FEEDING THE WORLD:
AGRICULTURE, DEVELOPMENT AND ECOLOGY

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Under present political arrangements feeding the world is a pipe-dream. Although more than enough food is produced for the world’s population, its distribution is strikingly unequal. Three principal reasons for this are: (1) industrial and bio-engineered agricultures systematically displace farmers who supply food for the poor; (2) markets respond to people with incomes, not people as such; and (3) agro-exporting, a structural imperative of the state system, exacerbates these tendencies. Ironically, while technology, markets and trade are touted as essential conditions of development and prosperity, these forces have combined, under the banner of ‘development’, to create ‘hunger amidst abundance’. The irony is compounded by the way technology, markets and trade further compromise the ecological conditions for future food production.

How and why does ‘development’ privilege a global agricultural system that is socially limited and ecologically unstable? This essay examines the ways in which ‘development’ has been represented and applied to the task of feeding the world, and its ecological consequences. ‘Development’, a term with universal appeal, has been appropriated as an ideological expression of capitalist development. It actually represents the political relations of global capitalism, though not of course without being contested. This essay frames capitalist development in terms of three successive historical ‘projects’: the colonial, development, and globalization projects. The contradictions of each successive project condition the one that follows, just as the crisis-ridden globalization project is today shaping an emerging, unstable, ‘imperial project’, focused on securing resources to sustain US military power and the global consumption relations of a minority class.

The colonial project ruptured age-old systems of agro-ecology by creating colonial monocultures in the service of European capitalist development, and its successor projects deepened the scale and scope of this rupture. The early twentieth century crisis (world wars, protectionism, and the mobiliza-
tion of labour) combined with the world-wide struggle for decolonization after World War II to dismantle the colonial project; the US then reconstructed the world economy under the aegis of an international ‘development project’, promoting ‘inner-directed’ growth as a model of capitalist regulation for the world of newly-independent states. This model, a Fordist-Keynesian compromise responding to the political mobilization of industrial labour and agro-industrialization, represented development as a national/public responsibility, with trade as the servant of the state. It also mirrored the state-centred accumulation regime pursued in the Soviet Union and its empire.

The international dimensions of the development project were conditioned by Cold War containment policies, which operated as a vehicle for US capitalism to secure global resources from, and extend its reach into, the post-colonial world, in the guise of foreign aid and military protection. The maturing relations of the US empire (the deepening of global supply chains by transnational corporations, the associated explosion of offshore money markets, and intervention in key states such as Iran, Indonesia and Chile) eventually overrode the ideology and practice of economic nationalism, prefiguring the successor ‘globalization project’. The latter redefined development as a private outcome. States now acted as the servants of trade, cross-border investment, deepening agro-exporting and the construction of an ecologically-invasive ‘world agriculture’.

Across all these periods capitalist agriculture has matured, from colonial plantations to bio-engineered agricultures, via social and ecological relations specific to each set of political relations. That is, capital’s need to convert natural processes into value relations is realized politically, and in each case this generates specific new social and ecological barriers to further development. In attempting to overcome these barriers, but always within the limits of its specific agro-industrial narrative, capital constantly deepens the developmental crisis, and it is out of this crisis that alternatives emerge. The current proliferation of agro-ecological alternatives shows that modernity does not need to marginalize farming based on ecologically-based knowledge, and that a modern, post-capitalist society can replenish modes of agriculture that are both socially and environmentally sustainable, and arguably capable of equitably feeding the world.

FEEDING THE WORLD?

The goal of ‘feeding the world’ emerged within the Cold War context, addressing postwar and colonial deprivations via the politics of containment, as communist movements threatened Western interests. In the context of food shortages and famines in the early 1940s, the United Nations Food and
Agriculture Organization (FAO) was established with a mandate to stabilize world agriculture and establish global food security. The FAO’s role was to foster and manage international trade in foodstuffs to this end. At its Second Session, in 1946, the FAO put forward a vision:

The raising of the levels of living of rural populations calls for the improvement of agriculture, rural industrialization, large-scale public works, and social and educational services in the countryside, and the raising of the levels of living of many different races and peoples. This in turn requires a reorientation of world agriculture and of world trade in which food will be treated as an essential of life rather than primarily as merchandise.7

This vision interpreted ‘feeding the world’ as an international endeavour to transcend the colonial-era extraction of food from the colonies for export to Europe. It conformed to the stipulations of the UN’s Universal Declaration of Human Rights (1948), which informed the ‘development project’,8 and echoed the demands of organized labour for improved levels of consumption.9 At the same time, this vision was founded in reductionist scientific representations of agricultural modernization: ‘new imaginations of people, places and food were premised on the acceptance of a scientific approach that permitted the comparison of otherwise distinct contexts and subjected local knowledges to the supremacy of scientific images of, and universal claims for, food and agriculture’.10

These claims were manifest in agro-technologies and dietary and nutritional sciences,11 which were premised on the continuation of class-based relations of food production and consumption, realized through the operation of global food markets – i.e. a premise opposed to the FAO’s vision of de-commodified food.12 And, just as ‘feeding the world’ licensed a universal ‘scientific agriculture’, so ‘development’ licensed representing post-colonial societies as ‘underdeveloped’ and ‘poor’, and rationalized all manner of neo-colonial interventions to gain access to strategic resources and markets within the context of the Cold War.13 As a result, the FAO (and its mother organization, the UN) facilitated the expansion of the US capitalist empire, sabotaging in the process its public vision of food ‘as an essential of life rather than as merchandise’.

