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Unpacking Lunch

Political Ecology & The Meat-Industrial Complex

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Abstract: This paper will highlight, theoretically and empirically, how development and underdevelopment are closely linked by looking at the global food system, with a special emphasis on the meat-industrial complex. Conceptually, this thesis mobilizes Foster's theory of metabolic rift, O'Connor's theory of the second contradiction of capitalism, and Harvey's "accumulation by dispossession" to account for the socio-ecological contradictions of the meat-industrial complex. This paper asks two questions from the standpoint of political ecology and critical development theory: How have the changing historical conditions of meat production transformed the social and ecological fabric in the US and China? How can the social and ecological transformations be understood within the wider economic and political networks of the meat-industrial complex? By researching the environmental, health and socio-cultural implications of factory farming I will argue that the meat-industrial complex reflects the ecologically destructive and unsustainable nature of the modern food system. I will use a world-system analysis and a commodity chain approach to analyze the Chinese example and to illustrate the global nature of animal production and meat consumption. The article will conclude with a discussion of how the meat-industrial complex also reflects the unsustainability of capitalist 'development' as a whole and will suggest that we should look outside the logic of capital for opportunities to build alternative food systems.

Key Words: meat-industrial complex, neoliberalism, factory farming, political ecology, development

Table of Contents

1. INTRODUCTION	5
2. RESEARCH QUESTIONS	6
3. RELEVANCY FOR DEVELOPMENT STUDIES	6
4. METHODOLOGICAL FRAMEWORK	9
WORLD-SYSTEM ANALYSIS	10
COMMODITY CHAIN APPROACH	11
LITERATURE REVIEW	12
5. THEORETICAL FRAMEWORK	12
POLITICAL ECOLOGY AND THE 'SECOND CONTRADICTION'	12
METABOLIC RIFT	14
ACCUMULATION BY DISPOSSESSION	14
6. HISTORICAL BACKGROUND	15
DEVELOPMENTS IN CAPITALIST AGRICULTURE	15
NEOLIBERAL ERA	18
7. FACTORY FARMING AND ITS DISCONTENTS	19
THE FIRST FACTORY FARMED CHICKEN(S)	21
FARMS WITHOUT FARMERS	22
ANIMAL BODIES	24
CHINESE FOOD	26
8. MATERIAL IMPACTS OF FACTORY FARMING	28
ECOLOGICAL IMPERIALISM	28
UNEQUAL DEVELOPMENT	29
BRAZIL	29
WASTE LANDS	31
WASTING WATER	33
AIR POLLUTION	34
9. SYMBOLIC IMPLICATIONS	34
CONSUMING MODERNITY	36

PHILOSOPHICAL IMPLICATIONS	38
NATURE/SOCIETY DIVIDE	39
<u>10. DISCUSSION AND CONCLUSION</u>	<u>40</u>
<u>11. EXECUTIVE SUMMARY</u>	<u>42</u>
<u>12. BIBLIOGRAPHY</u>	<u>45</u>

Nature builds no machines, no locomotives, railways, electric telegraphs, self-acting mules etc. These are products of human industry; natural material transformed into organs of the

human will over nature, or of human participation in nature. They are organs of the human brain, created by the human hand; the power of knowledge, objectified. The development of fixed capital indicates to what degree general social knowledge has become a direct force of production, and to what degree, hence, the conditions of the process of social life itself have come under the control of the general intellect and been transformed in accordance with it.

Marx in *Grundrisse*, Notebook VII 1858: 626

1. Introduction

Since 2007 there has been a growing wave of social instability resulting from a series of pressing environmental and economic crises. Skyrocketing food prices in 2008 meant increased food insecurity in the Global South (Morelli 2008) and haunting predictions about a structural crisis in the economy in the North have woken some people up from the capitalist spectacle of *le promesse du bonheur* (Wallerstein 2004). These ecological and economic crises reflect inherent cracks in the neoliberal development paradigm; and as public consciousness awakens to the realities of today the overall unsustainability of capitalism is becoming more and more apparent. Capitalism is a crisis-riddled system, rife with contradictions. While it relies on crises to revitalize accumulation, ecological Marxism states that capitalism will eventually “self-destruct by impairing or destroying rather than reproducing its own conditions of production” (O’Connor 1998: 165).

The processes and innovations that will revitalize accumulation at this current juncture are uncertain. In fact, it is not even clear that the current system will be able to sustain itself; there are many signals that it will not. Marxist political ecology highlights that the ceaseless expansion of capitalism is rife with contradiction because by expanding relentlessly, it also destroys the very social and ecological conditions of production that support it (O’Connor 1998: 159; Moore 2008, 2010). The current state of the global economy and wide spread environmental degradation can be understood as the degradation of the conditions and relations of production. It is this tendency, what O’Connor (1998) calls the ‘second contradiction,’ that I will explore in this thesis. I will illustrate this by highlighting the social and ecological degradation that the meat-industrial complex inherently creates and requires for its expansion. The imperative of endless accumulation of capital in the capitalist world-system generates a need for constant technological change and a constant expansion of frontiers (geographical, psychological, intellectual and scientific) (Wallerstein 2004: 2). The meat and agro-industrial complexes have been restructured under the neoliberal regime of accumulation, creating new sites of accumulation but also a situation of wide spread ecological degradation, undermining the socio-ecological conditions for long term development. The solutions to these global problems may not be found, as in past crises (Moore 2008, 2010), in the restructuring of capital through new geographical frontiers.

Since the 1970s, agriculture, meat production and food processing have become important sites for accumulation (Friedmann 1993). Distinctive to neoliberalism and at the apex of industrial agriculture is the meat-industrial complex. Involved in this complex

is a dynamic network of feedstock production (especially soy), global agribusiness, factory farming and the fast food industry. Furthermore, the meat-industrial complex is a bundle of economic and social relations and a mindset; a mindset which provides a way of perceiving, ordering, and justifying a historically specific way of producing and consuming. The meat-industrial complex knits together the soaring scale of farm animal production with the world food economy and agribusiness. It is based on a mindset which seeks to reduce production costs to the absolute minimum and to systematically ignore or “externalize” such costs (environmental degradation, human disease, and animal suffering) (Weis 2007; Safran Foer 2009:34). For thousands of years, farmers took their cues from natural processes, agriculture and meat production were very much linked. Factory farming industrializes all aspects of production considering nature as a mere obstacle to overcome, and through complex networks of inputs and outputs, the meat-industrial complex tends to destroy its conditions and relations of production.

2. Research Questions

My research questions are driven by a desire to understand the meat-industrial complex and how it fits into the global food system and global development. I am particularly motivated by the ecological and social degradation caused by factory farming. My research questions are:

- How have the changing historical conditions of meat production transformed the social and ecological fabric in the US and China?
- How can the social and ecological transformations be understood within the wider economic and political networks of the meat-industrial complex?

3. Relevancy for Development Studies

Amid the unfolding of food crises due to rising costs of grains in 2008 there has actually been an increase in food production worldwide (without a reduction in world hunger) (Weis 2007: 12). Although the global human population has more than doubled from three to six billion people since the 1960s, neo-Malthusian predictions that increased population will overwhelm food supplies is a myth. According to the Food and Agriculture Organisation (FAO) (2003) agriculture output worldwide has expanded at the same rate, if not higher, than global population. Since the 1960s there have been enormous increases in food production throughout the world, a startling 145 percent increase worldwide (Pretty 2002: 4). In Africa, food production has increased 140 percent, in Latin America it is up by almost 200 percent and in Asia it is up by a remarkable 280 percent (Pretty 2002: 4, Weis 2007). The greatest increase has been in China, an extraordinary fivefold increase in production, mostly occurring in the 1980s and 1990s (World Watch 2004; Nierenberg 2005). The enormous increase in aggregate productivity has not translated into substantial reductions in global hunger. Why?

Because industrialized agrarian landscapes are producing enormous quantities of food for animals (not to mention for cars), rather than directly for human consumption. And because production is determined by the most profitable opportunities for selling products not for feeding people.

As many as seven thousand plant species have been cultivated or collected for food in human history, and now about thirty crops feed the world (Weis 2007:16). In fact, just three cereals alone (rice, wheat and maize) account for more than half of all plant-based calories and 85 percent of the total volume of world grains produced (FAO 2004). Another 'big three' include pigs, chicken and cattle, which account for 88 percent of all animal meat consumed in 2005 (Nierenberg 2005). The impression of diversity in our supermarkets is indeed only an illusion of diversity since the range of crops and animal species has been concentrated into essentially six products (reconstituted of course into a myriad of ways). The growth of soybeans has earned it a place with the 'big three' of global crop production, and serves as a link between the industrial grain and livestock sectors. Soybeans provide a protein-intensive feedstock that is relatively cheap to produce. Since the 1970s soybeans have had the fastest growth in land space of any crop (FAO 2002, 2006). Between 1990 and 2005 alone, global soybean production doubled. I want to highlight the link between this world soy boom and the rise of the meat-industrial complex in the neoliberal era.

Since the 1950s there has been a fivefold increase in meat consumption most of which, at least outside of the US and Europe, occurred after the 1970s. This implies almost a doubling of meat consumption in the average diet of every single person on earth amid soaring human population (Weis 2007: 17). This trend is expected to continue throughout the world and accounts for the tremendous shift toward cash crops (soy) in the Global South. In the last few decades this global dietary transformation, what Weis calls the '*meatification of diets*', has been experienced differently in the North and the South (Weis 2007: 18). Although there are most certainly great disparities between the production and consumption of meat among nations and among people within nations (not everyone's meat consumption has doubled), the statistics clearly show the magnitude of a global dietary shift toward a more protein based diet. Since the 1970s, per capita meat consumption in the Global South increased 150 percent from ten kilograms to twenty six kilograms especially in parts of industrializing Asia and Latin America (FAO 2002, 2006; World Watch 2004; Nierenberg 2005, 2006; Weis 2007).

In the North, the twenty percent of the world's population living in the world's richest countries consume about forty percent of all meat, or 80 kilograms per person (FAO 2002). In the United States, the average American consumes 123 kilograms of meat per year (compared with 5 kilograms consumed per person annually in India). These numbers are expected to increase, in the North and especially in the South. As a result of this global 'livestock revolution' animal products already compromise 37 percent of gross agriculture production (Delgado et al. 1999; Delgado and Narrod 2002; FAO 2002, 2006). On a global level, the FAO (2002, 2006) projects the per capita consumption of meat to continue rising by another 44 percent by 2030, while consumption of most other food items will level off (Weis 2007: 18).

I present these numbers because food is central to our very existence, and it is an important site of power, tradition, culture and meaning. Food or lack thereof, shapes how we as humans are able to produce and reproduce ourselves and societies. The socio-economic conditions and relations of production and consumption are connected intrinsically to ecological and historical contingencies are worth unpacking. Global 'development' together with the parade of expanding connections through market exchange and technologies of trade and communication has been widely celebrated through the Washington Consensus as a vehicle for prosperous progress and an egalitarian future world. Fostered by particular ideas of development, increased world market participation has facilitated the expansion of the modern food system. There is overwhelming evidence that precisely these globalizing connections and promoting a neoliberal paradigm of development has generated devastating socio-ecological deterioration and led to increasingly severe inequalities within and between nations (Shiva 1989; Escobar 1995; Millennium Ecosystem Assessment 2005). Gunder-Frank boldly synthesizes these contradictions stating that "it is capitalism, both world and national, which produced underdevelopment in the past and which still generates underdevelopment in the present" (Gunder-Frank 1967: vii). He explains that "contemporary underdevelopment is in a large part the historical product of past and continuing economic and other relations between the satellite underdeveloped and the now developed metropolitan countries" (Gunder-Frank 1966:18). The development of the meat-industrial complex creates wealth for agribusinesses and underdevelopment in the form of deepening social polarization, rural displacement and ecological destruction. Even the World Bank (2007), an institution that claims to be committed to the eradication of global poverty (but which has come under much criticism for contributing through its lending policies to the further impoverization of 'underdeveloped countries') reports widening gaps between the GDP in the richest and poorest countries.

There is a growing body of post-development research aiming to expose the failures of 'development' to meet even the basic needs of the world's poor and revealed the discourse of development as neocolonial Eurocentrism (Amin 1976; Merchant 1992; Escobar 1995; Sardar 1999; Tucker 1999; Kapoor 2002). However, in development studies and in the social sciences in general, there is a lack of scholarly research which transcends the academic distinction between social and natural sciences (but see Harvey 1996; Foster 1999 and Moore 2003). Development is usually described in terms of projects and policies, flows of money and information, migrants and ideas, with the nation-state as the unit of analysis (Mackintosh 1992; Johnston 1996). Post-development theorists and critical development theorists question the power of one state or paradigm to dominate and transform another according to its agenda or world view. However, even the most salient critiques rarely address the tangible material properties and consequences from an ecological perspective and with the world-system as a unit of analysis that is more than the sum of its parts. They question economic, political, military and cultural domination, but rarely address the ecological dimension (Martinez-Alier 1987; Moore 2003; Hornborg 2009).

The production and reproduction of landscapes and ecosystems is equally important as the (re)production of meanings and unequal power structures. I argue that exercising hegemony in the control of the production of food is equally as important as controlling the production of knowledge. A Euroamerican-centered development discourse has considerable difficulty imagining that other ways of organizing the world, other forms of rationality, other ways of life, can possibly provide coherence for the societies which adhere to them (Tucker 1999: 8). The modern food system also tends to colonize and destroy the imaginary of alternative food systems, reducing or reshaping other systems of production (whether through World Bank programs or fast food chains) to its own mirror image. However, there are important projects that contest the neoliberal agro-food processes, such as Via Campesina, the food sovereignty and slow food movements (Friedmann 1993; McMichael 2009). The relevancy then, for development studies, is that this thesis aims to situate the meat-industrial complex, the apex of industrial agriculture and central to the modern food system, into a historical context of agro-ecological development and neoliberal development. Furthermore, I aim to connect the material properties of factory farming with the ecological and symbolic conditions of its (re)production.

4. Methodological Framework

This thesis focuses on the ways in which the changing socio-historical conditions of meat production transformed the environment in the US and China and the ways in which the social and ecological transformations can be understood with further reference to the wider economic and political networks of which they form constituent parts. The world market and industrialization are not just the background for the meat-industrial complex in the US but the historical conditions of the existence of this particular form of production. The development of the meat-industrial complex in the US was predicated on capitalist expansion and the formation of the modern food system. The world market, the world-scale integration of industrialized agriculture and division of labour, and the level of development of global productive forces are constitutive of the global food system and shape its socio-historical content. As a form of commodity production, factory farming finds its extension and completion in exchange relations. The continuing establishment of factory farming in China creates conditions of commodity production (soy) and exchange that further expand the world market and permits the emergence of new forms of labour relations and cultural expressions.

It is important to see that neither the world market nor the relations of production can be treated as isolated phenomena. Rather, these relations and processes of commodity production and exchange should be understood as part of an evolving whole, that of the expanding global food system. This approach to methodology is what McMichael (1990) calls "incorporated comparison." Generally, it blends theory and history in such a way to avoid abstract individuality (eg. perceiving wage, slave, or peasant labor in isolation), and abstract generality (eg. a world market of undifferentiated commodity producers). In this perspective we are reminded that capitalism *as a concrete historical phenomena* is not identified simply with production for the market, nor is it confined to the wage form of

labour (Tomich 1990: 4). The expansion of the global food system is not just the expansion of the market and industrialized production. Although the global market and industrial production are essential in determining the capitalist character of the global food system, as the market and wage labour are in defining the world economy, they must be viewed from complex historical processes (Tomich 1990: 4). Instead of unpacking the meat-industrial complex and looking at the categories of analysis (global reorganization of food production, factory farming, recomposition of labour, changing cultures of food) in isolation from each other, they must be looked at in relation to each other – as parts of a whole. Thus, in accordance with the development of this whole, the categories can be studied with respect of one another and their relations to each other, as each illuminates the other (Tomich 1990: 5). By studying the transformations in the global food system, in particular the development of the meat-industrial complex, I hope to highlight the dialectical relationship between transformations in the world economy and the historically developing nature of capital.

