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China, Factor 12
**Solutions for Agricultural Deficiencies in China**

China is a country in East Asia with an area of 9,596,961 square kilometers. This makes China the 4th largest country by land mass, and only slightly smaller than the United States. The climate within China is extremely diverse, ranging from tropical conditions in the southern part of china to sub-arctic conditions in the northern part. Mountainous regions claim 2/3 of China's land area, with deserts west of the mountains and plains, river deltas, and hills east of the mountains. Of all the land in China, 14.86% of the land is arable, and 1.27% of the land is held by permanent crops. 83.87% of the rest of the land is used for other purposes. China irrigates 641,410 square kilometers of their arable land.

China is a country in transition. Even since the one child policy was implemented in the late 1970's, the population still has climbed from 830 million to 1.337 billion people. Also, the number of elderly people has risen dramatically. 117 million people are estimated to be 65 years or older, which is around 9%. Not only is the median age of Chinese people getting older, the rate of people moving to cities is increasing dramatically. Since 1978, urbanization in China has risen from 18% to 47% in 2010. By 2020, urbanization is expected to reach 55%. More and more people are leaving the rural areas and moving into the cities in order to obtain jobs in the manufacturing sector. The reason for this is that on average, urban workers make almost four times as much as much as they would make working on a farm.

Still though, nearly half of the Chinese population still works in the agricultural field. The average farm size in China is about one hectare. The main crops grown in china are rice, wheat, corn, soybeans and tuber crops. Rice production accounts for nearly 2/5th's of the total grain output, making it the largest output crop in China. Wheat production in the northern regions accounts for a little over 1/5 of the country's total grain production, while corn provides 1/4th of the total grain production. However, China has not been able to stay self-sufficient in their agricultural sector. China imports one out of every four rows of soybeans grown in the U.S. China has also had to start importing corn in the recent years from the United States.

All in all this would not seem to be a bad thing. The United States has relied heavily on China's abundant labor force for the producing and manufacturing of material goods starting in the 1980's and increasing until today. In the same regard, China has had to rely increasingly on U.S. grains and meats in order to feed their growing population. It seems like the perfect give and take relationship between the two countries. However, there are major problems that come out of this relationship, problems that could be easily fixed through increased technology use, improved education for Chinese agriculture, and better understanding between the United States and China.

The main problem with this growing partnership between the United States and China is the effects it has on food security. Food security is defined as "When all people at all times have access to sufficient, safe, nutritious food to maintain a healthy and active life." 2 billion people on this planet, right now, are food insecure according to that definition put forth in 1996 by the World Trade Organization. That number will only continue to rise if we don't start becoming more productive in agriculture. By 2050, the world population is expected to reach 9 billion people. Right now, the pressure is on U.S. agriculture to double

their yields by that time, which is feasible in my opinion. U.S. agriculture has a long history of enduring through the most challenging times, including the dust bowl of the 1930's and the economic hardships of the 1980's. The United States can and will continue to increase its productivity and sustainability. The problem is, though, will that be enough?

People answer that question in different ways. Some say that agriculture in the U.S. can feed the whole world. Although it is possible, it seems highly unlikely because of one variable, China. If China was still completely self-sufficient in their agriculture, I would say that the U.S. could and would be able to help raise those 2 billion people out of food insecurity. The problem is, however, China no longer is self sufficient. Unlike the United States, which increased their production as their population increased, China fell behind because their population increased more rapidly. This added to the fact that 47% of people now live in Chinese cities is the reason China must now import food. This would not have to be the case. Chinese agriculture could be self-sufficient through increased education about more productive agricultural practices, more intense research into higher yielding crops, and government programs that allow for larger scale farming operations.

I was fortunate enough to experience Chinese agriculture first hand this summer by applying for an 8 day tour of China. I was thrilled for this experience because it is so hard to understand Chinese agriculture because there isn't much information available on it. I was shocked to see farming practices that looked one hundred years removed from the practices I am used to in the United States. With how stark of a contrast there was between the relatively good living conditions in the city and the extremely poor living conditions in the country, I now know why there is an urbanization rate of 2.7% per year. Between personal experience and in depth research that I did once I returned home, I have keyed three major factors that have caused China to lag behind in the agricultural sector.

