

# Towards 120 billion

## Dietary change and animal lives

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Across much of the world there is a growing distance, both physically and cognitively, between people and the animals they consume; at the same time the scale of this consumption marches steadily upwards. Put simply, it is increasingly difficult for people to know much about *where* and *how* the animals they consume actually live. So while the consumption of flesh, milk and eggs will always remain a profoundly intimate encounter with other animals, its moral dimensions are widely fading from view.

I use the term 'meatification' to mark the dramatic shift of meat from the periphery of human diets to the centre, something which is deeply embedded in everyday life and has been a powerful but underappreciated measure and aspiration of modernity, nourished by long-held views about the superiority of animal protein together with some potent cultural attitudes about meat. One reflection of this aspiration can be seen in the general expectation that, with rising affluence, the average person will be consuming more than 50 kg of meat per year in a world of 9–10 billion people, far more than double the per capita average of less than a century before, amidst a tripling of the world's human population. Another reflection can be seen in the huge disparities in per capita meat consumption between rich and poor countries, and the surging growth in fast-industrializing, middle-income countries in recent decades.<sup>1</sup>

The ecological hoofprint is a conceptual framework for understanding the system of agriculture at the heart of this trajectory, the industrial grain–oilseed–livestock complex – which occupies about 30 per cent of the world's arable land – and its momentous implications for human inequality, ecological change and animal life on earth. This system can be likened to 'oceans' of monocultures and 'islands' of concentrated animals, which are intertwined through the great volumes of coarse grain and oilseed feed (e.g. corn, soy, barley, sorghum, oats, canola) that flow through factory farms of pigs, poultry and dairy cows and feedlots of beef cattle.

Clearly, the ecological hoofprint bears a significant relation to the ecological footprint, an analytic approach-cum-pedagogical tool for approaching environmental change. At its core, the ecological footprint provides a way to assess and communicate differential resource budgets and pollution loads, and consider how this translates to disproportionate appropriations of ecological space.<sup>2</sup> While the footprint metaphor might reproduce a problematic Cartesian nature–society dualism of humans outside of nature and acting *upon* it, rather than social relations unfolding *through* nature,<sup>3</sup> arguably its most enduring contribution has been to fix attention on the centrality of inequality in the dynamics of environmental change, and this is the spirit in which the ecological hoofprint metaphor is invoked.

This commentary draws upon the key contours of the ecological hoofprint to set out a case for why understanding and communicating the trajectories of dietary and agricultural change in terms of soaring numbers of individual animal lives and deaths can help to put the destructive and violent metabolism of the industrial grain–oilseed–livestock complex into sharp focus. Engrained in this project is a belief that

problematizing and reversing meatification is fundamental to any prospects for more sustainable, just and humane agro-food systems, and that it must be an essential part of radical socio-ecological struggles.

### **Accelerating food commodities**

For most of the 10,000-year history of agriculture, small, mixed livestock populations typically had *multi-functional* roles; that is, they contributed to the prevailing organizing imperatives for agriculture in a range of ways (outside of the Americas prior to Conquest, where there were few animal domesticates). Work was often at the forefront of this, with animals able to transform photosynthesized energy into effective power for farming, off-farm transport and other labour.

Livestock also provided important sources of nutrition, especially protein, which was commonly scarce in agrarian societies, with the consumption of milk and eggs regularly more valuable than that of flesh, which for most was far from a daily event (much less every meal, as it has increasingly become in rich countries). A significant feature of this nutritional product is that it was generally derived in complementary ways, from land that was fallowed or less productive (i.e. in rotational or permanent pasture), as well as from household food wastes, crop stubble, and other parts of plants inedible to people. This meant that animals did not, in the main, tend to compete with humans for the products of arable land, though in temperate regions some crops had to be devoted to carry animals through the winter. The work and nutritional outputs of animals were further complemented by a range of other use values in households (e.g. hides, wool, down, tallow, dry manure as fuel) and on farms (especially returning condensed nutrients to land).

The range of use values, the nature of agricultural landscapes and the limits of technology together tended to ensure a degree of mobility and autonomy for farm animals, and set some parameters for how their health, welfare and longevity were understood by farmers and herders – although the ways that animals were treated could still vary considerably in light of such things as different uses, personal ethics and cultural norms.<sup>4</sup> Yet, whether animals were treated relatively harshly or well, there was an abiding intimacy to these inter-species relations and the consumption of animal products for most of agrarian history, in the sense that most people would have had a clear sense of how farm animals lived and died, and in many instances would have directly known the individuals whose products they consumed. Indeed, well into the twentieth century farm animals were proximate to the large majority of humanity, from daily interactions to plain visibility.