The global food system is not universal or an external factor abstracted from production relations. Rather, it is an entire system of social and political relationships, formed by specific social relations and historical contexts. The formation of the meat-industrial complex is the product of varied forms of social production encompassed in the global divisions of labour, and the structures among those forms. The market both expresses and mediates the ensemble of these relations of production in the reproduction of the world economy and therefore remains the ongoing conditions for the reproduction of social relations of production (Tomich 1990: 5). In this case the conditions for the reproduction of the global food system. Essentially, the expansion of factory farming is driven by the development of the world economy and the transformation of the global food system. The point of ‘incorporated comparison’ is to try to perceive the unity in diversity without reifying either (McMichael 1990: 395). The possibility of approaching this goal is enhanced by working with units of analysis that are specified in time and place. It is the social and ecological impacts of neoliberal expansion in the US and China that I wish to highlight using a world-systems analysis and a commodity chain approach.

World-System Analysis

The world-system as unit of analysis is essential because it provides an explanation of the global processes and dynamics which create and change opportunities for exchange and profit for dominant classes from the commodities produced in or extracted from specific regions (Wallerstein 1979, 2004). It becomes significant as a unit of analysis for my study to the extent that US agribusinesses and meat packers derive sufficient power from beyond the US to reorganization modes of production or extraction outside the local area and to the extent that local actors in the US reorganize modes of production in response to unequal exchange opportunities in China and Brazil. Levels of development and the potential for further development globally can thus be explained in terms of contemporary modes of production and extraction that are organized in response to world-system exchange opportunities, but it is important to note that they are also bounded in their local setting and respond to the demographic, ecological, and

infrastructural parameters set by previous modes of production (Moore 2008:11). The world-system analysis challenges sociological positivism. Wallerstein contends that “the fundamental error of ahistorical social science (including ahistorical versions of Marxism) is to reify parts of the totality into such units and then to compare these reified structures” (1974:388). I agree with Wallerstein that social and ecological change must be understood as part of an historical system which operates beyond the level of nation state. However, I also agree with McMichael’s effort to see the capitalist world-system, not as the ultimate unit of analysis, but as a whole which does not exist independent of its parts (1990: 386). In other words, the goal is not to develop hypothesis via comparison of more or less uniform ‘cases,’ but to give substance to a historical process (a whole) through comparison of its parts (1990: 386). Therefore all generalizations are historical contingent because the units of comparison are historically specific. I will employ a world-system analysis together with a commodity chain approach in order to bridge the gap between the whole and the parts, the universal and the specific.

Commodity Chain Approach

The concept of the commodity chain “refers to a network of labour and production processes whose end result is a finished commodity” (Hopkins and Wallerstein 1986; Friedland 1984, 2001; Gereffi and Korzeniewicz 1994; Raikes 2000). Although the usual approach of commodity chains is to begin with the finished product (tracing the burger back to the barn), the task of tracing frontier expansion requires a focus on relatively unfinished, ‘raw’ materials (from soy to sandwich) (Moore 2000: 410). Commodity chain analyses aim to 1) determine the boundaries and shifting configuration of the world-economy’s interdependent division of labour and 2) to analyze shifts between core, periphery, and semi-periphery over time according to each zone’s retention of surplus value (Moore 2000). The operations of commodity chains are transnational and impact the decisions made by a variety of state actors along the way. This approach, looking at commodity frontier, is relevant for my study because it takes into consideration the transnational nature of the global food system. Since the second half of the 19th century, the processes in animal production started to become more complex. Animals were born on one farm, fed in another and killed in yet another. Soy from a farm in Georgia traveled to a feedlot in North Carolina. Today, neoliberalism globalizes this relationship, and soy from a plantation in Brazil travels to feedlots in China. The chain connecting the processes of animal production and consumption are globalized and complex. Creating and integrating a global network of feed producers, international feed distributors, feeding operations, slaughter houses, processors, meat packing, transportation networks, processors and product distribution. Rather than looking at each of these processes individually, I use the commodity chain/frontier analysis as a device for linking together production and consumption, nature and society, nation and world. By transcending these binaries and unpacking the processes that bring home the bacon we can begin to understand the whole system of production and consumption and its relationship with nature.

Literature Review

Informing my research is an extensive foundation of secondary sources and a minority of primary sources (FAO, World Bank). An extensive literature review provides me with a guide to addressing the history and future of the meat-industrial complex and provides a solid background for my analysis. Comprehensive knowledge of the literature of the field is essential to most research papers, so for my research I have conducted a thorough literature review. I found that many news papers and research institutes (WorldWatch) highlight that factory farms are breaking the cycle between small farmers, their animals and the environment, having detrimental effects on ecosystems and damaging human health and local communities (Nierenberg 2003, 2005; Winne 2006). Many social theorists and academics write about industrial agriculture and the associated questions corporate control over landscapes (Cronon 1991, 1995; Krebs 2002), the political economy of animal rights (Torres 2007), the economic-moral and political questions surrounding eating animals (Shiva 2000; Safran Foer 2009), the labour conditions in factory farms (Gouveia and Juska 2002) and the environmental implications of the global meat-industrial complex (Cockburn 1995; Weis 2007). O'Connor began theorising the ecological and human effects of the combined and uneven development of capitalism in 1989, and McMichael (2005) contributes extensively to the discussion of the corporate food regime as a site of world-historical conjuncture in capitalist development. However, there is almost no scholarly discussion about the meat-industrial complex and its connection to the larger historical context of neoliberalism as an era of capitalist world-ecology. My thesis therefore, is an attempt to contribute specifically to this theoretical discussion.

To summarize so far, capitalism is a world-system and also an ecological regime which knits together material economies and symbolic orders. I am illustrating this with the meat-industrial complex. The production and consumption patterns imbedded in this complex have been exported to China under discourses of neoliberal development. The most relevant way to investigate the ensuing ecological and social transformations is by employing a world-system analysis and commodity approach. I will situate the meat-industrial complex, particularly factory farming, in a theoretical relationship to political ecology by exploring the social impacts and ecological consequences of this development.

5. Theoretical Framework

Political Ecology and The 'Second Contradiction'

Academics are generally assumed to conduct their research in accordance with well established ideas of objectivity, integrity and intellectual honesty. Yet many social

scientists find themselves pursuing research articulated by the agendas of their universities and by politicians who ultimately control their funding. Nevertheless, a minority of academics strive to pursue various research strategies to substantiate critiques of capitalism. Beyond the entire dissidence entrenched in Marxist tradition, specific efforts are done under the name of political ecology (Bryant and Bailey 1997; Low and Gleeson 1998; Martinez-Alier 2002; Paulson and Gezon 2005). Driving this research is an effort to reveal how the accumulation of money and technology in core areas of the world-system occurs at the expense of the natural resources, environment, and health of their peripheries (Hornborg 2009). Although there are a variety approaches and methodologies that guide political ecology, common to the theory “are concerns with the uneven deterioration of the natural environment, and with all the relations of power that generate and maintain unevenly distributed environmental impacts in global society” (Hornborg 2009: 7).

In order to understand how industrial meat production fits into the current regime of accumulation I will provide a brief history of meat production and factory farming, highlighting how this story can be analyzed theoretically within the contours of political ecology. Using a political ecology approach requires us to recognize that the social and ecological problems caused by capitalism are not simply external side effects, rather they are an inherent and integral part of the relations of global neoliberal capitalism (Swyngedouw 2006: 27). Furthermore, political ecology maintains that “accounts of environment and development should begin with the overall contradictory character of relations between societies and natural environments and recognize that dialectics remains a compelling theory of contradiction, crisis and change” (Peet and Watts 1996). In other words, the development of history is shaped not only by class struggle, state power and the organization of production but equally by agro-ecological revolutions (Moore 2008: 55). Changes in industrial production have always had an important influence with and on the natural environment; there is an intrinsic connection between industrial and agricultural revolutions. Moore explains that “every phase of capitalism *emerges through* a revolution in nature-society relations that create new possibilities for the expanded accumulation of capital [... and that] every great wave of capital accumulation has unfolded through and upon a greatly expanded ecological surplus, which finds its phenomenal expression in cheap food, cheap energy, and cheap inputs” (Moore 2010: 4). Historical materialism reflects on this relationship between humanity and the rest of nature dialectically, looking at the complex bundles of socio-ecological relationships which developments of capitalism are wrapped up in. Political ecology is an approach which looks at those connections as a way of understanding the facts that impact and result from ecology-society interaction. Political economy focuses on the dynamics of capitalist (re)production including, market-driven distribution of resources and urbanization, while political ecology recognizes how changes in political economy are situated in changing relations with nature (Moore 2010). Building from the foundations of political ecology, we can address the relationships between humans and the rest of nature, capital and nature, analyzing how they have been transformed. I will use the case of the meat-industrial complex as an illustrative example of this complex history and the dynamic transformations of capital/nature relations in the neoliberal era.

Metabolic Rift

A key theoretical concept I will use in this thesis to understand the unsustainable use of natural resources is Marx's *metabolic rift* (Foster and Magdoff 1998; Foster 2000; Foster and Clark 2004). Marx was concerned with the asymmetric exchange of nutrients and other material resources between town and countryside in the 19th century, which resulted in the impoverishment of rural soils and the accumulation of garbage and sewage in urban areas (Foster 2000). The deterioration of European soils prompted capitalist entrepreneurs to exploit deposits of fertilizers in the colonies (guano in Peru, phosphates in Oceania) (Clark and Foster 2009, Hornborg 2009). Marx's crucial observation can be extended to the metabolism of today's world-system (Moore 2000, Clark and York 2005). Some parts of the world are covered in garbage and rife with air and water pollution, others are ecologically impoverished and still other parts are still site of extraction. In the meat-industrial complex the pattern quick clearly represents a rift. When the tremendous amounts of water, nutrients and biomass are removed from the soil to produce soy, the result is loss of biodiversity, topsoil, etc. Furthermore, when too much matter and energy are concentrated and used in factory farms, there is an accumulation of waste, air pollution and acidification (Hornborg 2009). Indeed, the metabolic rift will help to conceptualize the unsustainability of factory farming, together with the strategy or concept of accumulation by dispossession.

Accumulation by Dispossession

The modern food system represents a historic moment in the reproduction of capitalism, and can be understood by the mechanisms of *accumulation by dispossession*. Accumulation by dispossession is a form of primitive accumulation. Primitive accumulation, as explained by Marx, entails taking land by enclosing it, then expelling a resident population to create a landless proletariat, and then releasing the land into the privatized mainstream of capital accumulation (Harvey 2003: 145). Furthermore, it entails appropriation and co-optation of pre-existing cultural and social achievements as well as confrontation and suppression (146). In the context of neoliberalism, "[w]hat accumulation by dispossession does is to release a set of assets (including labour power) at very low (and in some instances zero) cost. Over-accumulated capital can seize hold of such assets and immediately turn them to profitable use" (Harvey 2003: 149). This is possible through mechanisms of privatization, financialization, management and manipulation of crises, and state redistribution (145). In the context of the global food system, accumulation by dispossession operates through general mechanisms of structural adjustment, which devalue and privatize assets across the global South, as well as through particular mechanisms of displacement of peasant agriculture, as a world of industrial agriculture emerges (McMichael 2005: 270). Here, local provisioning is subjected to the combined pressures of dumping of Northern food surpluses, agro-industrial complexes, including the appropriation of land for agro-exporting (McMichael 2005: 270). Throughout my paper I want to highlight how the meat-industrial complex essentially takes first and makes second. Accumulating by dispossessing can only continue expanding, externally and internally through new frontiers for so long. But for

now, the concept can at least help us to understand the ecological and socio-cultural limits of the meat-industrial complex.

6. Historical Background

The struggle to maintain low food costs for wage workers has been a key motivation for capitalism as a regime of accumulation because essentially, cheap food prices decisively condition the price of labour (if wages are low, profits increase) (Moore 2010). Cheap inputs for reproduction, including cheap food and energy, are only ‘cheap’ to the degree that they are produced in a way that is significantly lower than the actual, system-wide production costs, and to the degree that their relative volumes are sufficient to drive down the costs of production for the system as whole (Moore 2010). Past empires (Dutch, British, American) have been built on waves of world accumulation on the basis of far-flung reconstitutions of world-ecology that have found expansive agricultural revolutions at their center (Moore 2008). Neoliberalism, as an era of capitalism, has had important implications for the modern food system.

The modern food system that neoliberalism has constructed revived the food surplus and issued cheap food, not from any great leap forward in productivity, but through *accumulation by dispossession*, exacerbating the *metabolic rift*. Before explaining the defining characteristics of neoliberalism and illustrating the contradictions inherent in the meat-industrial complex, I will highlight some important historical transformations in agriculture that brought us up to the neoliberal era.

Developments in Capitalist Agriculture

Revolutionary changes in agricultural production once unfolded over the course of millennia (eg. the domestication of crops and livestock) then over centuries (eg. the English enclosures and the rise of capitalist agriculture, the ecological impacts of imperialism) and in the twentieth century changes were compressed into the space of mere decades (eg. The Green Revolution, factory farming and genetic engineering) (Friedmann 2000; Weis 2007: 47).

While the focus of my thesis is on the transformations of animal production and consumption in the last three decades of the twentieth century, “the dynamics initiated by the enclosures and the ecological transformations wrought by imperialism are a necessary foundation for understanding the radical simplification, industrialization and integration” of the industrial meat complex (Weis 2007: 48). As Bernstein (2000: 28) suggests, there are two elemental ways in which capitalism conditions agriculture:

The first is the drive of technical innovation to simplify and standardize the conditions of agricultural production: to reduce variations, obstacles and uncertainties presented by natural environments to approximate the ideal of control in industrial production... The second, and related feature, is the increasing

integration of farming by capital concentrated upstream and downstream of production on the land.

During the enclosure movement landlords sought to expand their holdings by expropriating the subsistence rights of others. Coupled with the increasing concentration of land in the 16th century, this led to an agricultural system in which productivity was rising amid the loss and consolidation of smallholdings and a rapid erasure of common property, the most important defence against competition (Moore 2000; Weis 2007:48). This *accumulation by dispossession*, so central to the rise of capitalism, created a historic new social class: property-less workers, separated from access to the resources needed to sustain themselves and therefore forced to sell their own labour to farms, factories and mines in exchange for a wage in order to survive (Weis 2007: 48). For Marx, the ‘general law of accumulation,’ the transformation of the peasantry into wage-labour, the proletariat, was an essential means of accumulation as well. This type of accumulation will be illustrated later in the paper when talking about industrialization in China, which drew and continues to draw million of peasants into urban centers.

By the 18th century, roughly two-fifths of the English population has been pushed out of farming, a far higher level than anywhere in the world, providing the labour force for England’s Industrial Revolution and the soldiers for its imperial army and navy while England’s colonies were, in turn, generating immense raw materials stoking its industrialization (Weis 2007: 49). For many, including Marx, this push off the land was – however uneven, often ruthless and enmeshed in miserable wage labour conditions – a historically-progressive break because it released peasants from the shackles of feudal obligations and unleashed new scientific and technological dynamism. Peasants may have had direct access to land to meet their own needs in feudal societies, but the surpluses were devoted to enriching landlords and the system held together by force and various forms of coercion, innovation was stifled and peasant households often lived in persistent states of food insecurity and undernourishment, low life expectancy and threats of famine and epidemic disease (Weis 2007: 49).

