

Alpenglow: Binghamton University Undergraduate Journal of Research and Creative Activity

Volume 3 | Issue 1

Article 6

4-25-2017

Agriculture, Climate, and Capitalist World-Economy: Rethinking the Global Crisis

Dayne Feehan

Binghamton University, dfeehan1@binghamton.edu

Follow this and additional works at: <https://orb.binghamton.edu/alpenglowjournal>

Recommended Citation

Feehan, D. (2017). Agriculture, Climate, and Capitalist World-Economy: Rethinking the Global Crisis. *Alpenglow: Binghamton University Undergraduate Journal of Research and Creative Activity*, 3(1). Retrieved from <https://orb.binghamton.edu/alpenglowjournal/vol3/iss1/6>

This Academic Paper is brought to you for free and open access by The Open Repository @ Binghamton (The ORB). It has been accepted for inclusion in *Alpenglow: Binghamton University Undergraduate Journal of Research and Creative Activity* by an authorized editor of The Open Repository @ Binghamton (The ORB). For more information, please contact ORB@binghamton.edu.

Abstract

Our relationship with nature has been constantly changing throughout modern history. The ways in which we interact with extra-human natures in order to grow food and build empires has radically and successively transformed since the sixteenth century. With these transformations, the perception of our interactions with extra-human natures has changed as well. The modern perception of Humans versus Nature is challenged with a new ideological framework. This paper introduces the world-ecological framework, which recognizes the relationships of human and extra-human natures as deeply intertwined and dialectical histories. The world-ecological framework is contrasted with the modernist ontology in the debate of naming our current epochal era: Anthropocene versus the Capitalocene. Thinking through the global crisis using the world-ecological framework exposes the influence of capitalism on agriculture and climate. This paper uses the world-ecological framework to examine capitalist agriculture's relationship to climate change as well as illustrate the limits and threats this relationship poses to the capitalist world-ecology.

“So we fix our eyes not on what is seen, but on what is unseen, since what is seen is temporary, but what is unseen is eternal.” – 2 Corinthians 4:18

In this paper, I offer an interpretation of the global crises of capitalism that discusses climate and agriculture using the world-ecological framework. After introducing two contrasting ontologies, the Nature/Society framework and the world-ecological framework, I demonstrate their effectiveness by discussing the Anthropocene versus Capitalocene debate. This discussion allows for a better understanding of how the capitalist world-ecology organizes human and extra-human natures. This, in turn, allows for the global crisis to be understood as being a crisis of capitalism, the causes of which are inextricably linked. Identifying capitalist agriculture and its relationship with climate change highlights the contradictions of capitalism that are relevant to understanding the global crisis and are otherwise unseen in a Nature/Society analysis

Rethinking the Global Crisis: Contrasting Ontologies

The modern world, formed in the sixteenth century, has been shaped by a powerful way of thinking. The Nature/Society Dualism, the modern ideology that separates humans from nature,

has resulted in a division that has dictated the fundamental aspects of understanding the world. The Nature/Society Dualism has allowed for an in-depth focus on particular fields of study, such as technological innovations, scientific discoveries, and an increased awareness of how our actions impact our environment. However, “the alienation of the environment from its producer... stands in the way both of a further development of the sciences... and of the elaboration of rational environmental politics” (Lewontin & Levins, 1997, p. 96). The ideological division of humans and nature has become so vast that fundamental connections have been overlooked.

Nature/Society Dualism views humans, and the work and creations of humans, as separate from the rest of nature (Moore, 2015, p. 19). This dualism gained traction during an era of scientific revolution where nature became an external object that could be studied, beginning with the introduction of the clock. “The application of quantitative methods of thought to the study of nature had its first manifestation in the regular measurement of time” (Mumford, 1934: p. 14). By the fourteenth century in Europe the modern clock had begun to define urban existence. Later, the metric system spread throughout Europe during the eighteenth and nineteenth centuries. As a result, the study of environment has become separated from the study of people. Measuring distance, time, and *productivity* all encouraged a division between the work of man and the work of nature. The metric system aided in the systemic quantification of nature and allowed for standardization (Moore, 2015).