The nature and visibility of farm animal lives have been radically transformed as commodity relations have dislodged the logic of multifunctionality, or as animals have gone from being governed to attain *multiple use values* to being governed principally by the *exchange value* of their flesh, eggs and milk. This transformation is bound to a singular organizing imperative: to accelerate the turnover time of production, or increase rates of weight gain, laying and lactation.

For decades, the industrialization of livestock production, led by pigs and chickens, has been the driving force in meatification-enabling growth (i.e. production increases beyond human population growth), while eggs have become an ever-growing element of industrial foods. Pigs and chickens together now constitute roughly 70 per cent of world meat by volume, and further increases in the production of these species is expected to account for nearly all future meatification.<sup>5</sup> In 1960, there were roughly 7 billion farm animals on earth, with a slightly higher population killed for food every year. Today there are more than 25 billion farm animals on earth at any one time, a near *quadrupling* in little more than half a century, and more than 70 billion are killed for food every year. If global per capita meat consumption does surpass 50 kg,

as projected for 2050, then the annual population of slaughtered animals would reach 120 billion, a staggering *fifteenfold* increase in less than a century.<sup>6</sup> And this is without counting fish, a fast-rising share of which is coming from industrial aquaculture as open-ocean fisheries decline, and the populations and biomass at the top of oceanic trophic webs shrinks.<sup>7</sup>

Henry Buller warns that focusing on huge population numbers like this can risk reducing animals to an immense corpus of undifferentiated life, thereby obscuring the lives of individuals and making them more ‘killable’.<sup>8</sup> Drawing on Derrida, he argues that ‘the massivity of contemporary animal husbandry shifts the ethical ground by encouraging the (greater) disappearance and the “disavowal” of the individual animal “in conditions that previous generations would have judged monstrous, outside of every supposed norm of proper to animals.”<sup>9</sup> Yet while this caution is valuable, it might also be inverted. That is, rather than disavowing the individual, by examining how productive environments are organized it binds the (growing) ‘massivity’ and the (expansion of) ‘monstrous conditions’ inextricably together.

### **Monoculture oceans and animal islands**

Any durable agricultural system through history has involved the careful management of biodiversity, mutually beneficial species associations and localized nutrient cycling, rooted in the multiplicity of bioregions and long processes of innovation and adaptation. However, these historic organizing imperatives are inescapably labour- and knowledge-intensive, and face unremitting pressure from high-yielding industrial production. The competitive advantage of industrial agriculture is rooted in dramatic increases in per-farmer productivity (and hence declines in the relative cost of labour), and has long been fortified by both explicit government subsidies and the implicit subsidization that inheres in the failure to account for various environmental costs, noted below.

The ecological hoofprint approaches the industrial grain–oilseed–livestock complex as a contradictory system, characterized by a dialectical relationship between: the incessant pursuit of economies of scale (which necessitates the biological simplification and standardization in both industrial monocultures and livestock production); a series of intractable biological and physical barriers to scale in agriculture; and the continual application of short-term fixes, or *biophysical overrides*.<sup>10</sup> An important aspect of this system, and of how agriculture’s historic organizing imperatives are displaced, is the relocation of dynamics of innovation from bioregions and farming cultures (with knowledge, including that contained in seeds, which was uncommodifiable) to highly



secretive spaces that are controlled by a nexus of corporate-state biotechnology and focused on yield-enhancing (and patentable/commodifiable) traits.<sup>11</sup>

Industrial monocultures establish or exacerbate both immediate and chronic problems for production, in particular increasing soil erosion, water demands and vulnerability to insects, weeds and fungi. These problems are never resolved but are instead repeatedly met with massive volumes of nitrogen, phosphorous and potassium fertilizers, irrigation and a spectrum of pesticides, while seeds are also transformed from a regenerative means of production into an external input. This ties the great yield gains of industrial monocultures to an array of resource budgets (e.g. energy to power farm machinery; mined phosphorous and potassium; energy in manufacturing and moving fertilizers and pesticides; energy in producing and moving seeds; energy in pumping irrigation; vast freshwater diversions) and pollution loads (e.g. CO<sub>2</sub> and N<sub>2</sub>O emissions; persistent toxins; destabilizing nitrate and phosphate concentrations), while the standardization of large areas of land necessitates that both outputs and inputs must move further, necessitating more energy and emissions.

As with monocultures, the spaces of industrial livestock establish or exacerbate problems for production, in both the short and the long term. The transformation in the way that animals are fed – from rotated pastures, crop stubble, household food wastes and the like, to processed grain and oilseed monocultures – obviously expands this cost of production, as well as increasing the need to supply drinking water, since animals can no longer seek it themselves or obtain moisture from roughage. And because much of the crop nutrition and water are expended in ‘unproductive’ metabolic processes (i.e. without being converted to flesh and reproductive outputs) this dynamic necessarily expands the amount of land and water needed for agriculture, as well as expanding the various other resource budgets and pollution loads embedded in industrial monoculture production.

