Food Systems: Think Globally, Act Locally

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Abstract
The intention of this paper is to explain the evolution of food systems, which has been trending towards a singular global food system. Throughout the past century, global food systems have become increasingly integrated and resembling of a global food system, which depends upon industrial farming techniques and long-distance transport of foodstuffs. Leading the push for a singular global food system are a relatively small number of multinational corporations, called agribusiness, that control nearly all aspects of the food system. These agribusinesses have convinced governments, international organizations, and farmers that the only efficient way to provide enough food for the expanding global population is to adhere to there vision of a global food system, which is supplied by giant industrial farms that specialize in the production of monocultures. The nature of a corporation is to increase profits, not to look out for the welfare of communities, individuals or the environment, this has become evident by the destructive techniques, policies and practices that agribusinesses have implemented. There are alternatives to a corporately dominated global food system, that are healthy, environmentally friendly and sustainable. These alternatives must be further developed with support coming from international organizations, governments, corporations and most importantly, the global citizen.

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Food Systems: Think Globally, Act Locally

A Master's Thesis Submitted to
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Master of Science in International Studies

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Abstract

The intention of this paper is to explain the evolution of food systems, which has been trending towards a singular global food system. Throughout the past century, global food systems have become increasingly integrated and resembling of a global food system, which depends upon industrial farming techniques and long-distance transport of foodstuffs. Leading the push for a singular global food system are a relatively small number of multinational corporations, called agribusiness, that control nearly all aspects of the food system. These agribusinesses have convinced governments, international organizations, and farmers that the only efficient way to provide enough food for the expanding global population is to adhere to their vision of a global food system, which is supplied by giant industrial farms that specialize in the production of monocultures. The nature of a corporation is to increase profits, not to look out for the welfare of communities, individuals or the environment, this has become evident by the destructive techniques, policies and practices that agribusinesses have implemented. There are alternatives to a corporately dominated global food system, that are healthy, environmentally friendly and sustainable. These alternatives must be further developed with support coming from international organizations, governments, corporations and most importantly, the global citizen.
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I. Introduction

Globalization and global markets are growing realities in today’s world. Most industries have partially or fully integrated into this new economic and social structure of world economics. Many argue that a global economy, with global markets, led by large multinational corporations is the way of the future. Proponents of this view argue that this plan is the most affective and efficient means to provide for the growing population of the world. These same people, also, often tend to blanket all aspects of the market economy under the premise that a streamlined, global system, is the most efficient means to provide social and economic security to an ever expanding global population. One sector of the economy that is being transformed by this dominating global, economic view is agriculture. Agriculture is one of the oldest and most vital aspects of all economic systems, as procurement of a secure food system is of foremost importance to any society. It is only human instinct to have as a primary concern for survival a secure source of food. This primal human instinct of having a secure food source, has been recognized by 185 states at the 1996 World Food Summit, as a fundamental human right.\footnote{Jerry Buckland, ed., \textit{Ploughing up the Farm: Neoliberalism, Modern Technology, and the State of the}}

Obtaining a healthy and economically viable food system has been at the forefront of every society, government, and individual since the beginning of human existence.

Food systems have evolved over the millennia to adapt to new environments, weather patterns, technology and diet preferences; however, the strategic goal of food systems has remained constant: to provide sufficient amounts of food for the population. A large evolutionary jump occurred in food systems with the opening up of world
exploration, which is greatly attributed to Europeans, who set up the primitive beginnings of a global trading system. The Europeans ‘discovered’ new lands and civilizations, which they could exploit, share, and trade goods, technology and ideas with. As these ‘new worlds’ were settled and developed, populations increased, placing a high demand on food systems to feed ever more people, with a lessening percentage of these people participating in agricultural production themselves. Food became a commercial commodity, being produced, traded and distributed on an ever increasing scale.

As developed nations continue to move further and further from the ‘traditional’ agricultural economy of their pasts and developing nations attempt to climb the developmental ladder in their wake, people are migrating away from the land where in the past they had produced their own food, placing a much greater demand and importance on food systems. The reality of today’s global, industrial, hyper-growth focused world, is that no nation is entirely self-sufficient in all the commodities and materials which it consumes. On top of this, diets from around the world are beginning to homogenize and the tastes of people around the world are demanding certain types of food that aren’t or can’t be grown in their locale. Therefore, there are nations that produce agricultural goods strictly for export, while at the same time importing other agricultural goods for domestic consumption which had been replaced by high value export commodities. These nations have been ensnared into the assumption that it is economically advantageous for them to grow and export luxury commodities and industrial raw materials and import the food they need, which often tends to be cheaper relative to their exports. As a result, in recent years global trade in foodstuffs has

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increased nearly threefold since 1961. In 2002, nations shipped $442 billion worth of food and agricultural goods around the world. Not only has the monetary value of the food trade increased, but the volume of food stuffs and agricultural goods has also seen a drastic increase. Presently, over 898 million tons of food are traded and shipped around the world annually, up more than four-fold from the 200 million tons in 1961. This increased growth in global food and agricultural commodity trading has intertwined individual nations' food systems, increasing their dependence for food security on other nations, through a global network of trade. Increasingly, as nations integrate into the global economy, the food systems of the world are melding into one global food system.

As the age old adage goes, 'where there is smoke there is fire,' this holds true of a food system that is increasingly dependent upon global trade. There is a tremendous amount of money to be made in the production, trade and distribution of food stuffs and other agricultural goods. Just as large corporations have evolved to dominate the industrial sector, so too have a handful of large multi-national corporations come to dominate the agricultural sector. These corporations have increasingly expanded their control and ownership of the global food system by subscribing to the business theory of "vertical integration" where they play a determining role in all the processes of the food system, providing the consumer with products they control from "farm gate to dinner plate." These corporations belong to a sector which is termed "agribusiness." In the introduction of his book, Sowing the Wind, Harrison Wellford offers an excellent definition of the term 'agribusiness':

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16-18.


4 Norman Wirzba, *The Essential Agrarian Reader: The Future of Culture, Community and the Land*
The term 'agribusiness' refers to corporate enterprises engaged in the processing, marketing, and occasionally production of farm commodities, and the supply of services and technology to producers of these commodities. The term includes chemical companies selling pesticides and fertilizer, drug companies selling antibiotics and hormones, meat packers and processors, feed companies, and sellers of farm machinery. It does not include family farms, agricultural production units operated by one or more farm-operator families.  

Agribusiness is an extremely large and diverse sector within the global economy, with interests in further developing and expanding its dominance of a global food system. The corporations that comprise the agribusiness sector have invested untold billions of dollars into research and development, infrastructure development, advertising and lobbying to ensure their continued dominance of the agricultural sector and global food system.

When speaking of the agricultural sector and food systems, there is no avoidance of politics. A hungry populace makes for a very discontented population, therefore it is in the best interests of national governments and international non-governmental organizations to ensure food security. A government's power is often tied to its access to and control of food. A nation's ability to control the food supply dictates its role in the politics of the global economy, if its not able to provide the most basic provisions to its people, how can it have any power within the global economy? One of the methods in which governments attempt to maintain control over their food supply is through trade.

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agreements. These trade agreements often attempt to protect domestic agricultural production and consumption, and it is expected that other nations will establish reciprocal trade agreements. Due to the importance of food systems and traditional protectionism of domestic agriculture, the issue of agricultural tariffs and subsidies has been a great stumbling block in many bi-lateral and multi-lateral trade agreements.

Governments and international organizations such as the World Trade Organization, World Bank, and the International Monetary Fund have been inundated by lobbying from agribusiness. It is in agribusinesses best interests to see global trade in foodstuffs continue to increase and to see this increase rise along with their influence and control of national food systems. Agribusiness has spent years and billions of dollars developing techniques that support their structure of a food system and have spent billions in promoting these techniques as the only agricultural model that can support the ever growing human population. Agribusiness would like to see the abandonment of traditional farming techniques and local food systems, to be replaced with their model of industrial agriculture and a global food system, supported by a vast global trade network. Local systems are anathema to global corporations, therefore, agribusiness companies such as Con Agra, Monsanto, Cargill, and Archer Daniels Midland are strenuously lobbying governments and international organizations to convince them that small farmers are not productive or efficient enough to feed a hungry world. In the past, many governments and international organizations were convinced and in turn produced and backed policies which have greatly benefited the advancement of agribusiness interests.

XI.


7 John Cavanagh and Jerry Mander, eds., Alternatives to Economic Globalization: A Better World is
and global trade in foodstuffs.

The farming techniques that have come to define agribusiness have been termed industrial agriculture. This type of farming depends upon the concentration of farms to follow the principles of economies of scale. In this increasingly agribusiness dominated sector, farmers are forced to get big or get out. The result has been that there are increasingly fewer and fewer farmers, with ever increasing farm size. These farmers have become specialized, producing usually only one commercial crop. Hallmarks of this type of intensive farming are miles upon miles of one crop (monocropping) and feedlots with thousands, often times tens of thousands of single breed animals crammed into the smallest possible space in the name of efficiency. In order for these farms to succeed they require massive amounts of inputs such as fertilizer, pesticides, antibiotics, energy and feed, just to name a few. Is it any big surprise that the agribusinesses already dominate each of these input markets?

Is globalization and corporate industrial agriculture the future of food systems? And if so, is a global food system that is dominated by multinational corporate agribusiness, sustainable and even feasible? To answer these questions and shed light on a growing contemporary dilemma, this topic will be examined from multiple viewpoints (through the interests and concerns of developed and developing nations) and multiple levels (individual farmers, corporate agribusinesses, nation states and consumers).

The study of globalization and agriculture bring up many critical questions concerning whether they are compatible and if so what will the future hold, success or failure? This question is very significant, as the outcome of this paradigm will dictate how the world’s population will obtain their food. The obvious ramifications of failure to

produce and distribute food will result in famine and a world of chaos as those without scramble to survive. Currently the forces of globalization and trade liberalization are a driving force behind much of the world’s economic policies and are promoted and supported by international organizations (WTO, World Bank, and IMF), multinational trade agreements (NAFTA), and many national governments, especially those of the developed nations of the North. It can be argued that the industrial sector has seen vast success by adhering to these policies of trade liberalization and global markets that are dominated by multi-national corporations, but at what costs? Agriculture has been slow to follow due to traditional protective national policies that governments have long held. The trend now, especially in developed nations such as the United States, is for agriculture to evolve into a new style of agriculture termed industrial agriculture that is dominated by multi-national corporations called agribusiness. Industrial agriculture follows in the footsteps of the successes that the manufacturing sector has achieved through globalization by adhering to corporate values that look at bottom line profits, efficiency and market expansion as the only indicators of success. Currently there is great debate over whether or not the success achieved by the manufacturing sector in globalizing itself can be directly applied to agriculture. The debate seems to be split between those with a mind towards profits, efficiency, and market growth as the measures of success; and those with traditional agrarian mindsets, who look at long term effects for a sustainable future. This debate must be expanded to include and inform all who are affected by this trend, in order to develop a system that will meet the needs of the growing population, but not at the expense of the environment, the poor, or developing nations.
II. Food Systems

Up until recent history, food systems had evolved at a very slow pace, with the exception of the evolutionary jump that human civilization experienced with the discovery of agriculture approximately ten thousand years ago. This evolutionary step allowed humans to settle and develop grand civilizations. After this evolutionary step in food systems, from hunter and gatherer to agricultural practice, food systems evolved slowly, as the global population was small, dispersed and civilizations largely isolated from one another. Over the millennia, agricultural tools and techniques developed throughout the world's great civilizations, to help provide a functioning food system for their own civilization. These food systems remained relatively stagnant, with the vast majority of the human population being tied directly to some type of agricultural production. These traditional food systems relied on the masses to provide subsistence level food production, with little left over for trade.