Yet while Marx celebrated the triumph of capitalism over feudal orders and the technological innovation, creative impulses and expanded productivity that were set in motion, he also famously understood the destructive and polarizing dynamics of the new system. Capitalism is a complex system dictated by logic of accumulation, competition and expansionary growth. This system leads to a series of tendencies including: the incorporation of people into wage relations exploited by owners of capital; the concentration of vast agglomerations of wealth and control over time; the alienation of labour as work is broken down into even smaller bits of the production process; the relentless conversion of nature into resources; and the imposition of these systemic imperatives upon other societies and environments (Weis 2007). The expansionary force of capitalism in transforming even more labour, land, nature and other animal species into commodities – that is, things whose value is arbitrated by market forces- is part of the tendency towards ‘the commodification of everything’.

British and later European capitalism thrived as accumulation by dispossession was projected on a global scale with through imperialist ventures drawing more labour, land

and resources into capitalist circuits of accumulation, understood as a great global enclosure (Weis 2007: 50). Crosby (1972: 66) describes how ‘the Europeans immediately set about to transform as much of the New World as possible into the Old World’ in terms of implementing farming practices. At the vanguard of the Europeanization of agriculture landscapes were farm animals for both food (eg. cattle, pigs, goats, sheep, chicken) and draught (eg. oxen, horses, donkeys). The introduction of farm animals in the ‘New World’ wreaked havoc on local landscapes and completely transformed entire ecosystems. The biological consequences of colonialism are still being felt today. The rapid growth of livestock populations encroached upon Indigenous Peoples, their farms and gardens and the animals they depended upon (Crosby 1972, 1986; Cronon 1991, 1995). From the Argentinean pampas to the Australian grasslands, many examples can illustrate the human and ecological violence of the colonial enclosures that paved the way for the rise of the new grain and livestock complexes in the temperate ‘New World’.

Revolutionary transformations in agriculture cumulated through industrial transformations, the manufacturing of steel (as railways linked town to country) the synthetic nitrogen fertilizer revolutions and later the development of petrochemical-based pesticides, herbicides and fungicides (Weis 2007: 57). These developments of course impacted productivity and surrounding ecosystems, and transformed whole communities and individual farm households. These transformations in agriculture are also inseparable from manufacturing and industrialization in other areas. The increased use of fossil fuels and synthetic fertilizers tied agriculture to manufacturing at the beginning of the 20th century and the knot has only tightened since.

Agriculture (as well as industrial) production in the 1940s and 1950s was defined by the Fordist order (Davis 1986). The central characteristics of Fordism include: the simultaneous development of both mass production and mass consumption, the substitution of industrial for craft production, the development of process engineering and standardization of both production and products, patterns of vertical integration among economic sectors, in order to control information flows and to manage financial risks, and the invention of the de-skilled assembly line (Bestor 2006: 118). The second-stage Fordism, through the 1960s made some refinements to these basic principles. These include: the creation of flexible systems of industrial production, including ‘just-in-time production’ and ‘just-in-time distribution’ partly based on extensive networks of very-well-coordinated subcontractors, philosophies of ‘total quality management’ based on careful collection and statistical analysis of production and distribution information, extremely rapid product cycles, and the micro-segmentation of market niches and product differentiation (Bestor 2006: 119). These characteristics made their way, on a massive scale, into the socio-economic and ecological fabric of the United States and across the industrialized North.

An important symbol of the transformations in agriculture, the transformations of North American grasslands into grain and livestock landscapes was the Union Stockyards. In the 1840s-1860s the Union Stockyards of Chicago brought cattle by rail to the east where they were killed and processed in a massive abattoir and meat packing complex which “perfected the production line slaughter of living creatures, for the first time in the history

of the world” (Cronon 1991; Cockburn 1995: 26). The disconnection and simplification of natural processes started in those stockyards almost 150 years ago. The development of the industrial meat production into an entire global network of soy production, agribusiness, factory farming and the fast food industry (the meat-industrial complex) takes place in a particular historical context of neoliberalism.

Neoliberal Era

On one hand, neoliberalism is a theory of political economic practices proposing that human well-being can best be advanced by the maximization of entrepreneurial freedoms within an institutional framework characterized by private property rights, individual liberty, unencumbered markets and free trade (Harvey 2005, Harvey 2007: 22). On the other hand, it is an era of capitalism fuelled by an ideology that sets in motion an epistemological discourse. Since the 1970s there has been an emphatic turn toward neoliberal political-economic practices and thinking. Neoliberalism has, in short, “become hegemonic as a mode of discourse and has pervasive effects on ways of thought to the point where it has become incorporated into the commonsense way we interpret, live in and understand the world” (Harvey 2007: 23). The creation of the neoliberal system has been based on destruction, not only of prior institutional frameworks and powers, also of divisions of labour, social relations, welfare provisions, technological mixes, ways of life, attachments to the land, habits of the heart, ways of thought, etc. (Harvey 2007: 23). One of the ‘decisive battlegrounds’ of neoliberal globalization is agriculture, where the effort to remake agriculture in the image of capital has resulted in “rapidly declining returns for capital as a whole” (Moore 2008: 54). Industrial agriculture and the meat-industrial complex in particular, have become important sites of accumulation and embody distinctive characteristics of neoliberalism.

The creation of the World Trade Organization (WTO) in 1995 fostered new circuits of food and labour by rearticulating trade rules which celebrate free trade and global ‘development’. Consistent with the neo-classical agenda ‘food security’ came to be redefined and institutionalized in the WTO as an international market relation. That is, in spite of the asymmetry between the Northern and Southern agricultural labour force percentages (4 percent, versus 30–70 percent, respectively) (McMichael 2005: 281), a system of ‘free trade’ in agricultural products was installed to privatize food security as a global corporate relation (FAO 2003; McMichael 2005: 280). Although the privatization of food security and the corporatization of the food regime is not the focus of my thesis, it is important to note here that it marked an important shift. Under the 1995 WTO treaty, The Agreement on Agriculture, states no longer had the right to food self-sufficiency as a national strategy. The WTO’s minimum import rule required all member states to allow imports of food up to at least five percent of the volume of domestic consumption. There was an important shift from the nation-state as the site of food security to the world market. The formation of new circuits of food was facilitated by this agreement representing a historic moment in the reproduction of capitalism through mechanisms of ‘accumulation by dispossession’ (McMichael 2005: 267). McMichael explains that “in the context of corporate globalization, ‘accumulation by dispossession’ operates through general mechanisms of structural adjustment, which devalue and privatize assets across

the global South, as well as through particular mechanisms of displacement of peasant agriculture, as a world of agriculture emerges. Here, local provisioning is subjected to the combined pressures of dumping of Northern food surpluses, an agro-industrial supermarket revolution, and the appropriation of land for agro-exporting” (McMichael 2005: 267).

I argue that the meat-industrial complex, through mechanisms of structural adjustment and the corporatization of agro-exports and food supply chains, secures a food supply for the global consumer class which results in the mass production of agricultural commodities which are strikingly divorced from their ecological costs. During the era of neoliberalism, governments in the periphery world, under the influence of the World Bank, were required to plunge into schemes of intensive grain-based meat production which favours large producers and penalized small subsistence farmers (Cockburn 1995: 37; Friedmann 1999; McMichael 2005). Shifts toward growing export crops for animal feed and increasing numbers of intensive animal operations (factory farming) were central practices employed to meet the needs for further capital accumulation. These practices, through structural adjustment programs, led to the loss of land (displacement) and change of land (into more intensified production of monocrops, like soy for example), making important material impacts on the livelihoods of millions of people. While the changes of landscapes and loss of ecological knowledge through accumulation by dispossession constitute important losses to the corporate food regime, related symbolic forms of dispossession took place as well. Land expropriation/appropriation may be the original form of primitive accumulation, or ‘accumulation by dispossession,’ but the expansion of the meat-industrial complex, and generally the global corporate food regime involves a broader, reconstitution of material and symbolic culture and particularly ecosystems. The most salient example of the reconstruction of nature, time and space compression and the metabolic rift is the factory farm.

7. Factory Farming and its Discontents

Factory farming is hard to define but easy to identify. In a narrow sense it is a system of industrialized and intensive agriculture in which animals – often housed by the tens or even hundreds of thousands – are genetically engineered, restricted in mobility, and fed unnatural diets (which almost always include various drugs, hormones or antibiotics) (Safran Foer 2009: 34). Pioneered in the US with broiler (meat) and layer (eggs) chickens, Concentrated/Confined Animal Feeding Operations (CAFOs) keep animals in industrial conditions, where their growth and biorhythms can be managed and accelerated.

Globally, roughly 55 billion land animals are factory farmed every year and a full ninety-nine percent of all land animals eaten or used to produce milk and eggs in the United States are factory farmed (Weis 2007; Safran Foer 2009). Though the export of this model has been relatively recent on a global scale factory farms are already responsible for 40 percent of all meat production by volume, a dramatic increase from 30 percent only a decade earlier (Weis 2007: 20). Factory farms are responsible for a much higher percentage of the global farm animal population that this large and growing volume

suggests since 74 percent of the world's poultry and 68 percent of the world's egg production comes from factory farms. There are many more individual chickens than any other farm animal species, simply because their 'turnover time' is the shortest (Weis 2007: 20). Considering per capita meat and dairy consumption in China has more than doubled over the last twenty years and is expected to reach the levels of industrialized countries by 2020, to write about eating animals today is to write about the meat-industrial complex and factory farms.

Before the rise of industrialization and the consequent standardization and commodification of production people could not have forgotten that eating beef and pork was part of a partnership between animals and humans (Cockburn 1995: 27). The neatly wrapped packages and euphemistic discourse around meat consumption has led us to forget the ties between the field, butcher shop and dinner table, whereas fifty years ago the connections between humans and nature were far more apparent. With the rise of ranches, slaughter houses, packing plants and refrigerator cars many of the connections vanished from view and soon from the minds of meat eaters (Cockburn 1995: 27). The advances in transportation technology set the stage for the "annihilation of both time and space in matters of food consumption" (Cockburn 1995: 24). Time and space has been compressed, not only by means of railway construct, but also by modifying the very biophysical rhythms of humans and animals.

Around the 1840s the slaughter of animals became increasingly standardized, symbolized by the rise of the *(dis)assembly line* in packing houses. Essentially it was the beginning of corporate control over landscape, space and the natural world (Cronon 1991: 212). The rise of the stockyard in 1840s century Cincinnati and Chicago was perceived by some as an "economic miracle" because of the increased profit facilitated by increasing production. Others however felt "appalled that the taking of animal life could have become so indifferent, so efficient, so calculating and cold blooded" (Cronon 1991: 208). With the industrialization of animal farming the connection between farmers and animals changed to a relationship between worker and commodity, representing an important shift in the human relationship to nature. By the mid 19th century Chicago merchants started to see animals only for the potential profit they could *create*. And so, the faster they could be born, fattened and then brought to slaughter, the better. Stock owners sought to keep profits high by minimizing costs of feed, using corn instead of range fed and increasing the speed at which the cattle could be transported to market. As Cronon concisely states in *Nature's Metropolis*, "it was a landscape in which the logic of capital had remade first nature and brought together far-flung places to produce a profound new integration of biological space and market time" (Cronon 1991: 224).

Once the physical time and space were compressed in an external sense, into the walls of factory farms, the next frontier to bring into the logic of capital was to transform the bodies of the animals internally. Until the 1950s most livestock were reared in a natural environment without drugs, growth hormones or feed additives (Friedberger 1994: 37). After the 1950s the cattle industry began to use the growth hormones promoting rapid growth of lean muscle. Cattle raised with hormones could gain 25 kilograms more lean meat at a faster rate than cattle which digested normal feed. Hormone-treated cattle also

ate less grain and roughage in the feedlot, reducing expenses on feed (Friedberger 1994: 51). Despite the effort for a more 'efficient' and less time consuming cattle-raising cycle, the laws of nature prevented much change. As a result of cows' long productive cycle from birth to slaughter, cattle remain raised fairly 'inefficiently' compared with other animals (Friedberger 1994: 55). Chickens are much more 'efficient' animals and were the first animal to be taken off the farm and placed in the indoor factory farm.

The First Factory Farmed Chicken(s)

In 1946, the poultry industry turned its gaze to genetics and with the aid of the United States Department of Agriculture (USDA) launched a "chicken of tomorrow" contest to create a bird that could produce more breast meat with less feed. Beginning with this contest and throughout the 1940s the introduction of sulpha drugs and antibiotics to chicken feed stimulated growth and held down the diseases induced by confinement. To get into the details, the typical cage for egg-laying hens allows each 0.04 m² of floor space – about the size of this piece of paper. Such cages are stacked between three and nine tiers high. Japan has the world's highest battery cage unit, with cages stacked eighteen tiers high in windowless sheds (Safran Foer 2009: 47). Feed and drug regimes were increasingly developed in coordination with the newly bred 'chickens of tomorrow,' and by the 1950s there was not one "chicken" anymore, but two distinct chickens – one for eggs, one for meat (Boyd 2001; Tao 2003: 14; Safran Foer 2009: 106). The very genetics of chickens, along with their feed and environment, were now intensively manipulated to produce either excessive amounts of eggs or meat. From 1935-1955, the average weight of broilers increased by 65 percent, while their time-to-market dropped 60 percent and their feed requirements dropped 57 percent. Chickens once had a life expectancy of fifteen to twenty years, but the modern broiler is typically killed at around six weeks. Their daily growth rate has increased roughly 400 percent (Cockburn 1996: 30; Boyd 2001; Safran Foer 2009: 48). To gain a sense of this radical change, imagine human children growing to 150 kilograms in ten years, while eating only muesli and multivitamins.

This raises questions about the sustainability or even just the so-called 'efficiency' of factory farming. If there are two types of chickens, what happens to all the male offspring of layers? Humans have not designed them for meat, and nature clearly has not designed them to lay eggs, what function do they serve? They serve no function. This is why all male layers – half of all layer chickens born in the United States, more than 250 million chicks a year – are destroyed (Safran Foer 2009: 48).

The female chickens do not have a much better fate. Female chicken and turkeys mature at sixteen to twenty weeks, and twenty three to twenty six weeks, respectively. Once they mature, they are put into barns with very low lights or in total darkness for about two weeks and are fed a very low-protein, almost starvation diet. The entire process is highly mechanized. By controlling the light, the feed, and when they eat, the industry can force the birds to lay eggs year-round (Cockburn 1995: 25; Safran Foer 2009: 60). After the weeks of darkness, the lights are turned on for sixteen to twenty hours a day to simulate

spring and they are then fed a high-protein diet so that they start laying immediately. Using this system chickens lay over 300 eggs a year and turkey hens lay 120 eggs a year – two or three times as many as in nature. After the first year, they are killed because they will not lay as many eggs in the second year – the industry figured that it is cheaper to slaughter them and start over than it is to feed and house birds that lay fewer eggs. These practices are tremendously successful in providing more eggs and more meat in less time and space. Capitalism continually meets obstacles in the biophysical world which are barriers to capital accumulation (see Henderson 1998, 1999; Prudham 2005). The biophysical rhythms of chickens need to be modified, genetically and through confinement, so they can speed into faster cycles of accumulation. A chicken which is ready to slaughter in 45 days is better for capital than a 70 day chicken. Derrida (2008), philosopher and social critic, claims that industrial meat production is a war against animals. Modifying animals' biophysical rhythms by compressing the time and space they need to grow and live just to meet the needs of capital – is a war against animals. Changing chickens' genetics, filling them with drugs and keeping them in confinement has made the chickens more predictable and profitable; more chickens can be raised, faster, fatter and cheaper than ever. The same is true for hog farming, filled with hormones and pumped with corn and soy more pigs can be transformed into pork faster than ever, and requiring less human labour than ever. But these alterations also dictate how animals can be raised, since the birds and pigs pumped with antibiotics and hormones can no longer be healthy or even survive without the highly controlled contours of this industrialized system (Silverstein 1999; Boyd 2001; Weis 2007). It also has an important set of influences on workers and the environment.

