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China, Factor 7: Animal Agriculture

### **China: Animal Agriculture**

Agriculture, opposable thumbs, large brains, the ability to be a survivalist if the environment demands it, and luck are the traits that ultimately separate us from the rest of the animal kingdom. One could make an argument for which one of these traits is the most important, but I believe agriculture is the main innovation that separates us and makes us the dominant species on the planet. Before people settled down, humans were nomadic hunters and gathers. Eventually hominids started to domesticate crops in ancient river valleys such as Egypt and Mesopotamia. This epic revolution later became now as the *Neolithic Revolution*. This led to the development and birth of high civilization. People now lived in larger groups, leading to specialization of occupations and complex social hierarchies.

Fast-forward thousands of years: currently it is 2014 CE and not a soul could call our world simple. We all realize certain things have changed since the *Neolithic Revolution*, however our necessities have not changed. Agriculture is the most important industry in the world. Today the agriculture industry in some places in the world is broken. One in six people go to bed hungry, simultaneously, a greater number of people are feeling the health effects of being overweight or obese. One country that is not immune to these problems is the People's Republic of China.

### **Chinese Living**

Today Chinese families are at a crossroads of a social revolution between traditional Chinese culture and the increasing western influences. China has the highest population, about 1.351 billion people in 2012, or approximately one-fifth of the global population. Chinese families on the average are smaller than other global families; this is mostly a result of the 1980 one-child policy. This allows families to have one child and if they choose to have more children they will be fined. The one child policy led to many problems including a skewed female to male ratio. Sons are more desirable in Confucian cultures because they inherit the family name and property and take care of aging parents. This caused an abundance of girl babies to be abandoned or aborted, and an increased infanticide (Pletcher). In early 2014, the one-child policy changed, now some families that previously were unable to could have up to two children without being fined (Levin).

The education system in China is the largest education system in the world. According to a study conducted by the university of Michigan, China guarantees children starting from age seven, or in urban areas six and a half years of age, six years of primary education and three years of secondary education. Today the Ministry of Education estimates that 99.7 percent of the eligible population has achieved the universal nine-year education (Shaack). Statistics show over 20 percent of Chinese college age students are now attending higher education (China Education).

In 2011, statistics show 34.80 percent of the work force works directly in agriculture (Employment in Agriculture). China has a relatively low unemployment rate that has been stagnant around 4.1% in 2014. Despite the low unemployment rate this does not mean Chinese necessarily have decent jobs. Lack of government labor laws and regulation often times cause Chinese workers to have jobs that have absurd working hours in horrible, unsafe conditions. None the less, the differences in agriculture and non-agriculture employment salaries has led to a major migration of traditional agriculture workers to the cities and factory jobs.

The traditional Chinese diet of the past featured little to modest amounts of animal protein. It was primarily composed of steamed or lightly stir-fried vegetables accompanied with starches such as rice or noodles. The standard beverage was tea (Smith). More recently Chinese diets have incorporated much more animal protein.

Statistics show China on average has approximately 1.9 physicians per every thousand people (Physicians). Figures in 2011 indicate that China has approximately 21,500 hospitals; the vast majority of these hospitals are privately owned for-profit operations, but China is steadily moving towards universal health-care (China Hospital Development and Investment Report). In 2007, the government started to subsidize community health-care services in western and central China. The Chinese government now pays up to 16.25 USD for medical visits and procedures, which would only require the poorer person to pay about 3.24 USD out of pocket, similar to a co-pay in the American system (Parry, Weiyuan). It

is unclear how well this healthcare system is working, as the Chinese government does not publish any statistics regarding this.

### **Average Chinese Farm**

China is one of the world's largest producers and consumers of goods; China is also one of the world's leading producers of crops (Agriculture). China's main crops are rice, wheat, corn, soybeans and tuber crops. Paddy rice is commonly grown in the Yangtze River Valley in Southern China. Chinese farmers often grow sheep, goats, and cattle, however pigs and poultry are the most popular livestock (Neterval). The small dairy industry has been growing rapidly at an estimated growth of about 30% a year.

