Andean farmers' diets to less nutritious food sources. Here, prioritization of the demands, and values of the affluent may have resulted in unintended negative consequences requiring scientific, technological, and educational interventions even though there were economic benefits for Indigenous people. These outcomes underscore the need for deliberation that is inclusive of all stakeholders and facilitates an envisioning of the consequences of shifting to plant-based diets that meet human protein requirements *before* attempting to advance such transformational food agendas.

Finally, in contemporary discussions about meat eating, there is often insufficient focus on retaining the broadest array of dietary options given the diversity of needs and ability to access food that currently exists globally. It is important to remember that in many parts of the developed and developing world, undernutrition, and inability to access sufficient protein remain ongoing problems for numerous people, especially women and children. For example, the World Health Organization reported that 149 million children under the age of 5 are stunted due to malnourishment and have a 45% death rate attributed to the same cause ([WHO, 2021](#)). Micronutrients including iodine, Vitamin A and iron were singled out as deficiencies of global concern. While there are good reasons for deliberating about our eating habits and those of others, it is easy to forget that in both developed and developing nations, many people do not have the luxury of choosing their diets (elsewhere in this issue, [Ederer et al., 2023](#)). Access to adequate food is a well-established human right ([United Nations, 1999](#)) Therefore, any related moral reasoning exercise should consider whether it is just to deny others access to high quality and digestible protein foods, like meat, which could alleviate poor nutritional status, especially for those who subsist on foods of inadequate quality and low nutritional value. This is not to say that we should overlook or diminish the diverse concerns associated with meat consumption. Rather, we should be careful to avoid moral and cultural imperialism and the stigmatizing of others in discussions about what constitutes “good” food choices. The obligation to meet the needs of the growing global population for food suggests it may be ethically problematic to reduce rather than increase the number of options available to people who want and need high quality protein.

Is Cultured Meat a Viable Alternative?

Given the ethical and social responsibility concerns related to traditionally produced meat products, it should come as no surprise that innovation in science and technology has been looked to for solutions. Scientific developments in stem cell harvesting and in vitro technology have resulted in the successful production of laboratory-grown meat (Post, 2014; Post et al. 2020). Cultured meat shows promise to attain a biological and nutritional equivalency to traditionally harvested meat that plant-based substitutes have yet to achieve. The scientific advancements and benefits related to cultured meat are outlined elsewhere in this issue (see Wood et al., 2023).

However, cultured meat, while perhaps offering a means by which to assuage several ethical challenges, may not be the panacea that some envision. Lab-grown meat production still requires animals as a resource for the harvest of stem cells. The conditions under which animals might be maintained and the procedures to which they might be subjected for cell harvesting warrant as much scrutiny relative to their impacts on animal welfare as does traditional farming (Cronney et al., 2018). Thus, some concerns about the welfare of animals reared and killed for meat, may be addressed with cultured meat, but they are not entirely erased. In addition, key stakeholders, such as ranchers, who might be displaced or disenfranchised by a shift to cultured meat, should be thoughtfully considered in moral deliberation about this potential option. Far too often, philosophical arguments dismissively suggest that ranchers should “simply find new jobs”. This level of disregard de-prioritizes ranchers and others directly impacted by conclusions that meat consumption should be readily abandoned. This is inconsistent with the notion that moral deliberation should consider the interests of *all* stakeholders, while transparently prioritizing values and properly accounting for those who are adversely impacted by the resulting decisions.

In short, though cultured meat is very likely to address many of the ethical problems associated with farming animals for meat, new challenges may emerge that are unlikely to be easily addressed. Further consideration must also be given to consumer acceptability (which cannot be presumed) and the impacts of such technological innovation on developed and developing nations with diverse cultural backgrounds, preferences, values, and resources.

Conclusions

Whether and to what extent meat consumption should continue into the future is open to debate. Consumer perceptions studies conducted in developed nations suggest that moving forward, people will continue to eat meat, though it is likely that the frequency and amount of meat eaten may decline depending on individual demographics, knowledge, and values relating to animals, the environment, and human health. The debate about whether meat consumption is *ethically defensible*, though, remains. Though the available scientific information is equivocal in some areas, as previously outlined, meat

