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Review Article

The de-meatification imperative: To what end?

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Abstract

Meatification describes a momentous dietary transformation: the average person on earth today consumes nearly twice as much animal flesh every year as did the average person just two generations ago, amidst a period of rapid human population growth and with marked disparities between rich and poor countries. Further, meatification is projected to continue in the coming three decades, with growth concentrated in fast-industrializing countries, at the same time as the world adds another 1.5 to 2 billion people. There is overwhelming evidence to suggest that meatification bears heavily on a range of problems including climate change, biodiversity loss, food consumption disparities, mounting risks of antibiotic resistance, increasing rates of non-communicable disease, and growing realms of animal suffering. The basic implication is inescapable: the de-meatification of diets is an urgent environmental and social priority, and must be part of any project of providing critical food guidance. There are many signs that this recognition is growing in environmental and public health advocacy (including pressure to reform dietary guidelines), calls for a 'meat tax', and in rising levels of vegetarianism and veganism in some of the countries that have long been at the forefront of meatification. After briefly summarizing the course of meatification and the de-meatification imperative, this chapter focuses on its three primary possibilities: conscientious omnivory (which has various hues, as in calls for 'green' or 'ethical' meat); vegetarianism; and veganism. This paper suggests that thinking critically about different end-points is necessary to recognize the challenges of alliance-building and constructively communicating the de-meatification imperative.

Keywords: Meatification; industrial livestock production; vegetarianism; veganism; conscientious omnivory

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Introduction

This paper makes a case that *de-meatification* should be a fundamental component of all critical food guidance and explores the three main paths this could follow. The case for de-meatification necessarily starts with the trajectory it seeks to reverse: *meatification*, a term that encapsulates the surging per capita consumption of animal products on a global scale. The paper opens by briefly reviewing the major global patterns of meatification, before discussing why this is so destructive, focusing on the industrial grain-oilseed-livestock complex, the system of agriculture that underpins rising per capita consumption. This provides a foundation for understanding some key reasons behind the widespread assent to meatification (i.e., how it is accepted as a normative societal aspiration, either explicitly or implicitly), why cracks in this hegemonic development are starting to appear, and why attempts to brace meatification against its critics are unconvincing. The three paths for de-meatification are then explored—conscientious omnivory, vegetarianism, and veganism—in a way that seeks to convey the core logic of each camp and shed light on heated debates between them. While there may be some ground for strategic alliances, we start from the premise that critical thinking about these different positions is needed to effectively communicate the de-meatification imperative and ultimately rebuild more sustainable, equitable, and humane agro-food systems.

The meatification of diets

Appreciating the de-meatification imperative starts with the magnitude of meatification, a radical dietary transformation that is encapsulated in the fact that the average person on earth today consumes nearly twice as much animal flesh every year as did the average person just two generations ago amidst a period of rapid human population growth. From 1961 to 2020, the human population grew by one-and-a-half times, from 3 to 7.8 billion, and the average person on earth increased their annual consumption of meat from twenty-three to forty-four kg of meat per year, with marked disparities between high- and low-income countries (FAOSTAT 2022). The meatification of diets is projected to continue growing in the coming decades, as the world adds another 1.5 to 2 billion people by 2050, with much of this growth on a world scale concentrated in fast-industrializing middle-income countries. Meatification routinely appears as though it is an inexorable trajectory and is a key assumption behind calls to double agricultural production (Weis 2015).

This sense of inexorability reflects how meatification has been a powerful aspiration of development, as does the fact that it has tended to march in step with rising affluence. The widespread veneration of meat, eggs, and milk, especially meat, has diverse cultural lineages rooted in the fact that animal products tended to be consumed infrequently in agrarian societies, and often provided key sources of protein in contexts where they were relatively scarce in diets (Harris 1974; Rifkin 1992; Watson 2014). Cultural values were further fortified by modern

science, as nutritional profiling and metabolic analyses revealed that animal proteins tend to be more complete and more efficiently metabolized than plant proteins.

The expansion of livestock production has always been a major force in environmental change. Pasture is by far the world's largest anthropogenic land-use, which entails a central role in the historic reduction of self-organizing ecosystems, and ruminant livestock constitute the largest share of the total biomass of mammals on earth, followed by humans (Bar-On et al. 2018). Pasture is also a major contemporary force in tropical deforestation, principally in Amazonia, and in desertification, especially in arid- and semi-arid regions (IPCC 2019; Steinfeld et al. 2006). This contribution to both past and present environmental change makes grazing livestock an important factor in both biodiversity loss and climate change, as the conversion of forests, natural grasslands, and wetlands entails CO_2 emissions and means less habitat for other species and less carbon sequestration capacity across a given landscape (through both reduced vegetation and biologically impoverished soils). Furthermore, the great populations of ruminant livestock comprise the biggest source of global methane emissions (primarily from belching associated with their digestive process) and the land they occupy inhibits prospects for ecological restoration (Crist et al. 2017; IPCC 2019; Machovina et al. 2015; Ripple et al. 2014; Steinfeld et al. 2006).