The average Chinese farm is 0.6 hectares (approx. 1.5 acres); this small amount of farmland inhibits agricultural mechanization. The vast majority of farm employees are the family members of those who own the farm. Fertilizer is commonly used in Chinese farming (Krishnamurthi, Khandelwal). Genetically Modified Organisms are not commonly used in China. Very recently the Chinese government has put various bans on importing GMOs (Gunnar).

### **Major Barriers of Chinese Families and Farms**

Today the typical Chinese family has many impediments in everyday life. Approximately 482 million Chinese live on less than 60 American dollars a month (Sweatshops in China). Millions of Chinese work factory jobs in production of consumer goods for export to the western world. The majority of these factory jobs were once for the production of consumer products such as textiles and electronics, but now seem to be the production of anything that requires cheap labor as a main competitive edge. These jobs often require working seven days a week often with forced overtime in unsafe, hazardous conditions for about 130 American dollars a month (Chang).

The absence of unions and nongovernmental workplace advocate organizations often cause barriers to earning a living wage and having a safe working environment. However, due to the lack of jobs in rural areas of China and the difference between the 60-dollar a month and a 130-dollars a month a factory worker might make, many Chinese are moving to cities for employment. The vast majority of these migrants are women who leave their children in rural areas with caregivers, while they work in factories or other urban jobs (Sweatshops in China).

There are many barriers to overcome to raise Chinese agricultural productivity. Although China has a diverse climate with the Himalaya Mountains, 18,000 km of shoreline, the Gobi desert which is 9.6 sq. million kilometers, only 10% of the land in China is suitable for farming (land area). China is in transition between the 1950's collectivized agriculture (communist system) and private agriculture with more private agriculture in each year. Under economic reforms inaugurated in the 1980's farming was once again contracted to the peasants. These reforms occurred over thirty years ago and only a small number of farms estimated at .1% are still under the government's control and compete with family farms (Hu, Strohm).

Half of China's 10% of land that is suitable for farming cannot be irrigated. This restricts crops like wheat, which generally require irrigation to be grown in the 5% of the land, which could be irrigated. Wheat has not been a traditional part of the Chinese diet or traditional farm crop, but it is rapidly increasing due to new appetites for both bread and wheat-based noodle products. One impediment to the growth of the Chinese wheat crop was shown in a study led by Professor Jinxia Wang of the Centre for Chinese Agricultural Policy. It showed that to grow enough wheat for a small loaf of bread in China, 500 liters of water would be needed, and water is in short supply for agricultural uses. Even though Chinese are not famous for eating a lot of bread, noodles and western fast food incorporate wheat and are increasing in popularity. If each Chinese person ate a small loaf of bread a year approximately 675.5 billion liters of water would be needed to grow this amount of wheat.

Another barrier for the productivity of agriculture is the small farm size often inhibits mechanization generally found on western farms, such as tractors, cultivators, fertilizers, and harvesters. Tractors' usage is on the rise, but the price of fuel and the reliability of poorly made products deter farmers from investing. Technology that is popular in some western countries such as animal identification tags, which could trace back a disease outbreak to a certain farm, isolate the disease, and stop the spread of it. Biofuels, which are growing in popularity in the United States and other western

countries, are inappropriate for China because the amount of land suitable is not enough to produce crops for human and animal consumption, let alone the demand needed for a large scale national biofuel production.

The food market in China is faced with a variety of barriers to accessing adequate and safe nutrition regularly. Because, food marketing isn't well regulated, the food in China doesn't go through strict inspection, leading to outbreaks of food borne illness and adulterated food (China). In urban areas markets are available all year round for fresh fruits and vegetables at costs that are unaffordable to many people. Poor people in both urban and rural areas often times do not have an adequate diet.

