*A note from the author: Below are two word separate extracts. The first is from The Bloodless Revolution: A Cultural History of Vegetarianism from 1600 to Modern Times; the second is an extract from Waste: Uncovering the Global Food Scandal. I have preceded the first with a quote from Zizek, chosen to provoke some thoughts about what I am up to in both very different works.*
*Tristram Stuart*

"To demand consistency at strategically selected points where the system cannot afford to be consistent is to put pressure on the entire system. The art of politics lies in making particular demands which, while thoroughly realistic, strike at the core of hegemonic ideology and imply a much more radical change. ... A political movement begins with an idea, something to strive for... Once people get deeply engaged in it, they become aware that much more than meeting their initial demand would be needed to bring about true justice."

**Slavoj Žižek, *LRB*, 18 July 2013**

**[Extract of ch. 27 'The Malthusian Tragedy: Feeding the World', *The Bloodless Revolution: A Cultural History of Vegetarianism from 1600 to Modern Times*, Norton 2007]**

… Mushrooming populations were threatening to outstrip food-production. Britain had doubled in the eighteenth-century from about five million to nearly ten million people. When food shortages struck in Europe during the 1790s and 1800s, concern became all the more intense. Was misery and starvation the future of humanity?

In the quest to resolve this crisis, improving land-use efficiency became a national obsession. Robert Southey's critique of vegetarianism was again undoubtedly instrumental in providing a focus for Lambe, Newton and Shelley: 'The principle of abstaining from animal food is not in itself either culpable or ridiculous, if decently discussed', Southey conceded, 'But ultimately it resolves itself into the political question, *Whether the greater population can be maintained upon animal or vegetable diet?*'

Large populations were regarded as desirable in themselves. A nation's strength and honour depended on its economic, demographic and military size. The Utilitarians put a new gloss on the ancient ethic of 'peopling the earth' by pointing out that since each person was a potential unit of happiness, sustaining the greatest number of people was an essential ingredient to achieving the greatest possible happiness. The agricultural system that produced the largest amount of food was clearly the best. Vegetarians argued – with a significant body of agronomists, economists and demographers backing them up – that arable agriculture sustained far more people per acre than rearing animals or hunting.

The most important proponent of the moral implications of population growth was the Reverend William Paley (1743-1805)…In his chapter 'Of Population and Provision', Paley pointed out that the principal aim of politics was to nurture the greatest population; and herein lay the problem with meat-eating: 'a piece of ground capable of supplying animal food sufficient for the subsistence of ten persons would sustain, at least, double that number with grain, roots, and milk.' On ten acres of land one could either grow crops to feed people directly, or one could raise animals, using some of the land for grazing and some for fodder crops. A certain proportion of any

food given to animals was necessarily wasted (as faeces or heat, for example), thus leaving less nutrition in the end product. Furthermore, grasses grown for grazing were less productive plants than grain crops. Raising animals on land that could otherwise be used for arable agriculture was therefore a massive inefficiency.

> In England, notwithstanding the produce of the soil has been of late considerably increased...yet we do not observe a corresponding addition to the number of inhabitants, the reason of which appears to me to be the more general consumption of animal food amongst us. Many ranks of people whose ordinary diet was, in the last century, prepared almost entirely from milk, roots, and vegetables, now require every day a considerable portion of the flesh of animals. Hence a great part of the richest lands of the country are converted to pasturage. Much also of the bread-corn, which went directly to the nourishment of human bodies, now only contributes to it by fattening the flesh of sheep and oxen. The mass and volume of provisions are hereby diminished, and what is gained in the amelioration of the soil is lost in the quality of the produce.
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> This consideration teaches us that tillage, as an object of national care and encouragement, is universally preferable to pasturage, because the kind of provision which it yields goes much farther in the sustenation of human life.

In the context of this new Utilitarian emphasis on dietary ethics, the shining example of the Hindus was once again polished up with a new gloss. It was their strict vegetarianism, observed Paley, that allowed the Hindus to sustain populations which dwarfed those of Europe. If they were to develop a British taste for meat, they would have to 'introduce flocks and herds into grounds which are now covered with corn' and their population would necessarily decline. (Indeed, it is precisely this shift towards Western levels of meat-consumption in industrialising countries that is giving demographers today such anxiety about global food-security).

…

In his *Zoonomia; or the Laws of Organic Life* (1794-6) and *Phytologia; or the Philosophy of Agriculture and Gardening* (1800), Erasmus Darwin demonstrated with dispassionate technical detail how these new objections to the meat industry had become compelling even for the most staunch admirer of British roast beef. Darwin stuck to his claim that humans were anatomically omnivorous; that vegetarianism made the Hindus 'feeble', and that vegetable diets did more harm than good to medical patients in Europe. But faced with the inefficiency of animal agriculture, he warned that Britons did need to curtail their meat-consumption and revert to a more vegetable-oriented diet: 'perhaps tenfold the numbers of mankind can be supported by the corn produced on an hundred acres of land, than on the animal food which can be raised from it', he claimed. 'This greater production of food by agriculture than by pasturage, shews that a nation nourished by animal food will be less numerous than if nourished by vegetable.'

Darwin explained that the rapid growth of the meat industry was fuelled by landowners' thirst for profit: pastoralism required less labour, and its products – meat, cheese and butter – being luxuries, fetched higher prices at market than arable produce. The increased profit margin provided a financial incentive to enclose arable land and revert it to animal pasturage….Since pasturage actually produced less food and employed fewer people, this quest for profit was responsible for emptying whole villages and starving the poor into slavery – scenes which Darwin vividly evoked by

quoting Oliver Goldsmith's poem *The Deserted Village*. Moderating Rousseau's critique, Darwin concluded that '[T]his inequality of mankind in the present state of the world is too great for the purposes of producing the greatest quantity of human nourishment, and the greatest sum of human happiness'.

…The only viable way of 'preventing a nation from becoming too carnivorous,' he advised, was to ban the enclosure of arable land completely. Achieving this political imperative would ensure that Britain would progress to become 'more populous, robust, prosperous, and happy, than any other nation in the world.' In a vein of Godwin-like optimism, he looked forward to a time when things were reformed in such a way 'as may a hundred-fold increase the numbers of mankind, and a thousand-fold their happiness.'

…[I]t is little surprise that Shelley underpinned his attack on political oppression with this new emphasis. Extending several lines of Darwin's logic into robust radicalism, Shelley realised that meat-eating was not just a sign of wealth, it was one of the tools with which the rich oppressed the poor. The carnivorous rich literally monopolised the land by taking over more of it than they needed. Pointing his accusatory finger at consumers (in contrast to Darwin's focus on agricultural producers), Shelley argued that the flesh gorged by the rich literally *was* the grain stolen from the mouths of the poor:

> The quantity of nutritious vegetable matter, consumed in fattening the carcase of an ox, would afford ten times the sustenance, undepraving indeed, and incapable of generating disease, if gathered immediately from the bosom of the earth. The most fertile districts of the habitable globe are now actually cultivated by men for animals, at a delay and waste of aliment absolutely incapable of calculation.