The principal limitation of the Nature/Society dualism is that it fails to highlight dialectical relations between human and extra-human natures. The Nature/Society dualism follows a cause and effect analysis and assigns objects characteristics that are beyond the object’s relationship to other objects, meaning that they function and develop independently. This poses the concept that humans function and develop separately from nature. Underlining the limitation of the

Nature/Society dualism, Werlhalf asks us to imagine where the line between “nature” and “non-nature” could be drawn (Werlhalf, 1988, p. 1). The dualist framework cannot lead to a conclusive analysis of our current global crisis, one of finance, food, energy, and climate (Moore, 2013, p. 1). This “Cartesian dualism” is a systematic rationalization of our universe, turning on the concept that people are independent from nature, which leads to an incomplete view of our place in the world and clouds the central relations of the current global crisis.

Contrary to the Nature/Society framework, the *oikeios* is a term that represents the world-ecological framework, which emphasizes the symbiotic relations of human and extra-human natures. The *oikeios* is founded on the concept that human and extra-human natures are at one point in time produced by *and* producing one another in a dialectical fashion. In the *oikeios*, a classroom, a forest, a city, or a stream are all considered an environment – and all are making environments. The *oikeios* can be depicted as the relations created by a beaver damming up a stream. The beaver, a product of a larger ecosystem, has created the conditions for a sub-ecosystem wherein he becomes both the producer and product (Moore, 2013, p. 7). Furthermore, a construction company creating a large reservoir by damming up a river also constitutes as environment-making. While individuals are able to modify their environments, organizational systems have this ability as well. The world-ecological interpretation of development focuses on the ways in which “nature, including humans, is successively organized...through different environment-making projects” (Marley, 2016, p. 3). Capitalism, through the *oikeios*, is both a producer and produced in the rapid changes of agriculture, geopolitics, and social organization.

Capitalism as world-ecology is the most central environment-making project of modern history. Capitalism as world-ecology refers to the simultaneous double movement of the endless accumulation of capital as well as the endless transformation of the Earth. This concept relates

capitalism's specific and deep involvement in life-making relations throughout the history of the modern world. The world-ecological framework showcases that understanding the relations of capitalism through history portrays a trail of development for our current world. These historical events of man and nature are deeply intertwined, relational histories.

The world-ecological framework allows an inclusive analysis going beyond the scope of traditional Green Thought. While the reigning dualist perspective aims to fragmentize issues into separate and mostly-unrelated categories with little to no cross-referencing, world-ecological thought aims to develop an integrated, dialectical understanding of these issues. The *oikeios* aims to view what is largely unseen by the dualist thought by searching for the integrated connections of development that are fundamental driving forces in the web of life.

Anthropos v. Capital: Understanding the Nature of Our Crises Through Contrasting Ontologies

The leading narrative of the current global crisis is found in the Anthropocene, which reduces capitalist effects to a purely human dynamic. Steffen, Crutzen, and McNell argue that since the introduction of rampant fossil fuel usage during the Industrial Revolution, humans affect the environment in such extreme ways that we have entered into a new era, the "Anthropocene" (2007). The Anthropocene relates the accelerated climate change that has occurred throughout modern history as being a fundamentally human-inspired phenomenon. Their claims of human inspired climate change are supported by 30% to 50% of the planet's land surface being occupied by humans, energy use increasing sixteen-fold in the twentieth century alone, and the CO₂ concentration increasing from 310 ppm to 380 ppm since 1950 (Steffen, Crutzen, McNeill, 2007; Crutzen, 2002). The reduction of humanity to one unified actor overlooks the capitalist relations that, under the interpretation of the world-ecological framework, are the leading cause of the global

climate crisis. The Anthropocene invisibilizes the capitalist relations that have influenced the development of the modern world. Each human is surely not equally responsible for these changes (Cunha, 2015). Climate change is not anthropogenic; it is “sociogenic” (Malm, Andreas, Hornborg, 2014). As a result of their dualist approach, the trio overlooked the social inequity of the causes of the climate change.

