

China: Subsistence Farming and the Implications of Environmental Degradation  
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Thousands of years ago, China was the most technically advanced nation in the world. After a series of dynasties and the modernization of Western societies, the nation fell from power. Now China is rising again to a global status. With the population of nearly 1.3 billion, the nation has a formidable work force (CIA, 2009). Manufactured goods are produced at a staggering rate; to produce these commodities, factories must use precious water and other valuable materials. Chinese residents also produce much of their own food to feed their large population. China provides more than ninety-five percent of its needs of wheat, corn, and rice (UN ESCAP, 2009). China also produces its electrical power for its growing urban populations by a variety of means. Though most power is created from coal powered plants, China is proactive in creating the world's largest dam, the Three Gorges Dam.

Though China greets these feats in cultural and technological mastery, these advances also deeply affect the environment. At this moment, China is on the verge of an environmental catastrophe. Faced with a virtual double-edged sword, China must decide between manufacturing goods for a hefty global profit or protecting the environment for a long-term, reliable agricultural resource. Most of the industrial and agricultural activities that caused China's booming economy directly affect the environment. Agriculture and the manufacture of goods are taking precious water from shrinking underground aquifers that are required for drinking water for millions of people. Producing electricity from antiquated coal powered plants is polluting the air, creating acid rain and harmful conditions for Chinese residents. Intensive agriculture is now causing overgrazing and desertification, as well as a myriad of other environmental problems.

Intertwined in this conflict is the small subsistence farmer. Farmers must choose between making a profit from the meager amount of produce they grow or feeding their own families. Further worsening the situation are the levels of land degradation farmers must face. Farmers must cope with the challenges nature puts forth while growing more productive crops and livestock to feed an expanding population. Damage to land, air, and water quality deeply challenges subsistence farmers now and for years to come.

A typical subsistence farmstead consists of a man and woman and two children, though some families may have as many as twelve children. Although China implemented the One-Child Policy in 1979, this law only restricts the number of children an urban couple can have; it excludes rural and ethnic groups. Within the family, sons are the preferred gender. Infanticide may result with having too many daughters because the parents want to pass on the family name with a male child. Education in pastoral areas is slight and quite lacking; many farmers and rural workers are illiterate. This lack of education can lead to poor yields and further degradation of the land. Rural families consume the products they grow from their small plots of land. Many poorer families must obtain resources from surrounding forests and other wild regions to obtain the sustenance they need. The produce that is not eaten is sold in surrounding local markets at a low price. The money farmers make does not accumulate to much; of the eighty-four million people that live with under one dollar per day, ninety percent of them live in rural areas (United Nations in China, 2008). Many households only survive on 450 dollars per year (Nicolette, 2006).

Most rural farms consist of about three to five acres. On these plots of land, various types of agriculture are practiced. One of the most sustainable practices is used by the smallest land owners. This type of agriculture uses trees, shrubs, perennial crops, and annual plants, alongside with beneficial animals, to create a productive system. Many types of trees are grown; in temperate regions, pears, apples, dates, and peaches are grown; in the subtropics, oranges and bamboo are common; and in the tropics, papayas, palms, jack fruit, and mangoes are produced. Trees are also produced for lumber. Below these tall plants, many other herbaceous crops are grown according to the climate. Farmers also raise a

variety of livestock. Many of these animals include ducks, rabbits, geese, chickens, buffaloes, cows, pigs, and goats. Small ponds are also often utilized. Within these ponds, a variety of organisms are raised ranging from eels to fish to worms. Residual plant material or animal waste is used to feed the aquatic organisms. The pond substrate is cleaned a couple times per year. By using the waste on the pond bottom, the farmer can fertilize crops or use it as a culture to grow mushrooms. Crops like bamboo are grown near the house so merchantable products can be constructed in the household.

This type of agriculture is highly productive for many reasons. The plots of land create their own “microenvironment” by using a variety of plants. Labor can also be separated amongst the family; weaker members of the family can work in the smaller plots and on crafts while the stronger members work in the field. It also naturally works with the soil and natural systems of nutrient cycling. Although this type of agriculture can be highly efficient, a lack of education can keep a farmer from producing the maximum yield from the land. Many farmers do not know the light and nutrient requirements of the plants grown which can create a poor plot layout and reduced yield. Close quarters between different families’ plots can easily spread diseases around a region. Many farmers also lack the proper plants and animals to breed high producing livestock and crops, creating organisms that produce fewer and weaker offspring.