production does entail harm to animals and has significant implications for environmental and human health. However, there is also harm in entirely abandoning meat consumption at this point in time, not just for human health, but for food equity, justice, and economic viability for diverse stakeholders, including many of the most vulnerable in society. A purely plant-based diet is not feasible for all given constraints on arable land, and the economic and environmental costs of importing foods into such regions would introduce or exacerbate food security and access issues. Furthermore, plant-based diets clearly contribute to harming vast numbers of field animals whose lives and interests matter as much as animals raised for agricultural purposes. Whether or not the average person has a personal connection to field animals and related investment in their protection is irrelevant if indeed animal rights and welfare are deemed important enough to be factored into ethical assessment of our dietary choices. To argue otherwise is logically and morally inconsistent. However, to deprioritize human rights to food today (especially considering the urgency of meeting global protein needs) in favor of animal rights and current and future environmental protection is neither defensible nor necessary. Instead, alternatives that better protect animals, people, and the environment from foreseeable, avoidable harms should be explored. We therefore support the ideas of Shannon et al. (2015) who suggest taking the approach of combining “the principles of human rights and the values of public health with an agroecological perspective”.

How might this occur? Meat industry members and stakeholders should deliberately and thoughtfully engage the arguments against meat eating. This must be done not just with rhetoric (although effective communication with the public should always be a priority). Instead, what should occur is more concerted, collaborative effort and investment in the scientific advances needed to address the outstanding ethical problems associated with meat production and consumption, such as animal welfare. Innovation in alternative production, such as cultured meat and meat-alternatives are imperfect but important steps toward meeting changing societal expectations in more affluent countries. In addition, Shannon et al. (2015) propose several policy strategies covering production, marketing, processing, distribution, access, consumption, and overall food systems that could be evaluated in the context of more current science and practice. While some of their recommendations are likely to be contentious, reasonable requirements for greater oversight in areas such as antimicrobial stewardship, natural resource conservation, and protection of farm workers might be incorporated to reduce harms associated with meat eating. Our collective suggestions would permit retaining meat consumption with modifications (e.g., the amount of meat consumed, and the attributes and type of production). This option, while imperfect, and notably infringing on animal rights, benefits the broadest group of stakeholders. It duly considers their interests and the values of protecting others (including animals and the environment) from a more diverse set of harms, promoting more just, sustainable food systems, and reducing inequities in food access and security. Under these specified conditions, some

meat consumption could be morally justified and even regarded as ethically preferable as it not only offers a practical option, it also potentially reduces some forms of harm. This is particularly the case if the harms considered include the inequity of allowing those who are affluent, empowered, and food secure to constrain the dietary options available to those who are socially, politically, and economically disempowered.

Moving forward, we must be open to discussing what food availability and security means in the global context, how climate change will impact our natural resources and the food dynamic, and where the ethical boundaries are drawn with respect to what we eat and the multitude of factors that affect our choices and those of others. “Food shaming” in any form must be avoided in discussions of what we eat given the constraints on food security, quality, access, and affordability faced by many who are often the subjects of and rarely the agents of public discussions and decision-making. To that end, we must also be open to discussing current and future natural resource limitations and pro-actively seek solutions that are scientifically sound and ethically supported. This includes actively engaging or discovering new methods to produce high quality food, including meat and not just foods perceived to hold the “moral high ground”. Finally, we must be pro-actively prepared to face the possibility that life-sustaining natural resource scarcity like water may force choices, both social and political, that may cause a reduction or phase-out of using animals to produce some foods, including meat and water intensive crops.