Farms without Farmers

The tendency of industrial capitalism to reduce the lives of animals into commodities has long been the fate for humans too. Basically, capitalist relations of production reduce humans to little more than a material force, and value is extracted from their labour power through exploitation. The repulsive and haunting conditions of the workers on the first disassembly lines were first described by Upton Sinclair in his 'muckraking' novel *The Jungle* (1906: 316-317). The psychological impacts were also central to Sinclair's novel. The story's protagonist, Jurgis, reflects on the pigs that are slaughtered:

And yet somehow the most matter-of-fact person could not help thinking of the hogs; they were so innocent, they came so very trustingly; and they were so very human in their protests—and so perfectly within their rights! ... Now and then a visitor wept, to be sure; but this slaughtering machine ran on, visitors or no visitors. It was like some horrible crime committed in a dungeon, all unseen and unheeded, buried out of sight and memory. One could not stand and watch very long without becoming philosophical, without beginning to deal in symbols and similes, and to hear the hogsqueal of the universe (Sinclair 1906: 41).

Animal slaughter became systematized, wrenched from previous bonds of space and time. In Cronon's words, "geography no longer mattered very much except as a problem in management; time had conspired with capital to annihilate space... [a]bstract,

standardized and fungible, their lives were governed as much by the nature of capital as the nature which gave them life” (Cronon 1991: 259).

The first packing houses were rife with cruelty (toward animals and workers) and few measures were taken to ensure the animals were killed quickly and as humanely as possible or that workers were safe. The dramatic simplification, industrialization and commodification of meat production fit into the logic of capitalism and allowed for the expansion of the industry and increased production (Safran Foer 2009:104). The cruelty experienced by animals in factory farms and the terrible working conditions (physically and psychologically) in slaughter houses has been exacerbated rather than improved (Nierenberg 2003: 20). The experiences of workers on the first disassembly lines are not much different than the ones experienced by workers today. Human Rights Watch (2005) found that “the rate of injury in the meat packing industry is three times that of private industry overall, and meat packing as being “the most dangerous factory job in America.” New problems have arisen as well. The high quantities of hormones and antibiotics pumped into animals have serious consequences for people working in close quarters with the animals and for consumers.

The workers in first slaughter houses were often migrant workers or slaves who had left their chains on the country side to embrace their ‘freedom’ and find work under terrible conditions in the stockyards near cities (Sinclair 1906: 317). The same situation rings true in US slaughter houses today, those who are stunning, slicing, and skinning up to four hundred animals an hour are usually poor, immigrant, sometimes undocumented workers with a poor command of English and no union representation, who sustain multiple injuries, which they are encouraged not to report (Tao 2003: 10, Human Rights Watch 2005).

Chinese officials and economists are optimistic about the role that foreign investment will play in providing jobs and alleviating unemployment, but the rapid expansion of intensive factory farms will mean a drastic decrease in the labour necessary for farming; one person can be expected to ‘care’ for 10,000 broilers in an ideal factory farm (Tao 2003: 10). Compounding the problem of surplus labourers and unemployment in Chinese urban centres, the number of new labourers in rural and urban areas is increasing; a large reserve army of workers ensures the complacency of existing workers. The average annual increase from 1995 to 2000 was thirteen million new labourers a year, and this trend is unlikely to change (Tao 2003: 10). In the US there are many injuries and illnesses resulting from poor training and protection in factory farms, these conditions are even more devastating in the majority world where laws for safe working conditions are not as strict (Gouveia and Juska 2002: 376). Illnesses are caused by exposure to high levels of ammonia, hydrogen sulphide, hormones and dust, high quantities of which are characteristic to factory farms. Furthermore, simply the high levels of noise and odour that workers are exposed make for unpleasant working conditions. In slaughterhouses the risk of injury is especially high. For example, in 1997 Maple Leaf Foods initiated a major transition from local or regional facilities to more highly centralized and concentrated plants in a few centres and at the same time aggressively cut wages. At the same time wages were dropping, lines were speeding up as meatpackers increased the

number of animals killed and processed each day. In cold damp conditions, workers are susceptible to numerous injuries as a result: cuts, repetitive strain injuries, soreness due to working in cold, slips and falls, antibiotic resistant infections, exposure to diseases, etc. (Scarth 2003: 2; Human Rights Watch 2005). Deregulation and attacks on unionized labour exacerbate these risks. What I mentioned earlier about capital changing the biorhythms of animals is true for humans too; human rhythms are transformed through deregulation (forced to work longer hours) into ever faster cycles of accumulation.

The poor conditions experienced by workers in factory farms around the world are just part of the impact of industrial agriculture on human bodies. Due to the immense amounts of air and water pollution caused by factory farms, children raised on hog farms have asthma rates exceeding 50 percent and children raised near factory farms are twice as likely to develop asthma. Communities living near factory farms often suffer higher incidence of persistent nosebleeds, earaches, chronic diarrhea, and burning lungs. Given the problems of factory farming, especially the problems of food-borne illnesses, antimicrobial resistance and potential pandemics, the global implications of the growth of factory farming is enormous. The spread of factory farming is linked to a range of infectious food-borne (drug-resistant) pathogens, including *E. coli*, salmonella and listeria (Midkiff 2004; Nierenberg 2005; Weis 2007, Safran Foer 2009:138-141).

Furthermore, as more cows, pigs, and chickens go through the intensive farms to produce meat to satisfy growing demand, the meat industry launches huge public relations campaigns to encourage consumers to eat more meat, drink more milk. The diets of people living in industrialized countries, which include a high proportion of meat and meat products, have been conclusively shown to be a major cause of coronary heart disease and other diseases of the circulatory system (Tao 2003: 9). Simply the health implications of increased meat consumption worldwide are cause for alarm. Further critique of factory farming includes a discussion of the cruelty toward animals.

Animal Bodies

The industrialization and soaring scale of factory farming has polarized agricultural production, rendered land into sewage dumps and the value of animals into nothing more than the price of their consumable parts. In order to reduce the diseases and deviant behaviour caused by confinement, the crowding of factory farms has not be modified, but the instead the animals themselves. The ecological limits are overridden by pharmaceuticals, mechanization and genetic manipulation. For example, antibiotics are used in feed to address the vulnerability of chickens to respiratory and other diseases when housed in such densities and surrounded by so much faecal matter. As a result factory farms contribute substantially to the growth of antimicrobial-resistant pathogens. In the United States 1.5 million kilograms of antibiotics are given to humans every year and more than 10 million kilograms of antibiotics are fed to animals (Safran Foer 2009: 105, 140). Besides a diet of antibiotics, in order that chickens would not hurt each other with their pecking as they struggle in unnatural conditions, a system was devised to rapidly de-beak day-old chicks, which is performed rapidly without anaesthetic

(Nierenberg 2005; Weis 2007:61). Pigs do not have a much better fate. Breeding pigs spend their entire lives impregnated or nursing their piglets in gestation crates (less than two square meters per sow) on floors of grated metal or concrete in which they cannot turn around (Cockburn 1995; Ladd and Edward 2002; Weis 2007). Cockburn (1995: 39) illustrates the nature of industrial pig farming in North Carolina:

Its reeking lagoons surround darkened warehouses of animals trapped in metal crates barely larger than their bodies, tails chopped off, pumped with corn, soybeans and chemicals until, in six months, they weigh about 240 pounds [109 kilograms], at which point they are shipped off to abattoirs to be killed.

Although cows have a slightly better fate, as they are still partially reared on pastures, they are still increasingly industrialized and concentrated in feedlots. Beef cows (as opposed to constantly impregnated dairy cows) are given concentrated feed, which is sometimes full of growth hormones and other industrial by-products, sometimes including parts of other cows (Weis 2007: 67). This can cause a serious public health risk, bovine spongiform encephalopathy (BSE) known as ‘mad cow disease’. This occurs when (herbivorous) cows are given feed containing bonemeal and blood from other cows; when humans eat contaminated beef, they too can be infected with BSE (Midkiff 2004; Weis 2007). The lives of animals are reduced to their value as products, their needs as animals are disregarded, as are concerns for their health (which directly compromises the health of those who eat meat too).

Analytically we can explore the connections between the poor treatment of animals and the poor working conditions as reflections of wider, systemic problems. While a number of commentators (Elster 1985; Benton 1988) have argued that Marx lacked respect for animals, that argument is thoroughly refuted by others chief among them is Wilde (2000). Inherent in capitalism is a contradiction between the forces of production and the relations of production in which the drive to accumulation actually destroys the basis of production itself. Marx cites the plight of the working class and describes how the satisfaction of humans’ most basic needs, which we share with other animals, are frequently denied to workers in capitalism (Wilde 2000: 45). For example, “the dwelling in light, recognized by Prometheus as one of the greatest boons to humanity, is no longer available for the worker; ‘light, air, etc. – the simplest animal cleanliness – ceases to be a need for man’” (Marx 1975: 307 quoted in Wilde 2000). Furthermore the disregard of human needs in capitalist relations is systematically reproduced toward animal needs too. As explained in *Capital* the capitalist mode of production strips individuals their freedom to exercise the creative power which defines their humanity (Marx 1976a: 334). So too does factory farming deny animals their need for light, air, a varied diet, the freedom to roam and companionship; denying animals their ‘nature’. Marx demonstrates in *The German Ideology* that the needs humans share with animals are brutally disregarded. Marx provides examples in which the development of modern production methods prevents animals from meeting their essential needs, stating that:

The ‘essence’ of the freshwater fish is the water of a river. But the latter ceases to be the ‘essence’ of the fish and is no longer a suitable medium of existence as soon as the river is made to serve industry, as soon as it is polluted by dyes and other

waste products and navigated by steamboats, or as soon as its water is diverted into canals where simple drainage can deprive the fish of its medium of existence (Marx 1976b: 58 quoted in Wilde 2000: 46).

In other words, the essence of animals and the essence of human beings are transformed historically and socially by the means and relations of production. Factory farming does just that, it is a set of processes which alter the physical forms of animals, through confinement, cruelty, concentrated feed and the very biological make up and rhythms, first through hormones and now through genetic engineering. By examining these forms of domination that have been neutralized in our society, we begin to see other forms of domination too. Whether we look at the cruelty toward animals, or racism experienced by immigrant workers, we can see that domination is “not merely an artefact of human society, but rather, it is a set of historical relations used to benefit one class or group over another” (Torres 2007: 4). Animals are exploited as commodities as humans are exploited as labour power. We have yet to discuss the exploitation of entire ecosystems – a process so inherently bound up in industrial agriculture. Essentially, this discussion serves to do two things. First, to recognize that we as humans are part of nature (and the exploitation of it) and therefore we have the unique ability to reconstruct our relationship with it (change is possible) and second, to bring China into the discussion because Asia, whose global consumer class is larger than that of North America and Europe combined, is leading the livestock revolution (McMichael 2005: 289).

Chinese Food

The leader in the Asian livestock revolution is China. China has become ‘capital’s salvation’ (Muldavin 1996: 228) and an important model for the global South. It represents a vast new market; a place to invest surplus capital, a huge labour pool to discipline workers, and a powerful industrial system and diversified agricultural economy (Muldavin 1996: 228; Fuller 2002). Due in part to its ‘development success’ per capita meat and dairy consumption in China has more than doubled over the past two decades and is expected to reach the levels of industrialized countries by 2020 (Tao 2003: 3; Trihn et al. 2006: 5; Weis 2007: 18,). In 2005, China consumed more meat than the world’s entire human population did in 1961 (Nierenberg 2005). These trends will have important implications in terms of environmental impacts and long-term sustainability (Muldavin 1996: 229). First, in order to understand these trends, we must ask what drives this increase of meat consumption in China and second, and more importantly, what are the material and symbolic implications of this shift?

There are three main factors that have triggered this rising demand for meat in China. First, China’s membership in the WTO in 2001 resulted in various trade liberalization measures, including cutting tariffs on the sale of US meat products including cutting tariffs on the sale of US meat products and especially important was the access to soybean exports coming from the US, Argentina and, most notably, Brazil. While agricultural trade remains the center of political controversy in the WTO, it operates by trade rules that favour the expansion of the global food regime (McMichael 2005: 267).

The WTO is just one of a series of international mechanisms that discipline states and pull them into the global economy. In the last decade China has shifted from a net exporter of soybeans to the world's largest importer of whole soybeans and oils. I will go into the details of the connections between the industrial meat and the soybean complexes in the following section.

Second, rising incomes among China's growing middle class have fuelled the appetite for meat and other animal products, particularly dairy. In the post World War II era when Western Europe and North America experienced rapid economic growth, there was a dramatic increase in the factory farmed production and increased consumption of meat. At that time, the population of the North American and Western Europe was 400 million and the increased production and consumption took place over decades, whereas China's 1.2 billion people are experiencing an unprecedented expansion of their economy in the past two decades (Fuller 2000; Fan 2002; Tao 2003: 3). The pull from the cities is not nearly as strong as the push from the countryside, but in any case, urbanization is on the rise. The massive expansion of the Chinese economy is driving and is being driven by the enormous rural-urban migration. Eight hundred million people still live in rural China, but (with further dismantling of farm collectives and rural livelihoods) it is predicted that over the next fifteen years, 250 million peasants will move to urban centres (Harris 2005:10). The process of proletarianization of the Chinese peasants means that more food will need to be factory farmed and more factory farming will lead to further displacement of peasants.

The cyclical process of proletarianization coupled with an industrial revolution, cheap soybeans and rising incomes account in a large part for the rising production and consumption of factory farmed meat in China. A third significant factor contributing to rising meat consumption is the proliferation of fast food restaurants in China. In 2000, the State Administration of Internal Trade announced that China's fast food industry had grown more than twenty percent in the previous year, with annual sales of roughly USD 9 billion. Most fast food restaurants either are American franchises or resemble Western-style chains. The fast food industry has yet to yield the kind of control over the population and meat production in China that it has in the United States, but even without that control by 2003 the number of cows and chickens slaughtered has already caught up to US levels (Tao 2003: 4). Two thirds of the global expansion of meat consumption is in the global South, sourced with Brazilian soybeans, and is predicted to accelerate (Solot 2006: 41; Trihn et al. 2006:5). This acceleration and shift toward higher meat consumption is met with an increase of factory farming. The ecological implications, as well as impacts on health, economic and social factors associated with factory farming in China are tremendous.

In 1980s Chinese businesses begun constructing large mechanized feeding operations outside of major cities and already the ecological implications are becoming apparent. At the end of the 1990s over 600 pig slaughterhouses were opened outside of Beijing and some farms raised more than 250,000 pigs in buildings six stories high (Tao 2003:5). Six stories high. Here it is clear that in attempt to improve efficiency the logic of capital seems to have become illogical. The frightening irrationality of rationality is evident in

this effort to essentially take the nature out of nature. The logic of accumulation has determined that farmers should go to any lengths to make products fatter, faster and cheaper. The natural laws are completely disregarded wreaking havoc on animals, humans and ecological foundations of production.

The increase of factory farming in China was corporate-led and imbedded in the ecological and political narrative of neoliberalism. The US had a major influence in the expansion of factory farms in China. The capitalist accumulation model is based on foreign direct investment, transnationalized assembly lines, global labour stratification and the free flow of capital multilateral institutions developing common rules on trade, finance and investments (Harris 2005: 8). These processes are occurring in China absorbing a traditionally state-led economy into the global capitalist system. Throughout the 1990s individual US states conducted trade missions to China. For example, Nebraska's 1999 trade mission included participating delegates such as the Executive Vice President of Nebraska Cattlemen; the Chairman and CEO of Behlen Manufacturing, a company that markets livestock and agricultural systems; the President of Sand Livestock Systems, a company that prides itself on "confinement swine systems" and the *McDonaldized* approach to production" (Tao 2003: 4). Further international efforts have supported this transformation as well, in November 1999, the World Bank approved a 93.5 million US dollar loan to "improve smallholder cattle production" and develop over one hundred cattle feedlots and high-tech slaughterhouses (Fuller 2000; Fan 2002; Tao 2003: 4). Beyond monetary gains or losses, the material asymmetries in the flows of ecological and biophysical resources must be measured by looking at the social and ecological consequences. The contradictions of decollectivization have already led to deepening social polarization in China and the environmental problems resulting from increased factory farm force us to challenge the notion of 'success' and 'development' (Muldavin 1996: 227). Analyzing the ecological effects of factory farming includes situating the empirical transformations theoretically in conversation with political ecology.