Other types of agriculture are also used. More conventional farming practices are exercised in larger agricultural communities. Cotton, rice, corn, and wheat are common in these areas. According to the climate, crops are harvested two to three times per year, and in some areas, crops are harvested year round. Crop rotation is also poorly practiced. Some fields alternate between wheat and rice; after the wheat is harvested, the field is planted to wheat again in only thirty-five days (Nicolette, 2006). In other fields, “corn seed is directly planted into wheat stubble [or] they transplant cotton from nurseries after they harvest the garlic crop” (Nicolette, 2006). Copious amounts of conventional nitrogen fertilizer are used polluting nearby waterways and streams. These agricultural practices can lead to land degradation and decreased yields.

Free range grazing is also abundant in China. According to FAO, China has around 130 million head of cattle and 290 million head of goats and sheep. Since the economic social reform in 1978 which allowed a more free-trade market for agricultural products, ranchers have little incentive to enclose grazing areas and limit the head of livestock in production. This has allowed grazing animal population to explode in open grass areas, destroying native plant and animal populations and causing damage to the land and soil.

Climate change, especially pollution, water scarcity, and desertification, is a formidable problem in China. An estimated thirty-seven percent of the total land area of China is experiencing some sort of land degradation (China Daily, 2006). The areas that are required to feed over one-fifth of the world’s population are suffering from poor management and over-production. Though plant and animal goods are showing increased productivity across the country, these climate problems will cause millions of people to go hungry and increase the financial problems small Chinese farmers face in the near future.

Pollution is a great adversity to the Chinese people. Due to the growing industrialization and urbanization of the country, more and more pollutants are released into the air, water, and earth. In 2008, it is estimated that 760,000 Chinese residents died prematurely because of air or water pollution (Environment of China, 2009). China currently derives almost seventy percent of its electricity from coal powered plants (Coal Power in China, 2009). Few of these plants have desulfurization capabilities, which reduce the amount of sulfur in the emissions, preventing acid rain. Acid rain severely deteriorates natural vegetation and habitat and damages the plants and animals used in agriculture. Water pollution is also a serious issue in the nation. About one-fourth of China’s two biggest rivers, the Yellow River and the Yangtze River, are so polluted, they are unsuitable for agricultural use. The story is the same for forty percent of many of China’s largest lakes (Water, Air Pollution in China Still Serious, 2009). Algae

blooms are also plaguing many small lakeside communities; these algae blooms create toxic water conditions and choke out other organisms, damaging local fishing communities. Algae blooms can be traced back to fertilizer runoff. The excessive amount of fertilizer gives the algae nutrients to exponentially reproduce, filling the entire lake or pond. All of these types of pollution not only damage the ecosystem and the environment, but also attack the people of China. Seven million people drink contaminated water every day; countless others breathe in smog and other dangerous chemicals (China Water Crisis, 2009). China is even blaming the increased pollution to a rise in birth defects; the nation has seen birth defects rise by forty percent (Demick, 2009). This especially damages the small farmer who has less income to provide for a handicapped child and reduced accessibility to proper medical care.

Water scarcity also seriously affects subsistence farmers. The population of China alone provides a tremendous challenge to water availability; China contains twenty percent of the world's population but only seven percent of the world's fresh water (China Water Crisis, 2009). Adding to the problem of water scarcity, areas north of the Yangtze River contain around sixty percent of the land area of China but only about twenty percent of the country's fresh water. The southern part consists of around thirty-five percent of the nation's land but over eighty percent of the water resources (China Water Crisis, 2009). Underground aquifers and terrestrial rivers and lakes provide fresh water to the various industries and peoples of China. More than half of the water used by the nation is drawn from aquifers and underground wells. Though the underground system of obtaining water is still sustaining parts of the country, the aquifers are running dry. Water tables in some areas have been shrinking by four feet per year; some areas have even drained two-thirds of their groundwater (Yardley, 2007). Terrestrial water sources are not fairing any better. Rivers are being diverted to sustain enormous cities and provide water for industry. Other rivers are being dammed up for hydroelectric power or to provide reservoirs upriver. These changes to the rivers' natural courses threaten to destroy downriver ecosystems and farming communities that rely on the river for irrigation. Water derived from above and below ground sources is used not only for field irrigation and livestock, but also the ever growing urban and industrial requirements. The amount of water used for agricultural practices has slightly risen in recent years. The main change in water usage has been in the industrial and urban setting; population and industrial growth has caused a large increase in water usage. Water scarcity hits the farmers extremely hard; around thirty-six percent of all arable land in China is irrigated (UN ESCAP, 2009). Crops like cotton and wheat require high amounts of water to be productive along with other crops and livestock. This agricultural water is drawn from the same sources that industrial and urban resources utilize; unfortunately, the small farmer literally gets left in the dust by the urban and manufacturing requirements. Subsistence farmers are simply finding it harder and harder to find water.