### **Animal Agriculture**

Meat has been a natural part of the human diet for as long as humans have been on Earth. Recently, vegetarianism and veganism diets have been gaining popularity. People choose not to eat meat for a variety of reasons: some people believe it is unethical while others do not consume meat for perceived health reasons. The argument of if we should be eating meat tends to bring out the worst and feistiest arguments in people both defending the choice of vegetarianism, and supporting the choice to consume meat. Whatever the justification for choosing, the majority of people approximately ninety-five percent of Chinese-still consume meat.

Most people consume meat for three reasons: they were raised eating meat, they enjoy the taste, and it is a fairly cheap, nutritious way to get the protein our bodies need to function. Protein is a nutrient that is composed of Carbon, Hydrogen, Nitrogen, and Oxygen. Amino Acids are the building blocks of proteins. Our bodies can manufacture certain amino acids, but some we must obtain from the rest from our diet. The nine essential amino acids our body cannot produce are called essential amino acids. All meat protein contains these essential amino acids, and no plant protein yet discovered contains all nine.

To have a healthy vegan diet, a variety of plant proteins must be consumed regularly. Not only is a healthy, balanced, vegan diet hard to achieve, but also it is often times expensive and impossible for people living in food deserts or places where vegetables, legumes, and other plants are simply not available. As mentioned previously, the Chinese culture is becoming more like western culture, and the typical Chinese diet is also morphing to become more like its western counterpart. China eats one quarter of the world's supply of meat, or 71 million tons a year, or twice the amount of meat the United States of America consumes yearly. In 1982 the average Chinese ate a modest amount 13kg (28.6 lbs) of meat, this is equal to approximately one-tenth of a pig a year. At this time beef was so rare in China it was nicknamed the "millionaires meat". It is now a common part of some Chinese diets today (Moore). The typical Chinese family eats roughly quadruple the amount of meat that they did thirty years ago according to the USDA. This rapid increase has obviously strained the animal producers in China beyond their capacity to produce. To fill the shortage, China's meat-importing businesses have become a multi-billion dollar industry, which buys meat globally from the United States, Canada, Argentina, Australia and other distant places.

Raising animals is a lengthy process that requires large amounts of water, nutrients, and land. Commercial chickens take approximately eight weeks to mature for meat. Pigs take longer, about six to eight months. Beef production takes roughly eighteen months to raise a cow from birth to slaughter weight. Different types of fish vary greatly from the time of hatching to the time of harvest. A further challenge with fish, is that it takes an average of five pounds of fish protein to be fed to the fish for it to grow 2.2 pounds of their own protein, a net-loss of almost 3 pounds of protein.

Most fish-feed comes from byproducts of commercial fishing or shrimping, and this feedstock is rapidly diminishing in our oceans. This is not profitable, efficient, or environmentally friendly. The fishing ratio has become even more environmentally unfriendly since 2006: to catch 2.2 pounds of fish it took approximately one quart of fossil fuels, now takes more than double this amount. Overfishing mainly causes this; the United Nations estimates over 70 percent of world fisheries are over-exploited. Of the fish we do catch and eat, only 30 percent of this fish is consumed and the rest is waste.

The ratio of feed to meat for growing chickens is not promising either. It is estimated that it takes five pounds of grain to produce one pound of chicken, and there is more of the chicken we throw away in processing than there is of what we eat. Even using soybean as the main feed for chicken protein, when one considers the fuel, water, fertilizer and other "free" inputs to raising chickens, one can see that raising grain to feed animals to grow protein has long range sustainability

problems that should resonate far beyond China's agriculture challenges. In countries that cannot grow soybean as efficiently as American mid-west farmers, feeding a growing population on chicken does not seem sustainable.

What if there was a way to create a loop of recycled nutrients to produce protein more efficiently, environmentally consciously, and cheaper than the current way? There is, but chances are you may not be open to it, at least at first. Flies are the solution.