Much changed after the thirteenth and fourteenth centuries, when population growth, scarcity of food, and stories of grand riches abroad, prompted Europeans to set out on world exploration looking for new resources and riches. What followed was an unprecedented era of world exploration, war, colonization, and exploitation. Agricultural techniques and new crops from all around the world were now being introduced to new peoples, with every exploratory trip. Not only did crops and agricultural techniques and tools diffuse around the globe, so too did people. These people found new fertile lands that, when combined with new developing technology, increased agricultural production.8 As agricultural production increased, population seemed to follow directly in its

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footsteps. A better fed population, leads to a healthier population, which in turn leads to higher birth rates and longer mortality. This inevitably begins a cycle of higher population, requiring more food, then more food leading to more population, so on and so on.

It is through roughly the past four centuries that food systems have experienced drastic changes and have evolved into what we see today, which has an increasing resemblance to a completely global food system. As mentioned earlier, it all began with the Europeans’ opening of the world. In many of the lands that were ‘discovered,’ the Europeans settled and established colonies, whose prime objective was to produce goods and riches to send back to the mother country. One can see the slight beginnings of a global food system here, but the colonies were extremely limited in what could be shipped back to the mother country due to the cost of shipping, length of the trip and in the case of foodstuffs the fact that most were perishable. Nonetheless the globe was now open, with people and goods crisscrossing the oceans and continents, setting in motion the development of global trade.

It was one of these colonies that has played an extremely important role in the development of our current food system. There is no big surprise that this former colony, that has played a major role (if not the defining role) of developing a global food system, is the United States, as the U.S. has been the dominating figure in contemporary global affairs, especially the global economy. The U.S. is not only important to the evolution of a global food system because of its hegemonic position in global affairs, but also because it serves as a microcosm of the evolution of the food systems of the world.

The U.S. has had very similar beginnings as the rest of the world, in respect to
food systems. The nation was originally inhabited by indigenous peoples most of which evolved from hunter and gatherers to primitive agricultural societies. When the Europeans came they established settlements that were primarily dependent upon local agriculture to supply them with food. These settlements grew at an astonishing rate, leading to further settling of the continent and greater population growth. The vast majority of these people were small independent farmers, who were primarily subsistence farmers, with little left over for market. In the eighteenth century, over seventy percent of the American population worked in agriculture directly on the land, compared to just below two percent today. And over three quarters of the population lived in isolated farmhouses, hamlets, villages or small country towns. This is representative of much of the world at that time, there was not much need for anything more than a local food system, as most communities were primarily able to produce enough food quite literally in their own backyard. There also was not sufficient transportation or food processing technology to allow for any type of long distance transport of food.

Technological advancements allowed for the food systems of the industrial North to adapt to population growth and changing demographics that seemed to be exploding at lightening quick pace during the nineteenth and twentieth centuries. The nations of the Western world (Western Europe, North America, and Australasia) experienced never before seen rates of population growth throughout the past two centuries. Rough population estimates put the combined population of these areas at twenty-five million in 1000 AD, 110 million in 1800 and an astonishing 650 million in 1985. The population of these areas quadrupled in 800 years, but then rose nearly six-fold in only the next 180

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years.\textsuperscript{10} With this type of population growth and the subsequent demographic changes that went along with it, food systems had to grow and evolve. Technological innovation in agriculture production, food processing and transportation were the tools on which the food systems depended to feed these many hungry mouths.

As is often the case in technological development, war helped to spur technological innovation in the food processing industry, which was pretty much non-existent prior to the nineteenth century. In 1809, French chef Nicolas Appert developed the first technique for canning foods, in response to a substantial reward that had been offered by Napoleon Bonaparte to develop a method to keep military rations from spoiling. By 1860, the time and cost of canning food had become much less expensive.\textsuperscript{11} It was in Florida and California, both of which have ideal conditions for fruit and vegetable production, during the 1870s and 1880s that the canning of fruits and vegetables was developed into an economically viable commercial industry.\textsuperscript{12} The technological developments in food processing continued as U.S. innovators and businessmen developed ways to feed a hungry nation. In 1875, mechanical refrigeration was developed, which helped to maintain perishable foods for longer periods of time. And in the 1920s, Clarance Birdseye developed a method of quick freezing, which was first used for fish, but was quickly extended to the processing of fruits and vegetables. This method helped retain the nutritive value, flavor, and mouth feel, all of which made the processed food more appealing to consumers.\textsuperscript{13}

Advancements in food processing helped to prolong the shelf life of food, but

\textsuperscript{10} Ibid., p. 1.
\textsuperscript{11} See Halwell, \textit{Eat Here}, pp. 31-32.
\textsuperscript{12} See Grigg, \textit{The Transformation of Agriculture in the West}, p. 108.
\textsuperscript{13} See Halwell, \textit{Eat Here}, p. 32.
there was still the question of transporting the food. Due to the vastness of the U.S., an improved transportation system was needed to adequately ship supplies throughout the nation, especially foodstuffs. These advances in food transportation include the steam ship in the mid-nineteenth century, railroads later in the century and overland trucking in the twentieth century. The cost remained relatively low due to cheap energy.\textsuperscript{14}

Improved railroad service seen freight rates drop significantly as the cost of shipping one ton was $1.22 per mile in 1883; by 1900 this rate had dropped to $0.75 a ton per mile. In 1893, the government also embarked upon creating a national highway system that had 1,000 miles of concrete road in 1910, drastically expanding to over 307,000 miles of surfaced roadway by 1920. Yet another transportation advancement that helped to extend the food system beyond the local was the Panama Canal; completed in 1914, it shortened the sailing distance between the east and west coasts by over 5,000 miles.\textsuperscript{15} These transportation innovations were improved upon in the late 1870s when Gustavus F. Swift, a Chicago meat packer, introduced an improved refrigerated railroad car that helped to revolutionize food transportation.\textsuperscript{16} As key markets for their products were hundreds and even thousands of miles away, these innovators developed techniques, technology and infrastructure that allowed for the extension of the food system to move beyond the local.

There was a need for these innovations in food processing, storage and transportation as there was a major demographic change taking place within the U.S. This change had its roots in the early nineteenth century, but saw drastic changes later, due to the Second Industrial Revolution, which greatly altered the U.S. economy. It was during this time that there can be seen a widespread growth in urban population, with a shift

\textsuperscript{14} Ibid., p. 35.
\textsuperscript{15} See Cooper, \textit{Bitter Harvest}, p. 16.
away from the traditional family farm. This trend had two very important implications on the evolution of the food system: 1. there was a growing urban working class that was dependent upon the market to acquire its food and 2. the decreasing farm population was required to increase output to supply the market with adequate amounts of food.

The industrial revolution had great effects on the food system, it led to a rapid increase in urban population growth, which meant that the farmers’ market to sell foodstuffs and agricultural raw materials was greatly expanded. As the market and demand for foodstuffs to be purchased, saw enormous increases, the structure and role of the traditional family farm saw drastic changes. Farms now became larger, more mechanized, and more dependent upon capital intensive inputs, obtained from off the farm. This was all in an effort to adapt from being a traditional self-sufficient farmer, to a specialized commercial business, to provide commodities for the rapidly expanding market. The specialized products which these farmers produced was now directly tied to the market’s changing tastes and diets. Growing prosperity in the late nineteenth century and early twentieth centuries allowed consumers the luxury of purchasing more expensive products such as meat, milk, eggs, and fresh fruits and vegetables, which changed the structure of output. Farmers and processors focused on providing these traditionally expensive products in greater quantity and at cheaper prices to satisfy the vastly expanding market for these goods.

With urban population growth, industrialization, and rising prosperity, came the dire need for a change in the food system of the U.S. As more and more people moved away from the land that produces their food, to the cities, there was a greater demand on

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16 Ibid., p. 32.
the markets to provide more food. In order to provide adequate amounts of food to these rapidly increasing markets, farmers were forced to change production techniques and become specialized; food processing, packaging, and transportation underwent massive technological innovations; and the food system of the U.S. was forever altered, as food was now grown in one location, processed in another, and then shipped to the consumer, who could be hundreds or even thousands of miles away from their foods’ origin. It was during this period that large farm implement, chemical, and food processing companies such as John Deere, International Harvester, Archer Daniels Midland, General Mills, and General Foods, found their beginnings. With the growth of food processing companies, convenience foods and processed products experienced tremendous growth. Americans and the world were introduced to Mr. Peanut, Nathan’s Famous Frankfurters, Orange Crush Soda, Starkist Seafood, Sunsweet Growers products and Clark Bars, amongst many others. \(^{18}\)

Food systems of the other industrial nations were taking steps in the same direction as the U.S., but were much slower to follow as their nations were not as vast and they had centuries old traditional food systems well established. But it was due to events in Europe that a drastic increase in the global food trade took place. World War One devastated the European food system in multiple ways: the labor force of European farms was shipped off to war, energy and resources were diverted to the war making machine, and the land itself was being destroyed and occupied as a battlefield. Besides the drastic reduction in agricultural production capabilities, there was an enormous demand to feed the millions of soldiers fighting the war. The American agricultural sector became the unexpected beneficiary of this tragic war. American farmers, far from

the destruction and carnage, responded to Europe's dire need by placing 40 million more acres into production and producing a 29 percent increase in production per acre. The U.S. government also helped the American farmer by creating the Federal Farm Loan Act to provide farmers with credit for the purchase of machinery and land. By the end of World War One, the U.S. had become the major contributor to the global food supply. With only 4 percent of the world's farmers, the U.S. was producing 70 percent of the world's corn, 60 percent of its cotton, and 20 percent of the world's wheat. Less than a generation later, World War Two once again devastated Europe. The American agricultural sector again rose to the occasion by pumping out vast amounts of food to help support the war effort and feed the millions of starving people, whose lives were devastated by this global conflict. The American agricultural sector benefited not only from new technologies that came from the war effort, but also expanded markets throughout the globe as the hungry needed nourishment and time to rebuild.