- Lack of government support in pushing for increased farm size and technology use.
- Lack of farmer knowledge on how to grow their crops more efficiently
- Lack of research and use of higher yielding varieties

Factor number one is a direct cause of the type of government China has. After World War II, China, under Mao Zedong, formed an autocratic socialist system, which greatly restricted what people could do. One of the first policy driven disasters was the great famine in between 1958-1961. 3 years of drought, the rush into people's commune's and peasants leaving their farms to work on government projects all spelled disaster for food production. People's commune's was an extremely rushed idea in 1958. It was first tried in the Honan Province, and once it was deemed a quote "success", it was implemented to 90% of the country in 6 months. The problem was peasants mistrusted the idea. Because of that, they slaughtered their pigs and hid their grain, instead of having to give it up to the people's commune. The second problem of course was the government projects the peasants were required to work for. This left women, children, and the elderly at home caring for the crops. That wasn't a scenario for success.

China isn't making the exact same mistakes today, but it is a close parallel. China is blocking itself from increasing their food production by continuing to limit how much one family can farm. What I understood from when I was over there was that they were slowly letting families lease to other families so more people can move to the cities. I thought that was a very good step forward, but it still doesn't allow for large enough farms to be able to utilize machinery and technology to be able to increase yields. China's government is limiting itself from keeping up with the times. The government either hasn't noticed yet, or

they don't think that it matters. They aren't taking the same path the U.S. did in agriculture. Since 1930, U.S. corn production has increased fivefold. The government saw there was a need for change and changed with the times. China can't say the same thing.

Factor two has to deal with increased research into higher yielding crops. This is an area that China has made strides in. While in China, I got to meet professor Yuan Lowping of Lowping Hi-tech. Professor Yuan is accredited with creating the first hi-bred rice, something that had once been seen as impossible to do. He was a World Food Prize laureate in 2004 and is thought of as the father of hi-bred rice. He is the main reason that for a good 20 years China was able to feed 22% of the world's population on 7% of the world's arable land. Professor Yuan is still striving to produce even more efficient hi-breeds today at age 80.

China has made strides in research in rice. However, they have fallen behind in other areas. That is not just their fault however. The U.S. is partially to blame. Our countries have not yet realized that we need each other's help. China needs our hi-breeds for corn and soybeans in order to become self-sufficient again. The U.S. isn't willing to give that to them for fear that once China has that technology they will then replicate it and skip the cost of having to research it. Both countries need to understand the larger picture about feeding the world. It needs to be a cooperative effort between our countries for the benefit of starving people. The United States can't feed the world and become energy independent through bio-fuels by itself. If the United States is serious about wanting to be energy independent, then they need to be putting a focus on helping developing countries produce their own food so we don't have to continue to do it for them.

The last factor I would like to bring up is the one that I feel would make the most difference in increasing China's agricultural output. There is an extreme lacking of farmer education within China, much like the United States had in the late 1800's. The U.S. dealt with this problem in a very effective way by creating the land grant university, which in turn led to the creation of extension programs. Before this, farmers in the United States lacked the basic knowledge needed to understand how to grow crops so they reached their potential. Without these government backed extension programs, research into controlling insects and weeds with pesticides and herbicides may have been set back decades. Had that been the case, our yields would not be in the same place they are today. Extension programs have also made a positive impact on the youth of the United States. More than 6.5 million youth participate in the 4-H programs put on by the land grant universities around the country. This program teaches children at a young age how to be strong, positive leaders, communication skills, and also how those skills can help you no matter what field of study you go into. You also can gain background knowledge about agriculture at an early age. All of these programs have been around for over 100 years, and they have been well worth the cost the whole time. Extension always had something for the whole family; Fathers and older sons would talk with extension agronomists about what new farming practices they could try. Mothers would attend workshops that showed them how to preserve food correctly so they could have fruits and vegetables all year round. Younger children could be having a great time with their 4-H club, all the while learning more about agriculture and more about themselves as a person. The educational value of extension programs was second to none. From what I saw and heard from the agronomists driving down those roads in China and from reading about it in my research, China could increase its yields by 10% by just modernizing their farming practices and by another 20% by using up to date hi-breds of corn and soybeans. That's just the tipping point. If the Chinese government allowed farmers to increase farm size enough to be able to

justify the same technologies used in the United States, China could become a net exporter of agricultural products in 2-3 years. All it takes is education of the people and a change in government policy.

