

Brett Rumpel
Lumsden High School
Lumsden, SK
China, Factor 1: Plant Science

China: Rice Yields Approaching a Plateau

China is a populous country with many rivers, beautiful mountains, and steep terrain. Some of the world's finest rice is produced in China, and can be compared to Saskatchewan's wheat production being the breadbasket of the world. China provides for one-third of the world's rice and it sustains many people as it is a big part of diets all over the world. But China is reaching an important issue in production, a yield plateau. The average family farm in China is composed of only a small amount of land and is farmed by the low income working class (Krishnamurthi and Khandelwal, 2011). These families are the first to be affected by the flattening of rice yields. A yield plateau would be devastating for many people within the world. To increase rice yields, it is imperative to concentrate on three areas of farming practices including: improving harvesting methods, developing different nutrient treatments or genetically modifying the crop, and educating communities to prevent crop loss.

The average subsistence family farm in China houses, on average, four people, both children preferably male so the family farm can continue through the same last name (Riesselman, n.d.). This family is often uneducated with farming being taught generationally. Family farms face many barriers in their everyday life along with the hardships of agriculture. These families are often of low income, living out of small huts and putting most of their funds into growing more food. The rural farm in China has anywhere from four to twelve workers, including the family itself. This family faces many struggles, including deprived education, financial difficulties, and poor living conditions. Most of these rural farms live off one U.S. dollar a day (Riesselman, n.d.). These farms are important to China's sustainability and for providing for the population. With families and workers being illiterate, and with more people coming into the job with little education, the situation for uneducated farm families is becoming more serious. A risk that is ran when uneducated workers are controlling the food supply is the potential for more crop to be lost. In order for a farm to be successful, employees need a proper education on the functions of a rice farm.

The family does not own a large amount of land, with the average being approximately 0.6 hectares (Krishnamurthi, Khandelwal, 2011). The income gained for the family to live off of is directly correlated to the yield their crop produces. Family farms produce rice, wheat, potatoes, peanuts, tea, cotton, oilseed, and soybeans, among others (Agriculture in China, 2017). Furthermore, they also raise livestock including: cattle, sheep, pork, and poultry (n.d, retrieved July 18, 2017). A typical Chinese family diet consists of: soy milk, porridge, stuffed buns, dough sticks, noodles, meats, vegetables, and rice.

These rural farming conditions are not improving and need to be changed for the safe and increased production of rice. Workers spend many long hours on their land trying to produce

a successful crop. They struggle to breathe through the smog and go home to their own homemade hut. It is important that these poor living conditions are changed for the health and safety of China's rice workers. Basic shelter and clean air is something that the population of the United States and Canada takes for granted. There is a large problem with air pollution and smog, both of which are inputs into the water cycle, contributing towards poor water quality. Because the family farm is small, and not wealthy, they are the first to be affected by the flattening of yields or any other factors preventing the growth of food.

When a farm family does not produce enough rice, it affects their day to day living. These groups live off of their crops and when production decreases, there is a drastically reduced quantity left to sell for profit. If this family cannot sell for profit, they face more financial issues. If crops are damaged or deteriorated, they have difficulty providing for themselves. Living in a rural area means all food suppliers are within a far distance of the home. This family has too costly of a lifestyle at this point and will likely fall into poverty.

The production of rice is not an easy process. Some fields are not accessible by vehicle, so all the work needs to be done on foot. This work is very time consuming and requires a lot of physical exertion. With hard labour, the subsistence family farms tend to hire many seasonal workers to get the crop both in the ground for seeding and off for harvest. The extra cost for workers and the physical labour puts further financial and emotional stress on the family. In China, rice is produced in an area where it can be drained and flooded. Rice is initially planted in spring by either transplanting or direct seeding. Rice is then fertilized and watered throughout the summer and flooded one third of the way up the stalk, 7-10 days prior to harvest. The rice then sits in this water until it is drained for harvest four to five months after seeding. Rice is harvested in the fall every year in China, once the rice paddies have yellowed. When it is harvested, many workers cut the rice stalks and separate the paddy from the stalk, which is then cleaned. After the rice is picked, it is then shipped for further processing where it can be stacked, dried or bagged for storage. This is the traditional method of harvesting rice. Combining is also used as a harvesting method, but traditional methods tend to be used more often when field accessibility becomes an issue. Combining is recommended by many farmers because it performs many tasks at once and makes for a more efficient harvest. In comparison, the stacking of rice for drying is not a frequently used method, as it sometimes leads to crop loss through deterioration of the product ("Harvesting", n.d). This method of producing rice uses a lot of water, resulting in possible water shortage. As well, when water is scarce, rice production drops.

China is at risk of a rice yield plateau. By following the trends, which are measured by the amount of rice that is produced, the changing factors that affect production become evident. Not very long ago, Japan experienced a yield plateau where they could not produce more rice than an averaged limit. China's rice production is currently decreasing at a steady rate, whereas Japan has been showing an increase of production, in efforts to produce more rice for the growing population. Factors that affect the production of rice include: climate change, air pollution, water accessibility, harvest methods, solar radiation, altitude, nutrients in the soil, method/breed of rice, and many more (Nguyen, n.d). These factors directly affect the yield that farmers will be able to successfully produce. As the factors become more severe, a

flattening yield will be expected. Therefore, China has a worsening of production rates with a slow increase in yields.