Since the devastating world wars, the world has become a much smaller place thanks to revolutions in transportation and communications. In this smaller world international trade has skyrocketed, food commodities have been no exception to this phenomenon. However, because of traditional protectionist views on agriculture, the growth in international trade in this sector has not been as overwhelmingly complete as in most other sectors in the global economy. But nations have created bi-lateral and multi-lateral trade agreements concerning agricultural commodities that have increased international trade in these foodstuff products. Now these products are subject to global market pricing, prices for farmers in the U.S. are tied to market conditions in Asia, and vice versa. In this global food system, many developing nations in the South have

focused their economies and agricultural sector to produce commodities for export. Much of their products are high-end food stuffs and other luxury agricultural products (fruits, cut flowers, etc.) that are directed towards the rich nations of the North. This results in the average American’s food traveling between 1,000 and 3,500 miles between farm production and dinner plate.\textsuperscript{20} Even though the U.S. produces amazing amounts of food, more than enough to feed its own population many times over, the U.S. is a global leader in food imports. The U.S. imports over 600 different types of food from nearly 150 different nations, totaling over 30 billion tons of product annually. Of that, 6 billion tons are fruits, 8 billion tons are vegetables and over 3 billion tons are meat and poultry.\textsuperscript{21} To complicate matters even more, a handful of multi-national corporations have come to dominate most of the global trade in foodstuffs.

Advocates of a global food system are typically free traders, those who are pushing for more and more trade liberalization. These people believe that trade liberalization in the agricultural sector will benefit everyone. In this type of system, where agricultural goods are traded freely on an open market, free traders believe that prices will only slightly increase. But it is their belief that this slight increase in agricultural products will be very beneficial to the world’s poor. In their belief this will be the case because the poor in developing nations of the world are predominately rural and the purchase of food accounts for a major portion of their expenditures; but since agriculture accounts for a significant portion of their incomes, the higher prices paid for agricultural goods will spill over into profits for agricultural producers, which will raise the income of the poor. This theory depends upon unrestricted access to the large

\textsuperscript{20} See Halwell, \textit{Eat Here}, p. 29.
\textsuperscript{21} See Cooper, \textit{Bitter Harvest}, p. 162.
markets of the wealthy developed nations of the North. In theory, in a global food system, with open markets, the abundance of food that is being produced will enter the world market and be available to everyone in the world at a much more stable price than that of a national or local food system. In this line of thought, if one area of the world experiences a catastrophe such as drought or flood, the world market in food will act as a cushion to soaring food prices.

Another aspect that advocates of a global food system believe should be instituted is that developing nations should produce for export. This belief is heavily shrouded in comparative advantage theory. In this line of thinking, developing nations have a comparative advantage in food production because they have relatively large endowments of land and unskilled labor. Therefore, developing nations should place their natural resources and unskilled laborers into production to produce luxury food crops for the wealthy skilled workers of the developed world. There is no thought here of the value of the land outside of agricultural production or of educating these unskilled laborers and lifting them from the bottom of society. The long term trend of agricultural prices has actually been one of decline and volatility. Over the past twenty years, prices for manufactured goods have seen a tremendous growth in trade, in comparison agricultural goods’ prices have actually deteriorated. This trend suggests that the comparative advantage theory, when applied to agriculture, can put some developing countries in a downward and volatile export position, where their exports continue to decrease in value.

One final aspect of a global food system that must be mentioned is the

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homogenization of diets. With the opening and integration of food systems, new foods are introduced to new populations throughout the world. This diversity in diet and culture can most definitely be seen as a good thing. As an American, you can travel the world and find familiar foods, nearly everywhere. Chain restaurants, fast food establishments, convenience foods such as Twinkies, Doritos and Snickers Bars, can be found all around the globe. Not only that but the American diet, which is obsessed with meat, especially beef, is catching on throughout the world. As the populations of developing nations, such as China and India, become more prosperous, their demand for these types of food have dramatically increased. The problem lies in the environmental degradation, energy consumption, and waste generated by the production, distribution and disposal of such foodstuffs. As the food system becomes more and more global, diets tend to move further away from the traditional diets that have provided nutritious and local foods for centuries.

III. Corporate Agribusiness

The true beneficiary of a global food system is large corporate agribusiness. The many different types of corporations that make up the agribusiness sector are making tremendous profits from a food system that models agriculture in the form of industrial production methods. As agriculture is transformed into an industrial trade, to provide corporations with products that are highly processed and shipped thousands of miles around the globe to the consumers who can afford them, the actual producer, the agrarian folk hero, the farmer, receives less and less of the food dollar. The farmers’ share of the consumers’ food dollars has decreased from 41 percent in 1910 to under 9 percent in

1990; the giant corporate agribusinesses are taking the vast majority of the food dollar by increasing their profit margins and through increased processing and distribution networks.  

The beginnings of the corporate agribusiness again can be best illustrated with its development in the U.S. The development of corporations in American agriculture coincided with the American Industrial Revolution, which took place between 1820 and 1870. As discussed earlier, the food system had to develop to provide sufficient amounts of food for the altering demographics of the nation that were a result of the Industrial Revolution. The truly first agribusiness companies were those of the farm implement industry, such as John Deere, McCormick, and International Harvester. These companies focused their attention upon the mid-west, where local conditions lent themselves perfectly to mechanized farming. The implement companies went out to the countryside and sold mass produced tools and machinery. Their agents not only sold the tools and machinery, but they also educated and sold the farmers on the most effective and efficient methods to use them. These agents were strategically embedded into rural America, to provide an image of the local, while maintaining a constant corporate presence.

Farmers are traditionally an independent minded group of people, who do not look kindly on being told what to do and how to do it. Corporations quickly realized that to penetrate a diversified rural world, they would have to capture the progressive goal of upgrading farm life. This is how they marketed their products and services in order to captivate farmers and amend traditional agriculture practices into a new style that would

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be of economic benefit to the corporations. Farmers and corporations did come together and changed the face of agriculture. With the meeting of farmers and corporations, one saw a blending of several competing versions of agrarian visions. One was based on the traditional cooperative visions of farming communities, and the other on the new corporate way of producing and consuming. The corporations’ goal was to homogenize farming techniques so as to foster new patterns of production and consumption.  

These methods required vast amounts of inputs ranging from tractors and other farm implements to agro-chemicals, including fertilizer, pesticides, herbicides, and antibiotics. These inputs were costly and could only be purchased from these large agribusinesses, but they did seem to raise productivity. The corporations spent untold amounts of money advertising and ‘educating’ farmers on the idea that these inputs were essential to successful farming. As the capital risks increased, the farmers had to continue to grow in size to produce a profit margin that would allow them to survive. The result is a huge decrease in the number of farmers and an even greater increase in farm size. In 1900, 40 percent of the population lived on farms, today less than 2 percent do. Just since 1960, the number of farms has declined from about 3.2 million to 1.9 million, but their average size has increase by 40 percent.  

These agribusiness corporations that provide the inputs that farmers have been ‘educated’ into believing are absolutely necessary to provide sufficient productivity to be profitable, have undergone years of consolidation. Now this ultra consolidated industry offers minimal, to no competition for the agricultural inputs that they sell.

At the same time that corporations were infiltrating the farming community and

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26 Ibid., pp. 171-173.
27 Marion Nestle, Food Politics: How the Food Industry Influences Nutrition and Health (Berkeley, CA:
altering styles of production, the industrial revolution was in full swing producing huge markets of consumers needing food to purchase. Farmers, being directed by corporations, continued to develop new techniques to boost productivity. It was in the food processing and distribution sector that corporations found a new and very lucrative niche. Just after the turn of the twentieth century, with new food processing, storing and transportation methods, there was an enormous growth in the processed foods industry. In 1912 alone, many brand names still popular today came into being, Sun Maid Raisins, Diamond Walnut, Ocean Spray, Hellman’s Mayonnaise, Oreo, Quaker’s Puffed Wheat, Lifesavers and Whitman’s candy, just to name a few. As in the agricultural inputs sector, the agricultural food processing sector quickly began to consolidate.

By the 1920s, the corporate agriculturally based industries in the U.S., soon to be termed agribusiness, began a massive move toward consolidation. In the late 1920s, three of today’s global food giants came into being: Archer Daniels Midland, General Mills, and General Foods. These types of corporations have consolidated over the years and adhered to vertical integration business techniques. Now that we live in a global market place these same corporations have entered the world market and are playing major roles in other nations’ food systems. Internationally they are promoting increased global trade in foodstuffs, production for export, and homogenization of diets. They claim that their view will help to alleviate poverty and hunger in the developing world, but this looks to be a thin veiling of their true motivator: profits.

A handful of corporations have cornered the markets and control major portions of their respective markets. Today the top ten ‘farms’ in the U.S. are multinational

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28 See Cooper, Bitter Harvest, p. 19.
agribusiness corporations with names like Tyson Foods, Con Agra, Gold Kist, Continental Grain, Perdue Farms, Pilgrims Pride, and Cargill—each with annual sales ranging from $310 million to $1.7 billion. Cargill and Con Agra control fifty percent of U.S. grain exports; eighty percent of the U.S. beef market is controlled by just three companies—Iowa Beef Processors, Cargill, and Con Agra; four companies control nearly eighty-five percent of the U.S. cold cereal market—Kellogg, General Mills, Phillip Morris, and Quaker Oats; and only four companies in the flour milling industry control sixty percent of that market—Con Agra, Archer Daniels Midland, Cargill and Pillsbury. This kind of consolidation is due to years of mergers and buyouts; in just the nine years between 1982 and 1990, there were over 4,100 food industry mergers and leveraged buyouts.\(^\text{30}\)

These companies adhere to vertical integration and their dominance is not only in the processing and distribution of these commodities but also in the production of the raw agricultural commodities. Though some of these corporations do have complete ownership and control of a number of ‘farms’, most contract production out to ‘independent’ farmers. This type of contract production system works by the corporation contracting with the farmer for use of his land and its production resources. The corporation may or may not provide inputs such as seeds, feeds, fertilizers, antibiotics, livestock, etc., while the farmer supplies the land, labor, and management. The corporation gains the advantages of family farming (primarily cheap labor) without taking any of the costs and risks of capital ownership. Then the commodities are sold to

\(^{29}\) Ibid., p. 21.
the corporation's packer or processor at a previously fixed price.\textsuperscript{31} In 1980, the USDA released figures of different products that are primarily produced under contract. Though the data is relatively old, they are revealing as to the agribusiness dominance of the market. In the U.S., production and marketing contracts covered the production of ninety-eight percent of sugar beets, ninety-five percent of milk, eighty-nine percent of chicken broilers, eighty-five percent of processed vegetables and eighty percent of all seed crops.\textsuperscript{32}

This type of ultra consolidation can also be seen in the global market as well, which is no surprise, as nearly every one of these U.S. agribusiness corporations is a multi-national. The United Nations Centre on Transnational Corporations conducted a study in 1980 of the world’s 180 largest food and beverage companies and found significant market concentration in such segments as dairy, meat, tropical fruits, grain, and tropical beverages. Recently, Hope Shand of the ETC Group tried to replicate this same study to see if increased trade liberalization had affected these numbers. She found that hardly a third of the original companies still existed today. The further consolidation that happened on the world market is staggering: ten companies control eighty percent of the global pesticide market; five companies control seventy-five percent of the vegetable seed market; and two companies (Cargill and Archer Daniels Midland) control roughly seventy-five percent of the global cereal market.\textsuperscript{33}