Early on, the US overrode a 1946 proposal of the FAO and UN Relief and Rehabilitation Administration (UNRRA) to establish a World Food Board, preferring to develop its own network of bilateral aid programs. Thus in 1954 the US government instituted the PL-480 food aid programme,
which recycled food surpluses from its domestic commodity stabilization programmes as concessional food subsidies to selected states on the Cold War perimeter in Asia (including occupied Japan), the Middle East and Latin America. The PL-480 programme anchored a ‘food aid regime’, which resolved the over-production tendencies of petro-farming by subsidizing Third World national industrial development with cheap food, and extended the scope of agro-industrial production through the export of ‘green’ revolution (intensive farming) technologies to key Third World states, including Mexico, Brazil, Argentina, Venezuela, the Philippines, Indonesia and India.

The postwar food aid regime reinforced the US policy of containing the Soviet empire, and establishing the new capitalist world order based on the reconstitution of states within an informal US empire. Methods of political legitimation included state-building via military and economic aid – notably the introduction of petro-farming via the Marshall Plan in Europe, and the ‘green’ revolution in regions of the Third World, with the US consumption model as the development standard. This, in turn, drove Cold War rivalry, under which the political legitimacy of the competing systems depended to some extent on expanding meat-intensive agriculture and a meat-intensive diet – both of which the US exported to its neo-colonial clients through a variety of aid programmes, including PL-480, under which the ‘counterpart funds’ made available by the recipient countries were spent on agribusiness initiatives, laying the foundations of an ecologically-intensive ‘livestock revolution’.

While the postwar food aid regime lasted, agricultural commodity prices remained relatively stable because of the publicly-regulated trade in foodstuffs. This regime collapsed when US ‘détente’ with the Soviet Union in 1972–73 cleared surplus grain stocks for the first time in the post-war period; the price of grains and oilseeds tripled, generating the 1974 world food crisis. The FAO convened a World Food Summit in 1974, as ‘billions of people were defined as “food insecure” by the disappearance of US surplus stocks and a surge in world grain prices’. ‘Food security’ now became an explicit policy goal of the UN, through its member governments, linking food production and distribution. The mercantilist practices of the food aid regime were now replaced by a dual approach: food aid became explicitly ‘humanitarian’ (with grants replacing concessional sales), while food trade relations were institutionalized via the Uruguay Round of the General Agreement on Tariffs and Trade (GATT), in order to stabilize what had developed into a US-EU competition for market outlets for their domestic food surpluses generated by petro-farming. But separating public, humanitarian food aid from commercial sales led to ‘food security’ becoming identified with the
operation of food markets, and this in turn helped to shape a re-definition of ‘development’, in 1980, as ‘participation in the world market’. This in turn anticipated the ‘globalization project’; development was finally recast as a matter of private initiatives in and through global markets.

The 1980s, in fact, were a political dress rehearsal for the wholesale corporate globalization of the 1990s. Management of the debt crisis by the IMF/World Bank nexus via Structural Adjustment Programs forced states in the South to open their markets and resources to Northern business, and to give much higher priority to agro-exporting relative to the production of staple food crops, while austerity measures and the privatization of previously public systems of food subsidies and distribution led to a wave of ‘IMF riots’ across the South during this decade. The corporate solution to the food crisis was agro-exporting, which gave rise to a global livestock complex supplied by international chains of feedstuffs, alongside growing shipments of fruits, vegetables and seafood. The resulting expanded, and energy-intensive, circulation of food on a global scale was institutionalized in the WTO’s 1995 Agreement on Agriculture, which ‘prescribes a model for agriculture that has basically only one dimension: increasing agricultural production for exports, importing what cannot be produced without tariff protection or subsidies to producers’. As the Indian policy analyst Devindar Sharma noted, ‘whereas for small farmers the subsidies have been withdrawn, there is a lot of support now for agribusiness industry … The result is that the good area under staple foods is now shifting to export crops, so we’ll have to import staple food’. Simultaneously, the WTO’s Trade-Related Investment Measures (TRIMs) protocol has facilitated cross-border investments and mergers in the food sector, so that agriculture across the world is increasingly enveloped by corporate relations, including a recent ‘supermarket revolution’, notably in Latin America and Asia.

Through the Uruguay Round the United States redefined food security as ‘best provided through a smooth-functioning world market’, in order to secure a competitive advantage for US agribusiness. This definition became the organizing principle of the 1995 Agreement on Agriculture; under its provisions Southern states, in particular, were compelled to open up their domestic markets to cheap food imports and thus deepen their food dependency in the name of ‘food security’. The WTO’s political asymmetry, protecting indirect subsidies to agribusiness in the North and opening food markets in the global South, maximizes the impact of artificially-cheapened prices for agricultural commodities in world trade. In the last few years of the twentieth century agricultural commodity prices fell 30 per cent or more, reaching in 1999 the lowest level in 150 years. Low prices deepen the subjection of
agriculture to capitalist relations, with food dumping undermining peasant agriculture, and driving displaced peasants into unstable forms of contract farming, onto plantations (agro-maquilas), or into urban slums or maquilas.