Much more so than pasture, however, the meatification of diets pivots on the industrial grain-oilseed-livestock complex, which comprises vast 'oceans' of monocultures and concentrated 'islands' of densely-packed animals. This system occupies about thirty percent of the world's arable land and a much higher share in many temperate countries like Canada. In the industrial grain-oilseed-livestock complex, fast-rising animal populations are, in a way, spatially disaggregated from the land, and effectively command a large share of the total cultivated area through flows of feed crops. The rising scale of industrial livestock production—and its utter reliance on a simplified diet of grains and oilseeds for feed—has served to profitably absorb the surpluses from industrial monocultures, enabling their continuing growth, due to the fact that higher value commodities get generated in the course of burning large shares of the useable nutrition (Weis 2013; Winders and Nibert 2004). All dimensions of the industrial grain-oilseed-livestock complex are marked by dramatic consolidations of power, in terms of both inputs (e.g., farm machinery, fertilizers, agro-chemicals, seeds, pharmaceuticals) and outputs (e.g., grain and oilseed processing, livestock packing and slaughter, retailing) (IPES-Food 2017).

Pigs and poultry have been the driving force behind meatification (i.e., production increases over and above the rate of population growth) and accounted for seventy-three percent of global annual meat production by volume in 2020, with poultry (overwhelmingly chickens) surpassing pigs in volume terms on a world scale in 2017 (FAOSTAT 2022). The rapid growth in scale and smaller bodies of birds (i.e., more individual lives are needed for the same volume of flesh) make poultry by far the biggest force propelling rising livestock populations, and the planetary biomass of poultry is roughly three times greater than that of all wild birds *combined* (Bar-On et al. 2018). It is also necessary to recognize that a large share of this great 'mass' is being turned over very rapidly, as chickens can be brought from hatch to slaughter-weight in six

weeks in industrial systems. Although pasture remains the primary way that cattle, sheep, and goats are reared on a world scale, beef and dairy operations are widely growing in density and becoming more reliant on concentrated feed rather than grasses, with beef cattle increasingly 'finished' (i.e., weight gain is accelerated) on feedlots and dairy cows increasingly milked in large, mechanized 'parlours' (Gillespie 2018).

Like many industrialized countries, Canada has an extremely livestock-intensive agro-food system, with annual per capita meat consumption around 100 kg—more than double the world average, six times the average person in Sub-Saharan Africa, and twelve times the average person in South Asia. Between 1960 and 2020, the human population in Canada roughly doubled (from around 18 to 38 million) while the total volume of meat production increased by a factor of 3.5 (from 1.5 to 5.2 MT), with pigs (forty-four percent of the total volume in 2020) and poultry (28 percent) at the forefront of volume increases and poultry the primary factor in the five-fold increase in the total annual population of animals killed for food (FAOSTAT 2022). Over 800 million animals are killed for food every year, which translates to twenty-one for every Canadian citizen, with additional animal lives bound up in egg and milk production.

The burden of industrial livestock production

The ecological hoofprint is a conceptual framework for understanding the multidimensional burden of industrial livestock production. A key foundation for this is to examine how productive environments are organized, including both the 'islands' of concentrated animals and the spatially expansive feed crop monocultures they depend upon, while also recognizing the great wastage of useable nutrition at their nexus (Weis 2016; 2013). In both industrial monocultures and livestock operations, the incessant pursuit of economies of scale (reducing the relative cost of labour) is entwined with attempts to biologically simplify and standardize productive environments. In essence, a basic requirement for mechanization is to produce a lot of the same plant or animal at the same rate, resulting in large fields (and sometimes whole landscapes) dominated by a single crop, and huge enclosures containing a single animal species. Animals must be separated from land, as they cannot be functionally integrated into monoculture production. This simplification and standardization of crops and animals exacerbates some age-old biological and physical challenges in agriculture and establishes some novel ones. Since the pursuit of scale is an obstinate competitive discipline, ways must be found to continually respond to—or override—the biophysical problems posed, even as the long-term conditions of production get eroded and various short-term risks get heightened. In short, biophysical problems and overrides exist in a dialectical relationship, and assessing these dynamics helps illuminate the resource budgets and pollution loads of the system as a whole (Weis 2016; 2013).

High-yielding monocultures increase soil erosion, vulnerability to insects and weeds, and the demand for water relative to traditional farming practices and modern agroecological methods, which get overridden through repeated applications of fertilizers (principally nitrogen,

phosphorous, and potassium), pesticides, and irrigation (Gunstone et al. 2021; IPES 2016; McIntyre 2009; Sage 2012). Fossil energy courses through the veins of industrial monocultures in ways that are both obvious, such as powering tractors and combines, and veiled, such as in: manufacturing synthetic nitrogen fertilizer (which relies mainly on natural gas and coal to generate the intense heat needed); mining and processing phosphorous and potassium fertilizers; manufacturing pesticides; producing high-yielding seeds on controlled plots; moving fertilizers, pesticides, and seeds, often over long distances; and the pumping of some irrigation water against gravity (IPES 2016; McIntyre 2009; Ramirez and Worrell 2006; Sage 2012).

As with industrial monocultures, the pursuit of economies of scale in industrial livestock operations is geared above all at increasing labour productivity (i.e., output per worker) and yield (i.e., the flesh, eggs, and milk generated by each animal). Added to this is the competitive pressure to reduce feed inputs in relation to animal outputs, because although cheap surplus grains and oilseeds are central to labour and yield gains, they also represent a considerable cost to producers. These interwoven pressures to reduce labour, accelerate the weight gain and reproductive cycles of animals, and optimize feed together pose another series of intractable biological and physical problems (Weis 2016; 2013). Central to this are the adverse effects on animal health, as unnatural densities of animals and vast concentrations of feces and urine increase the risks of contagious pathogens, while the extreme crowding and immobility impede exercise, play, and normal social bonds and interactions, causing stress and increasing risks of self-harm or attacks on neighbours (with animal welfare generally only factoring into the design of operations to the extent that it affects productivity). Another parallel to industrial monocultures is that the biological and physical problems that inhere in industrial livestock operations must be perpetually overridden in a range of ways. These overrides include artificial insemination, routinized physical mutilations (e.g., beak-tipping, tail docking, castration, teeth clipping), chronic antibiotic use, large fans to vent noxious fumes and airborne particulates, and hoses and pumps to extract animal excreta and send it from enclosures to holding pits (Imhoff 2011; Lymbery 2014; Pew Commission 2008).