The dominant few global agribusinesses (Archer Daniels Midland, Monsanto, Novartis, Cargill, Con Agra, etc.) exercise control over multiple aspects of the production process--the production inputs and their distribution, the seeds and chemicals, the

\textsuperscript{31} See Wellford, \textit{Sowing the Wind}, pp. 103-104.
\textsuperscript{32} See Korten, \textit{When Corporations Rule the World}, p. 225.
farmers, the processors, the distributors, and the retailers—amounting to extensive vertical integration. Global prices and the supply of food, not to mention its quality, are subject to control by just a handful of corporate agribusinesses. This does not follow any traditional competitive market theory, which depends on many small and medium-sized enterprises, competing with each other to provide the best quality, price and new innovations in the industry.\textsuperscript{34} Because of these companies' size and dominant control of their markets they possess tremendous buying power. They can scavenge the globe to purchase millions of dollars of product at the lowest possible price, then turn around and sell it at the highest possible price in a global market place and are in the position to set industry prices and standards. Pesticides, herbicides, hormones, antibiotics, irradiation, bioengineering, food additives, production techniques, and land usage are all directly linked to the types and quantities of items these companies buy and sell. Their purchasing and utilization of these products and technologies paves the way for the future of food production and influences consumer choices as well as the health and safety of the food system.\textsuperscript{35}

The industrial farming techniques of intensive agriculture that have been promoted by agribusiness have been ever more applied in the post-World War Two era. Due to technological and science innovations developed for the war, chemical fertilizers, pesticides and herbicides could now be cheaply produced en mass. Plant and animal gene technology had also made great steps at this time too. Agribusiness and world governments teamed up to promote the use of these industrial farming technologies and

\textsuperscript{33} See Halwell, \textit{Eat Here}, p. 47.
\textsuperscript{35} See Cooper, \textit{Bitter Harvest}, p. 90.
methods in what has been called the Green Revolution. Farmers and their governments from all around the world were enticed with low-interest loans and educated about the efficiency of highly concentrated, high-input, industrial agriculture. The argument not only centered on boosting agricultural productivity to eradicate world hunger, but these practices were meant to bolster farmers’ standards of living as well through economies of scale. Large farms often have advantages in borrowing, in purchasing inputs, and in marketing. Therefore, large farms would find it easier to borrow from banks to finance improvements, gain discounts from fertilizer suppliers by buying in bulk, and to make advantageous arrangements with the purchasers of their products because of the large quantities which they have to sell.36

Due to the intensive agricultural practice of monocropping, the soil is rapidly eroded and depleted of its nutritional value. Unlike the traditional methods of growing crops, where organic materials (livestock manure, food wastes and other organic wastes) are returned to replenish the soil, intensive monocropping relies primarily upon chemical fertilizers to add the needed nutrients to the soil. Much of these fertilizers must be imported from other nations, making farmers dependent upon foreign imports and markets for their fertilizers. In the U.S., 85 percent of potash is imported, and significantly increasing amounts of nitrogen and phosphorus are also being imported to feed America’s soils, which are being depleted at an astonishing rate. American farmers now apply well over 20 million tons of chemical fertilizers every year.37

Monocropping also requires massive amounts of chemical pesticides and herbicides to kill any insect pest or weeds. Farmers have been persuaded away from the

36 See Grigg, The Transformation of Agriculture in the West, pp. 91-94.
traditional methods of weed and pest management such as crop rotation, field sanitation, and adjustment in planting and harvest dates to avoid peaks in pest populations. Instead, farmers have been handed a number of extremely hazardous chemicals to douse their fields and crops in. Between 1964 and the end of the century, pesticide use in the U.S. doubled from 500 million pounds to over 1 billion pounds a year. In 1983, there were approximately 19 thousand compounds contained within these pesticides that were toxic enough to be required to be registered with the EPA.\textsuperscript{38} Choosing a chemical to control a certain type of pest—in terms of its effectiveness, its proper dose level, and possible side effects—is often left to the advice of the agrichemical company fieldman, who very well may be motivated to promote excessive pesticide use by increased sales and commissions. Each year chemical companies invest several million dollars into the development of pesticides and herbicides and strive to make very large profits off of each. Therefore, these companies primarily develop chemicals that kill a broad range of organisms so that it can be marketed for many more uses, than a chemical which is very specific as to what organisms it kills. This provides chemicals that are extremely toxic to nearly everything they come into contact with.\textsuperscript{39} Two prime examples of such chemicals would be the infamous DDT and Agent Orange, both of which have been found to have terrible side effects and the use of which has been banned in the U.S. These compounds may have been banned from use here, but that does not stop U.S. chemical companies from producing them and selling them in other nations that have more lax regulations. Oftentimes these chemicals still find themselves in the U.S. food system due to massive food imports, that completely overwhelm the U.S. regulators ability to check for

\textsuperscript{38} See Wargo, \textit{Our Children's Toxic Legacy}, pp. 94-107.
\textsuperscript{39} See Wellford, \textit{Sowing the Wind}, p. 254.
residues. Many crops produced through monocropping are required to feed the vast number of livestock being raised throughout the world, the population of which is several times that of humans. There are over 20 billion livestock on earth, more than triple the human population. Globally, approximately 40 percent of grain produced is fed to livestock. In the U.S. nearly 80 percent of domestically produced grain is fed to livestock. It is estimated that the world’s cattle alone consume enough calories from these grains to feed 8.7 billion people. Many of these livestock are being produced by applying the industrial agriculture model and growing them in what is called feedlots. Feed lots concentrate livestock production in the smallest area possible, often in huge buildings where all aspects of the environment can be controlled, from temperatures to hours of light. These ‘factory farms’ have livestock concentrations in the thousands, very often the high tens of thousands. One farmer said of such operations, “this is not agriculture, but are 60 acres of concrete and 10 acres of manure pits.”

The animals are so densely populated that disease and parasites are a constant threat to production. To battle against this and boost productivity, animals are fed, injected, and doused repeatedly with antibiotics and pesticides to ward off disease, parasites, and also expedite weight gain. Disease and parasites are not the only worries of feedlot managers, another major dilemma of large numbers of densely populated livestock is waste management. On smaller livestock operations which produce their

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44 Ibid., p. 234.
own livestock feed, this manure serves as an excellent fertilizer for crops. On a feedlot, where feed is trucked, sometimes hundreds or thousands of miles, there are no fields to spread this natural and extremely constructive fertilizer. It must instead be stored in massive lagoons and undergo processing so that it can be released, much like a municipal waste treatment facility. As this waste is being stored and processed it is breaking down and emitting tremendous amounts of noxious gases (hydrogen sulfide, ammonia, and methane), many of which are toxic at these concentrated levels and/or are significant greenhouse gases. It is estimated that livestock are responsible for over 25 percent of the world’s methane gas emissions.\(^{45}\) The amounts of animal waste that these factory farms produce is absolutely staggering. In the U.S. alone, every 24 hours livestock produce over 20 billion pounds of waste, this is over 20 times the amount of excrement produced by the U.S. human population.\(^{46}\) It does not take much of an imagination to realize that this amount of animal waste, in highly concentrated amounts, has a high ecological impact.

An excellent example to illustrate this type of livestock production is the modern chicken production facility, as described by Richard Roop, director of corporate quality assurance for Tyson Foods, one of the largest chicken producers in the U.S. In 1997, this company alone processed over 2.1 billion chickens, 8.9 million turkeys and 1.6 million hogs and had approximately $8 billion in sales. He describes the typical “chicken house” as having 20 to 40 thousand chickens in each environmentally controlled facility. It takes approximately 38 to 40 days to grow the birds to the optimal slaughter weight of 3.8 to 4.0 pounds, requiring about 7 pounds of feed each. The typical “chicken house” of 20

\(^{45}\) Ibid., p. 267.
\(^{46}\) See Robbins, Diet for a New America, pp. 371-372.
thousand birds will produce 200,000 chickens and 100 tons of manure annually; while consuming approximately 1.4 million pounds of feed and 1.6 million gallons of water. To extrapolate this over the entire U.S. chicken industry would mean that 254 million tons of feed and 290 million gallons of water are consumed annually, while producing nearly 20 thousand tons of highly noxious chicken manure.\textsuperscript{47}

The typical explanation for the constant pressure to ‘get big or get out’ which is endemic in industrial farming, is that it improves efficiency of the food system by increasing the number of large farms that can operate at lower monetary costs. But these economies of scale typically level off. There is data for a wide range of crops being produced in the U.S. that show that the lowest production costs are often achieved on farms of much smaller size than the typical mega-farm. But these extremely large mega-farms can tolerate lower margins, therefore, even if they do not produce at the lower cost, they are still able to sell their crops at lower prices to the processor.\textsuperscript{48}

The state, especially in the North, international organizations (i.e. World Bank, WTO, IMF), and the market, most notably driven by multinational agribusiness corporations, have become the primary formulators of food systems and farm policy. Much of these policies over the past three decades have been in promotion of trade liberalization, which was fostered by the emergence of neo-liberal administrations in some of the major developed nations (U.S., U.K. and Canada) in the 1980s. These administrations called for a reduction in government spending and interference in the market, they assumed that the market was a better economic manager than the state.\textsuperscript{49} These administrations of the powerful, developed North administered pressure on

\textsuperscript{47} See Cooper, \textit{Bitter Harvest}, pp. 107-108.
\textsuperscript{48} See Halwell, \textit{Eat Here}, pp. 64-65.
international organizations and governments of the South to liberalize their own economies and open their markets. Many nations of the South did liberalize, removing much of their state controls and supports. With a lack of private domestic firms with adequate funds, much of the South's agricultural industry was opened for multinational agribusiness.  

Much of the liberalization of the economies of the world, has been through the promotion of such policies by international organizations like the International Monetary Fund, World Bank and the relatively recently established World Trade Organization. For years the World Bank and IMF have been providing loans to developing nations with stipulations requiring them to open their markets to imports from developed nations. These same organizations have also greatly encouraged, through the use of monetary incentives, the developing nations to focus their economies on specialized production for export. Unfortunately, much of these loans go directly to the agribusinesses and wealthy, who possess large farms and much of the arable land of the South. This money has typically gone to support large monoculture operations specializing in luxury commodities for export and large livestock operations. Guatemala offers a prime example of this, only 3 percent of the population owns 70 percent of the agricultural land. Much of the agricultural land and resources have been directed towards the production of meat. Annually, 40 million pounds of this meat is exported from Guatemala to the U.S., while 75 percent of Guatemalan children are undernourished and infants only have a fifty percent chance of reaching the age of 4.

49 See Buckland, Plowing Up the Farm, p. 9.
50 Ibid., p. 39.
51 See Halwell, Eat Here, p. 51.
52 See Robbins, The Food Revolution, pp. 286-287.
Many of the recent international trade agreements that have been instituted call for nations to reduce and eliminate their traditionally protective tariffs on agricultural commodities. These agreements restrict the ability of nations to protect their domestic agriculture by forbidding domestic price supports, tariffs on imported goods, and preference for products based on place of origin.\(^\text{53}\) These same agreements leave much room for the wealthy and powerful nations of the North, who hold the balance of power to manipulate the agreements in their favor. The U.S. and E.U. are responsible for domestic subsidies of a billion dollars a day, these subsidies lead to depressed world markets and export dumping.\(^\text{54}\) The farmers of the poor South can not compete with the subsidized commodities of the North. The WTO has repeatedly defended and imposed such policies.