A 1997 FAO study claimed that the overall impact of liberalization was to induce concentration in farming and the marginalization and dispossession of small producers. In West Africa, for example, cheap tomato concentrate imported from Europe undermines local tomato production and processing; in Jamaica and the Mercosur region (Uruguay, Brazil, Argentina and Paraguay), where dairy farms and coops are concentrating and transnational firms such as Nestlé (Swiss) and Parmalat (Italian) are reorganizing milk processing, subsidized EU dairy products are undercutting milk producers and coops. In Mexico almost two million campesinos have been dispossessed as a consequence of a torrent of corn imports from the US, enabled by NAFTA. While the FAO study does not measure dispossession directly, it is estimated that between twenty and thirty million people have lost land through the impact of trade liberalization. A related trend is the ‘semi-proletarianization’ of farmers. In Africa, some late 1990s evidence has suggested that between 60 and 80 per cent of rural household income was derived from off-farm sources, with the poorest households being the most heavily dependent on off-farm, informal and piecework labour. For Asia, between 30 and 40 per cent of rural household incomes are supplemented from off-farm sources, while in Latin America the great majority of the peasantry are semi-proletarianized, with ‘subfamily farmers…now increasingly complementing [60 per cent of] their incomes with rural non-agricultural employment’.

In sum, the combination of Northern mercantilism and Southern liberalization of farm sectors and food markets subjects producers everywhere to a punishing world price. The effect is to institutionalize national food dependency and create a market in food that excludes and starves rural peoples who formerly grew their own food. The neo-liberal mantra of feeding the world with cheap food conceals an unequal subsidy structure favouring corporate farming in the North, and destabilizing agriculture in the South.

ECOLOGY IN THE AGE OF DEVELOPMENT

The colonial project established specialized agriculture in the colonies for the export of raw materials and foodstuffs to the metropolitan centres. The tropical sugar plantation was an early prototype of modern, land-depleting monoculture. It was matched during the nineteenth century by the relocation of temperate agriculture (grains and livestock farming) to European settler regions of the world economy, as provisioning the European proletariat required increasingly large volumes of food staples.
temperate agriculture supplied cheap food to Europe and so cheapened the wage-costs of European capital, but it depended on the intensive exploitation of virgin soils in the New World via mono-cropping with increasingly complex farm machinery. Native grasses were systematically displaced by the plough and the introduction of non-native grasses, in a process of ‘ecological imperialism’ that was later reproduced and generalized via the globalization of the US model of agribusiness. While there are 10,000 grass species, 99 per cent of pastures sown depend on just 40 of them, the development of which was closely associated with domestication of cattle over the centuries. Britain’s outsourcing of its grain supplies and its beef culture was accomplished through a double rupture that governs global agri-food relations to this day: on the one hand the ‘metabolic rift’, and on the other the generalization of a ‘world agriculture’, and dietary patterns abstracted from place-based cuisine.

**Ecological rupture: the metabolic rift**

The first rupture was with the ‘high farming’ of the Victorian era, whereby ecologically-sustainable biological methods of crop rotation and the management of livestock sustained ‘the condition of the land indefinitely, even while production levels climbed’. On the American plains, however, farmers ‘ripped open enormous areas of prairie grasslands’ and enjoyed high yields so long as crops drew down ‘a vast storehouse of accumulated organic fertility just below the surface’; once this resource was consumed the frontier was simply extended until the process reached its ecological limits in the ‘dustbowl’ crisis of the 1930s. As already indicated above, the US solution to this crisis was publicly-supported capital-intensive agro-industrialization, centered on commodity stabilization programmes. While these programmes secured the farm belt as a political constituency, the intensive agricultural methods involved also had political origins. The agri-chemical revolution of the 1950s depended on the conversion of war-time nitrogen production (for bombs) to inorganic fertilizer, which displaced the nitrogen-fixing legumes and manure used previously. Along with mechanization, the use of inorganic fertilizer increased farm demand for fuel oils, gasoline and electricity, ‘thus increasing agricultural dependence on the energy sector and thereby converting the latter more than ever into a part of agribusiness’. Subsequently, the FAO agreed to an industry plan, in the name of the UN’s Freedom from Hunger campaign (1960), to provide extension services for the dispersal of surplus inorganic fertilizer across the Third World, intensifying agricultural dependence on the energy sector still more widely.

The US exported its agro-industrial model first to Europe via the Marshall Plan, and then to Third World regions via the PL-480 programme and
‘green’ revolution initiatives. This model responded in part to class-based insurrections in various parts of the Third World. While the ideology of the development project encouraged the stable provision of ‘wage foods’ for urban populations by national agro-industrial complexes, dependence on ‘green’ technology laid the foundations for a long-term process of marginalization of agro-ecological farming.

The ‘metabolic rift’, then, refers to the process whereby the agronomic methods of agro-industrialization abandon agriculture’s natural biological base, reducing the possibility of recycling nutrients in and through the soil and water. Thus, the progressive subordination of agriculture to capitalist production relations can also be seen as a metabolic rift between countryside and city. Petroleum plays a central role in widening this rift, through industrializing agriculture while also serving as a major input for the production of inorganic fertilizer, pesticides, herbicides and seed varnishes, as capital attempts to sustain productivity on a deteriorating ecological base. The subordination of agriculture to capital reinforces an abstract representation of agriculture ‘as an input-output process that has a beginning and an end’, rather than as a complex embedded in local biological cycles that replenish the soil through the maintenance of biotic diversity. Seen in this light, agriculture appears eminently available for abstraction, and relocation, with appropriate chemical inputs and bioengineered seeds, to specialized locales: ‘as artificial, off-farm inputs come to matter more and more, so the former intrinsic qualities of the land matter less’. Colin Duncan underlines the significance of capitalist politics in amplifying the perversity of industrial agriculture:

…the ‘West’ now relies on a chronically overproductive industrialized agriculture that is quite bereft of economic rationale, however politically convenient it may be…For once industrialized agriculture became the technical norm, price-support systems originally intended to keep farmers from poverty actually encouraged the excessive use of inputs produced by industry (where previously they had been a contributory cause of the use of excessive areas for crops).