The common housefly (*Musa domestica*) is not a protagonist of the fiction children stories we saw when we were young like the fox in Robin Hood, or Mutant Ninja Turtles. It is usually not a common pet we keep, or dream of keeping. For me the common housefly was little but a nuisance that showed itself in July and August. Historically, the fly has always had a bad reputation. In ancient Greek mythology Myiagros was a goddess whose duty was to shoo away flies from scarifies for Athena and Zeus. Even in the Old Testament of the Bible, the fourth plague was rampant swarm of flies. Flies are universal and present in every continent, and even President Obama has publicly swatted at these insects. However, flies may be the solution to our animal agriculture problems (Drew, Joseph, 18).

An average female fly can lay up to 800 eggs in three days. In a theoretical environment with no predators and enough food and water, if you left a loving fly couple together eventually they would create 200 quintillion children; this would be enough flies to cover the Earth 47 feet deep in flies in less than six months. These eggs hatch almost immediately, so their key to survival is being laid into or next to something they can eat immediately. When these fly eggs hatch they are in the larvae stage. Imagine this stage as the sixth grade of flies-they are awkward, ugly and mainly focus on eating and growing. Surprisingly when flies are at this stage they are fifty-five to sixty-four percent protein. To compare consider that a high-protein peanut is only twenty-five percent protein. Because of this high percentage of protein, fly larvae are easy targets and naturally eaten by a variety of animals (Drew, Joseph, 22).

Next comes the pupa stage of a fly. This is where the transformation to adulthood occurs. The baby-larvae pupate similar to the way a caterpillar turns into a butterfly. When they finish this stage, they emerge as adult flies, where their main goal is to breed and reproduce. Some breeds of flies such as the Black Soldier Fly doesn't even eat food during this adult stage of life, and doesn't even have a mouth or other eating apparatus. The Black Soldier Fly is an amazing creature. At the larvae stage it gains weight the fastest in a militaristic efficiency of eating. It's possible to harvest this protein and preserve it, and make high protein feed for monogastric animals or animals with one stomach (such as chickens, fish, and pigs- all favored in the Chinese cuisine). A company called Agriscience based in South Africa is doing this exactly (Drew, Joseph, 50, 45,89).

Essentially by recycling minerals from waste, whether it is manure, waste from the meat industry, or even sewage; these nutrients are ingested by the larvae and converted to protein. This "conversion" process is sort of a biological alchemy, as these animals turn waste product into something very valuable. Then the larvae are killed painlessly by being frozen, then dehydrated and packaged as protein nutrients for chicken, fish, and pork feed. Some of the larvae are left to pupate, become adults, lay their eggs, and the cycle then begins again. This closed loop may be the answer to all of our future animal agriculture and should definitely be part of the animal practice in China. A Chinese family farm could be capable of growing larvae themselves and have a small flock of chickens or other poultry or a pig. They could also use the castings produced for nutritious, natural fertilizer and soil conditioner.

The farm would first start of with a shelter that they could build themselves; this could be a simple shed or structure. Household waste such as food scraps, compost, organic waste, and possibly even sewage and waste from agricultural endeavors such as manure, butcher waste, and scraps could be used to feed the larvae. This protein packed larvae could then be used to feed the small herd or flock of pigs and or chickens. The small farm could feed the larvae live or process the larvae to be stored for use at a different time. If the family farm does not have access to a refrigerator or freezer, they could roast the larvae in an outdoor fire, and then feed it to their livestock or save for future use. This is not only an extremely environmentally friendly circle of recycled nutrients but, once established, it is virtually a free source of livestock feed.