Like Paley and Lambe, Shelley allowed that even the poor were to blame if they indulged a luxurious taste for meat: 'The peasant cannot gratify these fashionable cravings without leaving his family to starve.' Like Darwin – and Roger Crab and Thomas Tryon in the seventeenth century – Shelley pointed out that drinking alcohol carried the same implications, for it too was a superfluous luxury made from grain which could otherwise be eaten as food: 'the use of animal flesh and fermented liquors,' he wrote with characteristic bombast, 'directly militates with this equality of the rights of man.'

…By far the most influential demographer of the period – and still regarded as the founder of the modern discipline – was the Reverend Thomas Robert Malthus (1766-1834). Malthus's father had been a friend of Rousseau, and brought his son up according to the principles of *Émile*. But by the age of thirty Malthus rejected his father's faith in the perfectibility of mankind, and he published one of the most shocking works of economic realism the world had seen. His seminal *Essay on the Principle Of Population* (1798) aimed to refute the utopianism of Shelley's father-in-law, William Godwin, and he specifically attacked the faith in the comparative efficiency of vegetarianism. In a game of political tit-for-tat which stretched over three generations, Shelley and the Bracknell vegetarians took up the gauntlet and challenged the basis of Malthus's agronomic assumptions.

Malthus's most controversial observation was that populations had the potential to grow geometrically (at a rate of 1, 2, 4, 8, 16 and so on). Agricultural yields, meanwhile, were likely to decline as the soil became exhausted; even the greatest advocate of technological improvement, he suggested, could not expect yields

to be increased at the same rate as populations. In the real world, populations were always limited by the means of subsistence: the poor stopped reproducing when they were so miserable they no longer had the capacity to sustain large families. If populations were encouraged to grow unchecked, he commented bleakly, a certain swathe of each population would occasionally have to die. If it wasn't plague that killed them, there would have to be a war, and if neither of those materialised then the population would simply outstrip the supply of food and there would be famine. If the poor had more children than they could support, they were destined to live in abject poverty; regardless of whether one successfully averted plague or war, the same number of deaths would necessarily occur. Even Britain's Poor Laws should be abolished or radically curtailed, he insisted. Institutionalised benevolence merely encouraged the poor to bring excess children into the world, which stretched food resources beyond their capacity, creating a dearth for everyone. It was better, he suggested, to leave people to the harsh laws of nature's 'order and harmony' until they learnt to limit their procreation within their means.

A basic element of Malthus's population dynamics had in fact been propounded by the Comte de Buffon in his attack on Rousseau and the vegetarians decades earlier. If populations did not sustain regular deaths, said Buffon, they would multiply so that 'by their numbers, they would soon injure and destroy each other. For want of sufficient nourishment, their fecundity would diminish. Contagion and famine would produce the same effects'. Malthus's three instruments of population control are all there in Buffon – killing each other, disease, and famine – with the only other alternative as decreased fecundity, which Malthus also allowed for. The disturbing difference is that Buffon wasn't talking about humans, but about fish, and the mass-deaths he was justifying were not accidental but deliberate massacres committed by humans and other predators. Malthus's demographic model was like a sociological version of Buffon's ecological defence of predation, and both Buffon and Malthus were directing their arguments against vegetarians. Their *laissez-faire* attitude to natural checks and balances within ecological cycles – to which humans were subject as well as other animals – was in fundamental opposition to what they saw as the vegetarians' utopian attempt to circumvent nature's harsh laws. Some would say the analogy between Malthus and Buffon justified the accusation that Malthus complied with class-oppression by making famine and war look like natural phenomena rather than resulting from deliberate acts of political injustice. Indeed, Buffon's follower, John Brückner (1726-1804), had explicitly declared that warfare, like natural predation, was a providential blessing which benefited the general good by controlling populations. But in fact Malthus was more aware of the potential political abuse of population-control than critics have allowed, and he warned that superficially philanthropic attempts to alleviate poverty would have the sinister effect of swelling armies and creating cheap labour from desperation. Malthus insisted that the only safe way for populations to grow was to improve agricultural yields, so people would naturally have larger families as supplies became abundant.

William Godwin had imagined a society in which everyone shared in agricultural labour instead of slaving away in industrial cities. If everyone followed 'a frugal yet wholesome diet', Godwin argued, they would no longer have to labour to produce superfluous luxuries, and would thus only have to work for as little as half an hour a day. The result would be a happy populous society with no war, violence or crime. For the sake of argument, Malthus allowed that Godwin's system of perfect equality would remove some of the ordinary checks to population growth, and that England's population could perhaps be doubled. However, he argued that as

populations grew, everyone would have to become a vegetarian: ‘The only chance of success would be the ploughing up all the grazing countries, and putting an end almost entirely to the use of animal food.’ He readily acknowledged that ‘It is well known that a country in pasture cannot support so many inhabitants as a country in tillage’. He also acknowledged Adam Smith’s projection that ‘if potatoes were to become the favourite vegetable food of the common people...the country would be able to support a much greater population’. This was precisely what the vegetarians were arguing for, but Malthus thought that giving up meat was an undesirable eventuality. Apart from anything else, he objected that a purely arable system would not produce the manure required for improving soils in Britain. Animal agriculture, he implied, provided meat for the rich and shit for the poor.

But Malthus’s principal objection was that once the object of doubling the population had been attained – in twenty-five years or so – the problem of the limitation of resources would present itself again. With the population doubled from seven million, ‘the food, though almost entirely vegetable, would be sufficient to support in health the doubled population of fourteen millions.’ But as people continued to multiply, they would eventually outstrip the capacity for food production and face the prospect of famine once again. Then Godwin’s imagined reign of universal benevolence would give way to competition for resources: ‘The mighty law of self-preservation expels all the softer, and more exalted emotions of the soul...self-love resumes his wonted empire, and lords it triumphant over the world.’

To illustrate this, Malthus turned to the vegetarian Chinese and Indian masses championed by Paley and Adam Smith. These enormous populations, said Malthus, survived on the smallest possible quantity of resources produced in the most efficient way on the available land. While this might look like the kind of perfect situation Godwin and Paley imagined, Malthus argued that it was fatally precarious. Because the populations did not have any superfluous luxuries, he speculated that whenever they had a bad harvest, they must necessarily be hit with the most devastating famines: ‘It is probable that the very frugal manner in which the Gentoos are in the habit of living contributes in some degree to the famines of Indostan.’ Malthus regarded luxuries as a buffer against famine, and he imagined – with nearly as much idealism as the Godwinites – that wealthier classes would part with their luxuries in time of hardship and use their excess money to provide employment for the poor. Furthermore, Malthus did not agree with Paley and the others that large populations were in themselves desirable: bringing more people into a life of indigence merely multiplied the quantity of misery, not happiness.