Industrial livestock operations are also resource- and pollution-intensive spaces. Key energy demands stem from the need to transport feed and various inputs over greater distances (including newborn animals from specialized breeding sites) and to power monitors, automated feeding and ventilation systems, and temperature controls. Further, industrial livestock operations greatly amplify the demand for water relative to livestock on small mixed farms, as animals can no longer seek their own sources of moisture or gain it from roughage, and large volumes of water and chemical disinfectants are needed to regularly flush out excreta and decontaminate enclosures (Mekonnen and Hoekstra 2012; Imhoff 2011; Lymbery 2014; Pew Commission 2008). The rising scale and shrinking number of livestock operations also means that animals must be moved across greater distances on their final journey, especially when placed together with the parallel growth in scale and shrinking number of slaughter and packing plants. Within these plants, fast-moving killing and packing lines, systematized disinfection

techniques (chilling or scalding carcasses), and massive refrigeration units further amplify the consumption of energy, water, and chemical disinfectants.

The biophysical problems and overrides associated with industrial monocultures and livestock operations contribute to a range of environmental and public health problems (IPES 2016; Sage 2012; Weis 2013). The fossil energy intensity of these systems is implicated in CO_2 emissions, and atmospheric impacts grow further with the nitrous oxide and methane emissions that result from the immense applications of nitrogen fertilizer, concentrations of animal excreta, and the digestive processes of beef and dairy cattle. At the same time as these landscapes generate considerable greenhouse gas emissions, the lack of biodiversity (including in soils) diminishes their long-term carbon sequestration capacity of a given area. Pesticides pose diffuse long-term risks as persistent toxins accumulate in both aquatic and terrestrial trophic webs (Gunstone et al. 2020; Hladik et al. 2018). Although causation is complex and multidimensional, there is strong evidence to suggest that pesticides are a significant factor in the global crisis of declining pollinator populations, which has led to the development of another override for certain crops: the commodification of pollination services (i.e., bee colonies trucked across landscapes) (Ellis et al. 2020). The excess nutrient loads from inorganic fertilizers, livestock slurries, and excreta-filled pits are major drivers of freshwater and coastal marine eutrophication. Industrial livestock production magnifies the risks from infectious bacterial diseases like e coli, salmonella, and listeria, and the widespread sub-therapeutic use of antibiotics in industrial livestock production threatens to undermine their effectiveness over time as antibiotic-resistant bacteria develop resistance (Economou and Gousia 2015; Morehead and Scarbrough 2018; Ventola 2015). Another untold public health risk associated with industrial livestock production is that it accelerates the evolution of viruses like avian and swine influenza, increasing the threat that a more dangerous variant will eventually emerge and prove capable of spilling over and spreading among human populations (Davis 2020; Wallace 2016).

The inherent nutritional losses at the nexus of industrial monocultures and livestock operations makes the environmental burden bigger still. Cycling grains and oilseeds through animals to produce food is an extremely inefficient way of generating useable nutrition for human consumption, as much of the nutritional value of crops is burned in the metabolic processes of animals without becoming flesh, eggs, or milk (Weis 2013). This wastage, in human terms, necessarily expands the amount of land and water that must be devoted to agriculture, along with associated resource budgets and pollution loads, including greenhouse gas emissions (Eshel and Martin 2006; Foley et al. 2011; Godfray et al. 2018; IPCC 2019; Pimentel and Pimentel 2003; Poore and Nemecek 2018; Springmann et al. 2018).

Many perspectives on sustainability end here, prioritizing biophysical problems, technical challenges, and human interests, and evade the momentous ethical questions associated with what amounts to a revolution in interspecies relations. The scale and nature of industrial livestock means that a growing share of the world's mammalian and bird populations are utterly deprived of mobility, autonomy, mental stimulation, and familial bonds, and must endure short, anguished lives in which they no longer touch the soil, breathe fresh air, or experience natural

seasonal and diurnal rhythms (Imhoff 2011; Lynbery 2014). At the same time, the physical distance between these highly secretive spaces of production and increasingly urban populations contributes to growing cognitive distance, which is one reason why many people fail to appreciate the interspecies relations that are bound up in their consumption. In countries like Canada, fewer and fewer people have any encounter with living farm animals or any sense of the conditions of life they face.

The splintering hegemony of meatification

The meatification of diets has been so widely accepted as an aspect of progress that it amounts to a hegemonic perspective (Weis 2013). The hegemony of meatification includes a combination of: the veneration of meat on cultural or nutritional grounds; the failure to account for the multidimensional environmental costs and risks (and faith that the biophysical overrides of industrial grain-oilseed-livestock complex will continue to function in perpetuity); and either an explicit denial that farm animals are worthy of moral concern or an unconsciousness about the conditions of life they face. But there are some growing fissures.