Capitalism as an environment-making system created the social, political, and environmental conditions necessary to have reached what is better labeled as the “Capitalocene” (Moore, 2015, p. 173). The contrasting narratives of the Anthropocene and Capitalocene symbolize the ontological differences of Nature/Society Dualism and the world-ecological framework. When approaching the climate issue through the *oikeios*, emphasis is placed on the owners and leaders of large companies (such as Leprino, Tyson, or Exxon) that are responsible for significant ecological restructuring.. These companies have an intimate relationship with extra-human natures, relying on them as sources of value and spaces for disposing waste at little to no economic cost. Tyson, one of the world’s largest multinational meat producers, relies on the unpaid work/energy of the biophysical processes of animals to supply major fast food vendors with their meat. Leprino, the United States’ leading producer of cheese, purchases five to seven percent of the total available milk in the United States, meaning that one in twenty cows provide unpaid work for Leprino’s cheese production (Kaufman, 2012). Companies such as these have much more influence on the relationship of human and extra-human natures, ultimately leading to a greater contribution to climate change. As an inevitable result of the *oikeios*, the Capitalocene and the laborers are inextricably linked. However, the laborers of these companies and the general public’s actions have contributed significantly less to the epochal shift, as they are not the leading organizers of capital. Instead, they must conform to the will of the capitalists and (oftentimes

unknowingly) participate tangentially in ecological restructuring. In the Anthropocene, conversely, capitalists and laborers are equally responsible. The Capitalocene versus Anthropocene argument stands as the poster child of the Nature/Society vs. oikeios argument, to separate or to relate.

Through the oikeios, we can observe the relations of capitalist production and the agents responsible for the climate change. The oikeios emphasizes the moments of production that are invisibilized by the dualist ontology, such as the unpaid work/energy of women, colonies, and the rest of nature, which all come together to produce and be produced by each other in the web of life. As we will discuss below, the continuation of the current world-system is dependent on these moments of production; without them the system would falter, and without a world-ecological approach these relations could not be discussed. The world-ecological framework allows for a dialectical explanation for the causes of the global climate crisis, demonstrating its advantage over the dualist approach.

Highlighting the Significance of Food

Under capitalism, value is generated through the appropriation of the Four Cheaps: labor, food, energy, and raw materials. These “Cheaps” are inputs that come at little to no “market” cost, such as the energy emitted from the sun or the work done by rivers as they flow through their channels (Moore, 2013, p. 17). Cheap Food is central to capital accumulation. The purpose of Cheap Food is to produce as many calories as possible with the least average labor time (Moore, 2013, p. 241). As more unpaid work/energy is used to produce food, the cheaper it becomes. Cheap Food is vital to capital accumulation because of its direct influence on the price labor power. The relationship of Cheap Labor and Cheap Food comes from the concept that “declining price...of food equals

advancing labor productivity equals the rising rate of exploitation” (Moore, 2015, p. 72). As the price of food declines, the cost of the social reproduction of labor also declines, meaning the cost of labor declines. Cheap Labor comes in the form of valued labor, such as work done by a factory worker, and unvalued labor, such as the work done by a mother when raising children. In all of these cases, cheaper food allows for additional value to be extrapolated from the work of the laborer. The history of agriculture underscores key moments of capitalist world ecology as new sources of Cheap Nature are created.