8. Material Impacts of Factory Farming

Ecological Imperialism

The modest economic contribution of factory farming to world GDP is in stark contrast to the ecological, health and social damage caused by this sector of industrial agriculture (Silverstein 1999; Mallin 2000; Ladd and Edward 2002; Midkiff 2004; WorldWatch 2004; Nierenberg 2005, 2006; Weis 2007; Safran Foer 2009). When taken together, these impacts can help to understand the fundamental unsustainability of industrial agriculture and capitalism in general. The aim here is to highlight the contradictions between the forces of production and the relations of production, in order to understand how the drive to accumulation actually destroys the very basis of production itself (O'Connor 1998). Essentially, factory farming is fundamentally an effort to graph capitalist logic onto animal bodies and to accumulate wealth by producing more animals in less time and

space. Moore (2000) explains that the defining feature of capitalist agriculture is “the radical simplification of the natural ecological order” (Worster 1990: 1101). This radical simplification of nature is illustrated in the example of factory farming. I will now look at the particular ecological implications of factory farming to reflect the deeper unsustainability of neoliberal accumulation.

Unequal Development

A common criticism made by vegans and factory farmers alike is the simple inefficiency of animals to convert (expensive) feed into (profitable) meat (Weis 2007, Patel 2008). Some agronomists have calculated that the ratio of feed to meat is approximately twenty to one (Tao 2003: 8). This number depends of course on the protein content of the feed and species of animal. Other, more modest calculations show that on average, factory farmed animals fed a diet of grain and silage produce only one megajoule of meat for every three megajoule of grain eaten. Besides feed, it takes on average 28 calories of fossil fuel energy to produce one calorie of meat protein for human consumption, whereas it takes only 3.3 calories of fossil-fuel energy to produce one calorie of protein from grain for human consumption. Agribusiness has attempted to fix this ‘inefficiency’ by increasing the protein content in livestock feed (not to mention growth hormones) to increase profit as animal weight gains increases (Solot 2006: 41).

The problem is that, regardless of the efforts by agribusiness to change animals into cheaper meat producing machines, the more meat people eat, the more cereals and grains are diverted for animal feed (Solot 2006; Weis 2007; Safran Foer 2009). Today 72 percent of all cereals consumed in industrialized countries are consumed by animals. In ‘developing’ countries the pattern is inverted, with 74 percent of all cereal still being directly consumed by humans (Solot 2006). The acceleration of animal consumption globally means two things in this context. First that more land and water will be funnelled into an already inefficient and polluting system – exacerbating ecological degradation, and second, that part of the 74 percent of cereals consumed by humans in the global South will begin to be fed to animals, raising concern for the world’s already food insecure and malnourished populations. Between 1990 and 2003, levels of soybean meal used for feed purposes rose from 1.03 million tons to 19.6 million tons per year, an annual growth rate of over 25 percent. For comparison, use of corn for feed grew only 4.1 percent per year over the same period (Solot 2006: 41). If the acceleration of animal consumption continues at the present rates, by 2050, the world’s livestock will consume as much food as four billion people (Ilea 2009). The ecological implications of the entailing exploitation of the environment based on unequal exchange will be devastating.

Brazil

The global economy, driven by the interests of relatively few agribusinesses, has invested in this discrepancy to direct the flow of grains and cereals from the South to North (Weis 2007: 17). The case of Brazilian soybean production is paramount in illustrating the

radical industrialization of agrarian landscapes in the periphery to meet the needs to rising demand for animal feed in the centre, as well as growing demands in the semi-periphery, notably China.

China's shift towards more meat-intensive diets has turned it into a net grain importer, with increased feedstock import dependence likely in the future (Weis 2007: 28). In 1996 China became a net importer of soybeans and today they import almost forty percent of the world's soy (Trihn et al. 2006: 5). Only 16 percent of the Chinese's diets come from animal products and already China imports forty percent of the world's soy. To meet the increased demand from China for soymeal, soybean exporting has more than doubled since 1990, dominated almost exclusively by the United States, Brazil and Argentina (Weis 2007: 22). Together, those three countries account for over 45 percent of world soybean exports. Brazil and Argentina account for more than half of China's total soybean imports and close to 20 percent of China's meat imports as well (Trihn et al. 2006: 9). Between 1999 and 2004, China's imports of soybeans from Argentina and Brazil showed a ten-fold increase from USD 360 million to USD 3.6 billion. In 2003 China imported 21 million tons of soybeans, 10 percent of world production and 83 percent more than it imported in 2002; 29 percent of this soy came from Brazil (Nepstad et al. 2006: 1598).

The meat-industrial complex highlights the transnational character of the global food system and world development. Brazil is clearly a major player in the world of agribusiness, especially for soy (and more recently for the production of ethanol). This does not necessarily translate to improved livelihoods for Brazilians. In the 1990s foreign direct investment (characteristic of neoliberal globalization) led to an increase of foreign ownership in all of Brazil's agriculture export sectors, except coffee (Harvey 2005). Internationalization projects, promoted by the World Bank and IMF, increased the share of foreign ownership: for soy, from 30 percent to 48 percent; for pork, from 11 to 40; for poultry, from 8 to 34 (Jank et al. 2001: 365). The soy industry in particular has experienced rapid concentration since 1995 because of the acquisition of 12 large domestic firms, with substantial unused capacity, by four multinationals (Bunge, Dreyfus, ADM, and Cargill) (Jank et al. 2001: 369). The consolidation of power into the hands of so few transnational corporations reflects the neoliberal character of the meat-industrial complex. While the internationalization and corporate control of agribusiness is alarming in itself, and reflects global capitalist expansion through neoliberal policy packages, my focus will now return to the ecological impacts of soy production.

The Amazon and other sensitive ecosystems in Brazil are increasingly responsive to international markets. Soybean production and cattle grazing are replacing native forests and destroying soil fertility (Nepstad et al. 2006: 1596). Agro-industrial soy production is a recent development in Brazil. The leading cause of deforestation in the 1970s to the 1990s was the expansion of cattle ranching in Brazil (Friedberger 1994, Cockburn 1995, Weis 2007). Soy expansion on a large scale did not start until the 1990s, and as I mentioned earlier, it was not independent from cattle ranching and a shift to more protein intensive diets. In Brazil, low land prices and a growing demand for soy products globally, coupled with the fact that new varieties of soybeans were being developed

which tolerated the moist, hot Amazon climate, major soy companies invested in the south-eastern Amazonia in droves (Nepstad et al. 2006: 1598). As a result, the production of soybeans in the closed-canopy forest region of the Amazon increased 15% per year from 1999 to 2004 (Nepstad et al. 2006: 1597-98). Fearnside argues that soybeans represent a recent and powerful threat to biodiversity in Brazil because “soybeans are much more damaging than other crops because they justify massive transportation infrastructure projects that unleash a chain of events leading to destruction of natural habitats over wide areas in addition to what is directly cultivated for soybeans” (Fearnside 2001: 23). Biodiversity has been an essential factor for maintaining systems of agriculture for hundreds of years. The industrialization of agriculture and promotion of monocultures in Brazil has led to the loss of biodiversity resulting in the elimination of natural enemies to pests, chemical contamination of the soil and ground water, and destruction of natural control mechanisms (Altieri 2002: 198). The land degradation so often associated with soybean production goes beyond the harm the plants and pesticides have on the soil. Highway paving also leads to deforestation by improving access to vast areas of unclaimed (or loosely claimed) land along the highways. Built infrastructure, promoted by private investments, has stimulated soy expansion and includes the development of several deep water ports which fosters incentives to expand highways to connect the ports to the farms (see Harvey on Spatial Fixes in 2001).

Nearly one-third of the land surface of the planet is used for grazing and another third of all arable land is used for feed crop cultivation (FAO 2002: Chapter 3). Taken together, land use for livestock (including grazing land and cropland for feed and fodder) accounts to 70 percent of all agricultural land (FAO 2002: 272). Both intensive feed production and cattle ranching are associated with various forms of land degradation, as mentioned above. All of these problems of land degradation and loss of biodiversity are symptoms of larger trends of agro-industrial expansion. They are problems which are deeply rooted in the economic and political domination of the rural development agenda by agribusinesses (Altieri 2002: 198). Agribusinesses have thrived and as demand continues to rise in China for soybeans ecological destruction will continue and peasants will continue to be forced off their land in order to grow crops for export.

Industrial soy production and the network of export processes are rife with ecological consequences and still we are only at the starting point of a long commodity chain. Situated in the Brazilian context, soy production processes are part of a global system of farm animal production and consumption. Once the soy has been harvested and exported it eventually arrives in feedlots or CAFOs in the industrialized North and China’s new factory farms. Globally 55 billion factory farmed animals are slaughtered every year (FAO 2006; Weis 2007; Safran Foer 2009). 55 billion. It may take a lot of imagination to visualize the logistics of six story high buildings housing pigs, or how much food and water is consumed by 55 billion animals, but it does not take much imagination to imagine the smell.

Waste Lands

When people talk about the ecological impacts of industrial meat production, the problem that anyone living close to a factory farm will point to first is quite simple: massive amounts of manure. The typical pig factory in the United States will produce 3.3 million kilograms of manure annually, a typical broiler facility will produce 3 million kilograms, a typical cattle feedlot 154 million kilograms, millions of kilograms of manure which is increasingly difficult to contain (USDA 2009). The volume is so great that more than three quarters of it cannot be recycled into nearby fields. Despite efforts to contain the rest in massive cesspools, much of it end up seeping into rivers, lakes, and oceans – killing wildlife and polluting air, water and land in ways that are devastating to human health and ecosystems (USDA 2009 Statistics). Farmed animals in the United States produce 130 times as much waste as the human population, and the polluting strength of this manure is 160 times greater than raw municipal sewage (Weis 2007:34). One hog megafarm in Milford Valley, Utah, allegedly produces more sewage than the city of Los Angeles (Davis 2005:84)! The depletion of soils and deforestation associated with soy production takes place far from the offices of agribusinesses, just as the overexploitation of water and manure cesspools associated with hog farming contaminate rural communities, while the concentration of population and development take place in urban areas. Pollution and general depletion of nature is a result of uneven development (O'Connor 1989:3). Uneven development for O'Connor is the exploitative relationship between town and country (centre/periphery; developed/underdeveloped country), which is the basis for the reproduction of global capitalism (1989:3). The concentration of agriculture, material extraction and accumulation of waste and pollution in periphery areas does not translate into the same industrial production, commerce and development in the centre. This is an example of a metabolic rift, an unbalance in the basic 'metabolism' between people and nature, town and country side (O'Connor 1989). The division and even distance between the town and country side also limits the ability of workers to organize and further separates (shelters) the majority of humans who live in urban areas from the processes of food production.

If the sheer quantity of waste is not worrisome enough, then we need to think about what is *in* this waste too. Writing about Smithfield, the largest pork producer in the United States, Tietz lists the harmful substances often found in pig manure: "ammonia, methane, hydrogen sulphide, carbon monoxide, cyanide, phosphorous, nitrates, heavy metals... [and] more than one hundred microbial pathogens that can make humans sick, including salmonella, cryptosporidium and streptococci" (Tietz quoted in Safran Foer 2009: 175). It is no wonder that people living near hog farms have high asthma rates and are increasingly ill. These costs are 'externalities' which burdens the public, not the profit. Without passing these costs on, the profitability and efficiency of the factory farming system is negligible. To illustrate how destructive the waste can be, consider an example from North Carolina. In 1990 a hurricane hit North Carolina, a national leader in factory farmed pigs, causing 159 million litres of animal waste to end up in the state's water ways killing an estimated 10 million fish. The amount of waste was three times more volume than the oil spilled by the *Exxon Valdez*, one of the worst environmental disasters in US history (Mallin 2000; Weis 2007:34). Besides the water pollution caused by the actual manure, animal production requires exuberant amounts of water for irrigating pastures and cropland for feed production, water for animals to drink, for 'processing'

and cleaning the slaughter facilities. Growing feed for livestock also leads to the depletion of water. Almost half of the water consumed in the United States in 1992 was used to grow feed for livestock (Safran Foer 2009).

Wasting Water

The water that goes into the factory farming system is fresh water but the water that comes out is not. One slaughterhouse in Hong Kong, for example, generates five million liters of water waste a day (Nierenberg 2005: 27). In China, while animal products only account for 16 percent of the Chinese diet, farmed animals account for more than 50 percent of China's fresh water consumption (Tao 2003: 8; FAO 2006: 273; Safran Foer 2009: 262). While some of the most successful legal battles against pig farming in the US have focused on the pollution caused by waste, very few laws are in place to protect people from the air, water and land pollution from factory farms in China. In fact, the State Environment Protection Administration (SEPA), China's environmental protection authority, reports that the 14,000 large and medium-sized farms in China have become a major source of pollution and that farm animals produced 1.7 billion tons of excrement in 1995, most of it dumped into the environment without any type of processing (Tao 2003: 9).

If the US, a country with relatively strict environmental standards, has enormous pollution problems from seepage and run-off, national standards in China will have major problems controlling the pollution caused by livestock production. For example, *dead zones*, acknowledged by the World Bank to be "one of China's gravest environmental woes," are in urgent need of attention (Tao 2003: 9). Initially, chemical fertilizers were considered a revolution to Chinese farmers who went from difficult manual labour to lives of relative ease (if they kept their farms). The success came at a high price. Chemical fertilizer led to higher outputs which made for wealthier farmers. Wealthier farmers increase their meat intake, contributing to the growth of huge livestock farms. Factory farms create huge amounts of waste, undermining the ecosystems that supported the 'revolution' to start with. Pig and chicken farms in central China whose waste feeds into the Yangtze delta, produce 40 times more nitrogen than all of the region's industrial factories combined. This livestock waste and the Green Revolution have resulted in huge amounts of nitrogen runoff, creating red algal blooms that consume most of the oxygen in parts of the Yangtze delta, making it unliveable for aquatic life (Tao 2003: 9). Toxic red tides, south of the Yangtze delta in Hangzhou Bay are chronic, and the government estimates that over a three-year period red tides have done USD 240 million worth of damage to the Chinese economy (Tao 2003: 9). Not in this calculation is the priceless damage to the health of ecosystems, humans, fish and animals. To summarize, factory farming is a leading source of water pollution and a major contributor to water depletion. At a time when fresh water shortages are already a cause for global concern, this discussion could not be more relevant.

Air Pollution

To make matters worse, not only are land and water highly polluted by factory farming, the livestock sector is one of the largest sources of greenhouse gases, including a contribution to climate change of: 18 percent in CO₂ equivalent, 9 percent in CO₂ emissions, 37 percent methane emissions and 65 percent in nitrous oxide emissions (FAO 2006: 267). Animal agriculture generates about 1.4 percent of the world's GDP, but constitutes total of 18 percent of the global warming effect (FAO 2006: 272). This is a 40 percent greater contribution to global warming than all transportation combined, and accounts for the number one cause of climate change (Midkiff 2004; Nierenberg 2006; FAO 2006: 272; Weis 2007). The air pollution is caused by a variety of processes associated with factory farming including: processes of converting forested areas to crop land and pasture, use of chemical fertilizers, fossil fuel consumption used in the production and transportation of feed crops, gases emitted from animals and their waste, fossil fuel consumption used for housing animals, transporting animals to slaughter facilities and transporting animal products to supermarkets and refrigeration. With these ecological consequences in mind, the global implication of the expansion of factory farming is tremendously terrifying. Furthermore, the thread that leads us from Brazilian soybeans to the pigs, chickens and cows in factory farms, to the refrigerated packages of beef, burgers, bacon and eggs in Chinese grocery stores is not the end of the story.