The justification that animal products provide a superior source of protein has been undercut by mounting scientific evidence that meatification is tending to worsen rather than improve human health, and leading people to consume far more protein than they actually need. The heavy consumption of animal products is widely identified as a central factor in rising levels of obesity and a series of non-communicable diseases like cardiovascular disease, Type-2 diabetes, hypertension, fatty liver disease, and some cancers (Al-Shaar et al. 2020; Anand et al. 2015; Lim et al. 2012; Springmann et al. 2020; Willett et al. 2019), which are most pervasive in industrialized and fast-industrializing countries as indicated by their common description as ‘diseases of affluence’. Conversely, the recognition that there are many rich and easily metabolized plant-based sources of protein is replacing the notion that they are inherently ‘inferior’ (coupled with evidence showing the best ways to combine them), and well-balanced plant-based diets are increasingly acknowledged to have considerable health advantages, with the potential to help reverse some chronic diseases (Al-Shaar et al. 2020; Dinu et al. 2016; Popkin 2009; Sabate 2003; Willett et al. 2019). The weight of this health evidence has led to recent changes to dietary guidelines in a number of countries, including Canada in 2018, to signal the nutritional value of plant-based proteins and the benefits of substituting some animal products—although national dietary guidelines around the world generally still have far to go to better align with the scientific understanding of how diets bear on environmental and health outcomes (Springmann et al. 2020).

The health evidence for de-meatification is a potentially strong pressure point with respect to public policy in light of spiraling health care costs to individuals, governments, and insurance companies. One inflection of this can be seen in recent calls for a ‘meat tax’, which have tended to couple public health arguments together with environmental (especially climate)

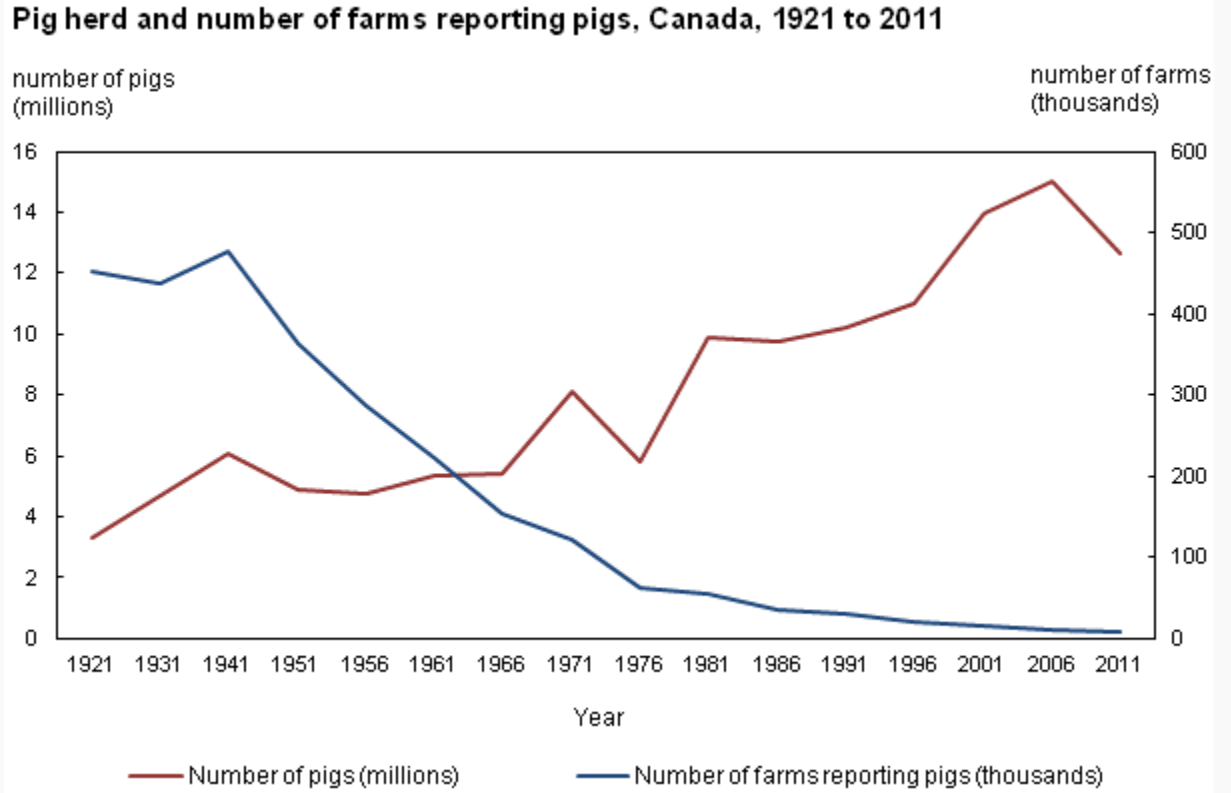
arguments to make a case that market signals should be tweaked to steer consumers away from unhealthy food choices. However, at present, the challenge to meatification is much less pronounced in public policy debates than it is in market forces. Rates of both vegetarianism and veganism have risen significantly in some of the countries that have long been at the forefront of meatification, including in Canada, the US, the United Kingdom, and Germany, especially among younger people (Charlebois et al. 2018; Sexton et al. 2022; Waters 2018; White 2018). Although vegetarians and vegans are still relatively small minorities in industrialized countries, there is abundant indication that this growth is affecting producers and retail spaces, from the proliferation of vegetarian and vegan options in supermarkets and restaurants, to the rise of entirely vegetarian and vegan restaurants, to the explosive development of plant-based proteins as a sub-sector of the food industry. *Beyond Meat* and *Impossible Foods* provide two dramatic illustrations of this, having moved quickly from small start-ups to multi-billion-dollar stock market capitalization.