Capitalist agriculture is established with the goal of sustaining and advancing the Cheap Labor / Cheap Food relationship. It is a fundamental part of continuing cycles of capital accumulation. “An ecological approach helps explain why [capitalist] agriculture has had its peculiar social effects as well as its managerial problems” (Worster, 1990, p. 1105). Included in this approach is the examination of the development of capitalist agroecosystems, an ecosystem reorganized for agricultural purposes (Worster, 1990, p. 1093). This analysis uncovers how capitalism as a world-ecology has influenced our relationship with extra-human natures, leading to a global crisis of climate

Pre-capitalist agroecosystems were organized based on a subsistence strategy, with most people growing their own food. The subsistence-based agroecosystems allowed for much of the ecosystems’ diversity to remain intact while preserving social stability (Worster, 1990, p. 1097). Pre-capitalist agricultural methods observed in peasant farming and the concept of “the commons” under feudalism were replaced with elementary capitalist strategies after the introduction of the fence in England during the twelfth century. Fencing created parcels of private property and reduced the availability of the common lands (Patel, 2015). The creation of private property led to primitive accumulation and played a crucial role in the development of capitalism by

systematically quantifying the land, allowing for taxation and productivity measurements. The introduction of fencing as an agricultural technology gave way to the emergence of Cheap Nature and capitalist agriculture.

During the late eighteenth century, Europe faced a developmental crisis of soaring food prices while real wages fell. A developmental crisis is an increase in the costs of one or more of the Four Cheaps and is resolved through the discovery of a new commodity frontier or a new source of unpaid work or energy that can be appropriated, restoring one or more of the Four Cheaps. This crisis in Europe was resolved through a double movement, first being the conversion of nitrogen-rich pastures to farmland in England. Second was the establishment of the English Caribbean sugar monocultures (Moore, 2013, p. 244). The use of newly claimed farmland restored Cheap Nature by utilizing the unpaid energy stored in the soil, which aided in improving labor productivity and lowered the cost of food. The establishment of the English-Caribbean monoculture system allowed for a restoration of Cheap Nature and Cheap Labor by using a slave workforce in numbers of over 150,000 to work on Caribbean soil (Ponting, 1991, p. 196). These double movements showcase how the restoration of Cheap Nature for the sake of capital accumulation degraded the land as a result of deforestation and sparked inequality and racism as a consequence of the slave trade.

Capitalism's breadbasket migrated during the nineteenth century from Europe to the United States. North America consisted of an abundance of labor and commodity frontiers that established a new era of industrial capitalist agriculture. By 1873, half of all Britain's imports was grain from the United States, increasing forty fold since 1846 (Moore, 2015, p. 136). North America had supplied Europe with much wealth stemming from Cheap Nature that was violently taken from the Native Americans and Cheap Labor through the privatization of new land and a self-

reproducing slave population (Ponting, 1991, p. 198). Additionally, after slavery was abolished in 1865, a great amount of value left the Cheap Labor sphere, not only in terms of slave labor, but also the unvalued, invisible labor done by slave mothers. These mothers represent an extreme case of labor appropriation in that they worked as slaves in the traditional sense as well as raising their own children, ensuring the next wave of slave labor. The reproduction of slave labor made the slave trade extremely profitable by ensuring the continuation of Cheap Labor (Federici, 2012, p. 86). The relations expressed during this shift showcase capitalist world-ecology's dynamic ability to secure commodity frontiers to appropriate the unpaid work/energy of extra-human natures for the accumulation of capital.

In the next wave of the restoration of Cheap Nature, new technologies were introduced, and North America offered a greater abundance of Cheap Food. Technological innovations such as steamships and railroads fueled by North America's Cheap Energy aided in a spatial compression that allowed for food to travel greater distances from farm to plate (Moore, 2013, p. 246). The introduction of fossil fuel represented a commodity frontier of an unprecedented magnitude. Transporting food cheaply became a crux of capitalism and established agricultures reliance on fossil fuels as a source of Cheap Energy. The Great Plains of North America experienced a rapid and drastic reduction of ecological complexity after the introduction of a single marketable crop. A wheat monoculture dominated these plains during the late nineteenth and early twentieth century. Monoculture is the optimal capitalist agroecosystem because it supports mechanization and standardization as a method of increasing labor productivity. However, a monoculture agroecosystem has an increased risk to a plethora of issues such as rampant disease and wind erosion. The Great Plains experienced severe dust storms as a result of a severe drought coupled with an oversimplified agroecosystem that rendered the plains useless (Worster, 1990, p. 1106).