The twin disciplines of reducing costs and accelerating turnover time have led to an array of innovations geared at enhancing feed-conversion ratios for meat, eggs and dairy. Yet while feed conversion ratios *within species* are subject to science and technology, up to some inevitable metabolic limits, the feed conversion hierarchy *between species* is beyond any foreseeable manipulation, which has profoundly influenced the trajectory of industrial production. The superior feed conversion of birds to mammals is a central factor in why poultry, both flesh and eggs, is the fastest growing segment of global livestock production by volume, and why poultry flesh (overwhelmingly chicken) is at the forefront of current and future meatification, although here it must be stressed that superiority does not give any connotation of being more environmentally benign: the feed conversion of poultry birds is better understood as being *less inefficient*.<sup>12</sup> The rising volumes together with the fact that birds have much smaller bodies and much quicker turnover times than mammalian livestock are why chickens have been by far the biggest part of the stunning population increases in recent decades, and why they will account for most of the 50 billion more animals slaughtered in 2050 than today.

Since the early twentieth century, the industrialization of chicken meat and eggs has been at the vanguard of increasing economies of scale in livestock production, including innovations in: specialized breeding sites; artificial insemination techniques; ongoing genetic manipulation (e.g. the specialization of layers and broilers); lighting regimes to manipulate biorhythms; and tight enclosures to reduce energy expenditure. As productive spaces were designed to churn out commodities faster and faster, from hatcheries to broiler and layer sheds to slaughter and packing plants, there was a need to confront the fact that chickens are not inert, malleable things but sentient beings, prone to suffer, get sick and lash out amidst conditions of crowding, filth, immobility, fear and pain. There are not only biophysical barriers to scale in industrial livestock

production (e.g. bacterial growth, contagious pathogens, large concentrations of biowastes), but psychosocial ones, which together necessitate an array of overrides. The key pillars of these overrides again emerged from poultry science and technology – physical mutilations (e.g. de-beaking chicks to prevent injurious pecking), proliferating pharmaceutical use (with antibiotics unexpectedly found to enhance feed conversion) and waste management systems (e.g. ventilation fans to mitigate poor air quality) – and became increasingly entrenched in other segments of industrial livestock production.

Just as with industrial monocultures, rising livestock yields hinge on a multidimensional environmental burden. This starts with the resource budgets and pollution loads of feed crop production, and the indelible inefficiency noted above, which necessarily magnifies the space needed for agriculture. Breeding sites, factory farms, feedlots and industrial slaughter-and-packing plants are also resource- and pollution-intensive spaces, demanding large inputs of energy (e.g. heating, cooling, venting air, pumping wastes, running monitors, moving feed, animals, and inputs over space, chilling or scalding tanks, amplified refrigeration demands), water (e.g. drinking, cleaning), and other resources, and generating CO<sub>2</sub> and methane emissions, localized airborne contaminants, and water pollution (from faeces, urine and corporeal wastes). The magnitude of infectious disease and antibiotic use and residues also presents mounting public-health risks, including diseases like *E. coli*, salmonella, listeria and campylobacter, threats of more virulent pathogens emerging, and the declining effectiveness of antibiotics in human populations – another reason why the shift towards chicken in meatification cannot be seen as more environmentally benign.

### **Number and nature**

The interrelated trajectories of meatification and the industrialization of livestock production have tremendous momentum, and it is easy to see them as being unstoppable.<sup>13</sup> As suggested at the outset, it is also easy to not see them at all. Because while animal flesh, milk and eggs are being consumed in ever-greater volumes, farm animals are vanishing into environments of concrete and steel, connected through complex and opaque long-distance flows to an increasingly urban world.

At the broadest level, the ecological hoofprint seeks to puncture the commodity fetishism that shrouds livestock commodities, taking aim at both the *invisibility* of the industrial grain–oilseed–livestock complex and the dietary change it braces, and the *fatalism* that they are beyond contest. The conceptual framework starts from a focus on the biological simplification and standardization of productive environments, which opens up a way of understanding their resource and pollution intensity. What comes into focus is a highly destructive system that is actively undermining the long-term biophysical basis of agriculture, through its contribution to climate change, soil degradation, water pollution and the loss of biodiversity. By focusing on how productive environments are organized, the ecological hoofprint also draws attention to the violent character of the system – which is a ubiquitous part of the violence of everyday life – from burning so much useable nutrition in a world with so much persistent hunger, to the uneven contribution to greenhouse-gas emissions amidst the highly uneven vulnerability to climate change, to the fact that the lives of so many sentient beings are governed by their exchange value.