For decades, vested interests in livestock production have tried to disparage plant-based advocacy in a number of ways. One well-established strategy has been to play up associations between meat and masculinity, connecting these to such things as historical imagery (e.g., rugged frontiersmen), physical strength, and ostensibly male-centered culinary practices (e.g., barbeques), or conversely seeking to associate plant-based diets with weakness, femininity, or naivety (Adams 2010; Gambert and Linné 2018). An especially blunt strategy is the establishment of 'food disparagement' legislation in the US, targeted largely at critics of livestock production, that seeks to either intimidate them into silence or muzzle them with the force of law should they proceed. A relative of this is the pursuit of laws to prohibit the producers and retailers of plant-based foods from using certain terms like meat, burger, sausage, hot dog, milk, and cheese to describe vegetarian and vegan alternatives (Gambert 2019).

Livestock processing corporations have also consistently tried to cast their products in positive terms, such as with food labels and advertisements featuring images of bucolic family farms and happy animals. Appeals to wholesome traditions and agrarian livelihoods are sometimes invoked to try to reduce criticism, as though opponents are trading in crude 'anti-farmer' conceptions. However, these images and this defense represent a very thin veneer that cannot hold up against the actual decline of farming livelihoods with industrialization, as Canada illustrates very clearly. For instance, in Canada's first agricultural census in 1921, almost two-thirds of over 700,000 farms reported having some pigs, whereas in the 2016 agricultural census only four percent of out of less than 200,000 farms reported pigs, in a context where the total population of pigs more than quadrupled. From the mid-1970s to 2016 alone, the number of pig-producing farms in Canada declined by a factor of seven while the average herd on a pig-producing farm rose from less than 100 to roughly 1700 (Statistics Canada 2016). Figure 1 shows the broad pattern of much fewer and larger pig operations in Canada.[1]

[1] Although there was a slight uptick in the number of farms reporting pigs from the 2011 to the 2016 census (rising just over 1000, to 8402) along with over 1.4 million more pigs (Statistics Canada 2016).

Figure 1:



Source: Brisson 2015

Further, an important aspect of industrialization that is understated in Figure 1 is the accelerating 'turnover time' of pigs, as the shortened time from birth to slaughter means that while there are now over 14 million pigs alive in Canada at any one time, every year around 21 million pigs are killed for food. A similar picture can be seen with poultry. In the 1950s, there were still over 400,000 farms in Canada that reported having some chickens, but in the 2016 agricultural census less than 19,000 farms reported layer chickens and less than 7300 farms reported having broiler chickens, with the average layer shed housing over 1300 hens and the average broiler shed housing over 14,000 birds at a time and turning over this 'inventory' more than six times a year. It is also noteworthy that Canada's entire layer hen and broiler chicken populations are reproduced at only around 1500 breeding sites (Statistics Canada 2016). The falling number and growing scale of animal enclosures and slaughterhouses are also entwined with the degradation of labour, from artificial inseminators at breeding sites to positions on fast-moving slaughter and disassembly lines, where workers face high rates of injury and job turnover and an immeasurable toll from contributing to and being constantly immersed in conditions of intense physical and psychosocial suffering (Blanchette 2020; Gillespie 2018; Imhoff 2011; Struthers Montford and Wotherspoon 2021). In short, any suggestion that criticism of industrial livestock production is anti-farmer melts against the reality that industrialization is

systematically expunging farmers and leaving fewer and larger operations that, while highly capitalized, depend upon many distressing and low-paying jobs.

A different but similarly flimsy diversion is the insistence that rising livestock production is needed to help feed the world, with specific reference to the potential nutritional value that more animal products could have for impoverished populations with protein-deficient diets. Such a claim deceives on two essential counts. First, meatification is driven by *effective* rather than *real* demand (i.e., the ability to pay as opposed to meeting basic human needs), reflected in the fact that it is skewed heavily towards more affluent populations, which is entwined with their highly uneven command of arable land and all the attendant wastage discussed earlier. Second, livestock production is a significant factor in climate change (Eshel and Martin 2006; IPCC 2019; Poore and Nemecek 2018; Ripple et al. 2014; Springmann et al. 2018; 2016; Steinfeld et al. 2006; Vermeulen et al. 2012), which is disrupting agricultural production most severely in the semi-arid and arid tropics that are home to the lion's share of food-insecure people. Thus, to submit that expanding livestock production is motivated by concerns about enduring problems of hunger and malnutrition is bound to call attention to the highly regressive character of meatification.

The possible paths of de-meatification

De-meatification is far from a 'single issue' political or activist stance. On the contrary, as discussed, there is amassing evidence that the rising scale of livestock production bears heavily on a wide range of important issues including: climate change; biodiversity loss; rates of non-communicable diseases; amplified risks of zoonotic disease evolution; mounting antibiotic resistance; poor health and safety conditions facing workers; and growing realms of animal suffering (Aiking et al. 2006; Blanchette 2020; Crist et al. 2017; D'Silva and Webster 2010; Imhoff 2011; Lymbery 2014; Machovina et al. 2015; Ripple et al. 2014; Springmann et al. 2018; Struthers Montford and Wotherspoon 2021; Weis 2013). The basic implication is that a "societal transition from meat to plant protein is indispensable" to rebuilding more sustainable, equitable, and humane agro-food systems (Aiking et al. 2006:187), and de-meatification must therefore be part of any project of critical food guidance.