The contradictions of industrial agriculture – soil erosion, salination and deformation, toxic chemical pollution, and unsustainable water practices – are noted by Marc Reisner in *Cadillac Desert: The American West and Its Disappearing Water*: ‘Westerners call what they have established out here a civilization, but it would be more accurate to call it a beachhead….And if history is any
guide, the odds that we can sustain it would have to be regarded as low’. In the US, a million acres disappear annually to urbanization and 2 million acres of farmland are lost to erosion, soil salinization, and flooding or soil saturation as a result of intensive agriculture, which consumes groundwater 160 per cent faster than its replenishment rate. The likely consequence is an acceleration of offshore production.

Here corporate food regime dynamics are decisive, as agriculture moves offshore to escape degraded environments and exploit cheap land and labour. While British capitalism outsourced agriculture in the mid-nineteenth century to cheapen ‘wage-foods’, in the twenty-first century, food corporations outsource production via TRIMS-related liberalization mechanisms. For instance, when the Doux group, the foremost French and European poultry producer, purchased Frangosul, the fourth largest poultry producer in Brazil (which had lower wage costs and weaker environmental regulations), and relocated poultry production there, it reduced its production costs by two-thirds. In the US, several decades of minimal returns on investment in agriculture (1.5 per cent) have led to the concentration of agricultural production. The result has been a wholesale exodus of small and medium farmers, an intensification of production technologies – deepening the metabolic rift – and a relocation of commercial food production offshore.

The outsourcing of food depends on the availability of cheap land and labour in the global South. Such resources are not naturally available, rather, they are made available by expelling rural populations from agriculture by importing cheap food and agro-technologies from the North. For example, after a decade of neo-liberal policies threatening India’s tens of millions of small farmers, the Indian Ministry of Agriculture noted in 2000: ‘The growth in agriculture has slackened during the 1990s. Agriculture has become a relatively unrewarding profession due to an unfavourable price regime and low value addition, causing abandoning of farming and migration from rural areas’. One consequence, a social experiment underway in Andhra Pradesh state, Vision 2020, is to consolidate agro-industrial estates, ‘farmed on a contract basis for corporations’, using genetically-modified seeds to produce agro-exports of vegetables and flowers, and requiring the displacement of upwards of 20 million small farmers.

Combine this effect with WTO-driven cross-border investment of agribusiness capital, and structural adjustment requirements to expand agro-exporting in order to service Southern debt, and the conditions are ripe for a steady relocation of industrial (and increasingly transgenic) agriculture to the South. Recent satellite land cover images show that about 40 per cent of the surface of the planet has been converted to crop or pasture lands, compared
with 7 per cent in 1700. While intensive farming has slightly reduced cropland in the US and Europe, agricultural conversion is intensifying in tropical forest regions, in particular through the expansion of soyfields in Brazil and Argentina for agro-exports to China and the EU.

The relocation of agriculture also implies a dramatic increase in ‘food miles’. Food transport, the cost of which fell 70 per cent for sea freight between 1980 and 2000, and continues to fall for air freight by 3–4 per cent annually, is one of the fastest-growing sources of greenhouse gas emissions. National accounting systems do not include these emissions and they are also absent from the Kyoto Protocol targets. As a result, a damaging amount of ‘food swapping’ exacerbates the ‘food miles’ problem, exemplified by the milk trade. As Millstone and Lang note, ‘Until recently most people consumed milk produced locally, but from 1961 to 1999 there was a five-fold increase in milk exports, with many countries both importing and exporting large quantities, resulting in millions of extra food miles’.

Analogous to the extension of the Southern land frontier for offshore food production is the rising fossil fuel consumption involved in the global fishing industry: with the depletion of fish stocks, boats venture farther out to sea, using 12.5 times as much energy catching fish as the fish provide to consumers. An ecologist claims that ‘it’s the wide application of fuel that has allowed fleets to expand and really has underpinned much of the overfishing of stocks and deterioration of aquatic ecosystems’.

**Deepening the ecological rupture: ‘world agriculture’**

The second rupture overlays the first. It is symbolized in the beef culture, spawned by British capitalist expansion into the Americas, and reaching into the twenty-first century as a key stress on the environment. Not only was the international cattle complex a financial frontier for English and Scottish firms in the second half of the nineteenth century, but it also converted South American land into an offshore pasture, laying the foundations for the twentieth century development project’s identification of beef with dietary modernity. Then as now the beef culture was differentiated by class: ‘While Argentina provided much of the beef for the British aristocracy and middle class, Uruguayan cattle were used to make the famed “Liebig extract” of meat, a cheap beef spread sold primarily to the English working class. For many Englishmen, the extract served as their main source of animal protein’ – prefiguring today’s class gap between beef steak and hamburger. Central America became a source of hamburger meat while whole regions of South America have been converted into off-shore platforms for supermarket-organized exports of beef to Europe and the Middle East. South America has
also become a major source of soybean exports to Asia, whose consumer class is larger than that of North America and Europe combined, and which has also become the leading edge of the global livestock revolution.\textsuperscript{62} Two-thirds of the increase in meat consumption is taking place in the global South, sourced primarily with Brazilian soybeans. China, once a net exporter of soybeans, is now the world’s largest importer of soybeans and oils.\textsuperscript{63}