These severe dust storms showcase capitalism as a world-ecology and the co-development of humans and nature in these environments.

The history of Cheap Food in the capitalist world-ecology reveals that capitalism has fundamentally altered the relationship between human and extra-human natures. Cheap Food was sustained through the discovery of multiple commodity frontiers, ranging from the privatization of land to the inclusion of North America into the nineteenth-century world-ecology. The restoration of the Four Cheaps through relations of capitalist agriculture has been the result of increasingly violent ecological restructuring and the appropriation of unpaid work/energy. These restorations allowed for the increase of capitalist world-ecology's grip on the appropriation of extra-human natures used to produce cheap food that powered the working class.

The “Success” of the Green Revolution and Recent Capitalist Agricultural Transformations

The Green Revolution is the most recent agricultural “revolution” that consisted of significant ecological restructuring. The Green Revolution began in Mexico after the implementation of an agricultural research program implemented by the Rockefeller Foundation in 1933 (Patel, 2012, p. 7). This research program created and introduced hybrid seeds that promised increased crops yields with less labor time. In the years following the end of the Green Revolution Era, advocates of its policies and strategies expressed contentment with the great amount of increased productivity that resulted from the Green Revolution.

The Mexican Agriculture Project encouraged the replacement of traditional subsistence maize agriculture with commercial wheat farming, while a similar practice occurred in India of replacing the traditional rice and wheat with corn. These shifts were encouraged through government subsidy plans, and political assurances with the intent of increasing world food

production (Patel, 2015). The new commercialized agriculture system created new barriers for smallholder farms, forcibly reducing their influence on capital's relationship with extra-human natures. These barriers consisted of an immense increase in the cost of inputs, such as the need to purchase expensive hybrid seeds and new farming technology. Along with these hybrid seeds, which required the farmer to purchase new seeds each season, pesticides and herbicides added to the initial cost of farming. Increased prices combined with a lack of access to credit to pose major constraints on these non-competitive farms. Due to the increased competitiveness of agriculture many smallholders were pushed into the cities after their farms were absorbed by a larger farm (Patel, 2012, p. 21). This points to a rapid increase in the market power of the food giants while also showcasing how larger farms were able to grow into powerful corporations due to declining competition and an increased availability of Cheap Nature.

The increase in initial production costs of farming and the displacement of non-competitive farmers was not an isolated event in India and Mexico, nor was it bound to the time period of the Green Revolution. To put the nature of increased production costs into perspective, from 2006 to 2013 per acre rice seed prices increased by 12%, fertilizer costs increased by 20%, and chemical prices increased by 42% (United States Dept. of Agriculture). Holistically, more than seventy-one thousand small U.S. dairy farmers alone have been pushed out of the dairy industry (Kaufman, 2012, p. 22). These occurrences indicate that the capitalist forces that emerged during the Green Revolution have continued to reshape relations between humans and extra-human nature and signal a crisis to the availability of Cheap Food.

The Green Revolution was not "revolutionary" in a traditional sense of raw productivity advancement as a result of direct technological or scientific innovation. The Green Revolution marked a new era of capitalist world ecology, one that heightened social inequality, brought an