If the strategic calculation is to try to affect behavioural change across as wide a spectrum as possible, it could be argued that the de-meatification imperative is best left at a general level in various forms of advocacy, and that the question framing this paper—what endpoint does it entail?—is best moderated or evaded altogether, especially if there is an assumption that many people are only likely to be open to making small changes. From this vantage, more open-ended messaging ('you should eat *less* meat') has a better chance of reaching the greatest number of people closer to where they are at and may be prepared to move to, while more strident demands ('you should eat *no* meat') could well cause many to instantly tune out. This sort of calculation is reflected in the campaign for 'Meatless Mondays', which encourages people to go vegetarian one

day a week, either for its own sake or as a possible gateway towards further changes (Weis 2015). Advocates for strategic moderation might also point to the risk that heated debates between conscientious omnivores, vegetarians, and vegans could inadvertently sow doubts about the coherence of the rationale and the changes needed.

However, while there is no disputing the primacy of challenging industrial livestock production, and there may be some grounds for strategic alliances between conscientious omnivores, vegetarians, and vegans, we argue that the differences cannot be masked or saved for that point in the future when industrial livestock is in retreat. Rather than distracting from the de-meatification imperative, debating its different endpoints is essential to strengthening it.

Conscientious omnivory

The notion of conscientious omnivory is entwined with calls for 'green' or 'ethical' meat and implies both a strident objection to the dominant system of livestock production (whether on environmental or moral grounds, or both) and a strident defence of meat, egg, and milk production associated with small, mixed farming systems. This position tends to place the nutritional value of animal protein together with the functionality of small livestock populations in mixed farming systems, stressing the role of livestock in recycling some wastes, returning condensed nutrients to land, and providing sources of labour. The case for animal functionality has been further augmented by claims that it is not only important in sustaining the health of land but that managed grazing by cows, sheep, and goats can have a key role in restoring soils in contexts of degradation, especially those contexts not suited to cultivation (e.g., mountain ranges, arid grasslands) and where native herbivores have been eliminated or drastically reduced (Holmgren 2002; Starhawk 2004; Toensmeier 2016). Clearly, to accept the necessary functionality of animals on farms and pastures augments the nutritional functionality, making some meat, eggs, and milk consumption both unavoidable and beneficial—or a 'benign indulgence' in Simon Fairlee's (2010) terms.

Claims to conscientious or ethical consumption also imply a degree of concern about animal welfare, with the belief that animals can have reasonably good lives before being killed and while generating milk, eggs, and honey. Some go further and insist that livestock are advantaged individually and in an evolutionary sense (i.e., at the species-level) by their place in human-managed environments, as they gain secure food supplies, protection from predators, and sometimes shelter from the elements.[2] The flipside of the evolutionary advantage is that physical and behavioural changes over the course of domestication have made these species unequipped for survival outside of human-managed environments, such that they would be fated for extinction without their place in human diets (Starhawk 2004). Of course, it is impossible to say

[2] The fact that livestock now comprise the majority of mammalian and bird biomass on earth (Bar-On et al. 2018) could presumably brace the case for the evolutionary advantage certain species have gained, though it also could be seen as a disaster for biodiversity.

definitively what a 'reasonably good' life would be for an animal destined to be killed short of a natural lifespan, or just how long it must last to be deemed good. But it is fair to assume that most people who explicitly identify animal welfare as a concern would acknowledge the need for animals to have degrees of mobility and choice in their everyday lives, allowing them to enact species-appropriate behaviours and have healthy social interactions with other members of their own species (Salatin 2017; 2011; Webster 2018). Related to this is a belief that farmers and herders can have affection for the animals they are raising and see them as individual subjects of their own lives (even as the inevitability of killing hangs over this interspecies relation), and further that animals might return affection to those farmers and herders who provide them good care.

Reflecting these concerns about sustainability and the ethics of animal husbandry, conscientious omnivores try to source their meat, eggs, and milk from small mixed farms or ranches. For some, this is entwined with a recognition that the vastly lower densities of animals in these systems compared with industrial livestock production translates to the need to significantly reduce levels of meat, milk, and egg consumption from those that prevail in wealthy countries like Canada and the United States. A good example of this is in one of Michael Pollan's well-known 'food rules' (Pollan 2008): to eat *mostly plants*, which implies that less but some animals are necessary in diets and in agriculture. However, there is no empirical evidence about the degree to which those who advocate 'green' or 'ethical' meat reduce their total volume of animal consumption. It is also possible that conceptions about the sorts of conditions that are possible at low densities (the shrinking minority in countries like Canada and the US) can lead down a slippery slope of justification, providing an offhanded rationalization for animal consumption at any scale, which is further problematic in light of the popularity of animal-heavy and grain-averse dietary fads (e.g., keto and paleo diets) that celebrate pastured livestock (Stanescu 2019; 2010).