The rising levels of consumption of animal protein (beef, poultry, pork, fish and shrimp), by global consumers divided into high- and low-incomes, demanding specialty cuts (including fresh fish and shrimp) and processed meats respectively, have a multi-layered ecological impact. Both cattle and shrimp farming have irreversible ecological effects on soil and forests and on coastal mangrove swamps in South America and South and Southeast Asia respectively. In the case of shrimp, as mangroves have been depleted, running down their fragile biodiversity and therefore the habitat for local fishermen, shrimp aquaculture has proliferated, along with new ecological vulnerabilities ranging from fresh water pollution and depletion to the disease outbreaks familiar in other forms of industrially-farmed livestock.\textsuperscript{64}

In addition to the direct environmental impact of livestock, its symbolic dietary function skews resource use along class lines. Cattle consume more than one-third of the world’s grain, and animal protein consumption in general bids cereals and land away from the majority of the world’s population. Roughly 95 per cent of global soybean production and a third of commercial fishing is consumed by animals rather than humans, and a ‘quarter of the earth’s landmass is used as pasture for livestock farming. Half of all US farmland, directly or indirectly, is devoted to beef production. In the EU, 75 per cent of agricultural land is used for growing animal feed’.\textsuperscript{65} In its recent report, ‘Eating up the Amazon’, Greenpeace notes that ‘Europe buys half the soya exported from the Amazon state of Matto Grosso, where 90% of rainforest soya is grown. Meat reared on rainforest soya finds its way onto supermarket shelves and fast food counters across Europe’.\textsuperscript{66}

Under the constraints of trade and foreign exchange needs, states encourage this pattern of indirect consumption of cereals by relatively affluent global consumers.\textsuperscript{67} The grain fed to US livestock roughly equals the amount of food consumed by the combined populations of India and China.\textsuperscript{68} The substitution of feed crops for food crops, known as the ‘second green revolution’, is part of the globalization of high-value production that intensifies monocultures and redistributes food from low- to high-income populations, undermining the staple food systems upon which a large proportion of the world’s population depends.\textsuperscript{69} While noting the importance of roots and tubers as a key staple for poor farmers around the world, and the recent increased
production of potatoes and yams, in particular, the International Food Policy Research Institute (IFPRI) reports that a ‘rapid expansion in the demand for roots and tubers for livestock feed has been under way for some time, particularly in Asia, and is likely to continue as demand for meat products grows rapidly in coming years’. Meanwhile, IFPRI predicts that demand for maize in the South ‘will overtake demand for rice and wheat’ and that about ‘64 per cent of the maize demand will go toward feeding livestock, compared with 8 per cent of wheat and 3 per cent of rice in 2020’.70 During the 1990s, while food cereals production in Brazil and China remained constant, feed cereals production almost doubled.71

In transforming the food landscape, corporate-led factory farming has unleashed a bio-war against the environment and the human body. In the US, for example, ‘animal factories produce 1.3 billion tons of manure each year. Laden with chemicals, antibiotics, and hormones, the manure leaches into rivers and water tables, polluting drinking water supplies and causing fish kills in the tens of millions’.72 In addition to contaminating the natural environment, the ecological crisis also has direct impacts on human health. To quote Millstone and Lang again: ‘Animals in cramped conditions easily catch and transmit bacteria, which may then be passed to humans. Farmers routinely use antibiotics to combat infectious diseases, but in so doing may be contributing to growing antibiotic resistance among humans’.73 The related global threat of an avian flu pandemic is rooted in the ecology of rising densities of urban populations and factory farming systems, and transnational human mobility. In The Monster at Our Door Mike Davis chronicles how the spread of factory farming is actually being intensified by East and Southeast Asian governments’ attempts to control virus outbreaks by culling backyard chicken flocks, rather than corporate chicken factories. Although poultry conglomerates claim that their industrial farming is impregnable to viral outbreaks and epidemics, factory farming, says Davis, is more likely to ‘maximize the accumulation of viral load and subsequent antigenic drift…In an epidemiological sense, the outdoor flocks are the fuse, and the dense factory populations, the explosive charge’.74 Affirming the politics of the corporate food regime, GRAIN charges that the FAO, like the WHO, has allowed the targeting of small-scale poultry farming, after years of promoting it: ‘Its technical advisor on bird flu to Viet Nam recently told Agence France-Presse that it made both public health and business sense for the country to shift from family poultry farms to large-scale factory farms. Such thinking goes right to the very top of the organisation. Samuel Jutzi, the FAO’s Director of Animal Production and Health, told a Swiss newspaper that small farms are
behind the spread of bird flu, not the large factory farms that he describes as “highly protected”.

Rising animal protein consumption is perhaps the key indicator of the ‘nutrition transition’, involving a declining consumption of cereals and legumes and a rising consumption of meat and dairy fats, salt and sugars. This transition is not an evolutionary process; rather it expresses the power relations of successive food regimes that have promoted forms of animal protein, and over-production, such as artificially cheapened surplus corn stocks that underwrite ‘supersizing’ in the fast food industry. Across the world, North and South, the nutrition transition is contributing to rising incidences of obesity, described by the World Health Organization as ‘one of the greatest neglected public health problems of our time’. The WHO estimates that 50 per cent of the world’s population suffers from malnutrition of one kind or another – indeed, ‘a survey of U.N.-sponsored studies indicates that hunger afflicts at least 1.2 billion people, while another 1.2 billion consume more than they need, becoming overweight with harmful consequences’. Most of these 2.4 billion people, both the hungry and the obese, are deficient in essential vitamins and minerals, which are lacking in both impoverished and affluent diets, a fact that is significantly linked to the effects of the global animal protein complex. The conversion of the natural world to service a livestock-based food system stresses both environments and bodies, and, in the context of private solutions to public health problems that privilege care over prevention, promotes a scientific and institutional complex geared to ameliorating, and thereby in practice deepening, the effect.