immense amount of labor (both paid and unpaid) into the commodity system, and increased labor productivity through a newly developed globally connected financialized industrial agriculture system. The increase in chemical fertilizers and pesticides has led to the emergence of superweeds, threatening as much as sixty million acres as of 2013 (Moore, 2015, p. 272). In India, 74% of working women are involved in agriculture and from 1960 to 1978 in the Punjab, wage rates remained almost constant while land value increased nearly fourfold as a result of increased government subsidies and enforced property laws (Patel, 2012, pp. 24-28). This connection highlights the importance of Cheap Labor in the capitalist world-ecology as a source of value. The work of women in India (and elsewhere) is highly undervalued, allowing for immense amounts of value to be brought into the commodity system in the form of inexpensive food. Occurrences like this and elsewhere express how women worldwide face the brunt costs of a continually globalizing economy (Federici, 2012, p. 85). The Green Revolution marked an environmental restructuring that fortified the availability of the Four Cheaps through the appropriation of Third World country labor and the commercialization of previously noncompetitive agroecosystems. This reconstruction concentrated influence in the hands of capitalist producers, increasing their ability to deliberately and violently reorganize environments for the sake of capital accumulation.

Recently, the traditional methods of monocultures and mechanization have reached new heights as mega farms have risen to dominate the market. Leprino foods alone buys up 5% of all milk produced in order to manufacture mozzarella cheese (Kaufman, 2012, p. 20). Additionally, Tyson is the sole provider of meat to several transnational fast food chains, including KFC, Dominos, and Pizza Hut (Kaufman, 2012, p. 27). These companies face serious constraints to production as the ability to appropriate unpaid work/energy diminishes after each successive

production cycle, limiting their ability to make profit and produce Cheap Food that powers the capitalist workforce.

The Green Revolution sparked a trend of scientific innovation that has not yet ended, with over half the crops in the United States being subject to genetic mutation (Kaufman, 2012, p. 75). The scientific concentration is focused in keeping the production of food as cheap as possible, rather than increasing the availability of food. This can be observed in the study of genetically modified tomatoes to grow in a cube shape in order to increase shipping efficiency (Kaufman, 2012, p. 91). Although this seems like an almost comical scientific pursuit, these movements towards increasing crop yield and efficiency of transport represent a broader issue of the declining availability of Cheap Nature in the agricultural system. This declining availability is expressed in the extreme efforts in searching for ways of marginally decreasing costs at the expense of ecological stability, as opposed to expanding towards new commodity frontiers.

While a productivity squeeze occurs in food production, a complementary issue of dietary change intensifies the speed at which production approaches these limits. The global increase of meat consumption poses a barrier to increased global food equality. Global meat consumption has increased 700% since 1961, and is expected to double by 2050 if current trends continue. The largest consumption increases occur in the middle and upper class of fast-growing economies, such as China, wherein roughly half of all pig meat is consumed (Weis, 2013, p. 2). While there is a push for increased efficiency in crop fields, there is an incredible amount of energy being lost in the factory farms. Feed-to-flesh conversion ratios are 2-3:1 for poultry, and are much higher for pigs and beef cattle (Weis, 2013, p. 115). This dietary change poses as a significant contributor to climate change because the biophysical contradictions of the “industrial grain-oil-seed-livestock complex”, which describes the production of meat as a relation of grains, transportation, and the

raising of farm animals as a major polluter of CO₂ emissions. The model uses large amounts of fossil fuels to inefficiently produce meat-based calories. Fossil fuel consumption is so heavily integrated into agriculture that Weis depicts food consumption as “eating fossil fuels” (Weis, 2013, p. 110). These interrelated issues of available farmland, calorie allocation, and increasing rates of accumulated negative value in the form of externalities pose significant barriers to the continuation of the Cheap Food sphere under the current capitalist world-ecology.

Economic Rationality: Invisibilized Unpaid Work/Energy; or, Trying to Keep it In the Black (Avoiding Costs at All Costs)

The era we are currently living through, The Capitalocene, is dependent on the unpaid work/energy of human and extra-human natures. “Nature” in the capitalist world-ecology has been reduced to a capital asset (Altvater, 2016, p. 145). Certain resources have explicit monetary values, such as the market price of timber, oil, or the cost of a dairy cow, while others such as water, forests, and soil come at little to no market cost. The work of extra-human natures is not valued under the economic rationality, “capital sees only what it can price” (Altvater, 2016, p. 148). In each of these examples, there is a great amount of unpaid work/energy that is appropriated and converted into surplus value in the capitalist system. “Absent massive streams of unpaid work/energy from the rest of nature...the costs of production would rise, and accumulation would slow” and “every act of exploitation... depends on an even greater act of appropriation” (Moore 2015, p. 54). In this relationship, the economic rationality feeds into the capitalist world ecology’s demand for appropriated value in the form of unpaid work/energy. Cheap Nature, Cheap Labor, Cheap Food, and Cheap Energy all represent the essential clusters of unpaid work/energy that is required for capitalism to continue.