Vegetarianism

The ethical basis of vegetarianism starts from an acceptance of the functional necessity of small livestock populations in mixed farming systems, including their ability to both provide beneficial on-farm services and generate useable nutrition, alongside abiding animal welfare concerns. For some, the nutrition component is undoubtedly augmented by pure palate pleasure, as in the love of ice cream, cheesy pizza, or scrambled eggs. Another assumption that vegetarians share with conscientious omnivores is that mutually affective relations between humans and animals being used for food are possible, with ideas about affection, care, and animal subjectivity all obviously easier to reconcile without slaughter looming. Unlike conscientious omnivores, however, ethical vegetarians do not believe that the need for animals on mixed farms justifies killing them for food, much less make it 'benign', and on the contrary hold out hope that a non-violent resolution is possible—an aspiration that has long roots in a range of cultures (Fox 1999; Preece 2008). The

first and more obvious aspect of this assumption is that reproductive outputs (i.e., milk and unfertilized eggs), wool, and honey can be taken without harm on an ongoing basis. The second and less obvious aspect of the prospect of use without violence is that animals have to be allowed to 'retire' and live out their natural lifespan after they cease to be useful to humans, which aligns with the belief that emotional bonds are possible.

These assumptions about what is possible run up against serious tensions in practice, especially between the advocacy of non-violence and the consumption of dairy and eggs. The central tension relates to the fact that for species where reproductive outputs are used, males do not have a direct nutritional function beyond their role in breeding, which does not require a commensurate population to females. Thus, in terms of nutritional yields, vegetarians have an interest in having populations heavily skewed towards females, as the function of surplus males in farming systems would lie mainly in cycling nutrients and, for some oxen (castrated bulls), providing traction where animal labour has not been outmoded by the combustion engine. While a female-dominated population might be plausible in a generational vacuum for hens, which can produce unfertilized eggs, the problem would always return anew when eggs are fertilized for the next generation. No such gap in reproduction (i.e., taking outputs before confronting the gender imbalance) is even conceivable for milked animals, as consistent supplies depend upon repeated states of pregnancy and lactation, which have been manipulated over millennia with varying degrees of coercion but little technology and now increasingly occur through artificial insemination (Gillespie 2018).

In sum, the gender imbalance that is optimal for vegetarians cannot be maintained without either killing or allowing many males to live out (in human terms) mostly unproductive lives. The tension gets much worse in contexts where eggs and milk primarily come from industrial systems, which many vegetarians are ultimately connected to, especially where eggs and dairy are heavily consumed to substitute for meat products. Industrial layer hen and dairy operations involve harsher enclosures than their broiler and beef counterparts and maintain extraordinary gender imbalances through systematized violence: male chicks are killed almost instantaneously upon birth, and motherly bonds with calves are swiftly broken and males mostly sentenced to short lives in crates to produce veal (Imhoff 2011; Lymbery 2014; Gillespie 2018). Taken together, it is important not to idealize non-violence within vegetarianism, and any effort to pursue it must be conscious of a number of considerations, including the scale at which it might conceivably be approached. In a world of nearly 8 billion people, it is hard to imagine that truly non-violent systems of egg and dairy production could generate the volumes needed to make these products an everyday expectation rather than just a rare treat.

Veganism

The essence of veganism is a rejection of all direct use of animals in production and consumption, which is rooted in varying combinations of ethical, environmental, and health motivations (Sexton et al. 2022; Twine 2018). For many (though certainly not all) vegans,

concern for animals is paramount, and food consumption practices not only provide a way to act upon one's values, but also a means to challenge the unconsciousness surrounding meat, eggs, and dairy. Mealtimes present regular opportunities to provoke others to think about how these products relate to the lives and deaths of other animals, and ultimately draw this everyday suffering out of the shadows (Twine 2018).

Vegans who seek to abolish all exploitation of animals refute the claims that affective relations with livestock are possible, as conscientious omnivores and vegetarians would have, given that these animals are conceived as property and human interests are inevitably paramount (Charlton and Francione 2015). While nutrient cycling can play out in benign ways, abolitionist vegans insist that it is impossible to reconcile affection with the coercion of animal labour (which also commonly involves castration and varying constraints on mobility during rest periods) and unnatural rates of reproduction, and most of all killing animals before a full life is lived and consuming their flesh. Abolitionist vegans also admonish vegetarians for their complicity in the slaughter of male chicks, male calves raised for veal, and 'spent' females, as well as for the misery of layer hens and dairy cows in industrial operations and male calves in industrial and non-industrial systems alike. Further, even small mixed farms face competitive pressures that make it highly improbable for unproductive males to be allowed to live or for females with declining reproductive capacity to be allowed to live out peaceful retirements, as is necessary for any non-violent conception of vegetarianism to hold.

Although the abolition of animal exploitation remains a central motivating factor for many vegans, vegan advocacy has also increasingly pointed to both environmental and health arguments, and their convergence (Sexton et al. 2022; Twine 2018; White 2018). This case pivots on the overwhelming evidence that plant-based diets tend to command much less land and resources than either omnivorous or vegetarian diets, and this greater efficiency is augmented by mounting epidemiological research showing that it is not only possible to be healthy with plant-based diets but that they tend to lower risks of non-communicable diseases and lead to improved health outcomes (Al-Shaar et al. 2020; Dinu et al. 2016; Popkin 2009; Sabate 2003; Willett et al. 2019). While these arguments are helping to increase the population of vegans, the three pillars of abolishing animal exploitation, increasing agricultural land and resource efficiency, and improving human health outcomes do not add up to a unified social movement with aligned political demands (Sexton et al. 2022; Twine 2018; White 2018). On the contrary, there are significant fractures between highly entrepreneurial and radical or anti-capitalist veganism, and between vegans who are motivated by animals in the first instance and those whose own health and well-being is the primary concern.