Desertification is the worst crisis facing subsistence farmers in China today. China currently consists of 3.3 million square kilometers of desert or about thirty percent of its land, and this type of land is rapidly expanding (Environment of China, 2009). Desertification is the process of land changing from a semi-arid region that supports plant growth to a much drier, sandier region void of much plant or animal life. Desertification in China is caused by the overgrazing of grass areas coupled with the rapid rate of urbanization and erosion. Overgrazing destroys all of the plants from the substrate, causing soil moisture to evaporate and the soil to blow away as sand since it is not held down by roots. Erosion happens by the same concept, only this type is more man-made. The rate of desertification in China is staggering; every year nearly 10,400 square kilometers of land is lost to the sand. Per year, desertification costs the nation 6.5 billion dollars and affects nearly 400 million people (Land Degradation Detection, 2009). Desertification extremely hurts the small farmer which relies on the land for food and income. The areas affected by this type of erosion are occupied by three-fourths of the country's poorest people (UN ESCAP, 2009). Farmers from around the nation are at risk; over the next fifty years, output in Northeast China could fall by forty percent, and in Southwest China, 100 million people are at risk of losing their land over the next thirty-five years (UN ESCAP, 2009). Desertification in these areas will cut food production and increase the hardships subsistence farmers face. China is currently enforcing laws that

restrict logging and further land degradation. It is also on the head of an ambitious project, the Great Green Wall of China. A 2,800 mile long strip of trees is to be planted by the year of 2074; almost nine million acres of forests have already been planted (Environment of China, 2009). This strip is being planted with the intention of holding on to the soil and preventing sand from depositing any further from deserts. Though this plan sounds effective, many people disagree; seventy-five percent of trees die after being planted (Green Wall of China, 2009). Though actions are being put in place, they are not enough to hold back the encroaching desert.

By improving the factors of climate change, including pollution, water scarcity, and desertification, subsistence farmers would have more reliable incomes and higher yielding livestock and crops. However, increasing agricultural productivity could extremely hasten the process of climate change and increase the likelihood of long term productivity reduction and soil degradation. Not only is the industrialization of the nation hurting the land, air, and water, but the farmers are causing more problems for themselves. The “Westernization” of farming practices is causing the fragile climate of China to fall apart; intensive farming practices and the increased use of fertilizers appear to generate more productive crops now, but these practices are hurting agriculture in the long run. Ranchers are also deteriorating the land. By not limiting herd sizes and not restricting grazing grounds, livestock are over-eating vegetation and causing tracts of land to become desert. Regardless of these problems, agriculture must continue to grow very carefully to feed an ever-expanding nation.

Due to the wide range of problems Chinese agriculture faces, many things should be done to fix agricultural predicaments. Solutions will be presented from the most short-term to long-term.

Laws that protect the environment must be thoroughly and consistently enforced. China already has one of the strongest and most strict environmental policies. Regardless of its rigor, economic growth in the industrial and manufacturing areas gives these companies excuses for breaking the law. If emissions and pollutants were reduced in these sectors, many areas would be rapidly cleared up and water usage would fall. Laws also need to be put into place for ranchers. By not limiting herd sizes or restricting grazing ranges, ranchers are getting a cheap profit while the land is being degraded. If a law was enforced, quality land would be left for the progeny of China.