9. Symbolic Implications

While it is important to look at how our food choices affect ecosystems, this focus alone is too narrow for two main reasons. First, to talk about food production together with the environment leaves out the significant cultural, gendered and philosophical implications of food and second, the nature/society separation is itself problematic.

Let us recall that 'technology' is a cultural concept and therefore technological changes in production operate along material strategies but also along cultural assumptions of efficiency. Since my aim is to bridge the gap between universal tendencies and practical experiences in order to highlight the unsustainability of global capitalism, to do so by looking solely at the ecological degradation would be to rob the argument of many other realms of discussion. These different areas of discussion are complex and so I outline some of the basic ideas here with the aim of opening up spaces for further research.

The dominant values of the global food system are informed less by the laws of nature (seasons, cycles, etc.) and increasingly by the logic of capital as we have seen by rehearsing the history of industrial farm animal production. The dominant values informing the human experience with food are also deeply imbedded in cultural processes. Essentially, nature (whether plants or animals) must be tamed, transformed and reinterpreted by humans in order to become food. All of these processes are culturally specific and often gendered, and have particular impacts on the bodies and minds of humans. Food is cultural when it is produced, prepared and when it is eaten

(Montanari 2004). When people travel to different places, they often marvel (sometimes in fascination, sometimes in disgust) at the very different ways people produce, prepare and eat food in different parts of the world. Take dogs for example, while it is legal to eat dogs in most parts of North America, even the most enthusiastic meat eater will not eat dogs. It is simply taboo to eat ‘man’s best friend’ in Canada and the United States and perfectly normal to eat cows, however, Koreans sometimes eat dogs, and Indians never eat cows. George Orwell was writing a much different story in *Animal Farm*, but his words fit well here: “All animals are equal, but some animals are more equal than others”. It is not only nature that dictates what we eat, but the cultural understandings we have about nature. Therefore, it is worth repeating the saying that *food must not only be good to eat but it must also be good for the mind*.

As I mentioned earlier, human bodies are part of the environment. Not only to humans embody industrial consciousness, adopt mechanistic views of nature and transform into appendages of the machines we use to produce our material life, humans also embody industrialization biologically by the food we eat (Mander 2002: 18, Marx 1976a). The health impacts of factory farming have been central in recent years with the raising awareness of diseases. Warnings of E.Coli poisoning, mad cow disease, avian flu and recently the H1N1 flu reflect the vulnerability of humans to animal diseases and the dangers of mass production. For example, the 2003 avian flu outbreak in China killed more than 100 people in just one week and over one million chickens were slaughtered in an attempt to contain the disease (Davis 2005: 94). Smaller outbreaks occurred in chickens and pigs in the Netherlands, Thailand, and the United States and a related virus strain triggered a Severe Acute Respiratory Syndrome (SARS) outbreak in 26 countries, leaving 916 deaths in its wake. Davis explains how the world’s increasing demand for animal protein, burgeoning human and animal populations, freedom of travel, and globalization of poultry production may lead to another international pandemic (2005: 91).

It is clear that serious health risks (for humans and animals) are associated with industrial meat production. Factory farming causes an abundance of health concerns in itself, but furthermore, the homogenization of urban diets toward fast food and convenience foods have health implications too. As diets converge on a narrowing base of staple grains, increasing consumption of animal protein, edible oils, salt and sugar, and declining dietary fibre, and as consumption of brand name processed and store-bought foods rises, there is an increasing prevalence of dietary diseases and obesity (McMichael 2005: 288).

The discussion of bodies in relation to agriculture, if it takes place at all, often ends with a conversation about public health. The concerns are often the impact of industrial food on the consumer, or the perhaps the working conditions in slaughterhouses and maybe the displacement of families and farmers caused by enclosures. Although these questions are important, I want to stress, if only in passing, the importance of the biopolitics of the meat-industrial complex. The hearty meat eating that characterizes American diets is celebrated as an expression of development and a symbol of power. ‘Western’ food habits prevail and are endorsed by the modern food system and global media cultures. Adams’ (1990) seminal text *The Sexual Politics of Meat: A Feminist-Vegetarian Critical*

Theory examines how systems of oppression intersect with one another and how capitalism, patriarchy, racism and classism converge and are expressed in the oppression and exploitation of animals. While I have argued in this paper for a synthesis between the material and symbolic orders of the meat-industrial complex, a limitation to this study is the absence of gender in my theoretical discussion. Further research could include a feminist analysis into the discourses of development surrounding food systems, industrialization, gender relations in the meat-industrial complex and the body as a place where political power is manifested (see Foucault). The body can be seen as a site of accumulation and also a site of resistance (Harvey 1998). Adams ends her text, stating that “our dietary choices reflect and reinforce our cosmology, our politics,” and I could not agree more.

Consuming Modernity

Escobar explains that the second contradiction of capitalism (O'Connor 1989, 1991) is exacerbated by the ecological crisis and social forms of protest this crisis generates (Escobar 1996: 55). We know that capital operates according to the logic of modern capitalist culture and rationality, but what impact does this tendency have on consumers? Many social theorists (Appadurai 1996; Sassen 1996; Ritzer 1999) have taken this issue up and argue, among other things, that transnational corporations (TNC) are becoming more influential in changing the very social fabric of societies, impacting people's everyday lives (as opposed to the less influential position such corporations had in the past, playing a less influential role than say, the state). In academic literature there is an abundance of arguments that TNCs, McDonalds and the like, are at the forefront of a new form of imperialism, “which has proved to be far more insidious than its militarist antecedents” (Watson 2005: 71). Today, the global fast food industry, grossing USD 110 billion a year in the US alone provides cheap and unhealthy fast foods and convenience foods. The shift to fast food is embedded in social transformations and the complex relations of political economy, but basically, it involves another form of dispossession and opens new spaces of accumulation. Friedmann argues that the global fast food industry is based on the appropriation of home-cooking activities and knowledges (Friedmann 1999). Whereas land appropriation leads to a material dispossession, the logic of capitalist culture promotes further forms of dispossession. Historically, food regimes were instrumental in securing global hegemony by securing specific political economic organization of food production and consumption (Friedmann 1999; McMichael 2005; Moore 2008). The era of neoliberalism has made a distinguishing mark on the current food regime through corporatization and financialization, but also through a new cultural imperialism. Essentially, the informal US empire legitimized through the ‘development project’ and sanctioned by ‘free’ trade agreements, has transformed the production and consumption of food. Symbolically, it is a form of imperialism that by way of fetishizing commodities has sought to homogenize urban diets globally through the fast food industry. It is essential for the maintenance of the meat-industrial complex that the fast food industry remains fetishized. The fast food industry *has* become fetishized to the point that it is maintained at all costs even at the cost of the land, animals and labour that supports it (and us). Packaged and sold as modern, fast and affordable,

the real costs (from displacing rural people in Brazil to the pollution of factory farms) of the fast food industry are hidden.

Looking again at China, the first McDonalds opened in Hong Kong in 1975, and in 1992 in Beijing. Nowadays both cities are teeming with American fast food chains and beverages: Coca-Cola, Starbucks, Pepsi, Pizza Hut and hundreds of KFCs and hundreds of McDonald's restaurants, hundreds (Watson 2005: 70). McDonald's could be the poster child of cultural imperialism. McDonalds today has more than 25,000 outlets in 119 countries (2005) and a new restaurant opens somewhere in the world every 17 hours (Watson 2005: 71). The cultural implications of these changes, in China and throughout the world, are tremendous. When the first fast food restaurants opened in Hong Kong (1975) they were promoted as exotic outposts of American culture for young people ready to forget they lived "in a tiny colony on the rim of Maoist China" (Watson 2005: 72; Yan 2005: 83), and as I see it, American fast food chains were also planting seeds for a homogenized global capitalist consumer culture. A new taste was fostered in the first fast food restaurants in China, taste for Western food, but also a taste for modern society. According to sociologist Pierre Bourdieu (1984), writing about French society, different attitudes toward foods, different ways of eating, and food taste itself all express and define particular structures of class relations. He states that "taste classifies, and it classifies that classifier" (1984: 6). Young people who wanted to be classified as modern could find the classifiers in the golden arches of McDonald's. Indeed, McDonald's and KFC restaurants exuded an exotic, modern image in China, a spectacle of all things clean, mechanized, beautiful, climate-controlled, fun. Customers could (and still can) get an experience or a sense of quality, friendliness, comfort in these manufactured spaces that project American modernity (Yan 2005: 90). Bourdieu describes that people prefer goods, and have the ability to develop tastes for goods and services that express their existing social position or the one they want to be (Bourdieu 1984: 471). In these Chinese cases, by consuming mass-produced Western food and by instilling a taste in their children, people could assume an identity that was modern, advanced, and cosmopolitan. The stronger government efforts to stop a taste for Western foods, and all forms of American pop culture for that matter, from entering China were futile, the more irresistible forbidden films, music, foods and web sites became. The first American fast food restaurants opened in Beijing (in 1992) at a time where the social fabric was already changing. As in other parts of East Asia, the start up of McDonalds and Kentucky Fried Chicken in China corresponds with wide spread urbanization and the emergence of a new class of consumers. In the 1990s more married women in Beijing and Shanghai started working outside the home, which in turn (as experienced in post-WWII North America) affects gender relations, child rearing practices, residence patterns and family constellations. Put briefly, the traditional system of newlyweds living with groom's parents was quickly dying out, even in the Chinese countryside (Watson 2005: 73) and a new Chinese family system emerged which the needs of the married couple and a single child. Quick meals in clean, modern, predictable, child-centered restaurant appeal(ed) to China's busy parents, and today many fast food restaurants are packed with not only busy commuters, families and students, but also handfuls of retirees. While the topic of isolation and China's aging population is beyond the scope of my research, it is cause for consideration that "tens of thousands of retirees roam Hong Kong's air-conditioned

shopping malls, congregate in the handful of overcrowded parks, and turn their local McDonald's during the midmorning hours into a substitute for the public gardens, opera theatres and ancestral halls that sheltered their parents" (Watson 2005: 79). Fast food restaurants have transformed from a symbol of something foreign to a main-stay of urban middle-class culture and replaced a tightly knit social fabric with plastic packaging.

The social ramifications of the fast food industry are dialectic in the sense that American fast food restaurants, while they change the landscape of Chinese cities and Chinese taste, also themselves change. Furthermore, resistance to Western fast food in China did not only come from the government. The explosion of fast food restaurants was seen as an alarming threat to local food industries and the national pride of Chinese culinary culture (Yan 2005: 83). So, on one hand there is a homogenizing effect and spread of American consumer culture, but some theorists have also written about the localization processes and resistance that also take place (Lozada 2005). Indeed, culture is not a static concept, and consumption does not take place in a vacuum. As stressed earlier in this paper, producing and consuming food takes place in particular networks of social relations and historical contexts. With that said, there is without a doubt that the recent increase of meat consumption in China is part of a particular historical context in which the forces of the global food regime and neoliberal expansion are paramount.

Philosophical Implications

The impact of food on human bodies, cultures and gender relations gives a deeper meaning to the old saying, "you are what you eat." To venture out and take it one step further, what we eat also impacts how we think about ourselves as humans. While it is important to emphasize the ecological implications of factory farming, it is equally important to highlight the philosophical implications. Historians, philosophers and literary figures alike, from Franz Kafka to Franz Fanon, Descartes to Derrida, have discussed the relationships between humans and nonhuman animals, humans and machines, animals as machines, etc. and it remains a philosophical (not to mention moral and ethical) issue fraught with debate. Not only is it a historical debate, but the symbolic orders that justify factory farming and eating animals must be understood in concert with the material impacts to see the whole story, which is large than the sum of its parts.

To take up only a couple of threads from these age old debates, I will look at the theme of shame, a concept explored most profoundly in Franz Kafka's fiction. Walter Benjamin (1999) was the most penetrating interpreter of Kafka's animal tales and shame is a crucial concept that Benjamin reads from Kafka's stories. Shame is a concept that is imagined as a unique moral sensibility felt only by humans, something that can be experienced deeply by facing the violence inflicted on animals in the processes of taming, transforming and reinterpreting them as food. Shame is both an intimate emotion – felt in the depths of our inner lives – and, at the same time, social – something we feel strictly when confronted or with others (Benjamin 1999). For Kafka, shame is also a response and a responsibility before invisible others – before "unknown family," to use a phrase from *The Trial*. It is the core experience of the ethical. Benjamin emphasizes that Kafka's ancestors – his

unknown family – include animals. Animals are part of the community in front of which Kafka might blush, a way of saying that they are within Kafka’s sphere of moral concern.

To refer just briefly to Kafka here, is to open space for further research, but also answer questions about how we think of ourselves as humans. Because to talk about animals and shame, is to talk about animals and forgetting. Forgetting in the sense that in order to avoid feeling shame (with the knowledge of violence and cruelty against animals and workers, plus the environmental degradation which is associated with eating factory farmed animals), we must forget our social obligations to others in favour of our immediate gratification. Beyond a literal forgetting of animals by eating them, “animal bodies were, for Kafka, [also] burdened with the forgetting of all those parts of ourselves we want to forget” (Safran Foer 2009: 37). If we wish to deny a part of our nature, we call it our “animal nature.” We then repress or conceal that nature, and yet, as Kafka knew; we sometimes wake up and find ourselves as animals. In other words, we can recognize parts of ourselves in animals – spines, pain receptors, endorphins (that relieve pain), all the familiar pain responses – but then deny that these animal similarities matter, deny that animal suffering matters, and thus we also are denying important parts of our own humanity (Safran Foer 2009: 37). What we forget about animals, we also forget about ourselves. More than 55 billion farmed animals are consumed every year, at stake is not only fresh water, soil, forests and air; nor is eating animals only a question about our ability as humans to respond to sentient life, but also our ability to respond to our own (animal) being. To continue, it is not only a war between us and them, but between us and us. Derrida reflects that it is:

An unequal struggle, a war (whose inequality could one day be reversed) being waged between, on the one hand, those who violate not only animal life but even and also this sentiment of compassion, and, on the other hand, those who appeal for an irrefutable testimony to this pity.

War is being waged over the matter of pity. This war is probably ageless but ... it is passing through a critical phase. We are passing through that phase, and it passes through us. To think the war we find ourselves waging is not only a duty, a responsibility, an obligation, it is also a necessity, a constraint that, like it or not, directly or indirectly, no one can escape ... The animal looks at us, and we are naked before it (Derrida 2008).

Whether we respond by changing our lives or doing nothing, we have responded. To do nothing is to do something. This choice between action and inaction extends to areas far beyond looking away from animals, from our plate or ourselves. As people living in this day and age, where information about the ills of the world are available to many of us, especially those living in the North, making informed choices in our daily lives is the least we can do.

Nature/Society Divide

The dichotomy between humans and the rest of nature is highly problematic and in the last few decades, industrial agriculture has further severed the link between farming and

the environment. Through processes of commodity fetishism and the globalization of the global food system, we have forgotten about the complexities of what we eat. We have very little idea about where our food comes from, who produces it and how it is processed? The information is there, but it is often hidden behind a thick veil of romantic farm imagery. To return to the ideas in the beginning of the paper, the tools of political ecology encourage us to critically examine this artificial separation between humans and the rest of nature. It is important to understand how we have become so far removed from how and where our food is produced in order to defetishize the commodification of nature and look for viable alternatives. Agriculture used to have a central place in communities and local economies, and the best approach to food production was one that was least damaging for the environment. These methods included rotation methods and recycling manure for soil fertility, the rules and norms that dictated production were based on collective management and the laws of nature. Cartesian reductionism and enlightenment change things over centuries. Series of scientific revolutions brought forth mechanistic reductionism, positivist science and agro-ecological revolutions. On one hand, these methods brought great progress and continue to transform our fields and food, but this 'progress' also left a legacy of forgetting and an enduring split in our minds between humans and the rest of nature (Pretty 2002: 7). The persistent dualism that separates humans from animals (and the rest of nature for that matter) is dangerous in a sense that it suggests we can be objective observers rather than acknowledging our part in the system and that we are inevitably bound up in it. By continuing to separate humans and nature, this modernist approach to nature provides solutions that are bound in the same logic and separation.