For capitalist agriculture, the economic rationality allows for firms to produce food cheaply through the unpaid energy coming from soil, the sun, and other biophysical systems. As CO₂ emissions from agriculture continue to increase, the world's oceans absorb a portion of these emissions and become more acidified as a result (Weis, 2013, p. 24). Some externalize the costs of handling waste through the use of pits to dispose of—in some cases—over 100,000m³ of animal feces, which contain harmful pathogens that pose health risks to those within a certain radius of the “lagoon.” I turn to a quote from Weis (2013) that highlights the magnitude of externalized costs conducted in the food industry, a sector that is a major contributor to climate change:

“The health burden of industrial livestock production is overwhelmingly externalized; passed downstream, downwind, and through the belly, with the costs of dealing with chronic disease, antibiotic resistance, and food-borne illness transferred onto consumers and governments.” (p. 139)

The unpaid costs in the food system have allowed for companies to create massive amounts of capital. Leprino foods alone had sales of \$2.6 Billion in 2009 (Kaufman, 2012, p. 20). Externalizing the costs of dealing with waste has little to no market cost for the firm; however, a contradiction in a cost-benefit analysis of these actions occurs when observing from a macroeconomic perspective. The externalized costs of the firms have negative effects for other capitalists and the rest of society (Altvater, 2016, p. 148). This discrepancy highlights the contradiction of the benefits of unpaid work/energy and the subsequent costs that are blocked out of the commodity sphere and placed onto extra-human natures. The reliance of unpaid work/energy points to capital's self-destructive nature. The declining availability of Cheap Labor and Cheap Food as previously discussed puts greater tension on systems of capital accumulation to find new sources of unpaid value while attempting to subjugate the issues and associated costs of changes in the global climate as a result of externalizing the costs of appropriating unpaid work/energy.

There are limits to the value generated from unpaid work and energy that pose as limits to capital accumulation. The availability of commodity frontiers comes to an end and accumulated negative value bares a cost that is too grand to be invisibilized. Climate crises are set into motion before these limits are reached. Crises do not reveal themselves as apocalyptic, end-all scenarios. Crises arise well before oil wells dry up, sea levels rise by a few feet, or crop fields become endless dunes of sand. The epochal crisis of capitalism and climate arise in the irreversible decline of the Four Cheaps. The epochal crisis of capitalism and climate has already arrived.

Conclusion

Capitalism itself is a frontier of organizing nature. Commodity frontiers are absorbed in effort to extend territorial and symbolic forms that allow for increased appropriated unpaid work/energy in commodity production, whether that unpaid work/energy comes from third world peasant farmers or from nitrogen-rich soil. With each commodity frontier that is consumed in order to restore Cheap Food, the results become less successful. All the while, as these frontiers include more desperate measures, they have continually more harmful effects on our climate. A fundamental contradiction of capitalism that is exposed through the oikeios framework is the doubled effort of deriving as much value from unpaid work or energy while constantly over-consuming the necessary resources for production. In short, “capital’s demand for cheap natures rises faster than its capacity to secure them, as expressed in the history of capitalist agriculture” (Moore, 2014, p. 288). The “advancement” of agriculture over the past centuries has led to an increase in global social inequality, violent environmental reconstruction, and increased concentrated wealth as a result of the capitalist world-ecology. The foundations of this epochal global crisis can only be *truly* understood through the world-ecological framework. By rethinking

our relationships with food and with nature, it is clear that the problems of capitalism lie deeper than market and labor economies. The problems of capitalism manifest within its dominant and violent relationship with human and extra-human nature and its dependence on invisibilizing costs at the expense of ecological stability. It is only through the world-ecological framework that we can identify the causes of the crisis and only through this framework that we can identify lasting solutions to the global crisis.