This model could also be practiced on a large corporate scale. A large building could be renovated into small areas where larvae are produced. Larvae always have a natural instinct to climb upwards. Tubes full of waste positioned in an upward direction place newly hatched larvae in their new home. They grow and become full of nutrients while climbing up this

tube. Once they reach the top of this tube they are then processed into nutritious animal feed. Waste such as animal manure, restaurant waste, butcher and slaughterhouse scraps, and sewage from Metropolitan areas such as Shanghai, Beijing, Nanning, Jinan, and Wuhan could be used to feed Black Soldier larvae. Massive amounts of larvae for animal feed could be produced simply from converting waste. These larvae could be humanely killed and packaged and shipped to rural-China as high protein animal feed and fertilizer.

Bio-conversion in China has unlimited possibilities to have impacts on the surrounding nations. China borders fourteen different nations all with very diverse cultures and ways of life. These nations include India, Myanmar, Mongolia, and Russia just to name a few. There are many ways China's future bio-conversion industry could impact these countries. There is a potential industry in educating private companies and small farms to bio-conversion and its practical applications. In addition there is also possible large scale manufacturing of larvae, and initial breeding stock and large foreign export market for both larvae and breeding stock. There is also an amazing potential for China and neighboring countries to use Black Soldier Flies as part of waste management.

Imagine the effect this could have on China. This could potentially emancipate China from the economic shackles of importing soybean, fishmeal and other expensive and wasteful grains currently used to produce meat protein to feed China's enormous population. This new agriculture could help solve China's food insecurities, produce middle-class jobs, reduce pollution, and use the land more efficiently. Bio-conversion of waste to protein is truly one of the few WIN-WIN possibilities in modern agriculture.

#### Bibliography

"Agriculture." *China.org*. n.d. Web. 3 Aug. 2014.

Chang, Chris. "The Shocking Conditions Inside China's Brutal Foxconn Factory." *Business Insider*. 19 May 2010. Web. 20 Aug. 2014.

"China." *Agri Food Asia*. n.d. Web. 29. Jul. 2014.

"China Education." *China Education Center*. n.d. Web. 3 Aug. 2014.

"China Hospital Industry and Development Report." *Research In China*. n.d. Web. 3 Aug. 2014.

Drew, Jason, Joseph, Justine. *The Story of the Fly And How It Could Save The World*.  
Vlaeberg: Chebiot Punlishing cc, 2012. Print.

Gunnar, Ulson. "Geopolitics of Organic Food: Russia, France, and China Ban GMOs." *Global Reasearch*. 2 May 2014.  
Web. 1 Aug. 2014.

Krishnamurthi, Lakshman, Khandelwal, Sugandha. "Agriculture Jornal: India Versuses China by Numbers." *India Real Time*. 20 Sep. 2011. Web. 6 Aug. 2014.

"Land Area." n.d. Web. 6 Aug. 2014

Levin, Dan. "Many in China Can Now Have a Second Child, but Say No." *Nytimes*. 25. Feb. 2014. Web. 15. Aug. 2014

Moore, Malcolm. "China now eats twice as much meat as the United States." *Telegraph*. 12. Oct. 2012. Web. 2 Aug. 2014.

Neterval, Margret. "History of Agriculture in China." *Citelighter*. n.d. Web. 1 Aug. 2014.  
"Employment in Agriculture." *Trading Economics*. n.d. Web. 2 Aug. 2014.

Parry, Jane. Weiyuan, Cui. "Making Health Care Affordable in China." *WHO*. n.d. Web. 4 Aug. 2014.

"Physicians." *World Bank*. N.d. Web. 30 Jul. 2014.

Pletcher, Kenneth. "One-child Policy." *Britannica*. n.d. Web. 7 Aug. 2014.

Schaack, Tara. "Comparing U.S. and Chinese Public School Systems." Sitemaker. n.d. Web. 6 Aug. 2014.

Shui, Huo. "China's Modern Family Problems." Chsource. 9 Oct. 2008. Web. 4 Aug. 2014

Smith, Melissa. "Traditional Chinese Diet." *Livestrong*. 13 Jan. 2014. Web. 5 Aug. 2014.

"Sweatshops in China." *War on Want*. n.d. Web. 5 Aug. 2014