Godwin responded to this by pointing out that Malthus had refuted his utopian vision by arguing that once it had been achieved it would eventually be defeated by its own success. But this, said Godwin, ignored the value of achieving it in the first place, and it assumed that when a population reached its capacity for food production people would still be hell-bent on multiplying as fast as possible. On the contrary, Godwin insisted, at this point people would sensibly turn to family-planning; men could be optionally sterilised or they would exercise moral restraint on their reproductive appetite. Thus, agricultural reform could achieve a doubling of the population without causing the famine Malthus predicted. In later expanded editions of the *Essay*, Malthus did in fact put more emphasis on curbing populations through ‘moral restraint’, by which he meant late marriage and celibacy. As Southey and Coleridge pointed out in 1803 in their joint review of Malthus’s *Principle of Population*, Malthus himself ended his essay with the paradoxical assertion that the Christian exercise of chastity could overcome the harsh laws of overpopulation.

Nature itself, Malthus had said, encouraged the use of restraint. By conceding that nature would force people to control reproduction, said Southey, Malthus revealed himself to be no less of a utopian than Godwin, for he had the optimistic *laissez faire* faith of Leibniz and Buffon that de-regulated natural forces would establish their own harmony: 'Malthus also is an optimist, but of the Pangloss school, holding that the present state of society is, with all its evils, the best of all possible states'. His inconsistent pessimistic attack on liberal reform, they argued, was really a sinister plan to reduce the poor to brutal slavery.

Although Malthus was not in favour of being forced to give up meat to increase agricultural yields, he did seem to assent to the vegetarians' basic argument that populations could thereby be increased. Godwin pointed out that Malthus's statistics reaffirmed that 'much would be economised as to human subsistence, by the general substitution of the vegetable for the animal productions of the earth.' Likewise, when Shelley came to refute Malthus, he did so by embracing the greater part of his arguments, but subtly manipulating the perspective: 'Without disease and war, those sweeping curtailers of population,' he said echoing the *Principle of Population*, 'pasturage would include a waste too great to be afforded.' If populations were not wiped out by war and disease, he implied, they would thrive so well that the meat industry would have to give way to the arable system to provide for all the people. The only reason why population growth had not forced a wholesale conversion to arable agriculture was because politicians allowed people to be oppressed by war, tyranny and disease. Shelley implicitly turned Malthus into a latent mass-murderer: he would prevent millions of people from coming into existence rather than make people give up flesh to increase food production.

…Shelley, Godwin and the Bracknell vegetarians imagined that Malthus's harsh law of population pressure could be overcome. Human societies could grow, competition could be eradicated, and humans could live in harmony with animals. The naturalists regarded the Romantics as absurdly ignorant of both ecology and agriculture, and Malthus, whose population dynamic was essentially an ecological model, agreed. Malthus's forebears were outspoken in their attack on the vegetarians' lack of realism. In the 1760s, Buffon's follower, John Brückner, had pointed out the naivety of the vegetarians' faith that arable agriculture could obviate the need to kill animals. Imagine asking the world's nomadic animal herders to convert to vegetarianism, he proclaimed: their land was not suitable for arable cultivation; the only way they could fit in with natural ecologies was as a sustaining carnivore. Both the animals and the humans depended on this relationship to survive. The naturalist-ecologists like Buffon, Brückner and before them the theodocists such as Archbishop William King, recognised that the relation between humans and their domestic animals was symbiotic. The vegetarians' desire to abolish these relationships was as absurd as it was unecological. 'Senseless and stupid mortal!' Brückner exclaimed, 'This perfect calm, this universal and uninterrupted felicity they wish to introduce into the world; this beautiful chimera, will always appear possible to those who judge of things according to their imagination only'. Brückner's own *laissez-faire* attitude was arguably far more ecological than the vegetarians' antipathy to predation. There was no sense in trying to separate humans from the rest of ecological system. Humans had unique power, but it was both in their ecological interests and in their compassionate nature to use that power responsibly. Man, said Brückner, 'is the only creature on earth upon whose will the preservation, or total ruin, of a multitude of species finally depend.' Humans' natural compassion, as well as their self-interest, was what could mitigate their dominion over the rest of the world's species.

William Smellie (1740-1795) translated Buffon's work and in his *Philosophy of Natural History* (1790) he reiterated why Buffon's theory flawed the vegetarians' idea of harmonious nature. 'Nature, it must be confessed, seems almost indifferent to individuals, who perish every moment in millions, without any apparent compunction...But, by making animals feed upon each other, the system of animation and of happiness is extended to the greatest possible degree.' It was the destruction of *individuals*, observed Smellie, that facilitated the co-existence of so many *species*. Smellie's warning against trying to tamper with this law of nature was just like that of Buffon and later that of Malthus: 'If the general profusion of the animated productions of Nature had no other check...the whole would soon be annihilated by an universal famine'. Humans were inescapably part of this cycle. It may seem cruel that domestic animals were killed for food, but, Smellie insisted, 'This is not cruelty. He has a right to eat them: For, like Nature, though he occasionally destroys domestic animals, a timid and docile race of beings, by his culture and protections he gives life and happiness to millions, which, without his aid, could have no existence.'

Buffon and his followers accepted the war in nature as a prerequisite for achieving the greatest number and greatest variety of species. This principle became their rallying cry. They can be charged with having fostered the 'Fascist' implications of ecological thought in their cool detachment from the plight of individuals in the struggle for survival. But theirs was the system which valued biodiversity in ways which today would be regarded as 'ecological'. They valued biodiversity for its own sake, and their values were inherited from the ancient valorisation of 'plenitude' – the idea that God's greatness was manifested in His creation of an infinite variety and abundance of life. Carnivorism, parasitism and scavenging were all essential in the planet's ecological equilibrium. Predator and prey were intimately connected and dependent on each other: the one obtained food, the other had its populations helpfully controlled. Attempts to tamper with the intricate workings of natural ecologies invariably ended in disaster. If carnivores – humans among them – did not kill to survive, the carnivores would cease to exist and the prey-species would suffer catastrophic overpopulation and subsequent annihilation. The same was true of human populations. Just as the vegetarians wished to prevent mass deaths of animals by stopping human predation, so they ignored Malthus's stark observation that allowing human populations to grow unchecked would result in a devastating tragedy of mass death. This attitude, warned the counter-vegetarians, was a futile attempt to evade the human place in an ecological system of which death was an integral part.