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Literature Cited

- Archer, M. 2011. Ordering the vegetarian meal? There is more blood on your hands. *The Conversation*. <https://theconversation.com/ordering-the-vegetarian-meal-theres-more-animal-blood-on-your-hands-4659> (accessed December 7, 2022).
- Baltzer, K. 2004. Consumers’ willingness to pay for food quality—the case of eggs. *Acta Agric. Scand. C Food Econ.* 1:78–90. doi:[10.1080/16507540410024506](https://doi.org/10.1080/16507540410024506)
- Botonaki, A., K. Polymeros, E. Tsakiridou, and K. Mattas. 2006. The role of food quality certification on consumers’ food choices. *Br. Food J.* 108:77–90. doi:[10.1108/00070700610644906](https://doi.org/10.1108/00070700610644906)
- Burini, R.C. and W.R. Leonard. 2018. The evolutionary roles of nutrition selection and dietary quality in the human brain size and encephalization. *Nutrire.* 43:19. doi:[10.1186/s41110-018-0078-x](https://doi.org/10.1186/s41110-018-0078-x)
- Campbell, C.S., and J.M. Hare. 1997. Ethical literacy in gerontology programs. *Gerontol. Geriatr. Educ.* 17(4):3–16. doi:[10.1300/j021v17n04_02](https://doi.org/10.1300/j021v17n04_02)
- Chamanara, S., B. Goldstein, and J.P. Newell. 2021. Where’s the beef? Costco’s meat supply chain and environmental justice in California. *J. Clean. Product.* 278:123744. doi:[10.1016/j.jclepro.2020.123744](https://doi.org/10.1016/j.jclepro.2020.123744)
- Council for Agricultural, Science and Technology. 2018. Scientific, ethical and economic aspects of farm animal welfare. In: C.C. Croney, J.A. Mench, and W. Muir, editors. Task Force Report R-143. <https://www.cast-science.org/publication/scientific-ethical-and-economic-aspects-of-farm-animal-welfare/> (accessed December 9, 2022).
- Croney, C.C., and R. Anthony. 2010. Engaging science in a climate of values: tools for animal scientists tasked with addressing ethical problems. *J. Anim. Sci.* 88(suppl_13):E75–E81. doi:[10.2527/jas.2009-2353](https://doi.org/10.2527/jas.2009-2353)
- Croney, C., and R. Anthony. 2014. Food animal production, ethics, and quality assurance. In P.B. Thompson, and D. Kaplan editors. *Encyclopedia of food and agricultural ethics*. New York, NY: Springer; p. 1–10.
- Croney, C.C., B. Gardener, and S. Baggott. 2004. Beyond animal husbandry: the study of farm animal cognition and ensuing ethical issues. *Essays Philos.* 5(2):391–403. doi:[10.5840/eip20045213](https://doi.org/10.5840/eip20045213)
- Croney, C., W. Muir, J.Q. Ni, N.O. Widmar, and G. Varner. 2018. An overview of engineering approaches to improving agricultural animal welfare. *J. Agric. Environ. Ethics.* 31(2):143–159. doi:[10.1007/s10806-018-9716-9](https://doi.org/10.1007/s10806-018-9716-9)
- Davis, S.L. 2003. The least harm principle may require that humans consume a diet containing large herbivores, not a vegan diet. *J. Agric. Environ. Ethics.* 16:387–394. doi:[10.1023/a:1025638030686](https://doi.org/10.1023/a:1025638030686)
- Dawkins, M.S. 2016. Animal welfare and efficient farming: is conflict inevitable? *Anim. Prod. Sci.* 57(2):201–208. doi:[10.1071/AN15383](https://doi.org/10.1071/AN15383)
- De Backer, C.J., and L. Hudders. 2015. Meat morals: relationship between meat consumption consumer attitudes towards human and animal welfare and moral behavior. *Meat Sci.* 99:68–74. doi:[10.1016/j.meatsci.2014.08.011](https://doi.org/10.1016/j.meatsci.2014.08.011)
- de Boer, J., H. Schösler, and H. Aiking. 2017. Towards a reduced meat diet: mindset and motivation of young vegetarians, low, medium and high meat-eaters. *Appetite.* 113:387–397. doi:[10.1016/j.appet.2017.03.007](https://doi.org/10.1016/j.appet.2017.03.007)
- De Vries, M., and I.J.M. de Boer. 2010. Comparing environmental impacts for livestock products: a review of life cycle assessments. *Livest. Sci.* 128(1–3):1–11. doi:[10.1016/j.livsci.2009.11.007](https://doi.org/10.1016/j.livsci.2009.11.007)
- Delgado, C.L., N. Wada, M.W. Rosegrant, S. Meijer, and M. Ahmed. 2003. Fish to 2020: supply and demand in changing global markets. International Food Policy Research Institute and WorldFish Center. WorldFish Center Technical Report 62. <https://www.worldfishcenter.org>
- Ederer, P., S. Tarawali, I. Baltenweck, J.N. Blignaut, and C. Moretti. 2023. Affordability of meat for global consumers and the need to sustain investment capacity for livestock farmers. *Anim. Front.* 13(2).
- Ernststoff, A., Q. Tu, M. Faist, A. Del Duce, S. Mandlebaum, and J. Dettling. 2019. Comparing the environmental impacts of meatless and meat-containing meals in the United States. *Sustainability.* 11(22):6235. doi:[10.3390/su11226235](https://doi.org/10.3390/su11226235)
- FAO. 2021. The state of food security and nutrition in the world. Food and Agriculture Organization of the United Nations. <https://www.fao.org/state-of-food-security-nutrition/2021/en/> (accessed December 7, 2022).
- Fischer, B., and A. Lamey. 2018. Field deaths in plant agriculture. *J. Agric. Environ. Ethics.* 31:409–428. doi:[10.1007/s10806-018-9733-8](https://doi.org/10.1007/s10806-018-9733-8)
- Francione, G. 2022. Letters to the Editor. Animal welfare and society - part 1. Viewpoints of a philosopher. *Anim. Front.* 12(1):43–47. doi:[10.1093/af/vfac006](https://doi.org/10.1093/af/vfac006)