At the same time a ‘nemesis effect’ unfolds, as eroding ecosystems interact in unpredictable ways. The UN World Commission on Environment and Development has noted that ‘major unintended changes are occurring in the atmosphere, in soils, in waters, among plants and animals, and in relationships among these….The rate of change is outstripping the ability of scientific disciplines and our capabilities to assess and advise’. These changes foretell threats to global public health, such as immune system suppression by ultraviolet radiation, indirect health consequences of climate change on food production and the spread of infections, and the loss of biological and genetic resources for producing medicines – all arising from ‘planetary overload, entailing circumstances that are qualitatively different from the familiar, localized problem of environmental pollution’. Broadly, human cultural evolution, distorting ecological relationships, has caused four types of health hazard: ‘First came infectious diseases. Then came diseases of industrialization and environmental pollution by toxic chemicals. Simultaneously, in rich populations, various “lifestyle” diseases of affluence (heart disease, assorted
cancers, diabetes, etc.) emerged. Today we face the health consequences of disruption of the world's natural systems.

One form of disruption is genetic engineering, by which capital reinforces its attempt to convert nature to a system of expanded reproduction of value relations. Genetically-modified seeds become a commercial input whose current use-value is principally designed to reduce barriers to chemical agriculture. Commodification of seeds via commercial patenting ‘steals’ nature’s harvest by destroying biodiversity, increasing the use of herbicides and pesticides, and spreading the risk of irreversible genetic pollution. Genetic engineering of foods, rationalized as essential to global food security, deepens the metabolic rift by replacing biodiversity with uniformity based on the control of the biology of agronomic species, via corporate intellectual property rights institutionalized in the WTO. The resulting genetic erosion contributes to the ecological crisis: ‘the U.S. soy crop, which accounts for 75 per cent of the world’s soy, is a monoculture that can be traced back to only six plants brought over from China… of the seventy-five kinds of vegetables grown in the United States, 97 per cent of all the varieties have become extinct in less than eighty years’. Vandana Shiva warns of ‘a clear narrowing of the genetic basis of our food supply. Currently, there are only two commercialized staple-food crops. In place of hundreds of legumes and beans eaten around the world, there is soybean. In place of diverse varieties of millets, wheats, and rices, there is only corn. In place of the diversity of oil seeds, there is only canola’.

Where the ‘green’ revolution increased yields on staple foods through the monoculture of rice, wheat and maize, the current gene revolution focuses on herbicide resistance – 54 per cent of the expansion of transgenic crops is aimed at improving herbicide resistance rather than food increases. In other words, the ‘gene giants’ (Astra-Zeneca, DuPont, Monsanto/Pharmacia, Novartis and Aventis) deploy their monopolizing technology to expand control of the food chain, to resolve problems exacerbated by ‘green’ revolution monocultures (plant disease, soil depletion and pest/weed infestation) and to capture competitive advantages on the transgenic frontier, rather than to address the distributional issues behind world hunger. As a leading chemical industry analyst with Lehman Brothers noted: ‘Let’s stop pretending we face food shortages. There is hunger, but not food shortages. GM food is for the rich world. The money for GM is in developed countries’. The current focus of the ‘gene giants’ on ‘functional foods’ confirms this view: the new generation of ‘agbiotechnology’ includes ‘nutriceuticals’, designed to address health concerns ranging from obesity, body development, cancers, diabetes and gastrointestinal functions.
The other segment of the new generation of agbiotechnology, ‘terminator’ technology, is designed to eliminate traditional seed saving, and compel farmer dependence on annual seed renewal via non-renewable commercial seed. To this end, the biotechnology industry expands its investment in crop development in the South, purchasing local seed companies and relocating over 60 per cent of the production of transgenic crops, mainly soybean, canola, corn and cotton. Recent research discloses that there are 132 genetic patents on crops originating in the South, now grown worldwide – 68 for maize genes, 17 for potato, 25 for soybean, and 22 for wheat, suggesting that biotechnology firms are targeting control of staple foods and feeds. Transgenic technology threatens the foundational biodiversity of intercropped seed varieties across the world, expropriating farmers, who lose control of their land and/or seed, or converting them into ‘bioserfs’. Genetic reductionism forecloses possibilities of agro-ecological futures through instituting a ‘world agricultural’ corporate empire.

CONCLUSION: AGRO-ECOLOGY FUTURES?
In addition to deepening the metabolic rift and, therefore, the ecological crisis, twenty-first century corporate agriculture privileges biotechnological solutions over the possibility of sustaining food cultures or reforming land relations to overcome hunger via democratic forms of social reproduction. It is in this nexus that social opposition arises, combining the classical questions of land and bread with the green question. Since the expanded reproduction of corporate agriculture depends on either eliminating or incorporating pre-existing agro-ecologies, it gives rise to opposition in the shape of proliferating land reclamation and food sovereignty movements, the most notable being the Vía Campesina. This organization is waging a global struggle against the socially exclusionary and de-naturing effects and implications of corporate agriculture. Formed in 1992, the several million-strong Vía Campesina unites some 140 local and regional chapters of landless peasants, family farmers, agricultural workers, rural women and indigenous communities across 56 countries in Africa, Europe, Asia, and North, Central and South America. At the Rome World Food Summit in 1994, Vía Campesina introduced the concept of ‘food sovereignty’ into global discourse in the following way:

Food sovereignty is the right of peoples to define their own agriculture and food policies, to protect and regulate domestic agricultural production and trade in order to achieve sustainable development objectives, to determine the extent to which they want to be
self reliant, and to restrict the dumping of products in their markets. Food sovereignty does not negate trade, but rather, it promotes the formulation of trade policies and practices that serve the rights of peoples to safe, healthy and ecologically sustainable production.\textsuperscript{93}

In the Vía Campesina vision trade is not ruled out; rather there should be alternative multilateral institutions to regulate it, including a Convention on Food Sovereignty and Trade. The anti-capitalist resistance represented by the Vía Campesina does not retreat into ‘the local’ but seeks to re-politicize ‘the global’ in ways that support democratic conditions of food production and distribution. For example, in the conflict between the French Farmers’ Confederation and McDonalds in 1999, Jose Bové and his colleagues destroyed transgenic corn produced by global firms ‘not because the seeds are produced by “others” but because of the way they are produced’.\textsuperscript{94} Bové and the Vía Campesina emphasize two central premises: first, that the international tensions surrounding the politics of food ultimately derive not from conflict between states, but between models of production and rural development – ‘a conflict that exists in both the North and the South’;\textsuperscript{95} and second, that the struggle is global but decentralized in content and leadership: ‘The strength of this global movement is precisely that it differs from place to place…The world is a complex place, and it would be a mistake to look for a single answer to complex and different phenomena. We have to provide answers at different levels – not just the international level, but local and national levels too’.\textsuperscript{96}

Answers in themselves are easy enough – clearly building sustaining food systems means drastically reducing ‘food miles’ and ‘food swapping’, reducing fossil fuel dependence (via alternative energy sources such as wind, solar, bio-fuels), and democratizing agriculture (which would return more of the value-added in marketed foods to the farmers). We know that sustainable agriculture almost doubles productivity per hectare while simultaneously conserving scarce water, and can be many times more productive than monocultural farms.\textsuperscript{97} But the question is, how to move towards a post-capitalist agriculture. Not only is the entrenched power of the agribusiness complex, evident in Northern intransigence and failed WTO Ministerials, unmistakably strong, but it also threatens to appropriate alternative technologies\textsuperscript{98} – from organic foods\textsuperscript{99} to bio-fuels – that are needed for a democratic and ecologically sustainable agriculture. While these may yield some environmental and health benefits, such solutions, in catering to class purchasing power (e.g., bio-fuel crops for cars vs. hunger, are likely to deepen social inequality globally at the expense of peasants and poor consumers.\textsuperscript{100}
There are perhaps three inter-related paths toward a post-capitalist agriculture: (1) public education regarding the rethinking of food relations via a new ‘ecological–public health’ paradigm, raising awareness of ‘ecological footprints’ and the impact of industrial foods on human and environmental health, and including long-term strategies for alternative energy, de-urbanization/re-localization, and the de-commodification of food; (2) class and peasant mobilizations around land and food rights, prefiguring alternatives to the corporate food regime, generating new fair-trade conventions, and based on cooperative (rather than comparative) advantage principles (as in the Bolivarian Alliance for the Americas); and (3) using the crisis, and eventual collapse, of the industrial food system (in the form of food-borne illnesses, water shortages, the shortage of fertile land for intensive farming, peak oil, climate change/remedies vs food production, etc.), to advance alternative development models of farming and of the political regulation of food provision.

There is, of course, no ‘magic bullet’, and it is most likely that industrial and ecological food systems will coexist in uneasy tension for some time. In the meantime a practical necessity is to reverse the wholesale movement of farmers off the land. The ‘food sovereignty’ movement addresses that issue directly. It is a very long-term strategy of reversing the social, cultural and environmental damage of a privatized food security system. Some of its movements, such as the MST, engage strategically with urban forces, but remain preoccupied with consolidating the ‘struggle on the land’ as a social project. Longer-term questions about linking sustainable, cooperative models of agriculture to large-scale urban provisioning schemes are yet to be resolved, but their resolution is not impossible given an appropriate political climate (and indeed, there are already smaller-scale urban provisioning models, such as that in Brazil’s Belo Horizonte: ‘the only city…in the capitalist world that has decided to make food security a right of citizenship’). Beyond promising experiments with urban gardens (which provision 35 million people in the US alone) and community-supported agricultures, securing the legitimacy of ‘peasant spaces’ is vital to surviving the crisis of industrial and transgenic agricultures.

In this sense, the transnational peasant movement represents a strategic intervention to broaden future possibilities through its diverse organizations. Within the European Confédération Paysanne, Bové practices the artisan model of specialty cheese production in France, but on the other side of the world in Brazil another chapter of the Vía Campesina, the Landless Workers Movement (the MST, occupying over 15 million hectares of land) combines staple food production for Brazil’s working poor with organic agriculture.
and fair trade, ‘transforming the economic struggle into a political and ideological struggle’. Joao Pedro Stedile, the MST president, declares: ‘We are convinced that nowadays it is necessary to reorganize agriculture on a different social base, democratize access to capital, democratize the agro-industrial process (something just as important as landownership), and democratize access to know-how, that is, to formal education’. Rather than conceding to a corporate agro-industrial future, or viewing land redistribution as a solution to surplus labour, the food sovereignty movement envisions an agrarian trajectory that would reintegrate food production and nature in an alternative culture of modernity.