In the 1800s, when Shelley revived the movement of Rousseauist vegetarianism, Buffon and Brückner's critique was once again reignited. This time by Shelley's acquaintance, Sir William Lawrence, the young radical materialist whose theories on spontaneous variation later assisted Charles Darwin's discoveries and earned him the undying respect of Darwin's 'bulldog', Thomas Huxley, for helping to 'break down the barrier between man and the rest of the animal world'. In 1814 or thereabouts, Lawrence had participated in Shelley's vegetarian experiment and kept it up for about a year, and in 1815 William Lambe claimed that Lawrence acknowledged that it had improved his health. But when Shelley consulted Lawrence in 1815 with his chronic abdominal illness, Lawrence seems to have decided that vegetarianism was a dangerous fad and apparently instructed Shelley to eat some meat, which Shelley duly did for part of that year. Lawrence immediately went on to develop a thorough scientific attack on Shelley's vegetarian ideals in his notorious *Lectures on the Natural History of Man*, delivered to the Royal College of Surgeons

in 1817 and published in a summarised form in the article on 'Man' in Abraham Rees's monumental thirty-nine volume *Cyclopædia; or Universal Dictionary* (1819).

Lawrence assented that human teeth and guts were similar to those of herbivores: 'In general, then, the human teeth and joint of the jaw resemble most those of herbivorous animals: and man approaches most nearly in these, as well as in other points, to the monkey race, which are, in their natural state, completely herbivorous.' (The Bracknell vegetarians seized on this concession and Lambe quoted it in his own vegetarian treatises.) Lawrence also agreed that a serious scientific experiment needed to be conducted to test the effects of the vegetable diet, though on a broader spectrum than the domestic trial he had attempted with the Bracknell vegetarians; numerous people of different constitutions would have to be tested over three generations. But Lawrence went on to insist (and needless to say Lambe excised these points from his own discussion) that 'In stating these circumstances, we do not wish our readers to draw the inference, that man is designed by nature to feed on vegetables.' To make this deduction, he suggested, was to misunderstand the entire meaning of 'nature', for as the Bracknell crowd had always agreed, 'nature' and 'civilisation' were not distinct. It was perfectly natural for humans to use their hands and the art of cookery to procure animal food. Vegetarianism, he indicated, was inherently a primitivist attack on civilisation and society. Quoting Buffon, he ridiculed the vegetarians' beliefs 'that, in the golden age, man was as innocent as the dove...and always in peace both with himself and the other animals.' It was appalling, said Lawrence, that in the nineteenth century 'men are actually found, who would have us believe, on the faith of some insulated, exaggerated, and misrepresented facts, and still more miserable hypotheses, that the development, form, and powers of the body are impaired and lessened, and the intellectual moral faculties injured and perverted by animal diet.' Shelley thought his use of 'empirical' evidence defied the characterisation of him as a hyper-imaginative idealist – or 'Romantic' in the modern idiom; but Lawrence pointed out that people like Shelley and Lambe just manipulated facts to match their idealistic dream. Vegetarianism was not scientific and it was not ecological: it betrayed a total misunderstanding about how ecologies worked.

It was from the counter-vegetarian naturalist tradition of Buffon, Brückner, Erasmus Darwin and Malthus that the modern understanding of the human place in nature eventually emerged. Their recognition that mass death was essential for sustaining the greatest possible biodiversity was an essential ingredient to Charles Darwin's discovery that it was mass death that created the variety of life in the first place. It was on reading Malthus's theory of mass-death in 1838 that Charles Darwin had the epoch-making flash of realisation that natural selection was the driving force of evolution. This eureka moment is preserved in Darwin's notebooks, which reveal that it was the passage in which Malthus addressed the potential for population increase under the Godwinite vegetarian utopia that triggered Darwin's discovery. In his *Autobiography*, Darwin explained that 'I happened to read for amusement Malthus' *Population*, and being well prepared to appreciate the struggle for existence…[it] at once struck me that under these circumstances favourable variations would tend to be preserved and unfavourable ones to be destroyed. The result would be a new species. Here then I had at last got hold of a theory by which to work.' When he finally published this theory in *The Origin of Species* (1859) and in *The Descent of Man* (1871), Darwin acknowledged that his theory of evolution rested on Malthus's observations on the 'struggle for existence'. The mass deaths which afflicted every generation, Darwin pointed out, were the pressures which drove natural selection and were thus responsible for creating biodiversity in the first place:

‘It is the doctrine of Malthus applied with manifold force to the whole animal and vegetable kingdoms; for in this case there can be no artificial increase of food, and no prudential restraint from marriage.’ The co-discoverer of natural selection Alfred Russel Wallace, also credited Malthus with having triggered his breakthrough. Species evolved *because* great swathes of each generation died before maturity. The survival of the fittest depended on the death of the less fit. Attempting to cleanse ecologies of that dynamic would rupture the entire system of nature. The exoneration of mass deaths had always been a defence of predation against the ideals of the vegetarians. The theory of evolution sprung from the naturalist tradition which had traditionally been articulated against vegetarian idealism.

Modern preconceptions have led scholars to search among eighteenth- and nineteenth-century vegetarians and ‘nature lovers’ for the pioneers of ecological philosophy. If the anachronism of ‘ecology’ is to be used at all, it is vital to distinguish between the ‘idealist’ ecologies of the vegetarians and the ‘realist’ ecologies of the counter-vegetarians, as well as between the political implications of both. The confusion between these variant positions persists in modern thought, and underlies some of the paradoxes in the animal-rights and environmental movements, as well as in the assumptions of those who oppose them. It is true that vegetarians helped to formulate the idea of valuing non-human creatures in their own right, and to drive home the realisation that humans were related to the apes. They were therefore crucial in the construction of modern sensibilities towards nature. The vegetarians nurtured the value of *life*, but this invariably led them to regard violent death as a destructive force. They focused on the value of individual animals. But this was broadly antithetical to the perspective of the ecological naturalists, who saw the death of individual animals as the prerequisite for the life of others. This was a fundamental axis of difference between the vegetarians and the counter-vegetarian ecologists.

These divergent traditions can be traced back to the seventeenth century. Hobbes used his theory of the ‘war of all against all’ to attack the idealist dream that nature was originally peaceful. Hobbes in turn was opposed by vegetarians like Thomas Tryon who idealised interspecific harmony. This was part of the ongoing dichotomy between an ‘idealist’ and ‘realist’ view of nature, and it was frequently deployed in the political debate between egalitarians and *laissez-faire* defenders of political hierarchies. This debate crystallised in the spat between Buffon and Rousseau, and it was carried forward into the Romantic era by Shelley and his friends on the one side and Lawrence, Smellie and Erasmus Darwin on the other. It subsists today in the ethical disputes between animal-lovers who attribute rights or value to individual animals, and ecologists who care more about the equilibrium within ecosystems. Idealist vegetarians, by and large, stood on the other side of the line from the ecologists. It was the counter-vegetarians who valued ecosystems in their own right, and who saw humans as an integral, dependent part of them – even while they participated in the brutal act of eating meat.