It is true that all governments could subsidize their agricultural sector, but the reality is that the governments of the South do not have the funding available that the wealthy nations of the North have. Oftentimes nations of the South are strongly ‘encouraged’ by nations of the North and international organizations not to subsidize their agriculture sector. Meanwhile, nations of the developed North are pumping billions of dollars of subsidies directly into their agricultural sector. The U.S. government gives direct subsidies to the agriculture industry of well over $20 billion annually and the E.U. directly subsidizes their agricultural sector with over $50 billion annually. To compound this discrepancy gap in agricultural subsidies, the vast majority of the subsidies go to large industrial farms, which have direct connections to corporate agribusiness. In the U.S. less than 20 percent of farmers receive 86 percent of the subsidy money. The

\(^{53}\) See Halwell, *Eat Here*, pp. 138-139.

\(^{54}\) See Buckland, *Plowing up the Farm*, p. 97.
numbers in the E.U. are very similar with only 20 percent of the farmers receiving the subsidy money.\textsuperscript{55}

Surely the government’s chief concern is the health and safety of the nation’s food system, but there are so many different factors that are involved that it is sometimes difficult to know whose interests government officials support. The reality is that government regulations often favor the wealthy and powerful constituencies representative of agribusiness.\textsuperscript{56} Agribusiness has spent billions of dollars on advertising, lawsuits, and lobbying of law makers, to help tilt agricultural production, trade, and regulation policies in their favor. These corporations spend millions of dollars a year in lobbying political contributions. The job of a food lobbyist is to ensure that the government does nothing to impede clients from selling more of their products and that the government does as much as possible to create a supportive sales environment.\textsuperscript{57}

Agribusiness often benefits from its relentless lobbying of government and international organizations. A prime example would be the E.U.’s banning of genetically modified commodities and livestock raised with hormone implants to promote growth. Although there is no hard scientific evidence to directly connect either of these types of products to human health problems, the people and governments of the E.U. have deep objections to consuming them. The E.U.’s position holds that it is only a matter of time before a direct connection can be made, but until that time the W.T.O. has ruled in favor of the U.S., who had brought a lawsuit against the E.U. The E.U. must pay the U.S. $150 million annually as compensation for lost profit.\textsuperscript{58} This is most upsetting to the E.U., especially

\textsuperscript{55} See Cavanagh and Mander, eds., Alternatives to Economic Globalization, pp. 211-213.
\textsuperscript{56} See Korten, When Corporations Rule the World, pp. 125-126.
\textsuperscript{57} See Nestle, Food Politics, p. 108.
\textsuperscript{58} See Robins, The Food Revolution, pp. 142-143.
since the practices of genetic modification and the use of hormones to facilitate growth are not regulated within the U.S.\textsuperscript{59}

Corporate agribusiness has evolved and consolidated over the past century within the U.S. and throughout the world. The consolidation of these corporations has been astounding, as a mere handful of corporations have a significant control of much of the agricultural and food markets of the world. They have used their sheer size, power and wealth to press governments and international organizations to support policies for trade liberalization, production for export, and industrial farming, that directly benefit the dominance and expansion of multinational corporate agribusiness in a global food system.

\textbf{IV. Negative Consequences of a Corporate Global Food System}

As agricultural practices and food systems develop throughout the world to feed the growing population, both short-term and long-term consequences of the structural changes must be evaluated to determine the path or paths that should be followed. By adhering to the corporate vision of industrial agriculture production and a homogenized global food system that is concerned with short-term quarterly profits, many negative consequences are evident. These negative consequences include social, economic and environmental problems that will have lasting effects on local populations, global populations and the environment. National governments, international organizations, and the individual global citizen must evaluate these consequences to determine what types of practices and policies are appropriate to not only feed themselves but future generations as well.

\textsuperscript{59} Ibid., pp. 335-339.
The most concerning of these consequences may very well be the environmental degradation caused by the practices that are promoted by corporate agribusiness. We live on a planet of finite resources that depends on a delicate balance of ecosystems to sustain life and provide humans with the ability to obtain an adequate food supply. We are dependent upon the earth's natural resources (both renewable and finite) and ability to absorb our wastes (sink function) to maintain a hospitable environment. Although all agriculture and food systems are dependent upon the manipulation of natural resources, certain types are much more destructive and unsustainable in a long-term view. The environmental degradation that takes place affects every aspect of the ecosystems that we are dependent upon, from soil and water degradation to atmospheric degradation.

Due to the practice of planting intensive monocultures of crops, of which a vast majority are used to feed livestock, the world's topsoil is being degraded and eroded at an alarming rate. Topsoil is important because it is the dark, nutrient-rich soil that holds moisture and serves as the medium in which plants grow. According to the International Food Policy Research Institute 40 percent of the world's agricultural land has become seriously degraded due to soil erosion, nutrient depletion and salinization.\textsuperscript{60} Salinization is the increased salt content of soil, which is detrimental to crop growth. Most soil salinization is due to repeated irrigation, because nearly all ground water, used to irrigate, contains some amount of sodium chloride. With repeated irrigation, the soil is continuously being doused with water, which after it evaporates leaves a salty residue that accumulates over time.\textsuperscript{61} Monoculture growing techniques also deplete nutrients rapidly and rely upon chemical inputs to artificially feed crops, while the soil remains

\textsuperscript{60} See Robbins, \textit{The Food Revolution}, p.283.
\textsuperscript{61} See Cooper, \textit{Bitter Harvest}, pp. 44-45.
depleted. Once the natural nutrients are used in the soil, agribusinesses push for more and more chemical fertilizers to be pumped into the soil to provide plants' nutritional needs. In the U.S. alone farmers apply over 20 million tons of chemical fertilizers a year. Much of these fertilizers do not end up feeding crops, as intended, but end up as run-off. When combined with the millions of tons of herbicides and pesticides applied to these same lands, a toxic brew is sent into water sheds around the world. Not only is the soil degraded by using such practices, but much of it is lost as it is eroded by wind and water. In most industrial monocultures, the ground is continuously being worked and all ground cover is destroyed. Winds and rain carry away massive amounts of the exposed soil, and with the shift away from traditional agricultural land management techniques to a much greater dependence upon chemical fertilizers, inches of valuable finite topsoil are lost every year. The U.S. Soil Conservation Service reports that over 7 billion tons of top soil are lost every year in the U.S. Traditional methods of agriculture depend on returning organic waste to the fields, this includes livestock manure which also serves as a highly effective fertilizer. This organic material helps foster topsoil replenishment to reverse the depletion and erosion for which the previous crop was responsible. With monocultures providing feed for feedlot livestock operations that are hundreds, maybe thousands of miles away, there is no economical way to close the cycle of use and replenish.

As everyone is now aware, there is an abundance of greenhouse gases in the atmosphere causing global warming. What is not as well known is that current industrial agricultural practices that are heavily promoted by corporate agribusiness, are one of the top culprits of releasing greenhouse gases. This problem is compounded by the fact that forests and rainforests, which act as the natural 'sink' to dispose of many greenhouse

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gases, have been and are still being cleared at an astonishing rate to provide more land for agricultural use. Industrial agricultural practices are responsible for 25 percent of the world’s carbon dioxide emissions, 60 percent of methane gas emissions, and 80 percent of nitrous oxide emissions. Nitrous oxide emissions are the result of millions of acres of tropical rainforest being cleared to make room for monocultures and beef production, along with increased use of chemical fertilizers with high concentrations of nitrogen. Massive carbon dioxide emissions in agriculture are due to loss of soil carbon and increased use of fossil fuels to run machinery, transport products and provide energy to the various energy intense techniques used in industrial agriculture and a global food system saturated with highly processed foods. Loss of soil carbon is due to such industrial agricultural practices as deforestation, drainage of wetlands, deep plowing, use of heavy machinery, overgrazing, and the extensive use of chemical fertilizers and pesticides that destroy soil structure. Methane gas emissions, which contributes significantly more to global warming than carbon dioxide, are the direct result of increased industrially raised livestock and the industrial method of producing rice. In industrial production of rice, fields are flood irrigated and then doused in nitrogen fertilizers, resulting in massive methane emissions. As discussed, industrial livestock production depends upon high concentration feedlots that pump the animals full of grain and legumes (soybeans). These livestock, cattle especially, do not have a natural diet that is high in grains and legumes, they are traditionally consumers of grass. This unnatural diet force the livestock to be extremely gaseous, when combined with the emissions from their waste, the result is significant amounts of methane gas. With the dangers of global warming becoming more evident every day, the only responsible thing to do is to re-

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evaluate these methods to help curb greenhouse gas emissions, especially since farmers are so very dependent upon the environment and weather.

The atmosphere and soil are not the only victims of corporate sponsored industrial agriculture, the fresh water of the world is also at great risk. The troubles facing the world’s fresh water from industrial agriculture are two-fold: over consumption and pollution. The majority of the fresh water used in the world today is used in agricultural production and of the fresh water not used in agriculture much of it is contaminated in one form or another by industrial agriculture. Today, 70 percent of fresh water consumed throughout the world is used in agriculture production. Of this 70 percent, much is used in crop irrigation, but the increasing livestock populations also demand a significant amount of water. Presently, 17 percent of the world’s cropland is irrigated.64 These crops require irrigation primarily for two reasons: 1. the seeds used are commercial hybrids or genetically modified seeds which require more water because of shorter roots65 and 2. crops are being grown in water deprived areas such as the U.S. Southwest, where crops are only able to be grown because of hugely subsidized water divergence programs that run many rivers dry. As discussed earlier, most of the grains and soybeans being raised go to the feedlots to feed the huge number of livestock being produced. With this taken into account, on average the water required to produce one pound of U.S. beef is 2,500 gallons.66 The massive irrigation and water divergence systems are depleting aquifers around the world, and people around the world are noticing. Currently, Mexico has filed suit against the U.S. for water rights, as the natural flow of fresh water into Mexico has been vastly depleted due to large scale industrial agriculture irrigations

64 See Buckland, *Ploughing up the Farm*, p. 45.
systems throughout the southwest.

The other half of the fresh water problem is pollution, which industrial agriculture contributes to in multiple ways. Major contributors to water degradation are the huge livestock feedlots that are scattered throughout the world, but primarily found in the U.S. As previously mentioned, feedlot operations produce tremendous amounts of animal waste that must be stored, processed and disposed of. Much of this waste eventually finds its way into the fresh water of the world. Livestock waste accounts for more than 10 times as much water pollution as the total amount attributable to the human population. In the U.S., the industrial meat industry accounts for more than 3 times as much harmful organic waste water pollution as the rest of the nation’s industries combined. When this waste enters the waterways, dissolved oxygen levels drop significantly, while levels of ammonia, nitrates, phosphates and bacteria, are greatly increased.\textsuperscript{67} Sometimes the huge storage lagoons that hold the animal waste are subject to accidental ruptures or overflows; one such incident happened in at a North Carolina hog farm in 1995, where over 35 million gallons of hog waste spilled and entered the water system. The spill killed over 10 million fish and closed 364 thousand acres of coastal wetlands to shellfish harvesting.\textsuperscript{68}