There are many possible ways into constructive conversations that might subvert either the invisibility or fatalism of meatification and the industrialization of livestock production. One is to think about them in terms of the fast-rising number of animals killed for food every year. It is jarring to recognize that this was around 8 billion just a half century ago, has now surpassed 70 billion, and is racing *towards 120 billion* by 2050 if projections of continuing dietary change and industrialization materialize.

This picture of extraordinary quantitative growth can lead us to think about how this growth is grounded in extraordinary qualitative changes in the nature of animal lives, and why confronting it is so urgent.

One objection is that their moral significance of these numbers is diminished by the fact that a large share is 'just' (implication: stupid) birds. But such a suggestion leads quickly down a slippery moral slope, to questions such as whether 100 broiler chickens on a packed floor or 50 layer hens in cages suffer as much in their lives as, say, five pigs living in a small pen? Or one cow that spends much of her life in a high-tech milking barn? Or one steer that is fattened on a feedlot? What set of considerations might go into such an assessment? (The duration of lives? The degree of immobility? Levels of chronic and intermittent physical pain? The extent to which animals' behavioural repertoires are stifled? The differential intellectual or emotional capacities between species?) Philosophers, evolutionary biologists, comparative ethologists and others might provide some insights into these sorts of question, but inevitably the expanding worlds of animal suffering are incommensurable. So, rather than eroding the force of this evocation, questions about the relative value of different animal lives can be seen to fortify it, because – short of disavowing any moral significance to animals – they demand that people think seriously about different species-being, the specific conditions that animals endure, and the responsibilities this entails.

Such sparks also relate to a deeper pedagogic motive. If people can begin to see productive environments as wretched *lived* environments for a growing share of animal life on earth, it could help draw attention not only to the course of agrarian change but to the amorality of capitalism as a way of organizing nature.

## Notes

1. The average person on earth today consumes 43 kg of meat per year, versus 23 kg in 1960. One indication of the inequalities embedded in this momentous global shift is that the average American consumes between 6 and 7 times more flesh per year than the average person in Africa and 15 times more than the average person in South Asia. Tony Weis, *The Ecological Hoofprint: The Global Burden of Industrial Livestock*, Zed Books, London, 2013.
2. Mathis Wackernagel and William E. Rees, *Our Ecological Footprint: Reducing Human Impact on the Earth*, New Society Publishers, Philadelphia PA, 1996. The ecological footprint has other conceptual progeny, most notably atmospheric and water footprints.
3. Jason W. Moore, *Capitalism in the Web of Life: Ecology and the Accumulation of Capital*, Verso, London and New York, 2015.
4. Although not all intensive confinement of animals began with the rise of industrial capitalism. Andrew Johnson, *Factory Farming*, Basil Blackwell, Oxford, 1991.
5. Weis, *The Ecological Hoofprint*. This should not obscure the fact that the expansion of pasture continues to occur in some places, most destructively Amazonia.
6. *Ibid.*
7. The decline of open-ocean fisheries has potentially highly regressive dynamics. In particular, the decline of in-shore fish stocks, coupled with the rapid transformation of coastal ecosystems like mangrove forests, disproportionately affects small-scale fisherfolk and local markets, while rising deep-sea trawlers and industrial aquaculture are more destined for global markets. There are also significant parallels and growing linkages between systems of industrial agriculture and aquaculture that are beyond the scope of discussion here. See Stefano B. Longo, Rebecca Clausen and Brett Clark, *The Tragedy of the Commodity: Oceans, Fisheries, and Aquaculture*, Rutgers University Press, New Brunswick NJ, 2015.
8. Henry Buller, 'Individuation, the Mass and Farm Animals', *Theory, Culture and Society*, vol. 30, nos 7/8, 2013.
9. *Ibid.*, p. 26. Jacques Derrida, *The Animal that Therefore I Am*, Fordham University Press, New York, 2008.
10. Tony Weis, 'The Accelerating Biophysical Contradictions of Industrial Capitalist Agriculture', *Journal of Agrarian Change*, vol. 10, no. 3.
11. Jack R. Kloppenburg, *First the Seed: The Political Economy of Plant Biotechnology*, University of Wisconsin Press, Madison, 2004.
12. Ruminant animals, predominantly cattle, accounted for almost half of world meat production just half a century ago. The dramatic relative shift towards poultry might seem obviously beneficial, especially given the enormous role that ruminants have in factors such as desertification, deforestation and global methane emissions. However, this shift should be considered not only on a spectrum of livestock feed conversion, but in relation to if feed crop production was oriented differently and plant-based nutrition consumed more directly. Weis, *The Ecological Hoofprint*.
13. Elsewhere I have argued that such assumptions are a crucial part of the influential narrative that world food production must double by 2050. Tony Weis, 'Meatification and the Madness of the Doubling Narrative', *Canadian Food Studies*, vol. 2, no. 2.

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