## Chapter 11, 'The Evolutionary Origins of Surplus', *Waste: Uncovering the Global Food Scandal* (2009)

> And in the seven plenteous years the earth brought forth by handfuls. And [Joseph] gathered up all the food of the seven years, which were in the land of Egypt, and laid up the food in the cities … And the seven years of dearth began to come, according as Joseph had said: and the dearth was in all lands; but in all the land of Egypt there was bread.[1]
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> Genesis, 40.xlvii–liv

Many people assume that society's blasé attitude to wasting food is a recent phenomenon and that in the past people were more frugal, and food was too valuable to discard. If this were true, rectifying our current levels of waste would simply be a matter of reverting to earlier customs. But the history of human wastefulness has deeper roots than late capitalism or consumer culture. Waste is a product of food surplus, and surplus has been the foundation for human success for over 10,000 years. Everything we call civilization depends upon it.

When we talk about food waste, it is essential to differentiate between inevitable inefficiencies and gratuitous wastage that actually harms our long-term prospects. Some waste is adaptive and desirable; some is maladaptive and destructive. If we are currently indulging in the destructive kind, what are the social and evolutionary forces that make us behave with such apparent irrationality?

Archaeological records suggest that some early humans actually treated their food with a profligacy that matches that of modern supermarkets. When people first walked southwards across the American continent from Alaska down to Patagonia around 12,000 years ago, they encountered continent-sized herds of docile animals. In contrast to the animals of the African savannah, which had evolved alongside our ancestors for 2 million years, American species had no previous knowledge of human predators and hence a very limited capacity to evade them. Equally, having never faced such easy prey before, the human hunters probably had no idea how to regulate their hunting sustainably.

Giant sloths, woolly mammoths and bear-sized rodents fell to the collective human onslaught. Seventy-five per cent of America's large animal species were wiped out in barely more than a millennium, with climate change being a debated contributor to their demise. Archaeological remains of mammoths hunted by humans at this time reveal that only a small proportion of bones show signs of having been butchered. Early hunters could have cut the carcass into strips and dried it out to preserve the meat, but instead it seems that they left much of it to rot. It was apparently more convenient to move on and make a fresh kill than go to the effort of preventing dead meat from reaching its use-by date too rapidly.[2] The fact that this practice led to the extinction of their preferred prey is an alarming legacy – and it is one we, in our own way, are still pursuing by our over-fishing of the oceans. The half-finished carcasses of woolly mammoths strewn across the continent in the wake of America's first humans are the forebears of modern fish discards and supermarket garbage bins, packed full of butchered animals and stale groceries, all sacrificed on the altar of human rapacity.

After most American megafaunal species were extinct, people had to seek other sources of food; it was apparently in this context that the evolution of

agriculture in the Americas occurred. Hunter-gatherers who had formerly collected the wild ancestors of maize and potatoes started to domesticate and cultivate them, replacing the nutrition that had previously come more exclusively from gathering wild plants and hunting large animals. A parallel scenario occurred in the Fertile Crescent – stretching from modern-day Jordan to Iran – where agriculture had emerged thousands of years earlier. There, people turned to cultivating grains after the enormous herds of gazelle that once roamed the region had been seriously depleted – again by either hunting or climate change, or more probably a combination of both. In Australasia, the first human inhabitants burned entire forests to capture a few large beasts as they escaped – most other animals were left to go up in smoke, though by the time their rampage was over there were no more suitable species left to domesticate.[3]

Mass extinction of large animals testifies to two things: humans' efficacy as hunters and their disregard for the sustainable use of resources. In the past, when faced with abundance, humans have often reproduced exponentially and gorged themselves on all available resources. In this regard, we resemble other species – exploding rabbit populations, or the cyclical blooms and decays of marine plankton. However unsustainable this may seem, in the past these short-term bonanzas have provided enough food to boost human population growth. They caused the extinction of numerous wild animals and the permanent destruction of large ecosystems. But they also created the conditions under which human settlement developed, agriculture emerged, and the path to modern civilization was beaten.

Just as hunter-gatherers sometimes over-hunted their prey, so when humans turned to agriculture, they often over-exploited the environment until the land became barren. This has occasionally resulted in the collapse of entire civilizations as their resource base became depleted. In innumerable technical articles and the books *Collapse* and *The Third Chimpanzee,* Jared Diamond gives many examples, including the Maya of Central America, the inhabitants of Easter Island, the Anasazi of New Mexico's Chaco Canyon, and the Mediterranean civilization surrounding Petra in the Fertile Crescent itself.[4] But, conversely, the strain on resources sometimes drove people to new levels of ingenuity. As Esther Boesrup argued in the 1960s and '70s, population growth has often stimulated human innovation, producing new technologies and, over the long term, increasing agricultural productivity and standards of living. Constantly over-reaching the supply of food has been, according to Boesrup, an incentive for technological and social development.[5]

In a territorial species such as humans, the size of a population is a crucial factor in determining its ability to defend or enlarge territory. A group that lives sustainably and keeps its population in check may merely discover that it is outnumbered and overpowered by a neighbouring clan which has grown large enough to overwhelm it. A group that over-exploits its territory may destroy the resource base it depends upon, but if this temporarily boosts its population, it may find itself able to conquer the territories of its neighbours. It is a risky business and unfortunately it rewards unsustainable rapacity, but this is one successful route that humans have taken in their monopolization of the earth.

Around 13,000 years ago, antecedents of the first farmers in the Fertile Crescent developed ways of storing wild grains in pits – and later in ventilated granaries – which (mostly) kept food dry and prevented seeds from germinating.[6] Surplus stored in this way could be used to provide food throughout the year, for trade, and for distribution at feasts which cemented alliances between different peoples. This continuity in the food supply also allowed people to raise more

offspring and to live a more settled life, rather than shifting around in a persistent nomadic search for food. Semi-permanent and permanent settlements appear in the archaeological record at around this time, and these gave rise to the greatest revolution in human history – the domestication of plants for food and the development of arable cultivation. At first, plant domestication probably happened by accident: discarded seeds from wild gathered plants grew up where they fell on the ground near human settlements, and people gradually realized the benefit of deliberately scattering them for cultivation. Residing in one place meant that crops grown in this way could be guarded and collected when ripe, while the cultivators lived on grain stored from previous harvests. The revolutionary symbiosis between humans and grasses yielding edible seeds emerged.

The creation and storage of agricultural surplus meant that some members of social groups could specialize in occupations that were not directly related to food production. Artisans, soldiers, priests and chieftains could be fed on the spare food, and so social specializations and hierarchies developed in tandem with growing supplies. The more non-food producers a population could sustain, the likelier it was to be able to defend its territory and invent technologies that would further its aims. (Even in the modern world, European and American powers found that their success in the two world wars of the twentieth century depended as much on their ability to produce food as the sagacity of their generals – leading to propaganda slogans such as 'Food is a weapon: don't waste it! Buy wisely – cook carefully – eat it all'.)[7] Agriculture spread around the world partly by neighbouring groups observing and learning the new technology: but arguably more significant was the fact that people who practised agriculture and grew surplus reproduced faster and conquered anyone who did not.