Entrepreneurial veganism essentially seeks to couple moral suasion with market mechanisms, placing great faith in the power of ethical consumption along with technological innovation bent on developing and mainstreaming plant-based substitutes for meat, milk, and eggs (Gheihman 2021; Reece 2018). The dynamism here is clearly evident in many modern supermarkets, which now contain vastly more fake meats, egg replacers, and dairy alternatives than just a decade or two ago. Some of this is emerging from new corporations expressly

dedicated to vegan processed foods, like *Beyond Meat* and *Impossible Foods*, which have been stoked by huge flows of venture capital emanating from Silicon Valley and have quickly penetrated some of the biggest food retailers, from *Burger King* and *Yum! Brands* in fast food to *Wal-Mart* in the supermarket sector. It is also significant to note that a considerable amount of the growth in vegan products is coming from large corporations focussed on livestock slaughter and packing or on processed foods that are heavy in animal products, partly through acquisitions of smaller plant-based companies and partly through the in-house development of new product lines (Yaffe-Bellany 2019). Another contradictory dimension of entrepreneurial veganism is that some plant-based start-ups touting moral claims have been found to engage in anti-union practices, which is clearly at odds with anti-capitalist vegans (Press 2020).

While most vegans would obviously find something heartening in the rising presence of vegan options in mainstream retail outlets, radical vegans warn against leaving veganism at the level of an individual lifestyle choice, where it amounts to a limited sort of identity politics (Gheihman 2021; Sexton et al. 2022; Twine 2018; White 2018). The great risk here is that it can diminish the need to challenge the systemic nature of animal exploitation and foster a level of complacency about the extent of changes when they are still on the far margins. Here, it is worth considering the extent to which entrepreneurial veganism might be capable of propelling change beyond a few aisles or freezer boxes in a supermarket or a few options in most restaurants, or the extent to which these additional options might help fortify the status quo by de-politicizing some vegans. In contrast, radical vegans seek to tie the ethical concern for non-violence and the environmental rationale together with anti-capitalist critiques and outreach strategies, including efforts to build alliances between veganism and other anti-systemic movements (Twine 2018; White 2018).[3] Related to this, radicals are also wary of the bourgeois cultural associations stemming from the growth of upscale vegan products, boutique retailers, and restaurants,[4] as well as the sorts of meat, egg, and dairy alternatives that emerge from industrial capitalist agriculture, including the reliance on large-scale monocultures, genetically modified organisms (for instance, key to the simulation of blood in the fake meat produced by *Impossible Foods*), and heavy fertilizer and pesticide use, with negative implications for farming livelihoods, wild animals, and ecosystem health.

Another divergence within veganism is between those who seek to abolish all use of domesticated animals (Charlton and Francione 2015) and those who envision some level of peaceful co-existence (i.e., interspecies relations that are free of all violence and exploitation)

[3] A popular vegan podcast provides good illustrations of this perspective: *Total Liberation* (https://totalliberationpodcast.com).

[4] The Toronto neighbourhood of Parkdale provides an important cautionary tale of entrepreneurial veganism becoming entwined with exclusionary dynamics of urban gentrification and impeding rather than fostering potential anti-systemic alliances. The debate centred around a vegan entrepreneur who bought up several properties to become high-end food businesses in the west Toronto neigbourhood of Parkdale, an area of the city facing intense gentrification. He coined his section of the neighbourhood 'Vegandale', and the upscale connotations this carried contributed to an outcry from many long-term residents and social justice activists (Ngabo 2018).

with domesticated animals on farms (Donaldson and Kymlicka 2013), which entail different transitional and operational challenges for agriculture.

Conclusions

This paper set out the case for de-meatification as a fundamental component of critical food guidance in light of the urgent need to transform the dominant agro-food system, exploring the three main paths it could follow. One underlying assumption is that while individual consumer choices matter to some degree (as can be seen in the rapid growth of new meat, egg, and dairy substitutes), there is also a need to recognize the limits of demand-driven dietary change in the face of structural problems. For instance, it is important to consider the extent to which it is possible for people to eat their way to more sustainable, equitable, and humane societies when the prevailing economic logic makes it much cheaper to consume a meat-heavy, chemical-laden diet as opposed to an organic vegan diet that commands much less land and resources. To put it another way, if the value of commodities continues to be determined in a way that greatly discounts environmental costs and completely disregards interspecies violence, in the context of large and growing social inequalities, then people do not have the same power to act on their principles through markets—which is a big part of why principles-based commodities tend to be confined to small upscale market niches. The skewed determination of value is further compounded by the immense disparities in advertising capacities between the dominant actors in the agro-food system, and the prevailing lack of information about the nature of production embedded in commodities.

These systemic barriers point towards the need to extend the de-meatification imperative from a matter of individual responsibility, as it largely is conceived of today, into a broadly-based political demand. While there are no strategic blueprints for this, we believe it is especially important to continue building awareness about the destructive impacts of industrial livestock production among those constituencies and social movements that are already attuned to environmental and social justice concerns. We also believe, as indicated at the outset, that while blurring over the endpoints of de-meatification might seem to provide an easier basis for coalition-building, working through the tensions within and between conscientious omnivory, vegetarianism, and veganism is necessary to strengthen not only individual convictions but also the footing for de-meatification within anti-systemic alliances.

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