Farmers also need more available agricultural education. Many subsistence farmers experience yield drag because of poor agricultural practices; fertilizers may be used incorrectly, plots may be set up wrong, or livestock are not cared for correctly. By increasing education, farmers could reduce their impact on the air, water, and soil by bettering their practices with new technology.

More efficient crops and livestock could also improve yields. Many crops and livestock are “genetically poor,” meaning that the gene pool in that community is shallow, reducing productivity and increasing the likelihood for devastating diseases. Adding new genetically improved organisms would allow farmers to improve food output and increase income. Farmers also need to be wary of hybrid, genetically modified seed crops. With these crops, farmers must buy seed every single year instead of saving seed from the most productive plants. Saving this seed allows farmers to have high-yielding crops in times of hardship and economic troubles.

Finally, farmers should have access to a stronger agricultural market system: organic farming. Because of the rising middle class in China, increased foreign demand from the United States and Europe, and the desire for safe and reliable food, organic farming has experienced a boom in recent years. Organic farming is a type of agriculture in which conventional fertilizers, pesticides, and herbicides are abandoned for fertilizer from manure and pest control with manual removal and natural predators. This type of farming not only increases the farmer’s profit, but it also uses natural systems that preserve the environment and work in harmony with the land, slowing down the impact agriculture has on the earth.

Of its many benefits, organic farming has shown to use less water for irrigation and increase soil loam and health. Not only does organic farming protect the land, but it also spreads the wealth to the rural poor by increasing the amount of rural workers. Traveling rural workers, some of the poorest people in China, could extremely benefit from the increased need of work and wages provided by organic agriculture. Care needs to be taken in implementing organic farming since this type of agriculture experiences slight yield drag, which could cause food production to go down; a balance must be made in food production and protecting the land.

The Chinese Government must take a more active step in enforcing environmental policies. It can do this by restricting pollution from industrial and manufacturing areas, monitoring water usage, and reducing emissions from smog-producing power plants. The Chinese Government must also be proactive in protecting the environment; this can be done by preserving natural areas that are susceptible to land degradation like semi-arid regions and steppes and reducing the impact grazing animals have on the land to reduce desertification. Finally, the Chinese Government can educate farmers so they can plan and prepare the land so more efficient crops and livestock can be grown. The World Bank can also subsidize rural Chinese farmers so they have the funds to make a transition to more effective agricultural practices. Other associations can have additional roles. The Centre for Alleviation of Poverty through Secondary Crops Development in Asia and the Pacific or CAPSA has the ability to map out China and determine which crops would be the best suited for different regions, increasing agricultural education and yield. The United Nations Asia-Pacific Centre for Agricultural Engineering and Machinery or UNAPCAEM can promote environmental vigilance.

China has proven itself throughout the ages to be a resilient nation. For China to succeed in the long run, it must take care of all of its citizens, including the most poor. Small subsistence farmers produce and sell some of the most diverse crops that are tailored for markets around the world. This trait makes subsistence farmers an asset to the Chinese government and a reason to protect them from financial and economic troubles.

Subsistence farmers face a plethora of problems, many of which are environmental predicaments. Problems ranging from pollution to water scarcity to desertification create more pressure for small farmers. Pollution from power plants, industry, and agriculture is damaging water sources and causing health problems for Chinese residents. Water scarcity not only threatens the millions of urban residents that need clean drinking water, but also pressures the small farmers that rely on it for irrigation. Desertification is causing arable land to be extremely damaged, making sustainable agriculture quite difficult. Even now, these problems are amplifying. Environmental disasters caused by these factors, coupled with unforeseen problems in the future, will challenge subsistence farmers more than ever to create a merchantable crop that will not only feed their family but also the nation.

In the face of these problems, China must act quickly and swiftly to repair its environmental woes. By enforcing stronger environmental protection policies, providing more agricultural education, establishing more efficient crops and livestock, and creating more available agricultural markets, China can be on the right path to fixing many of its environmental problems. Though projects to fix these environmental predicaments may be costly and time-consuming, they are required to ensure a strong agricultural future for million of Chinese farmers.

China was once a leading nation budding with knowledge and power. Now this country is once again on the verge of a technological and industrial revolution. To protect and preserve this moment for the country and its people, China must protect the most important element: the environment.

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