Sustaining population growth, division of labour and military prowess are the first rationale for the production of food surpluses. Above and beyond these requirements, a population would be well-advised to grow even more food than its basic nutritional needs in case of extraordinary times of scarcity.[8] As the cultural anthropologist Marvin Harris argued, 'An established principle of ecological analysis states that communities of organisms are adapted not to average but to extreme conditions.'[9] The thinking behind this principle is that any population that is not adapted to extremes will die out every time there is a freak environmental event, such as a particularly cold winter or dry summer. In good years, surplus could be stored against scarce harvests in the future – as in the biblical story of Joseph, who, warned by Pharaoh's dream, kept aside 20 per cent of the harvest for seven years and thus averted famine in Egypt. Major grain-producing countries still lay up to stocks – currently about 20 per cent of what is actually used – to ensure stable supplies.[10] Producing surplus every year may look like a horrendous waste of good food: but what if one year, or for several years, a catastrophe eliminated a sizeable chunk of our agricultural output? By constantly over-producing, all we would have to do in such a year is waste a little less to avoid inconvenience. This, as we have seen, is exactly what happened after the destruction of nearly half the British potato harvest in 2007.

But the surplus of the West today appears to exceed the population's nutritional needs to such an enormous degree that it is difficult to believe that the level of surplus is either necessary, healthy or safe. If we are to make the global food supply more efficient, we need to determine more carefully the margin between the safety net of essential surplus and unnecessary waste.

The first question to ask is: how much food do we actually need? Taking into account the different requirements of men and women, children and adults, on

average in the West – where there is a large ageing population and prevalence of sedentary urban lifestyles – the FAO estimates the minimum energy requirements of western Europeans and Americans to be between 1900 and 2000 kcal per person per day.[11] Agronomists reckon that in order to guarantee food security, nations should aim to supply around 130 per cent of nutritional requirements. A supply of 2,600 to 2,700 kcal per person per day would therefore be sufficient for affluent countries.[12] The question of desirable surplus has not received anything like the attention it deserves, and it would require extensive historical surveys of human populations to test how successful this level of surplus has been in insuring against famines. But from the evidence and expert opinion available, it seems that 130 per cent of needs is a reasonable safeguard, though clearly all sectors of the population also need adequate access and entitlement to food, which is a chronic problem in many developing countries. As I shall discuss in more detail in the next chapter, the shops and restaurants of Europe and the US make available to their populations a smorgasbord of nourishment between 3500 and 3900 kcal per person per day, or up to 200 per cent of what they physically need. If the edible grains and pulses currently fed to livestock were included, the total available food supply in the US comes to over 400 per cent of the country's energy requirements, and just about every European country is well above 300 per cent.[13] What is the purpose of all that extra food?

Current levels of over-production in the West exceed anything that would be deemed desirable from an agricultural or public health perspective. There may be an argument for individual nations to reduce imports and even increase local production to enhance food security, but on the issue of actual food available to consumers the surplus in rich countries is clearly excessive. So the next key question to ask is *why* we do it?

Marvin Harris argued that 'there generally are good and sufficient practical reasons for why people do what they do.' Though he was critical of Western over-consumption,[14] it was with this pragmatic assumption that Harris attempted to explain some of the world's most counter-intuitive eating habits, arguing that they had evolved as a functional adaptation to environmental conditions, and that they invariably served human material interests. Others, such as Vaclav Smil have judged that the current level of food waste 'is among the most offensive demonstrations of human irrationality'.[15] But, according to the logic of Harris's theory, modern Western culture ought to obey his laws of pragmatism no less than any other. So what happens if we apply his thinking to the conundrum of wasted food surplus in the modern world? Rather than appalling evidence of idiotic profligacy, are the mountains of rotting meat, croissants and cauliflowers actually evidence of Western capitalism's intricate wisdom? Could food waste actually serve society's interests in hidden ways?

Harris himself identified a number of societies where over-production and over-consumption appeared to have practical advantages. One was the ceremony known as 'potlatch' observed among native American peoples, such as the Kwakiutl, in the American north-west, Canada and Alaska. In the potlatch ceremony, chiefs invited guests from neighbouring villages and gave away box-loads of fish and whale oil, dried fish, heaps of blankets, furs and ceremonial masks. Fish oil would be poured onto the fire or guzzled in competitive feasting events. Even entire houses were reportedly burnt down in what many believed was a megalomaniac urge to display wealth and power. A potlatch feast was judged a success only if the guests could 'eat until they were stupefied, stagger off into the bush, stick their fingers down their throats, vomit, and come back for more'. Rival chiefs were spurred into competition, hosting their own potlatch giveaways, and failure to match a rival led to loss of

prestige. European onlookers assumed that this was a senseless waste of valuable goods, and the Canadian government outlawed the practice from 1885 to 1952.[16]

Despite the assumed 'irrationality' of potlatch, Harris argued that it in fact accrued sophisticated material benefits to society as a whole. Comparable institutions, he observed, could be found in other cultures. In Melanesia and New Guinea, the village 'big man' encourages his friends and relatives to extend their yam gardens, catch extra fish, gather more pigs, and then, in one big feast, he gives away all the surplus goods. Harris believed that the big man was benefiting society by squeezing people into producing more than they otherwise might. 'Under conditions where everyone has equal access to the means of subsistence,' he writes, 'competitive feasting serves the practical function of preventing the labor force from falling back to levels of productivity that offer no margin of safety in crises such as war and crop failures.' The giveaways also serve the function of redistribution between villages that have enjoyed different levels of production as a result of their varying microenvironments – good fishing years on the coast can compensate for bad growing years on land or hunting in upland territories.[17] One retort to Harris's theory could be that Melanesians and the Kwakiutl simply enjoy an occasional blow-out like the rest of us. But this does not in itself explain why so many humans have cultivated or evolved an enjoyment of producing and eating more than their bodies require. This demands an explanation, and Harris's theory applies as much to modern Western cultures as to the Kwakiutl and the Melanesians.