- Godfray, H.C.J., P. Aveyard, T. Garnett, J.W. Hall, T.J. Key, J. Lorimer, R.T. Pierrehumbert, P. Scarborough, M. Springmann, and S. Jebb. 2018. Meat consumption, health, and the environment. *Science*. 361:6399. doi:[10.1126/science.aam5324](https://doi.org/10.1126/science.aam5324)
- Gunderson, R. 2015. Meat and inequality. In: J. Emel, and H. Neo, editors. *Political Ecologies of Meat*. London: Routledge, p. 101–109. doi:[10.4324/9781315818283](https://doi.org/10.4324/9781315818283)
- Harnack, L., Mork, S., Valluri, S., Weber C., Schmitz K., Stevenson, J., and Pettit, J. 2021. Nutrient composition of a selection of plant-based ground beef alternative products available in the United States. *J. Acad. Nutr. Diet.* 121(12):2401–2408.e12. doi:[10.1016/j.jand.2021.05.002](https://doi.org/10.1016/j.jand.2021.05.002)
- He, J., N.M. Evans, H. Liu, and S. Shao. 2020. A review of research on plant-based meat alternatives: driving forces, history, manufacturing, and consumer attitudes. *Compr. Rev. Food Sci. Food Saf.* 19(5):2639–2656. doi:[10.1111/1541-4337.12610](https://doi.org/10.1111/1541-4337.12610)
- Hull, S.C., J. Charles, and A.L. Caplan. 2023. Are we what we eat? The moral imperative of the medical profession to promote plant-based nutrition. *Am. J. Cardiol.* 188:15–21. doi:[10.1016/j.amjcard.2022.10.006](https://doi.org/10.1016/j.amjcard.2022.10.006)
- Klurfeld, D.M. 2018. What is the role of meat in a healthy diet? *Anim. Front.* 8(3):5–10. doi:[10.1093/af/vfy009](https://doi.org/10.1093/af/vfy009)
- Jacobsen, S.E. 2011. The situation for quinoa and its production in southern Bolivia: from economic success to environmental disaster. *J. Agron. Crop Sci.* 197(5):390–399. doi:[10.1111/j.1439-037x.2011.00475.x](https://doi.org/10.1111/j.1439-037x.2011.00475.x)
- Leroy, F., N. Smith, A.T. Adesogan, T. Beal, L. Iannotti, P.J. Moughan, and N. Mann. 2023. The role of meat in the human diet: evolutionary aspects and nutritional value. *Anim. Front.* 13(2).
- Mameli, M. 2013. Meat made us moral: a hypothesis on the nature and evolution of moral judgment. *Biol. Philos.* 28(6):903–931. doi:[10.1007/s10539-013-9401-3](https://doi.org/10.1007/s10539-013-9401-3)
- McCarthy, J., and S. DeKoster. 2020. Nearly one in four have cut back on eating meat. Gallup News, Economy. <https://news.gallup.com/poll/282779/nearly-one-four-cut-back-eating-meat.aspx> (accessed December 9, 2022).
- McKendree, M.G., C.C. Croney, and N.O. Widmar. 2014. Effects of demographic factors and information sources on United States consumer perceptions of animal welfare. *J. Anim. Sci.* 92(7):3161–3173. doi:[10.2527/jas.2014-6874](https://doi.org/10.2527/jas.2014-6874)
- Monteiro, C.A., T.M. Pfeiler, M.D. Patterson, and M.A. Milburn. 2017. The carnism inventory: measuring the ideology of eating animals. *Appetite.* 113:51–62. doi:[10.1016/j.appet.2017.02.011](https://doi.org/10.1016/j.appet.2017.02.011)
- Morgan, C.J., C.C. Croney, and Widmar, N.J. 2016. Exploring relationships between ethical consumption, lifestyle choices, and social responsibility. *Adv. Appl. Sociol.* 6:199–216. doi:[10.4236/aasoci.2016.65017](https://doi.org/10.4236/aasoci.2016.65017)
- OIE Global Animal Welfare Strategy. 2017. Paris, France: World Organisation for Animal Health. http://www.oie.int/fileadmin/Home/eng/Animal_Welfare/docs/pdf/Others/EN_OIE_AW_Strategy.pdf (accessed December 9, 2022).
- Olen, H. 2022. Opinion: falling sales suggest plant-based meat maybe all hat, and no cattle. *Washington Post*, November 7, 2022.