Another main culprit of fresh water pollution is the vast monocultures of crops being raised on a steady diet of chemical fertilizers, pesticides, and herbicides. These chemicals are washed off crops and out of the soil by rain and enter the fresh water supply. The chemicals can be found in many wells, rivers and lakes. The effects can be detrimental to human and animal health. It was for this reason that the Clean Water Act

\textsuperscript{66} See Robbins, \textit{The Food Revolution}, p. 236.
\textsuperscript{67} See Robbins, \textit{Diet for a New America}, p. 373.
was established in the U.S. in 1972, as the U.S. Environmental Protection Agency found that nearly 70 percent of river “impairment” was caused by agricultural pollution. More recently, the U.S. Geological Survey released a study that analyzed 5,000 water samples from wells and waterways; the result was that at least one pesticide was present in half of all wells and nearly every river and stream tested.\(^69\) Run-off of Nitrogen based fertilizers presents an equally disturbing problem. As the Nitrogen enters bodies of water, it feeds and promotes the growth of algae and other water weeds. This presents problems to the recreational users of the waterways and to others who use the waterways, such as hydroelectric plants. However an even worse consequence of increased Nitrogen levels in water is the massive algae blooms that it feeds. As these blooms are decomposed, the bacteria that feed upon them dissipate dissolved oxygen levels in the water, which kills nearly all other organisms in the area. An example of these dead zones can be found in the Gulf of Mexico. Due to the run-off from millions of acres of monocultures throughout the mid-West that flow into the Gulf of Mexico from the Mississippi, there is a massive algae bloom feeding off of the Nitrogen from the fields, which in turn creates a ‘dead zone’ This particular ‘dead zone’ is 20,000 square kilometers or roughly the size of New Jersey and is located in one of the U.S.’s most productive fisheries.\(^70\)

Farmers practicing traditional agriculture have always manipulated the environment, but they also saw themselves as stewards of the environment. Agriculture is so very dependent upon the land and environment that it only makes sense that it is in the farmers best interests to maintain a healthy planet. With the move towards a global food system, which is dominated by corporate agribusiness, farmers are increasingly

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\(^68\) See Cooper, _Butter Harvest_, p. 108.

\(^69\) Ibid., p. 29.
pushed into industrial style farming, which exploits the land for short-term profit, not long-term sustainability.

Since the beginning of human civilization, the purpose of food systems was to provide the population with sufficient amounts of healthy food to meet their caloric needs. For thousands of years, food systems were typically able to do just that, meet the population's caloric needs. Today, in the food system that is being established by multinational corporate agribusiness, there is a problem of overabundance in the food supply of the wealthy nations of the North, while over a billion poor people still go hungry. People in both categories suffer from malnutrition, the poor undernourished for obvious reasons, the wealthy overfed for a range of reasons, many of which can be traced back to the policies and practices that stem from the global food system that corporate agribusiness pushes.

Due to the practice of industrial monocultures in the production of grains, fruits, vegetables and animals for meat, milk, and eggs, the food supply is laced with a wide range of chemical residues. The Molotov cocktail of pesticides, herbicides, antibiotics and hormones that these industrial foods are raised on, are never fully eradicated from the product and show up in trace amounts in our food. There are concerns that chemical residues in the food supply may have serious health ramifications on the public. To begin with, there is clinical evidence from experiments performed on mammals, that many of the pesticides in use today cause cancer and birth defects after prolonged periods of consistent exposure.71 Nearly 80 percent of all meat, milk and eggs consumed in the U.S. is from animals that were fed medications during all or part of their lives. The health

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70 See Halwell, Eat Here, p. 73.
71 See Wellford, Sowing the Wind, p.187-189.
hazards involved in using mass amounts of antibiotics on the animals that eventually end up in the food supply is very alarming. The concerns are: allergic and toxic effects of drug residues in drug sensitive persons; and most importantly, the development of drug resistant bacteria, which may make some antibiotics obsolete for humans.\footnote{Ibid., p. 141.} These are legitimate concerns, but due to the long-term nature of the risks of being repeatedly exposed to chemical residues in food, it is hard to draw a direct correlation between the cause and effect. Without solid direct evidence, it is nearly impossible to battle against the multibillion dollar agribusiness corporations, who have extremely high stakes involved in maintaining the status quo. Besides, due to the short sightedness and low attention span of the public, especially in the U.S., most in the public are completely blind to the dangers, until a crisis develops.

Surprising as it may sound, overabundance in the food supply also has very negative consequences, although not everyone in the global population has the benefit of suffering from it. In 2000, the number of overweight people in the world matched the number of malnourished people at 1.1 billion each, for the first time ever. The greatest example of overabundance in the food supply is undoubtedly the U.S., where nearly two-thirds of the population is overweight or obese. This is a very alarming trend that has taken place in about two generations, 50 years ago only 5 percent of the U.S. population was overweight. Obesity alone costs the U.S. about $70 billion a year in direct health care expenses and lost productivity and when that is added to the $50 billion a year diet and weight loss industry, the true monetary cost of over consumption is staggering.\footnote{See Cooper, Bitter Harvest, pp. 169-170.} The U.S. food system --domestic food production plus imports-- provides a daily average of
3,800 calories per capita. This is nearly double the requirements needed to meet the needs of most women, a third more than needed by most men, and much higher than is required for children and the elderly population. These excess calories are due to the relatively few corporations within the food system, who must compete amongst one another for the consumers food dollars.\textsuperscript{74} The result is increased production, marketing and consumption of the wrong types of food that are very unhealthy and are a significant contributing factor to obesity and many chronic diseases such as cardiovascular disease, diabetes, and several types of cancer. The U.S. food supply has a gluttony of meat and highly processed chemical laden food choices, both of which are significant contributors to the over-consumption of the wrong foods. The majority of meat eaten by Americans today --usually the centerpiece of every meal Americans consume-- is beef, pork, lamb, and veal, which just happen to already have some of the highest percentages of fat in them, but are fattened even further on the grains fed to them at the feedlot, so as to have a more flavorful appeal to consumers. The highly processed foods that are overflowing U.S. grocery stores are packed full of preservatives, food coloring, fake fat, fake sugar, fake salt, and a host of other chemicals; attempting to read the ingredients label makes you wonder if you need an advanced degree in chemistry just to know what is in your food. These things are so commonplace to U.S. consumers that we seldom question why and what is in our food, until some food crisis hits the headlines, then it is of great importance for a week or two.

The increasingly global food system, which is dependent upon industrial agriculture for export, is a vastly energy deficient system that is greatly dependent upon huge infusions of largely subsidized energy. This system, that has been established to the

\textsuperscript{74} See Nestle, \textit{Food Politics}, pp.13-17.
benefit of multinational corporate agribusiness, depends on huge amounts of energy for the production, distribution and application of the many agrochemicals it consumes. Huge amounts of energy are required for the maintenance of the highly mechanized monocultures that have been designed to decrease human labor, from the huge diesel tractors to the environmentally controlled livestock production facilities and for the increasingly more refining and processing of foods. Possibly the most energy consuming of all, the great food swap that takes place in the global market that has increased the food miles of the average American meal to anywhere between 1,000 to 3,500 miles. The typical trip for ingredients of an average meal in the U.S. starts in multiple locales throughout the globe where the raw ingredients are grown on specialized industrial factory farms, they are then transported to a packer, processor or refinery where they are processed into a refined ingredient, they are again transported to yet another processor that could be next door or thousands of miles away, where they are again processed into a form that can be consumed, from here the product is shipped throughout the world to be distributed to consumers, sometimes making stops along the way at several distribution centers where it is routed and re-routed so that it ends up in the locale with greatest demand and highest prices possible, which may be the very same place that the original raw ingredients had been grown. In today’s global economy this is considered a model of efficiency: buy ingredients from the cheapest producers and sell the final product for as much as possible in the market that can afford to pay the most. It was cheap because of the relatively cheap price of energy, especially when it was largely subsidized, the scary thought is what will happen when energy prices begin to rise? We are beginning to see the consequences of this today, with oil prices rising. The cost of oil is directly affecting
the price of food, causing what the World Bank and U.N. are calling a food crisis as protests and violence break out across the poor developing world over access to cheap food and here in the wealthy developed world, higher food prices add to a slowing global economy that is heading into recession.

Another significant problem that is being facilitated by corporate agribusiness is the loss of biodiversity. As corporate agribusiness gains increasing portions of the world market in agricultural inputs, commodities, and foodstuffs, more farmers and farmland are devoted to smaller numbers of crops and an ever more decreasing number of livestock breeds and crop varieties. This is leading to a homogenization of the globe’s crop varieties and livestock breeds. Agribusiness systematically breeds out plant varieties and animal breeds in favor of the few that they see as more efficient, in order to turn a quicker profit. In the U.S. where 75 different vegetables have traditionally been grown, over 97 percent of the varieties of those traditional vegetables have gone extinct in the past 80 years. Fruits have suffered much the same fate. For example, between 1804 and 1905, there were calculated to be over 7,000 varieties of apples in the U.S., today over 86 percent of those varieties are extinct because they were not profitable to corporate agribusiness. Livestock are in the same boat with over 90 percent of all eggs consumed in the U.S. coming from just one breed of chicken and 70 percent of the nation’s dairy coming from just one breed of cow. This lack of biodiversity makes the food system very vulnerable to disaster in the form of diseases, pest infestations and, in today’s world, bioterrorism that may target the specific breeds or varieties of plants and animals that provide the vast majority of the food supply. This threat is compounded even more by the fact that increasingly, regions are becoming specialized to one or two monocultures,
expanding the risk of crop failures from natural disasters like drought and flood. Over-reliance on a few varieties of plants or breeds of animals is putting the global food supply at unnecessary risk. Biodiversity of not only varieties of plants and breeds of animal, but also different crops within a region, makes for a much more secure food system, not to mention a healthier ecosystem.