Now, there are some challenges associated with trying to increase yields in China. The first would be that China doesn't have the rural infrastructure to be able to support the amount of grain that China would be producing. The United States also had this problem and continues to have this problem as machinery continues to get larger. However, I believe China can deal with this issue better than the U.S. could because of the efficiency at which they are building roads and buildings in their country. A great example was when China opened one of the largest ports in the world on an artificial island. Six months after the port was made, there was a complete six lane highway out to the port. China can improve their infrastructure, and if yields increase, they will improve their infrastructure.

One other challenge is that China needs to make sure that if other countries decided to help them out by selling them new, advanced seed hi-breds, that they remain credible and don't just let the hi-breds be replicated. The emphasis on intellectual property needs to be heightened if the Chinese want to have more collaboration between countries. Collaboration is what world agriculture needs in order to meet the growing demands for food production, but there has to be mutual cooperation within that collaboration. One country can't see itself as above the rules.

One last point I would like to bring up is the expansion of bio-fuels in the United States as a means of becoming energy independent. For the first time this year, the amount of corn used in ethanol production could amount to more than the amount of corn used in livestock production. 5.05 billion bushels of corn are expected to be used for ethanol production, while only 5 billion bushels are expected to be used in livestock production. That is both a positive and a negative for the United States. By continuing to produce more ethanol, we are steadily decreasing our dependence on foreign oil and leaving a smaller carbon footprint behind. The negative is how this affects the amount of pressure on our food production. For the food prices inside our country, the difference will be next to none. The problem is that developing countries aren't able to compete with the U.S. consumer's buying power. So how do we lower the price of food for those developing countries that can't produce it themselves? You create competition in the market. If China becomes an exporter, it will lower the cost of food worldwide without causing producers in the U.S. to feel the pressure of lower grain costs. The reason is that if the value of grains goes down, inevitably the value of bio-fuels goes down. The cost of fertilizers and seed costs could go down too. The overall trend would be a reduction of inflation which doesn't hurt the U.S. producer at all. It could turn out to be a win-win scenario for not only world agriculture, but could start another green revolution that could possibly cut the number of people that are food insecure to fewer than one billion.

China is at a pivotal moment right now in their economic standings. They can either decide to continue to turn a blind eye to their subpar agricultural practices and focus only on becoming the world (s) leading manufacturing superpower they are. They can continue to be content with importing more and more agricultural products each year to keep up with their growing demand to feed a population that not only is getting larger, but is also getting richer. China has the spending power to buy the products they need. They don't have to be agriculturally independent, and the United States is completely content with providing the agricultural products China needs. Producers in the U.S. want the Chinese market, and I don't blame them. Agriculture is a tough sector to be a part of anymore. With the cost of inputs, producers need corn to be above 5 dollars and beans to be above 11 dollars just to stay in the black. They want

China to continue to import the commodities they produce, which is why they aren't looking at the larger picture. All the research shows that the U.S. can double the yields for its crops, but is that enough to also double world food production by 2050? It might be. There is no doubt that U.S. agriculture gets the job done when it comes to crunch time. They can produce all the food the world needs. The world, however, needs to be able to buy that food. The United States by itself will never be able to create enough of a surplus of food to lower the cost so African countries can buy it. The U.S. will always find a way to utilize the commodities they produced either in this country, or sell it to the highest bidder. It's just good business. If we have extra corn to produce into ethanol, we will do it. If China continues to import food, we will continue to export it there. It is just the nature of the business and the United States cannot be blamed for needing to make more money to pay for increased production costs that are partially because of China's rapid use of steel, coal, and oil, which drives up the price on everything American farmers buy. The one thing that can be done to ease the pressure is creating an agricultural partnership between the U.S. and China. There are many things that the Chinese can learn from Americans in the agricultural sector. Simple things like the best populations to plant at, the best insect control techniques that have the least amount of impact on the environment, and the use and research of genes that are specifically traited to maximize yields in harsh environments. The first and easiest step though would be education of the farmer. Government sponsored extension programs in China to help educate producers would be extremely beneficial. Education is always the first step, and when that education pays off, it opens doors instantly. If farmers utilize new techniques shown to them through extension programs and they see a yield increase, they will keep coming back to extension. They will be more open to new ideas and technologies and won't just stick to the same old same old. Extension programs would break the cycle in China of not keeping up with the times by implementing research funding and technology, which is why China would benefit greatly by investing in education, training and extension, with the added benefit of the world becoming food secure, instead of having global food insecurity.

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