References

- Altvater, E. (2016). The Capitalocene, or, Geoengineering Against Capitalism's Planetary Boundaries. In Jason W. Moore (Ed.), *Anthropocene Or Capitalocene?: Nature, History, and the Crisis of Capitalism*, (138-152). Oakland, CA: PM Press/Kairos.
- Crutzen, P. J. (2002). Geology of Mankind. *Nature*, 415(6867), 23.
- Cunha, D. (2015). The Geology of the Ruling Class? *The Anthropocene Review*, 2(3), 262-266.
- Federici, S. (2014). The Reproduction of Labour Power in the Global Economy and the Unfinished Feminist Revolution. In Maurizio Atzeni (Ed.), *Workers and Labour in a Globalised Capitalism*. Basingstoke, Hampshire: Palgrave MacMillan

- Haraway, D. (2016). Staying With the Trouble. In Jason W. Moore (Ed.), *Anthropocene or Capitalocene?*, (34-76).
- Hartley, D. (2106). Anthropocene, Capitalocene, and the Problem of Culture. In Jason W. Moore (Eds.), *Anthropocene or Capitalocene?*, (154-165).
- Kaufman, F. (2012). *Bet the Farm: How Food Stopped Being Food*. John Wiley & Sons.
- Lewontin, R., & Levins, R. (1997). Organism and Environment. *Capitalism Nature Socialism*, 8(2), 95-98.
- Malm, A., & Hornborg, A. (2014). The Geology of Mankind? A Critique of the Anthropocene Narrative. *The Anthropocene Review*, 1(1), 62-69.
- Marley, B. (2016). From War on Poverty to War on Coal: Nature, Capital, and Work in Appalachia. *Environmental Sociology*, 2(1), 88-100.
- Moore, J. W. (2015). *Capitalism in the Web of Life: Ecology and the Accumulation of Capital*. New York: Verso.
- Moore, J. W. (2014). The End of Cheap Nature, or, How I Learned to Stop Worrying about the Environment and Love the Crisis of Capitalism. In Christian Suter and Christopher Chase-Dunn (Eds.), *Structures of the World Political Economy and the Future of Global Conflict and Cooperation* (285-314). LIT Verlag.
- Mumford, L. (2010). *Technics and Civilization*. University of Chicago Press.
- United States Department of Agriculture. (n.d.). Retrieved November 6, 2016, from https://www.nass.usda.gov/Surveys/Guide_to_NASS_Surveys/Ag_Resource_Management/
- Patel, R. (2013). The Long Green Revolution. *The Journal of Peasant Studies*, 40(1), 1-63.
- Patel, R. [The Edible Schoolyard Project]. (2015 March 4). *Edible Education 101: "The Long Green Revolution" by Raj Patel with Mark Bittman*. [Video File]. <https://www.youtube.com/watch?v=Jn5R5tyv8Bs>
- Ponting, C. (1991). *A Green History of the World*. London: Sinclair-Stevenson.
- Steffen, W., Crutzen, P. J., & McNeill, J. R. (2007). The Anthropocene: Are Humans Now Overwhelming the Great Forces of Nature. *AMBIO: A Journal of the Human Environment*, 36(8), 614-621.
- Webb, W. P. (2003). *The Great Frontier*. Lincoln: University of Nevada Press.
- Weis, T. (2013). *The Ecological Hoofprint: The Global Burden of Industrial Livestock*. London: Zed Books.

Worster, D. (1990). Transformations of the Earth: Toward an Agroecological Perspective in History. *The Journal of American History*, 76(4), 1087-1106.