The modern global food system does resemble potlatch in many ways. In industrialized nations, a similar custom goes under the name of food aid: offloading surplus to countries that have a deficit. Food aid donations from Western countries such as the US have been a vital safety valve for domestic over-production, saving farmers from bankruptcy. In 1961 the Kennedy administration had to deal with the greatest food surplus in American history, and it was this that led to foreign aid policies under which, for example in 1966, one fifth of the US wheat harvest was sent to India. At first glance, it might look like donor nations are motivated by altruism. But, just as with potlatch, donors accrue prestige: one only has to look at the proud announcements by industrialized nations of the number of tonnes of food they give away to see that surplus is presented as generosity. Indeed, Western powers in the late nineteenth and early twentieth centuries really did present potlatch chiefs with unmatchable 'gifts' of flour and blankets in an early example of the political leverage of food aid.[18]

Further benefits accruing to donor nations can be summed up by the Eskimo proverb: 'Gifts make slaves just as whips make dogs.'[19] Food donations in the modern world often help stave off famine, but they can also create dependency. If the survival of a poor country's population is threatened by food shortages, then food aid will tend to make them dependent on donors. They may have to pay for this with political complicity, or through what might be considered inequitable trade agreements. In the US, the Agricultural Trade Development and Assistance Act (1954) made this perfectly clear: sending food to Africa and Asia opened up new markets for American exports, and the threat of denial could be used to exert political and economic pressure.[20] To address developing nations' loss of independence, aid agencies such as Care in 2008 called for an end to non-emergency food aid.[21]

Over-production and over-consumption in the modern world have reaped material benefits for individuals as well as whole nations. When a powerful person or nation gives away food or throws a lavish feast, they increase their prestige and their number of friends or followers. In *The Theory of the Leisure Class* (1899), the

Norwegian-American critic of Western conspicuous consumption Thorstein Veblen wrote that 'Since the consumption of these more excellent goods is an evidence of wealth, it becomes honorific; and conversely, the failure to consume in due quantity and quality becomes a mark of inferiority and demerit.'[22] Individuals certainly behave in this way, but businesses like supermarkets similarly pile their shelves high with innumerable products, aiming to increase their customer base by demonstrating that they provide more abundance than their rivals.

As with the Kwakiutl, over-eating in the West has been another outlet for surplus – but this time on a far greater scale. Two thirds of Americans are overweight, half of those are obese, and nearly 8 per cent suffer from the related condition of type 2 diabetes; Europeans are well on the way to joining them. The steep rise in obesity in the United States since 1980 is strongly correlated with the increasing food supply.[23] Experiments done on rats suggest that eating sugar and fat triggers the release of a chemical in the brain that makes the consumer feel good.[24] For the entire history of mammalian evolution, this has probably been a helpful adaptation, encouraging us to eat when food is in abundance and lay up stores of fat against periods of dearth. (Our agricultural systems, in this sense, replicate what our bodies evolved to do millions of years ago). However, for the inhabitants of affluent nations, there have been no major food shortages for decades, and so this evolved instinct to over-consume is constantly elicited. These problems are probably best managed by encouraging people to eat less and more healthily, and trying to make healthier food more affordable relative to unhealthy energy-dense food (fresh fish and fruit cost up to five times more per calorie than fast-food meals and soft drinks).[25] But it is certainly the case that supplying more food than we can possibly eat contributes to the problem of over-eating.

Beyond over-eating, we feed in addition an unprecedented number of livestock, and still there is more food than we can use so we throw a sizeable proportion of it away. Again, this follows a long-established way of using up surplus, but on a far larger scale than ever before.

As early as 1798 the founder of modern demography, Thomas Robert Malthus (1766–1834), drew attention to the vital role that surplus and luxurious consumption played in maintaining slack in the food supply. Malthus looked at the agricultural systems of China and India, where he saw enormous populations surviving on the smallest possible quantity of resources produced in the most efficient way on the available land. The Indians and Chinese, he noted, ate primarily vegetarian diets based on rice and other local cereals. Europeans, by contrast, expended extensive resources in fattening up huge numbers of animals, often wastefully using land to grow animal feed rather than food that could have been more efficiently used for human nourishment.

But there was a catch in the efficient system of the Asians. Because they did not have any slack in the system, Malthus argued, there was famine every time they had a bad harvest: 'It is probable that the very frugal manner in which the [Indians] are in the habit of living contributes in some degree to the famines of Indostan,' he wrote. Malthus regarded luxuries like the wasteful production of meat as buffers against shortage. In extremely bad years, Europeans could avoid starvation merely by wasting fewer agricultural resources on them.[26]

Malthus had good reason to be familiar with such eventualities. Just two years before the first publication of his *Principle of Population* (1798), England had been afflicted by a scarcity of wheat following two consecutive bad harvests. This was compounded by poor yields across Europe and America and was thus not remediable

by food imports, which Malthus in any case did not favour precisely because they were not dependable. Both Houses of Parliament and the Privy Council warned that if wheat were consumed at the usual rate, there would be none left before the next harvest: the only option was to use more efficiently what remained. It was time to start eating into those buffers and tightening the slack in the system. The Archbishop of Canterbury issued a letter calling on the wealthy to consume less in order to leave more for the poor. As one preacher, William Agutter, explained, this meant observing with special urgency Christ's commandment to 'Gather up the fragments that remain, that nothing be lost.' 'Waste,' he explained, 'proceeds from ignorance, ingratitude and unthankfulness, from luxury, and want of compassion. … He, then, who eats more than is requisite … is guilty of waste. He heedlessly consumes what does himself no good, and what many really want.' Beyond straightforward wastage and over-consumption, Agutter suggested that keeping unnecessary numbers of animals constituted a waste of common food stocks: 'In times of general or particular scarcity,' he explained, 'it is necessary to omit some articles of food which may neither be luxurious or extravagant in themselves, but which would consume too much of the article most wanted; in which case it is wise and patriotic to restrain where we can.'[27]

At around the same time, the Society for Bettering the Condition and Increasing the Comforts of the Poor issued a report affirming a similar point: 'Whenever the means of subsistence are inadequate to the population … nothing, in short, *but increase of food, or improved economy and management in the use of it*, can supply the deficiency, or remedy the evil.' This meant limiting meat consumption and profligate wastage, through the 'increase of the most productive modes of husbandry; as of corn and potatoes in preference to fattened animals, and … by instructing the rich, as well as the poor, in a more economical use of food, and in a less wasteful application of the necessary articles of life.'[28] Fattening livestock and indulging in profligacy were ways of converting surplus into luxuries at times of plenty, and providing a dispensable cushion in times of dearth. Wasting resources and continuing unnecessary luxuries were not crimes: they performed the role of a self-regulating buffer, or homeostatic system, in the human agro-economy, arguably benefiting society by stimulating surplus production, which in turn protected it against extreme conditions. It was when resources reached their limits that overconsumption and waste became sinful.

In the Western world today we have a greater buffer against famine than Malthus or his contemporaries ever imagined would be possible. In favourable ecological conditions, producing and consuming all this surplus can be harmless or even useful; but there is a trade-off when the danger of over-exploiting resources is so great that *it* threatens to undermine food security. What if, like the inhabitants of Easter Island, our ecological limits are reached? Profligacy could become a lethal habit.