10. Discussion and Conclusion

With the aim of shaping agriculture in to the logic of capital to meet the needs of accumulation the meat-industrial complex has been successful in producing more meat, milk and eggs from each animal and from each square meter of land than ever before, and requiring less labour than ever before. Agribusinesses have been successful in securing monopoly power for few companies over just about every stage of the food chain and transnational corporations like McDonalds and Kentucky Fried Chicken have never enjoyed such high profits (Mintz 1996; Pretty 2002; Safran Foer 2009).

The success of factory farming to provide cheap meat to the masses in the United States and throughout the global North relies on exploitation of land and labour. This has alarming, and analytically important, implications for the health of animal and human bodies. The severe ecological consequences of factory farming raise important questions about industrial agriculture, global food systems and their sustainability, and force us to challenge the notion its 'success' (Muldavin 1996: 229). The political ecology of food and the meat-industrial complex also extend to the symbolic orders that justify and reproduce these material forms of commodity production.

With the rising the so-called 'new middle classes' across the Global South (Harvey 2005) rising meat consumption is linked not only to the assumed nutritional importance of meat, but also to the class cultures and connotations of affluence (and power) associated with

eating meat. In a very basic way, food security has been defined as the absence of hunger or malnutrition (FAO 2003). The FAO considers a household “food secure” when its occupants do not live in hunger or fear of starvation, whereas, in terms of food, affluence is often associated with the ability to access nutrition beyond the basics and eat according to taste and preference (FAO 2003). Shifts in diet are a result of rising incomes, urbanization and individual preferences, but our food choices do not take place within a vacuum. Despite the illusion of food choices in supermarkets (which are all essentially just reconfigurations of the ‘big six’ food substances), our choices are contained within the contours of the specific interests of agribusinesses and our shifts in diet are driven by the dictates of the global food system (Weis 2007; Patel 2008). Anyone trying to produce and or consume in an alternative way knows only too well the forces they must confront, and agro-food capitalists have proven adept at colonizing such “organic” alternatives.

When confronted with economic and ecological obstacles in the past, capital has been able to restructure the conditions of production by expanding the logic of capital into new geographical frontiers in order to sustain accumulation. While there are efforts to overcome the current unsustainability of monoculture agriculture and factory farming through the expansion of biotech industries and through market solutions, there are already limits to that frontier. Not only is the potential for profit undermined by the high cost of technological fixes there is a rising hesitation among consumers to purchase genetically modified foods (Nierenberg 2006). The ills of factory farming and the global food system’s unsustainability are making their way into popular consciousness through documentaries like *Food Inc.*, *Our Daily Bread*, *We Feed the World*, and through popular authors like Michael Pollan. Furthermore, international peasant movements like Via Campesina and grassroots guerrilla gardening groups are planting alternatives into the cracks of international meetings and urban centres around the world. While the debate about eating animals and worries about mass produced food are older than neoliberalism, it is in the context of the current crisis that people are starting to become more conscious of the connections between the food they consume and wider global contradictions in capitalism.

Rising food prices coupled with the global economic crisis has increased the number of undernourished people in the world to more than one billion (FAO 2009: 8). That same billion people, one fifth of our planet’s population, live on less than one dollar a day (Shaikh 2005: 41). Not only are people unable to access or afford basic food stuffs (let alone meat) the ecological destruction associated with industrial agriculture has led to further food insecurity for many more. The deterioration of the social and ecological conditions are telling signs that the neoliberal promise that ‘a rising tide lifts all boats’ is false. The current contradictions are signs of the opposite. The apparent solution to environmental problems is to offer up another serving of capitalism but in the form of green consumerism, carbon credits, biotechnological solutions etc. But green market solutions and biotechnology only “sustain the current trajectories of accumulation and consumption” rather than challenge them (McMichael 2009: 247). As I mentioned before, capitalism is a crisis-riddled system and it will always try to restructure itself to expand accumulation. ‘Green’ options simply encourage continued consumption under the guise of ‘sustainability’ (albeit ‘conscious’ consumption) it also perpetuates the same

problems it aims to solve without fundamentally questioning distribution and our relationship as humans with the rest of nature. The language of ‘sustainable development’ and ‘green’ solutions avoid questions of power, conflict and inequalities, and tote instead technology as a solution. It is assumed that technology can intervene to reverse the damage caused by the society/nature dualism it is so clearly part of (Pretty 2002: 13). However, there should be a strong aversion to solving problems by more of what caused it in the first place. Industrial agriculture, factory farming above all, draws on no local traditions, it is placeless, inflexible and monoculture. While technology serves to take the nature out of nature it is doubtful that technology will be able to put the pieces back together again, in the unlikely event that there is the will to do so. In the third volume of *Capital* Marx writes about humanity achieving freedom within the realm of natural necessity, “whereby the associated producers govern the interchange with nature in a rational way under conditions most worthy and appropriate for their human nature” (Marx 1976a: 959). What this means is that we fulfill our nature as humans when we realize our potential for social creativity and create a world that is sustainable in the real sense of the word. The logic of accumulation determines that farmers or rather agribusinesses must go to any lengths to increase profitability. As we have seen, these lengths include the complete disregard and violation of natural laws and the needs of humans and animals. Any resistance to cruelty to animals must be coupled with a resistance to the production process that dictates that cruelty (Torres 2007). What is necessary is the development of social and ecologically sustainable forms of production based on small and medium-sized producers and social justice in relations of production. Only then will the knot of social and ecological degradation inherent in capitalism slowly unravel and that lives beyond the realm of necessity can be achieved.

In this thesis I have argued that with tools from critical development theory and political ecology we can gain a deeper understanding of the power, people and products that are involved in producing the food we eat. Once the complex relationships of our social-ecological system are understood, we can see that the unsustainability of the meat-industrial complex is only one example of the failures in our current regime of accumulation. The unsustainability of meat production reflects the unsustainability of capitalism as a whole, the incessant expansion of accumulation has a limit. By looking at the details in different global examples, from food production and consumption to a failing economy and rising social conflicts, we can unpack the current contradictions in capitalism and start to work toward a most social and ecologically-just future.

11. Executive Summary

The overarching focus of this thesis is that development and underdevelopment are closely linked. Confronted with today’s ecological and economic crises I make the argument that by studying the transformations in the global food system, in particular the development of the meat-industrial complex, the transformations of the world economy and the historically developing nature of capital can be understood. By researching the

ecological, health and socio-cultural implications of factory farming, I illustrate that the meat-industrial complex reflects the development of underdevelopment. I do this by looking at the ecologically destructive and unsustainable nature of the modern food system and capitalism in general. Essentially, this thesis is motivated by the fact that industrial meat production has wreaked havoc on the animals, soil, water, workers and human bodies in the United States. This entire package of producing and consuming farmed animals has been exported to China (among other places in the world) raising alarm for the environment, people and animals in China and challenging the notion of 'development'. This raises questions for the rest of the planet too, as increased deforestation of the Brazilian Amazon is directly related to increased soybean production for Chinese import (Hecht 1993). We live in a complex and interrelated modern world-system which is shaped by the endless accumulation of capital (Wallerstein 1979, 2004) illustrated by the meat-industrial complex.

To unpack the complexities of the modern world-system this thesis asks two questions: How have the changing historical conditions of meat production transformed the social and ecological fabric in the US and China? And how are the social and ecological transformations understood within the wider economic and political networks of the meat-industrial complex? My methodological framework employs a world-system analysis and a commodity chain approach to analyze the Chinese example and to illustrate the global nature of animal production and meat consumption. Conceptually, this thesis mobilizes Foster's theory of metabolic rift, O'Connor's theory of the second contradiction of capitalism, and Harvey's "accumulation by dispossession" to account for the socio-ecological contradictions of the meat-industrial complex. In order to make the arguments in my thesis explicit, my main theoretical framework draws on insights informed by political ecology and critical development theory. This theoretical perspective lends itself to the methodology of what McMichael (1990) calls "incorporated comparison." Generally, it blends theory and history in such a way to avoid abstract individuality (eg. perceiving wage, slave, or peasant labor in isolation), and abstract generality (eg. a world market of undifferentiated commodity producers).

With these tools in hand, I analyse the transformations of capitalist agriculture and highlight the accumulation of these transformations in the meat-industrial complex. The purpose of this historical analysis is to highlight that neither the world market nor the relations of production can be treated as isolated phenomena. Rather, these relations and processes of production and exchange should be understood as part of an evolving whole, that of the expanding global food system. From this perspective we are reminded that capitalism *as a concrete historical phenomena* is not identified simply with production for the market, nor is it confined to the wage form of labour (Tomich 1990: 4). The expansion of the global food system includes the expansion of the market and industrialized production, but it also includes bundles of socio-ecological relations.

My intention with this thesis is twofold; first to show how these bundles of socio-ecological relations and the logic of capital have been graphed onto nature, particularly in the last three decades and secondly to highlight the violence involved in this process.

With the aim of shaping agriculture in to the logic of capital to meet the needs of accumulation the meat-industrial complex has been successful in producing more meat, milk and eggs from each animal and from each square meter of land than ever before, and requiring less labour than ever before. Agribusinesses have been successful in securing monopoly power for few companies over just about every stage of the food chain and transnational corporations have never enjoyed such high profits as they do today (Mintz 1996; Pretty 2002; Safran Foer 2009).

The success of factory farming to provide cheap meat, milk and eggs to the masses in the United States and throughout the global North relies on exploitation of land and labour. My analysis explores the material impacts of the meat-industrial complex including a discussion on the mass displacement, tremendous amounts of waste, and finally water, air and land pollution inherent in factory farming. These processes can be understood analytically as expressions of accumulation by dispossession and the metabolic rift. The severe ecological consequences of factory farming raise important questions about industrial agriculture, global food systems and their sustainability and force us to changing the notion of 'development' and its 'success'. The political ecology of food and the meat-industrial complex also extend to the symbolic orders that justify and reproduce these material forms of commodity production. Anyone trying to produce and or consume in an alternative way knows only too well the forces they must confront, and agro-food capitalists have proven adept at colonizing such "organic" alternatives.

When confronted with economic and ecological obstacles in the past, capital has been able to restructure the conditions of production by expanding the logic of capital into new geographical frontiers in order to sustain accumulation. In fact, the first form capital takes in its ecological phase operates according to the modern capitalist culture and rationality (Escobar 1996: 54). This is what O'Connor (1989, 1991) calls "the second contradiction" of capitalism. While there are efforts to overcome the current contradiction and unsustainability of monoculture agriculture and factory farming through the expansion of biotech industries and through market solutions, there are already limits to that frontier. The contradiction between productive forces and production relations is aggravated by ecological crisis and the social protest this crisis generates (Escobar 1996: 55). Not only is the potential for profit undermined by the high cost of technological fixes there is a rising hesitation among consumers to purchase genetically modified foods (Nierenberg 2006). While the debate about eating animals and worries about mass produced food are older than neoliberalism, it is in the context of the current crisis that people are starting to become more conscious of the connections between the food they consume and wider global contradictions in capitalism.

The deterioration of the social and ecological conditions are telling signs that the neoliberal promise that 'a rising tide lifts all boats' is false. The current contradictions are signs of the opposite. The apparent solution to environmental problems is to offer up another serving of capitalism but in the form of green consumerism, carbon credits, biotechnological solutions etc. But green market solutions and biotechnology only "sustain the current trajectories of accumulation and consumption" rather than challenge them (McMichael 2009: 247). The language of 'sustainable development' and 'green'

solutions avoid questions of power, conflict and inequalities, and tote instead technology as a solution. It is assumed that technology can intervene to reverse the damage caused by the society/nature dualism it is so clearly part of (Pretty 2002: 13). However, there should be a strong aversion to solving problems by more of what caused it in the first place. Industrial agriculture, factory farming above all, draws on no local traditions, it is placeless, inflexible and monoculture. While technology serves to take the nature out of nature it is doubtful that technology will be able to put the pieces back together again, in the unlikely event that there is the will to do so. The logic of accumulation determines that farmers or rather agribusinesses must go to any lengths to increase profitability. What is necessary is the development of social and ecologically sustainable forms of production based on small and medium-sized producers and social justice in relations of production. Only then will the knot of social and ecological degradation inherent in capitalism slowly unravel and that lives beyond the realm of necessity can be achieved.

In this thesis I argue that with tools from critical development theory and political ecology we can gain a deeper understanding of the power, people and products that are involved in producing the food we eat. Once the complex relationships of our social-ecological system are understood, we can see that the unsustainability of the meat-industrial complex is only one example of the failures in our current regime of accumulation. The unsustainability of meat production reflects the unsustainability of capitalism as a whole, the incessant expansion of accumulation has a limit. By looking at the details in different global examples, from food production and consumption to a failing economy and rising social conflicts, we can unpack the current contradictions in capitalism and start to work toward a most social and ecologically-just future.

12. Bibliography

- Adams, C. (1990). *The Sexual Politics of Meat: A Feminist-Vegetarian Critical Theory*. New York: Continuum.
- Altieri, M. (2002). "The Ecological Impacts of Industrial Agriculture." in *Fatal Harvest: The Tragedy of Industrial Agriculture*. Eds. A. Kimbrell. Washington: Island Press. 197-200.

- Amin, S. (1976). *Unequal Development: An Essay on the Social Formations of Peripheral Capitalism*. New York: Monthly Review Press.
- Appadurai, A. (1996). *Modernity at Large: Cultural Dimensions of Globalism*. Minneapolis: University of Minnesota Press.
- Benjamin, W. (1999). "Critique of Violence." in *Selected Writings* Volume 1. Trans. E. Jephcott. Eds. M. Bullock and M. Jennings. Cambridge: Harvard University Press. 277-300.
- Benton, T. (1988). "Marxism and Natural Limits: An Ecological Critique and Reconstruction." *New Left Review*. I(178): 51-86.
- Bernstein, H. (2002). "Land Reform: Taking a Long(er) View." *Journal of Agrarian Change*, 2(4): 433-463.
- Bestor, T. C. (2006) "Kaiten-zushi and Konbini: Japanese Food Culture in the Age of Mechanical Reproduction." in *Fast Food/Slow Food: The Cultural Economy of the Global Food System*. Eds. R. Wilk. Lanham: Altamira Press. 115-130.
- Bourdieu, P. (1984). *Distinction: A Social Critique of the Judgment of Taste*. Cambridge: Harvard University Press.
- Boyd, W. (2001). "Making Meat: Science, Technology, and American Poultry Production." *Technology and Culture*. 42 (4): 631-664.
- Clark, B. and J. B. Foster. (2009). "Capitalism in Wonderland." *Monthly Review*. 61(1): 1-18.
- Clark, B. and R. York. (2005). "Carbon Metabolism: Global Capitalism, Climate Change, and the Biospheric Rift." *Theory and Society*. 34: 391-428.
- Cockburn, A. (1995). "A Short, Meat-Oriented History of the World: from Eden to the Mattole." *New Left Review*. 215: 16-42.
- Compa, L. (2005). "Abuses against Workers Taint U.S. Meat and Poultry." *Human Rights Watch*. January 24: <http://www.hrw.org/en/news/2005/01/24/abuses-against-workers-taint-us-meat-and-poultry>
- Cronon, W. (1995). *Uncommon Ground: Toward Reinventing Nature*. New York: W. W. Norton.
- Cronon, W. (1991). *Nature's Metropolis: Chicago and the Great West*. New York: W. W. Norton.