One final negative consequence of a corporate dominated global food system is the distinct disadvantage that it places developing nations in. Developing nations are exactly that, nations that are attempting to develop their economic and social structures to comparable levels of the prosperity that the developed world has enjoyed for generations. Most developing nations have followed the lead of the developed world, including developed nations’ governments and international organizations, by implementing structural adjustment programs that were pushed upon them with the promise of decreasing poverty and increasing their economic standing in the global market place. Such policies include, but are not limited to: economic liberalization, trade liberalization, and export-oriented industry. These policies have dramatic repercussions in the agricultural sector of these developing nations as the vast majority of the populations of these nations live in rural areas and depend on agriculture for their livelihoods, many still participating in subsistence farming. As developing nations acquiesce to the bullying of rich developed nations and the international organizations in which wealthy developed nations enjoy a significant balance of the power and open themselves to an unfair system dominated by quite literally only a few huge corporations. This is a much different environment than the one the developed nations themselves experienced when they were developing. The nations, organizations and corporations that are pushing these policies

75 See Cooper, *Bitter Harvest*, pp. 46-47.
see the developing world as an area rich in resources of land, unskilled labor, and lax environmental laws, that are ripe for exploitation. Much of the money and support that has gone into the structural adjustment programs have gone to the already wealthy landowners to develop huge monocultures for export. Such practices reduce production of staple crops and create an ever-increasing number of landless poor, those still living off the land are pushed to marginal lands. The theory used to justify these policies stated that increased exports would provide increased amounts of money and capital to import and replace the staple crops that feed the nation. In a system that is dominated by a few multinational corporations, who push mechanized industrial agricultural practices and siphon off as much profit from the products as possible, the reality is that the rich are getting richer and the poor are getting poorer and more hungry. The governments of the developed world are not moving to improve the situation much either, as most trade agreements established between developed nations and developing nations are largely tilted in the favor of the already wealthy, developed North. The nations of the North often force trade agreements on the nations of the South, which allow for the North to place tariffs on some commodities from the South and provide huge subsidies to commodity producers in the North, all while the South is typically barred from placing tariffs on commodities from the North and do not have the funding to match the subsidies given to Northern commodity producers. The nations of the developing South are at a disadvantage and rely on tainted advice from governments, international organizations, and corporations that have much different interests in mind, that are more focused on the status quo than on the flourishing and prosperity of the people and nations on the developing world.
V. Alternative Sustainable Practices

There are alternatives to the industrial agriculture and global food system that is currently being promoted and dominated by a small number of conglomerate corporate agribusinesses. Many of these alternatives are currently already in practice, but to make a significant impact they must be greatly expanded. Other alternatives are dependent upon the support of national governments, international organizations and corporations to institute the structural and policy changes that are required to set into motion agricultural practices and food systems that are not only sustainable but also will provide ample amounts of food to all in the global population. Most importantly, the majority of the alternatives require the global citizen to become informed about the issues at hand and to voice their concerns, whether it is through petitioning their governments or simply by voting with their food dollars and making choices that will help maintain healthy and secure societies, food systems and the environment.

One alternative that has many benefits and great potential is the practice of eating locally grown and processed foods. The most obvious benefit of eating locally produced foods is the significant cut in food miles. The reduction in food transportation will help to conserve the vital and finite fossil fuels that power the world, while at the same time curbing greenhouse gas emissions. It has been calculated that by eating locally produced food, a person can cut their carbon dioxide emissions by 5 to 17 times and reduce their carbon footprint by about 2,000 kilograms a year.\(^76\) Not only will this reduce fossil fuel use but it will also cut the amount of trash produced by the extensive packaging that long-

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distance food requires. It is estimated that in North American cities, up to one third of
the waste sent to landfills is from food packaging. The reduction in food miles also
reduces the chances of the food becoming contaminated by either chemicals or disease
causing bacteria. Consumers will also benefit from the reduction in food miles as they
will receive much fresher produce, and a greater number of options in the varieties of
produce they consume. Farms that produce for the local area can offer a wide selection
in the varieties of the produce, as they do not have to grow monocultures of specific
varieties of crops that are known for their durability in long-distance distribution, not
their taste or nutritional value.

The farmers themselves also benefit from producing for local markets. When
farmers cut ties with the corporate long-distance food system and produce for the local
market, they are able to diversify their crops and animals. By moving away from
monocultures to polycultures, farmers are able to grow many different crops and animals
on the same land. When measuring production by the amount of food produced per acre,
these polycultures have been shown to produce 1000 percent more output than industrial
monocultures that measure production by the amount of one crop produced per acre.

The rotation of crops and the use of animal manure to fertilize the crops produces a much
healthier soil that requires considerably less chemical inputs, which are expensive.
Typically, these farms do not require the extremely large and very expensive tools,
machinery and infrastructure. A typical tractor on an industrial farm is very large and
costs several hundred thousand dollars; on smaller farms that produce for the local
market there is no need for such a large piece of machinery, a much smaller and less

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77 See Halwell, Eat Here, p. 39.
78 Ibid., p. 75.
expensive one is adequate. By providing a more diverse selection of crops to the consumers, farmers will also diversify their customer base. This will increase their odds of financial success. The farmers’ share of the food dollar will also increase, making the products sold much more profitable.

There are numerous different ways in which consumers can participate in local food systems and obtain locally grown foods. The age old farmers market is a typical way in which most locally grown food is distributed and is again growing in popularity. According to the U.S. Department of Agriculture the numbers of farmers markets in the U.S. grew by 150 percent between 1994 and 2006. Today there are more than 4,300 farmers markets in the U.S.\textsuperscript{79} Farmers markets provide an opportunity for farmers to sell their products directly to consumers. Consumers are able to purchase extremely fresh produce and connect with the farmers who grew it, providing opportunity for discussion about how it was raised and future crops that the farmer is or will be growing.

Another increasingly popular way for people to gain access to local food is through community supported agriculture (CSA) programs, which now has numbers upwards of 1,100 farms in the U.S. supplying over 100,000 households with fresh local food.\textsuperscript{80} A CSA operates through a type of partnership between farmers and consumers. At the beginning of the year consumers invest an amount of money into the farm, which helps the farmer pay production costs, in return the consumer receives a share of the harvest. City dwellers can participate in CSAs as well, but residents of large cities may find it difficult to find a participating farm within a reasonable distance.

There are alternatives for these residents of large cities that involve the direct

\textsuperscript{80} Ibid., p. 158.
involvement of citizens in the raising of crops in what has been dubbed “urban gardens.” These urban gardens take advantage of open space in cities, such as vacant lots and rooftops. The urban gardens provide more than just food to the city communities in which they are present, many have reported that the urban gardens have sparked further community participation in other community and social building programs. As much as the words urban and garden sound antagonistic of each other, there is substantial participation in such gardens worldwide. In a recent survey conducted for the United Nations, it was estimated that cities worldwide already produce on average a third of the food consumed by their residents. Over 800 million city residents worldwide participate in urban gardening, of these 200 million are producing for the commercial market. It has also been shown that participants in urban gardening eat better in terms of caloric and protein intake and children’s growth rates. Urban Gardens have also become relatively popular in the U.S. where the American Community Gardening Association estimates that there are roughly 18,000 community urban gardens throughout the U.S., with 750 in New York City alone. Although urban gardens will never provide enough food for all of the residents of the cities in which they are located, with increased interest and participation, increasing percentages of the food that city dwellers consume can be grown right in their own cities. By using innovative ways to make use of “dead” unproductive space such as rooftops and vacant properties, urban communities can supplement their diets with fresh home grown foods, while providing a community building activity that could also be turned into a lucrative operation of providing fresh food.

An interesting development in the local food movement is the participation of

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81 See Halwell, *Eat Here*, pp. 92-94.
corporations. Supermarket chain Wegmans Food Markets has a “Home Grown” section that features produce from local farms when it’s in season. Wegmans gives bonuses to produce managers who exceed a certain quota of produce from local growers. This program has been successful and Wegmans knows that local food choices will draw people into their store and that people are generally willing to pay a little more for it.\textsuperscript{83}

As the interest in local food increases, so too will its availability. Greater supply and demand of local foods should also help to decrease prices slightly, while still giving a greater share of the food dollar directly to the farmer, increasing his profits. As has been shown by Wegmans, there is room for some corporate involvement in local food. To help increase the success of local food, governments need to offer tax incentives and subsidies to farmers producing for their local areas, much like they already do for corporate agribusinesses. Although local food is not able to provide fresh food all year round in many temperate areas, farmers are adapting to the increasing markets for local foods by growing year round in large green houses. Local food will not completely satisfy everyone’s food demands and a complete elimination of long distance food is not realistic, but there should be an increased focus on local food being the first option.

Another alternative, which would greatly help to produce food systems that are more environmentally friendly, healthy and nutritious, and capable of providing abundant amounts of food to the entire global population, would be a reduction in meat and other products produced by livestock. As has been mentioned, the ecological consequences of mass produced livestock are tremendous; when coupled with the health consequences of over-consumption of meat and other livestock products, it is absolutely mind boggling why humans, especially Americans, consume as much as they do. Traditionally and still

\textsuperscript{83} See Halwell, \textit{Eat Here}, p. 138.
today in many developing nations, the consumption of meat and animal products is a luxury. This is not so in the U.S., where the American population long ago developed a meat habit that called for tremendous amounts of cheap meat to serve as the focal point of every meal. This type of diet seems to be spreading amongst other cultures worldwide; this is evident in China with its growing middle class population and can be seen with the increased share of Chinese grain being used to feed livestock (only 8% in 1978 compared to 26% in 1997 and much greater today).\textsuperscript{84} In 2006, it is estimated that farmers worldwide produced 276 million tons of chicken, pork, beef, and other meat, 4 times as much as produced in 1961; on average each person consumes twice as much meat as in 1961: approximately 43 kilograms.\textsuperscript{85} Increased production and consumption of livestock products puts tremendous stress on the environment, natural resources and food systems of the world, leading to increased hunger and a world less able to sustain future generations.

By cycling grains and legumes through livestock to produce meat and other animal products for human consumption we waste 90 percent of the protein, 96 percent of the calories, 100 percent of the fiber, and 100 percent of the carbohydrates.\textsuperscript{86} This is not to mention the much greater amounts of grain, water and fossil fuels that are used to produce animal products in comparison to plant based products. As previously mentioned, it takes nearly 2,500 gallons of water in the U.S. to produce 1 pound of beef. To produce a typical meat eating American’s food for one day it would take over 4,000 gallons of water; a lacto-ovo vegetarian’s (one that eats dairy and chicken products, but no other meat) daily food production takes 1,200 gallons; and a pure vegetarian’s daily

\textsuperscript{84} See Robbins, \textit{The Food Revolution}, p. 285.
food intake only requires 300 gallons of water.\textsuperscript{87} When comparing the production costs of meat versus plant-based food (using current industrial agriculture practices) in terms of fossil fuel expenditure the numbers are equally atrocious: for every calorie of protein from soybeans it takes 2 calories of fossil fuels, for 1 calorie of protein obtained from corn or wheat it takes 3 calories of fossil fuels, and for every calorie of protein obtained from U.S. beef it takes 54 calories of fossil fuels.\textsuperscript{88} According to the U.S.D.A. Economic Research Service, it takes 16 pounds of grain to produce just one pound of U.S. beef. This helps explain why 77 percent of U.S. corn is fed to livestock, 70 percent of all U.S. grain and cereals are fed to livestock and over 56 million acres of U.S. farmland are dedicated to the production of hay for livestock (compared to only 4 million acres dedicated to fruits and vegetables).\textsuperscript{89}

These numbers paint a picture of a very selfish and wasteful society, especially in a world were there are 1.1 billion malnourished people. The fact that makes this even more appalling is that there are an equal number of obese people that are feasting on meat, animal products and other highly processed foods that often times may have a tie to the nation or locale of these malnourished people.\textsuperscript{90} As it would be vastly unpopular and even impossible for Americans and the world’s wealthy to give up their tremendous meat habit, and it would not be ethical to deny the rest of the world’s population the opportunity to include meat and other animal products in their diets, a concession must be made. Those who consume the most meat and animal products (coincidentally, also the same that suffer from obesity and other diseases linked to overconsumption), must

\textsuperscript{86} See Robbins, \textit{Diet for a New America}, p. 352.
\textsuperscript{87} Ibid., p. 364.
\textsuperscript{88} See Robin, \textit{The Food Revolution}, p. 266.
\textsuperscript{89} Ibid., p. 292.
change their diet lifestyles and reduce their intake of these wasteful foods. By doing so, there will not only be great environmental benefits and reductions in fossil fuel and natural resource use, but tremendous amounts of agricultural land will be freed from production for livestock to production for human consumption. According to Lester Brown of the Overseas Development Council, if Americans reduced their meat consumption by as little as 10 percent, this would free over 12 million tons of grain annually, which would be enough to feed the 60 million people who die every year due to malnourishment. In order to create sustainable food systems, with sufficient food at affordable prices to feed the global population, there must be a change in people’s diets (especially Americans and other wealthy people of the world), to make meat and animal products a treat or special accompaniment to a meal and not its primary dish. If the mountains of grain, fossil fuels and fresh water continue to be squandered to feed the overfed, food prices will continue to rise and there will be growing discontent among the world’s poor as they will not be able to tame their hunger. In today’s world you can not go a day without hearing a news report concerning at least one aspect that the industrial livestock industry touches: food prices, the hungry poor, fossil fuel prices, environmental damage and the increase of disease and obesity amongst the overfed.