There are countless other, and just as significant, movements practising agro-ecology, seed saving, and other sustainable practices in the interstices and on the margins of the corporate system. The Slow Food movement, originating in Italy but now global, builds on similar principles to those of fair trade: localizing food-sheds, retaining local cuisines, and protecting food heritage in general. The Slow Food Foundation for Biodiversity was formed in Italy in 2003 to ‘know, catalogue and safeguard small quality productions and to guarantee them an economic and commercial future’. In relation to this, COOP-Italia, a consortium of over 200 consumer co-operatives, co-ordinates the production and sale of quality food products traceable to their socio-spatial origins, with the aim of protecting links between consumers and producers within a broader ethical engagement that includes supporting fair trade initiatives and supplying people with water in Africa, and contesting the diffusion of genetically-modified organisms. Alternative Food Networks also contribute to the proliferation of new rural development practices, such as agro-tourism, energy production, and landscape management.

As globally-networked movements Vía Campesina and Slow Food, despite their quite distinct class compositions, are paradigmatic in combining a strategic, single-point perspective to challenge corporate ‘food security’ with ‘food sovereignty’, and corporate ‘fast food’ with ‘slow food’, while yet embodying the kind of multi-perspectival politics and practice called for by a world needing to transcend its fixation on accumulation. Of course, neither movement is focused specifically on ‘feeding the world’. But stemming dispossession and reclaiming the right to farm are critical to provisioning the 2.5-3 billion rural poor who are being starved under the corporate food regime. And reconnecting urban consumers with rural producers under an ecological regime, whether in France, Italy, Brazil or India, is a precondition of alternative methods of feeding the world for the future. The international ethics of such movements are also preconditions (certainly requiring development) for constructing these methods around global social needs rather
than national economic accounts. These kinds of interventions champion biodiversity and the reversal of the catastrophic ecological impacts of industrial and biotechnological monoculture. They reformulate the idea of ‘development’ as the art of democratic self-reliance, as opposed to a singular, centralized dynamic of unbridled accumulation. And they model methods of feeding a diverse world that are inherently more sustainable than the corporate method of feeding a global minority who happen to have purchasing power.

NOTES
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3 The term ‘project’ refers to the ideological and political relations through which dominant structures of capital accumulation are represented and implemented, although not without contradiction or contestation.


6 Jules Pretty makes the case for the reality of sustainable agriculture projects across the world that, on average, produce a 93 per cent increase in agricultural yields, and represent ‘novel ways in which to feed the world and to save biodiversity’, in Agri-Culture, London: Earthscan, 2002, pp. 84-95.


In the US, the ‘growth of working class power in the 1930s and during the war forced capital to meet urban worker demands for cheap and plentiful food, just as it was forced to provide full employment and rising wage levels. This required a significant increase in farm productivity, which could only be accomplished by keeping farm income up through price supports – without the guarantee of which farmers would refuse to invest in productivity-raising new technologies’. Harry Cleaver, ‘Food, Famine, and the International Crisis’, Zerowork, 2, 1977, p. 16.


See Philips and Ilcan, ‘A world Free from Hunger’.

Some regions were more equal than others within the early Cold War context, so that the introduction of industrial agriculture and the administration of food aid followed predictable containment patterns: heavily focused on Asia, Latin America and the Middle East.


Ibid., p. 245.

21 Ibid.


30 Madeley, *Hungry for Trade*, p. 75.


33 Ibid., p. 75.


38 The experience of the Philippines is instructive, as outlined in 1999 by the Hon. Wigberto Tanada, a member of the Philippines’ House of Representatives:
'Under the globalized trading rules, our rice imports grew more than ten times from 1993 to 1998, from 201,000 metric tons to 2.2 million metric tons; corn imports swelled by close to 500 times, from 640 metric tons to 462,000 metric tons; beef imports by almost 4 times; and pork, 164 times. Mr. Speaker, it is obvious that under the WTO, we have become a major agricultural importer and have lost all hopes of becoming self-sufficient in, if not a net exporter of, agricultural products. We are now importing everything – rice, corn, sugar, beef, pork, poultry, fruits and fishery products. Our food security is now completely dependent on the availability of importable agricultural products, particularly cereals. The annual growth rate of agricultural production in the country is one of the lowest in the region – 0.23 per cent from 1994 to 1998, which is indeed devastatingly low compared to our annual population growth rate of 2.4 per cent'.


Ibid., p. 102.


Ibid., p. 28.


This concept is attributed to Marx. See, for example, Foster and Clark, ‘Ecological Imperialism’, p. 188.


Ibid., p. 122.

Ibid., p. 114.


As Frances Moore Lappé pointed out in her *Diet for a Small Planet* a quarter of a century ago, the mass production of animal protein is an inefficient and inequitable use of world grain supplies, using seven times as much grain for livestock feed as for human food. To illustrate: ‘The U.S. beef industry... generate(s) close to $40 billion per year, (but) leaves less than 10% of planted forage crops to feed people in the U.S. and elsewhere. Chemical companies also benefit greatly from having land farmed to feed animals, since animal feed carries far less stringent pesticide tolerances than does feed intended for human consumption. The net result of using transgenic crops to feed animals is that more chemicals can be used’. Frances Moore Lappé and Britt Bailey, *Against the Grain. Biotechnology and the Corporate Takeover of Your Food*, Monroe, ME: Common Courage Press, 1998, p. 87.


Ibid.


Ibid, p. 103.

In fact, most of the food products (milk, soybeans, animal feed, canola, sugar beets, corn and potatoes) targeted by Monsanto for transgenic development enhance their chemical business rather than address the issue of supplying food to the world’s hungry. Kenny Bruno, ‘Monsanto’s Failing PR Strategy’, *The Ecologist*, 28(5), 1998, p. 293.


98 ‘Unilever, one of the largest food businesses in the world, is developing policies and processes that will eventually allow it to source all primary agricultural produce from sustainable systems’, ibid., p. 124.