- Crosby, A. (1972). *The Columbian Exchange: Biological and Cultural Consequences of 1492*. Westport CT: Greenwood.
- Crosby, A. (1986). *Ecological Imperialism: The biological expansion of Europe 900-1900*. Cambridge: Cambridge University Press.
- Davis, M. (2005). *The Monster at Our Door: The global Threat of Avian Flu*. New York: The New Press.
- Davis, M. (1986). *Prisoners of the American Dream: Politics and Economy in the History of the U.S. Working Class*. London: Verso.
- Derrida, J. (2008). *The Animal That Therefore I am*. Trans. D. Wills. Ed. M.L. Mallet. New York: Fordham University Press.
- Delgado, C. L. and C. A. Narrod. (2002). "Impact of changing market forces and policies on structural change in the livestock industries of selected Fast-growing Developing Countries." Report to the FAO by IFPRI:
<http://www.fao.org/wairdocs/LEAD/X6115E/x6115e00.htm>
- Delgado, C. L. et al. (1999). "Livestock to 2020 – the next food revolution." Food, Agriculture, and Environment Discussion Paper 28, Washington: *International Food Policy Research Institute*.
- Elster, J. (1985). *Making Sense of Marx*. Cambridge: Cambridge University Press.
- Escobar, A. (1996). "Constructing Nature: Elements for a poststructural political ecology." Ch. 2 in *Liberation Ecologies*. Eds. R. Peets and M. Watts. New York: Routledge. 46-68.
- Escobar, A. (1995). *Encountering Development: The Making and Unmaking of the Third World*. Princeton: Princeton University Press.
- Fan, S. and Zhang, X. (2002) "Production and Productivity Growth in Chinese Agriculture: New National and Regional Measures." *Economic Development and Cultural Change*, 50:819–838.
- Food and Agriculture Organisation (FAO). (2009). *The State of Food Insecurity in the World 2009*. Rome: <ftp://ftp.fao.org/docrep/fao/012/i0876e/i0876e.pdf>
- FAO. (2006). *Livestock's Long Shadow - Environmental Issues and Options*. Rome: <http://www.fao.org/docrep/010/a0701e/a0701e00.HTM>
- FAO. (2004). FAOSTAT Statistical Database, at apps.fao.org
- FAO. (2002). "Meat and Meat Products" *FAO Food Outlook*. October: (4).

- FAO. (2003). *The State of Food Insecurity in the World 2003: Monitoring progress towards the World Food Summit and Millennium Development Goals*. Rome: FAO.
- Fearnside, P. M. (2001). "Soybean cultivation as a threat to the environment in Brazil." *Environmental Conservation*. 28: 23-38.
- Foster, J.B. (2007). "The Imperialist World System: Paul Baran's Political Economy of Growth after Fifty Years." *Monthly Review*. (May):1-16.
- Foster, J. B. (2000). *Marx's Ecology: Materialism and Nature*. New York: Monthly Review Press.
- Foster, J.B. and F. Magdoff. (1998). "Liebig, Marx, and the depletion of soil fertility: Relevance for today's agriculture." *Monthly Review*. 50(3): 32-45.
- Friedberger, M. (1994). "Cattlemen, Consumers, and Beef." *Environmental History Review*. 18 (3): 37-57.
- Friedmann, H. (1993). "The Political Economy of Food: A Global Crisis," *New Left Review*. I (197): 29-57.
- Friedmann, H. (1999). "Remaking 'traditions:' How we eat, what we eat and the changing political economy of food." In: *Women working the NAFTA food chain*. Eds. D. Barndt. Toronto: Second Story Press.
- Fuller, F. et al. (2000). "Reconciling Chinese Meat Production and Consumption Data." *Economic Development and Cultural Change*. 49:23-43.
- Gouveia, L. and A. Juska. (2002). "Taming Nature, Taming Workers: Constructing the Separation between Meat consumption and Meat Production in the US". *Blackwell Publishers*. 42(4): 370-390.
- Frank, A. G. (1966) 'The Development of Underdevelopment.' *Monthly Review* 18(4): 17-31.
- Frank, A. G. (1967). *Capitalism and Underdevelopment in Latin America: Historical Studies of Chile and Brazil*. New York: Monthly Review Press.
- Harris, J. (2005) "Emerging Third World Powers: China, India and Brazil." *Race & Class*. 46(7): 7-27.
- Harvey, D. (2007). "Neoliberalism as Creative Destruction". *The ANNALS of the American Academy of Political Science and Social Science*. 610(21): 22-44.

- Harvey, D. (2005). *A Brief History of Neoliberalism*. Oxford: Oxford University Press.
- Harvey, D. (2003). *The New Imperialism*. Oxford: Oxford University Press.
- Harvey, D. (2001). *Spaces of Capital*. New York: Routledge.
- Harvey, D. (1998). "The body as an accumulation strategy." *Society and Space*. 16: 401-421.
- Harvey, D. (1996). *Justice, Nature, and the Geography of Difference*. Oxford: Blackwell.
- Hecht, S. (1993). "The Logic of Livestock and Deforestation in Amazonia." *BioScience*. 43(10): 687-695.
- Henderson, G. L. (1999). *California and the Fictions of Capital*. Oxford: Oxford University Press.
- Henderson, G. L. (1998). "Nature and Fictitious Capital: The Historical Geography of an Agrarian Question." *Antipode*. 30(2):73-118.
- Hornborg, A. (2009). "Zero-Sum World: Challenges in Conceptualizing Environmental Load Displacement and Ecologically Unequal Exchange in the World-System." *International Journal of Comparative Sociology*. 50(3/4): 237-262.
- Hornborg, A. (2001). "Symbolic technologies: Machines and the Marxian notion of fetishism." *Anthropological Theory*. 1(4): 473-497
- Hornborg, A. (1992). "Machine Fetishism, Value, and the Image of Unlimited Good: Towards a Thermodynamics of Imperialism." *Man*. 27(1): 1-18.
- Ilea, R. C. (2009). "Intensive Livestock Farming: Global Trends, Increased Environmental Concerns, and Ethical Solutions." *Journal of Agricultural Environmental Ethics*. 22: 153-176.
- Jank, M. S. et al. (2001). "Concentration and Internationalization of Brazilian Agribusiness Exporters." *International Food and Agribusiness Management Review*. 2(3/4): 359-374.
- Johnston, R.J. (1996). *Nature, State and Economy: A Political Economy of the Environment*. Chichester: John Wiley.
- Kapoor, I. (2002). "Capitalism, culture, agency: Dependency versus postcolonial theory." *Third World Quarterly*. 23(4):647-664.

- Ladd, A. E. and B. Edward. (2002). "Corporate Swine and capitalist pigs: a decade of environmental injustice and protest in North Carolina." *Social Justice*. 29(3).
- Lozada, E. P. (2005). "Globalized Childhood? Kentucky Fried Chicken in Beijing." Ch. 10 in *The Cultural Politics of Food and Eating: A Reader*. Eds. J. L. Watson and M. I. Caldwell. Malden: Blackwell Publishing. 163-180.
- McMichael, P. (2009). "Contemporary Contradictions of the Global Development Project: geopolitics, global ecology and the development climate." *Third World Quarterly*. 30(1): 247-262.
- McMichael, P. (2005). "Global Development and the Corporate Food Regime." *Research in Rural Sociology and Development*. 11: 269-303.
- McMichael, P. (1990). "Incorporating Comparison within a World-Historical Perspective: An Alternative Comparative Method." *American Sociological Review*. 55(3): 385-397.
- Mackintosh, M. (1992). "Questioning the State." in *Development Policy and Public Action*. Eds. M. Wuyts et al. Oxford: Oxford University Press. 61-89.
- Mallin, M. (2000). "Impacts of industrial animal agriculture on rivers and estuaries." *American Scientist*. 88 (1): 1-26.
- Mander, J. (2002). "Machine Logic: Industrializing Nature and Agriculture." Ch 3 in *Fatal Harvest: The Tragedy of Industrial Agriculture*. Ed. A. Kimbrell. Washington: Island Press. 16-18.
- Marx, K. (1996). *Collected Works*, vol.35. trans. E. & C. Paul. London: Lawrence & Wishart.
- Marx, K. (1976a). *Capital*. Trans. B. Fowkes. New York: Viking.
- Marx, K. (1976b). *Collected Works*, vol.5. trans. E. & C. Paul. Lawrence & Wishart, London.
- Marx, K. (1975). *Collected Works*, vol.3. trans. E. & C. Paul. Lawrence & Wishart, London.
- Martinez-Alier, J. (1987). *Ecological Economics*. Oxford: Basil Blackwell.
- Merchant, C. (1992). *Radical Ecology: The Search for a Livable World*. New York: Routledge.

- Midkiff, K. (2004). *The Meat You Eat: How Corporate Farming Has Endangered America's Food Supply*. New York: St Martin's Press.
- Millennium Ecosystems Assessment (MEA). (2005). *Living Beyond Our Means: Natural Assets and Human Well-being*. MEAT 2005:
<http://www.millenniumassessment.org/en/Reports.aspx#>
- Mintz, S. (2006). "Food at Moderate Speeds" Ch 1 in *Fast Food/Slow Food: The Cultural Economy of the Global Food System*. Eds. R. Wilk. Lanham: Altamira Press. 3-12.
- Montanari, M. (2004). *Food is Culture*. New York: Columbia University Press.
- Moore, J.W. (2010). "End of the Road? Agricultural Revolutions in the Capitalist World-Ecology, 1450-2015." Unpublished paper for the Research Group on World-Ecology. Lund University. 1-60.
- Moore, J.W. (2008). "Ecological Crises and the Agrarian Question in World-Historical Perspective." *Monthly Review*. 60 (6): 54-62.
- Moore, J.W. (2003). "Capitalism as World-Ecology: Braudel and Marx on Environmental History." *Organization & Environment*. 16(4): 431-458.
- Moore, J. W. (2000). "Sugar and the Expansion of the Early Modern World-Economy," *Review* 23(3): 409-433.
- Morelli, Carlo (2008). "Behind the world food crisis," *International Socialism*. 119.
- Muldavin, J.S. (1996). "The Political Ecology of Agrarian Reform in China: The case of Heilongjiang Province." Ch. 11 in *Political Ecologies* Eds. R. Peets and M. Watts. New York: Routledge. 227-259.
- Nepstad et al. (2006). "Globalization of the Amazon Soy and Beef Industries: Opportunities for Conservation." *Conservation Biology*. 20(6):1595-1603.
- Nierenberg, D. (2006) "Rethinking the Global Meat Industry," in Worldwatch Institute's *State of the World*. New York: W.W. Norton.
- Nierenberg, D. (2005). *Happier Meals: Rethinking the Global Meat Industry*. Worldwatch Institute. 171.
- Nierenberg, D. (2003). "Factory Farming in the Developing World." *World Watch Institute*. (May): 1-16.
- O'Connor, J. (1998). "The Second Contradiction of Capitalism" Ch 2 in *Natural Causes: Essays in Ecological Marxism*. New York: Guilford Press. 158-179.

- O'Connor, J. (1989). "Uneven and Combined Development and Ecological Crisis: A Theoretical Introduction." *Race & Class*. 30(3): 1-12.
- Patel, R. (2008). *Stuffed and Starved: Markets, Power and the Hidden Battle for the World's Food System*. New Jersey: Melville House Publishing.
- Peets, R. and M. Watts. (1996). *Liberation Ecologies*. New York: Routledge.
- Potts, J. (2006). "Global Commodity Chain Sustainability Analysis: An analytic framework for assessing ecological impacts of commodity supply chains and appropriate policy responses." *International Institute for Sustainable Development*: http://www.iisd.org/pdf/2007/global_commodity_chain.pdf
- Pretty, J. (2002). *Agri-Culture: Reconnecting People, Land and Nature*. London: Earthscan Publications.
- Prudham, W. S. (2005). *Knock on Wood: Nature as Commodity in Douglas-Fir Country*. New York: Routledge.
- Raikes, P. et al. (2000). *Global Commodity Chain Analysis and the French Filiere Approach: Comparison and Critique*. Copenhagen: Centre for Development Studies.
- Ritzer, G. (1999) *Enchanting a Disenchanted World: Revolutionizing the Means of Consumption*. Thousand Oaks: Pine Forge Press.
- Safran Foer, J. (2009). *Eating Animals*. New York: Little, Brown and Company.
- Sardar, Z. (1999). "Development and the Locations of Eurocentrism." Ch 3. in *Critical Development Theory: Contributions to a New Paradigm*. Eds. R. Munck and D. O'Hearn. London: Zed Books. 44-62.
- Sassen, S. (1996). *Losing Control? Sovereignty in an Age of Globalism*. New York: Columbia University Press.
- Scarth, T. (2003). "Labour Pains in Brandon." *Canadian Centre for Policy Alternatives*. July: 1-2.
- Shaikh, A. (2005). "The Economic Mythology of Neoliberalism." Ch. 4 in *Neoliberalism: A Critical Reader*, Alfredo Saad-Filho (ed.). London: Pluto Press. 41-49.
- Shiva, V. (2000). *Stolen Harvest: The Hijacking of the Global Food Supply*. Cambridge: South End Press.

- Shiva, V. (1989). *Staying Alive: Women, Ecology and Development*. London: Zed Books.
- Silverstein, K. (1999). "Meat Factories: hellish hog plants, lakes of sewage, and lifeless waterways - are cheap bacon-burgers worth it?" *Sierra*. January/February.
- Sinclair, U. (1906). *The Jungle*. New York: Bantam Books.
- Solot, I. B. (2006). "The Chinese Agricultural Policy Trilemma." *Perspectives*. 7(1): 36-46.
- Swyngedouw, E. (2006) "Impossible 'Sustainability' and the Post-Political Condition." Forthcoming in: David Gibbs and Rob Krueger (Eds.) *Sustainable Development*. Guilford Press: New York.
- Tao, B. (2003). "A stitch in time: Addressing the environmental, health, and animal welfare effects of China's expanding meat industry." *Georgetown International Environmental Law Review*. Winter: 1-20.
- Torres, B. (2007). *Making a Killing: The Political Economy of Animal Rights*. Oakland: AK Press.
- Trihn, T. et al. (2006). "China's Commodity Hunger: Implications for Africa and Latin America." China Special. *Deutsche Bank Research*. 13:1-16.
- Tucker, V. (1999). "The Myth of Development: A Critique of a Eurocentric Discourse." Ch 1. in *Critical Development Theory: Contributions to a New Paradigm*. Eds. R. Munck and D. O'Hearn. London: Zed Books. 1-26.
- USDA. (2009). "The Transformation of U.S. Livestock Agriculture: Scale, Efficiency, and Risks." *USDA. Economic Information Bulletin* 43: 1-46.
- Wallerstein, I. (2004). *World-System Analysis: An Introduction*. Durham: Duke University Press.
- Wallerstein, I. (1979). *The Capitalist World Economy*. Cambridge: Cambridge University Press.
- Wallerstein, I. (1974). "The Rise and Future Demise of the World Capitalist System: Concepts for Comparative Analysis." *Comparative Studies in Society and History*. 16:387-415.
- Watson, J. L. (2005). "China's Big Mac Attack" Ch 5. in *The Cultural Politics of Food and Eating: A Reader*. Eds. J. L. Watson and M. I. Caldwell. Malden: Blackwell Publishing. 70-79.

- Weis, T. (2007). *The Global Food Economy: The Battle for the Future of Farming*. London: Zed Books.
- Wilde, L. (2000). “‘The Creatures, too, must become free’: Marx and the Animal/Human Distinction.” *Capital & Class*. Autumn (72): 37-53.
- World Bank. (2007). *World Development Report 2008: Agriculture for Development*. Washington, DC: The World Bank.
- World Watch (2004). “MEAT Now, It's Not Personal!” *World Watch*. 17(4):12-20.
- Worster, D. (1990): “Transformations of the Earth: Toward an Agroecological Perspective in History.” *The Journal of American History*. 76(4): 1087-1106.
- Yan, Y. (2005). “Of Hamburger and Social Space: Consuming McDonald’s in Beijing.” Ch. 6 in *The Cultural Politics of Food and Eating: A Reader*. Eds. J. L. Watson and M. I. Caldwell. Malden: Blackwell Publishing. 80-103.