In the past other societies have reined in their wasteful habits in response to similar ecological limits, and this could hold valuable lessons for us. One of Marvin Harris's favourite examples was the ancient Indians who used to sacrifice cattle as an extravagant display of wealth and power. But cows – the source of milk, manure and farm labour – were worth more to Indian peasants alive than dead, and so at a time of population growth and agricultural hardship a grassroots rebellion erupted against cow slaughter. At first led by the break-away religions of Buddhism and Jainism, both of which railed against meat eating and particularly cow sacrifice, even the Brahmanic elite who had officiated in the cattle sacrifice eventually absorbed their

message. From being a creditable display of wealth, cow slaughter became a heinous crime.[29]

A parallel development occurred on the Pacific island of Tikopia 400 years ago. There, farming people had lived for thousands of years in the densest possible populations on the available farmland. After the arrival of pigs with Polynesian migrants in around AD 1200, pork became a primary protein source and a central sign of status. But by 1600 the people of Tikopia realized that pigs ate too much agricultural produce and had become an unsustainable luxury. In a dramatic resource efficiency drive, a decision was made to kill every pig on the island.[30]

Today, rich countries channel surplus food supplies into farm animals, rubbish bins and their own overweight bodies. If there were a global democracy, among the first measures proposed by poorer people would probably be a cull of livestock fattened on cereals and a proscription of the unnecessary waste of food. On Tikopia and in ancient India, people did start doing what was 'good' and 'practical' for them by reining in their wastefulness, even if it took many years for this to be achieved.

As this point suggests, the problem with Harris's definition of benefit to 'society' is that it does not sufficiently separate competing interests within and between individual societies. Supermarket directors may profit from – and therefore have a rationale to instigate – the waste of agricultural resources. Similarly, rich nations may profit from excessive meat production and waste despite the fact that it is fuelled by unsustainable exploitation of the land and the sea. Even though there may be nothing approaching global democracy, however, there is more reason than ever to view society's interests in a global perspective. It is no longer rational for rich nations to deplete natural resources regardless of where they are in the world. Doing so harms those local environments and indigenous people, and it deprives others of food needed for survival, which is no longer morally tenable, if it ever was. Waste may still accrue short-term benefits for a few individuals or groups with vested interests, but for human society as a whole it is potentially catastrophic.

In the past, consuming local resources unsustainably could temporarily fuel the growth and muscle-power needed to overcome neighbouring territories – and this is still what we are doing by encroaching on tropical forests inhabited by peoples less populous and industrialized than ourselves. But it is increasingly evident that doing so threatens to upset the climatic system of the planet, which could have a devastating effect on our ability to grow as much food as we currently do. This time, when the whole planet has been over-exploited, there will be no neighbouring territories left to invade.

[1] King James Version.
[2] Diamond (1992), pp.342-47; Martin and Klein eds (1984), pp.345-53; Haynes (1980); cf. Dunnell and Greenlace (1999).
[3] The role of climate change in megafaunal extinctions instead of, or as well as, human hunting, is still a fiercely debated topic; cf. Martin (1973); Mosimann and Martin (1975); Martin and Klein eds (1984); Diamond (1992), pp.342-47; Diamond (1999), pp.42-4, 47, 175; Martin (2005); Hopkin (2005a); Hopkin (2005b).
[4] Diamond (2005); Diamond (1992), pp.333-35; Kipler and Ornelas (2000), II.1124-25.
[5] Stuart (2006b).
[6] Diamond (1999), p.111; Kipler and Ornelas eds (2000), II.1124-25. A team of archaeologists co-directed by Ian Kuijt working in the Jordan Valley have found the earliest climate-controlled granaries in permanent dwellings, dated as 11,500 years old. Preservation technologies for other foodstuffs came later: fermentation from 6000 BC; dairy churns from 4500 BC and salting from possibly as early as 5th millennium BC. Sterile canning, or 'bottling' was only perfected in 1795 by the Frenchman Nicolas Appert to supply Napoleon's armies.
[7] United States, Office of War Information Poster No. 58, Division of Public Inquiries, (US Government Printing Office, Washington, D.C., 1943), http://digital.library.unt.edu/permalink/meta-dc-603. See also Stone (1800), pp.65-67.
[8] Kipler and Ornelas eds (2000), II.1416.
[9] Harris (1975), pp.20-21.
[10] FAO (2008b), pp.9-10; Proctor ed. (1994).
[11] FAO do not disseminate data on Minimum Dietary Energy Requirements (MDER) for developed countries, but for the purposed of my work FAO statistician Cinzia Cerri kindly revealed that FAO estimate a minimum value of MDER for Western Europe, from 2000 to 2007, between 1900 kcal/person/day and 1910 kcal/person/day, while the maximum, over the same period, is around 2000 kcal/person/day. In North America the minimum is 1950 and maximum is 1980, in Oceania (developed) the minimum is 1940 and the maximum is 1950 (personal communication, 18 December 2008). Cf. Smil (2001), p.236.
[12] Smil (2004) suggests 130% of needed mean or no more than 2600 kcal/person/day; Bender (1994) suggested 130% of requirements; Bender and Smith (1997) and Lundqvist (2008), p.18 recommend supplies of 2700 kcal/person/day; others suggest 3,000 kcal Bruinsma ed. (2003). On food entitlements, Sen (1987); Sen (1981).
[13] EU supply from FAO (2003a); US supply from Hiza and Bente (2007). Minimum requirement in US of 1950 is exactly half of the current estimated supply of 3900 kcal/person/day.
[14] Harris (1975), p.32.
[15] Smil (2004).
[16] Bracken (1997), pp.167-68.
[17] Harris (1975), pp.111-127.
[18] Bataille (1985), p.121; Douglas (1990); Jonaitis ed. (1991), p.162; Bracken (1997); footage of a 'reconstructed' potlatch scene can be seen in Curtis (1914).
[19] Harris (1975), p.127. Cf. Mauss (1990).
[20] Kipler and Ornelas eds (2000), II.1424.
[21] Doyle (2007).
[22] Veblen (1970), p.64; cf. Frow (2003).
[23] Jeffery and Harnack (2007).
[24] Wright (2008); Shell (2003).
[25] Baylis (2008).
[26] [Malthus] (1798), chs. 3, 7, 10, p.187; Malthus (1826), II.25-7.
[27] Agutter (1796), pp.3-8, 20-22.
[28] Society for Bettering the Condition and Increasing the Comforts of the Poor (1802), III.66-67. Tom Holland informed me that in early medieval Europe it was common practice for parochial bishops to sacrifice their oxen for the benefit of the poor in times of dearth. In the bad harvest year of 1972 in Russia chicks were killed because it became unaffordable to feed them.
[29] Harris (1986), pp.47-66; Harris (1975), pp.12-32.
[30] Diamond (2006), pp.292, 440, 542. Diamond assumes that Tikopia chiefs presided over the pig extermination, but it seems plausible that this was a rebellious grassroots movement, only retrospectively adopted by the pork-eating elite.