Yet another way that consumers can break the chains of agribusiness and find alternative foods that are more environmentally friendly, healthy and nutritious in comparison to the industrially raised products of agribusiness, is to eat organically grown foods. In order for food to be considered organic, it must have been grown and processed without the use of any non-organic or unnatural chemical fertilizers, pesticides,

herbicides, antibiotics, hormones or preservatives. Within the U.S. this is a relatively new practice, with very little government or private research taking place prior to 1980. It was widely believed that the bigger, efficient technology being pushed by agribusiness was the future of agriculture. Still today in the U.S. there are loose organic standards that are not strictly regulated by any particular government agency. It is the E.U. that has taken the lead on organic agriculture, where a phenomenal 35-fold increase in organic acreage took place in the last 15 years of the twentieth century. In 1999, over 10 million acres of the global 17 million acres of organic crops, were planted in Europe. The advantages of organic foods are both environmental and health related. On the environmental side organic farming tends to reduce soil erosion, greatly improve soil health, contribute far less to global warming and dramatically reduce water pollution. As for improved healthiness and nutrition from organic foods, the obvious implication would be the non-existence of harmful chemical residues, but also increased nutritional values. A study published by the Journal of Applied Nutrition analyzed the mineral content of organically grown apples, potatoes, pears, wheat, and sweet corn versus their conventionally grown counterparts. The study found increases in the mineral content of the organically grown foods; an increase of 63 percent in Calcium, 78 percent in Chromium, 73 percent in Iodine, 59 percent increase in Iron, 60 percent in Zinc, 138 percent increase in Magnesium, a 125 percent jump in Potassium and a whopping 390 percent increase in Selenium content.

The argument that organic farming is not efficient also does not hold water. A study conducted by the Center for the Study of Biological Systems at Washington

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University in St. Louis, matched groups of farms with similar crops, acreage, and soil conditions, one half using organic production methods and the other half using conventional chemical intensive production methods. The results of the study concluded, “A five year average shows that the organic farms yielded, in dollars per acre, exactly the same returns. In terms of yield, the organic farms were down about 10 percent. The reason why the economics came out is that the savings in chemicals made up for the difference.”95 When you match this study with other studies that show increasing resistance by insects and weeds to the increasingly toxic and expensive chemicals used to battle them, it becomes ever more obvious that a change in focus of agricultural practices and techniques is needed. A study by Jenny Tesar compared crop loss due to insects with chemical pesticide use in both 1945 and 1988. She found that U.S. farmers lost 3.5 percent of their corn crop to insects in 1945, compared to the 12 percent loss experienced in 1988 even though there had been an increase in pesticide use by over 1000 percent.96 This study acknowledges the fact that nature will adapt, in this case insects mutate and become ever more resistant to the increasing amount and toxicity of chemicals sprayed over millions of acres of cropland to kill them. Using mass amounts of toxic chemicals to kill pests and to artificially increase the nutrient content of soil seems to be a losing battle that is unhealthy to not only the environment but also to the human population.

Another program that supports the health of agricultural systems and the people who are directly tied to the production of agricultural products is the Fair Trade program. This program ensures that the farmers and farm workers producing the agricultural products receive a living wage and have a safe, dignified working environment. Even

94 Ibid., p. 370.
95 Ibid., p. 372.
though the primary focus of such programs is on the developing world, there is also a dire need for this type of program here in the U.S., where farm workers’ standards of living are among the poorest in the country. Many live at or below the poverty line. A 1997 study conducted by the U.S.D.A. Economic Research Service reported that the median weekly earnings for hired farm workers in 1994 was $238, not nearly enough to raise a family within the U.S.\textsuperscript{97} International fair trade programs affiliated with Fairtrade Labeling Organizations International, work to increase pay, living standards and working conditions by passing the savings from decreased middlemen and minimized overhead costs, along with usually slightly higher consumer prices to the farmers, to farm workers and their communities. Fair trade commodities include but are not limited to coffee, chocolate, tea, bananas and honey, and are certified by nonprofit organizations in 17 different countries, all affiliated with Fairtrade Labeling Organizations International. The fair trade coffee system alone benefits over 350,000 farmers organized into over 300 cooperatives and more than 40,000 cocoa farmers organized into 8 cooperatives.\textsuperscript{98} These programs are improving the wages, living standards and working conditions of hundreds of thousands of poor farmers and farm workers, primarily in the poor developing South, but the fair trade programs only represent a fraction of the trade in agricultural commodities and therefore only help a fraction of the impoverished farmers and workers that are providing the plentiful supplies of food to the well fed wealthy. There is clearly plenty of room for expansion of such programs.

I have mentioned 4 alternatives to the corporately controlled global industrial agricultural complex. By no means are these the only alternative initiatives being

\textsuperscript{96} See Cooper, \textit{Bitter Harvest}, pp. 138-140.
\textsuperscript{97} Ibid., pp. 53-54.
undertaken to establish environmentally safe and sustainable food systems that provide ample amounts of healthy, affordable food to all in the growing global population, along with providing increased wages and living standards for those farmers and workers who supply the food systems. There are programs in both the developed North and developing South that are working on ways in which to feed the increasing global population without destroying the environment, endangering the health of people, or widening the gap between the poor and wealthy. Ultimately it takes the participation of every global citizen, national government and agribusiness corporation to alter the way that our food is produced, processed and distributed.

VI. Conclusion

Food systems, which involve food being grown, harvested, processed, packaged, distributed, shipped and marketed have evolved over the history of human civilization. Food systems had to evolve their tools and techniques in order to provide for growing populations and changing demographics. It is primarily for these two reasons that contemporary foods system have had a tremendous leap in evolution over the past few decades and even centuries. Today, food systems are increasingly linked and more dependent upon international trade, while at the same time over the past century they have been increasingly dominated by large corporations that form a sector of the economy called agribusiness. These corporate agribusinesses have undergone a series of vast consolidations, so that now only a few ultra-large corporations control majority shares of almost every aspect of food systems. In the global economic world that we live in today, these corporate agribusinesses have extended their domination across

international borders, and are working hard to create a single global food system. Their vision of a global food system, sees a system of long-distance food that is dominated at every level by the few mega-agribusinesses that subscribe to vertical integration business techniques to increase profits at nearly any cost.

The reality of today’s world is that human activities are having a considerable effect upon the environment. The system of long-distance food that is grown, processed and distributed using an industrial model is significantly contributing to this environmental degradation. The argument that has been strenuously given by corporate agribusinesses is that this type of food system is needed in order to provide sufficient amounts of food to the growing global population. Their argument has many holes in it as millions of people go hungry every day, while millions of others are dying from problems and diseases brought on by overconsumption. The sad truth of the matter is that corporations have been reaping tremendous profits by promoting such environmentally and socially destructive practices. With their billions of dollars, agribusinesses have been able to convince national governments and international organizations to support policies that promote increased production for export, industrial farming techniques, and greater trade liberalization. As a result a singular global food system is emerging that greatly benefits these corporate entities, but puts national and local food securities at great risk, while practicing unsustainable farm production, food processing and distribution practices. The environment is being damaged at a tremendous rate, while human health is also being put at risk. There is no doubt that there is currently more food being produced than ever before, but in the interests of profit millions still die every year because of malnutrition.
There are many alternatives to the corporate dominated global food system that the world has been moving ever closer to in the past few decades. As the environmental, health, and social consequences of this type of food system are becoming ever more visible, more and more people are joining the ranks of those that have been called tree huggers and animal lovers, not because they want to save a tree or an animal, but because they want to pass on and invest in a healthy future for many generations to come. I have offered many such alternatives that will alter food systems in a manner to be sustainable and capable of providing for many generations to come. These are only a few suggestions as the possibilities are endless with innovators coming up with new techniques and practices on a daily basis. Many are in pursuit of finding sustainable alternatives, others want to fight hunger and poverty, while still others are realizing the increasing opportunities to make a profit from such technologies and practices.

Education may be the single biggest weapon in this effort to provide the growing global population with safe, reliable and most importantly sustainable food systems. The consumer must be made aware of the environmental, health and social consequences of the food that they eat. Once consumers are educated on the dangers and risks involved in their eating habits, greater numbers of people will participate in alternative systems. This will have beneficial effects as more people will be "voting" using their food dollars to increase the market for sustainable foods. Agribusiness corporations will not go down without a fight but if they do see an opportunity for profit they will adjust. Governments and international organizations must also be pressured into seeing the light. It is crucial that these institutions start investing into programs that will help promote local sustainable food systems, instead of continually giving corporate agribusiness and their
supporters the vast share of subsidies, and favoring them with beneficial restructuring programs and trade policies.

Even with the numerous benefits of these alternative practices, there will be many, primarily citizens of wealthy nations and corporate agribusinesses, that will strongly oppose such alternatives because of the need for changes in diet and the potential loss of profits. It must not be seen in this manner, but instead seen as an opportunity to regain a healthy, nutritious diet that is supplied by many local, smaller and much more sustainable farms, processors and distributors. By no means will all populations be able to maintain a local food system that will supply all their needs, and the international trade in agricultural goods should not be ended, but what does need to happen is a change of focus from industrially produced, highly processed, long-distance food being the first option to sustainable local foods being the first option. Slight changes on a global scale can have tremendous results. It is my hope that as increased numbers of consumers are educated about their food systems, an increasing number will make choices that support more sustainable practices within the food system, which in turn will have a snowball effect that will help push government, corporations and more citizens to make adjustments so that we will be able to provide ample amounts of healthy, nutritious, and environmentally sound food for many generations to come.
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