Figure 1: China's yield productions

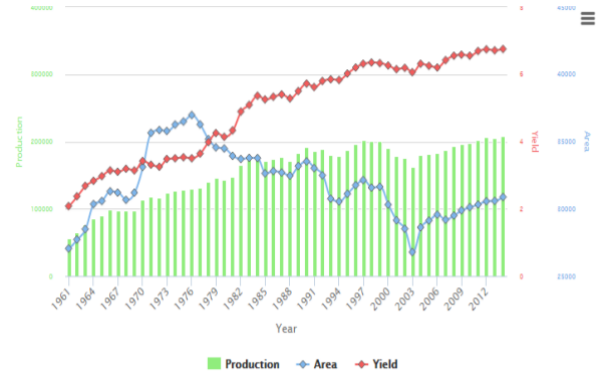


Figure 2: Japan's yield productions

Figures 1 and 2 above show the production, yields, and land area affected during the production of rice. The rice production in China and Japan is currently following a different trend. The yields in Japan are much higher than the area in spite of what has happened in the past few years of low yields. To prevent a plateau, farming practices need to change. Once this happens, daily living for the farming community will become more comfortable, which will attract more future producers.

When the national rice yield is in a plateau, it affects all other agriculture systems in China. Food becomes less available as a majority of the population lives off these rice fields, having rice for two out of three meals almost every day. When the rice production cannot keep up with this demand, it puts pressure on all other products to supply for the population. With the high demand of food, the quality of the food goes down, and food prices rise. The high prices of food cause increased rates of starvation, especially for the poor who live primarily off of rice.

There are many factors that affect the yields of rice, one of which is the climate in China. Climate change is an important issue prevalent in the media and many universities have been studying it for several years. The current climate is significantly drier than in 1960. There have been less wind events, hailstorms, and thunderstorms in the last fifty-seven years (Messier, 2017). The decrease of hailstorms in the area has caused a negative feedback loop regarding rice production. If hailstorms were more prominent, a positive feedback loop would occur, and hail damages to the crop would make the sale of rice difficult. The decline of wind storms has also affected the rice production in a negative feedback loop, allowing the stalks to grow taller and stronger. This climate has also changed the production negatively because the rice needs a high-water table to grow.

Rice production puts a lot of stress on the land to have high yields and a successful crop. The environment is being degraded from the production of rice itself. The high-water content over saturates the soil, which in turn can lead to soil erosion. Ways to save the environment in these areas would be to use less water, reduce cultivation, and use fertilizer more cautiously. Cultivating this land decreases soil moisture, increasing the risk of desertification. This land is very precious; it is needed for China's well-being and to produce rice to supply the world.

The decreasing of rice yields affects family farms and many others in China drastically. When yields are at a low, the rice quality decreases and the cost to purchase the end product increases. There is a direct correlation between environmental stressors and cost to produce a quality crop. Also, increasing yields would put less of a footprint on the earth because less land would need to be used for more rice production. With using less land, less water is needed to be used. If rice yields increase, the growing number of impoverished people will decrease. Food will become more readily available for the population and prices of rice would decrease. Increasing rice yields would also benefit the small holder farms. When the land is not producing high enough yield, the government may consider urbanization or commercialism to boost the nation's economy. In contrast, if the land is producing quality yields, the smallholder farmers can continue to use their land for agriculture, also helping the environment due to less push for urbanization.

Increasing the yields of rice is important for the population of China, and the world. An issue that could be addressed is current harvesting methods. Traditional methods require an abundance of physical labour and time. If these farms were to use more current conventional methods, harvest would be done faster with less crop damage. A problem with using a combine is the cost, as they are expensive, but can save money in the long run. Also, combining the rice accomplishes many tasks at once whereas with the traditional method, all steps must be done individually. Furthermore, when rice is stacked or dried, it deteriorates the product, causing more crop loss. During this process, rice falls and is no longer a good quality product. For better rice production rates, it is recommended that rice farmers harvest through the progressive method of using a combine.

The production of rice requires fertilizers of nitrogen and phosphorus. Sometimes these crops are not given enough fertilizer due to the prices of the products. Rice is also affected by the leaching of other chemicals into the crop, as rice fields are often in low land that is prone to flooding. The leaching of other chemicals may affect the crop positively, so that it has better production, or negatively, and risk exposure to a sterilant that can kill the crop and deteriorate the soil health. To improve the yields of rice, the rice crop could be genetically modified to have more grains on one stalk, ultimately requiring less space for each stalk. With the genetic modification, the crop could also have a shorter growing season. As of right now, the rice paddies take about five months to grow. However, with additional research and trade access, different cultivars could have a shorter growing season, and eventually be able to have two growing seasons within one year.

The farming community in China is a large one that tends to be uneducated. These families in the community are taught by working on their farm. The practices of the farm are passed on and new farming methods are not always sought out or accepted. It is important to give these communities a proper education to deal with their financial struggles and to provide information about the changes in the industry. With proper education, these workers would be better equipped to handle money, be able to read and write, and learn more about the product and prevent crop loss. By providing education on aspects of the rice industry in schools, more young adults could become interested in rice farming and become more involved in farming, potentially allowing for higher production rates. Therefore, if there was to be a change in the curriculum and/or local education projects, the communities would be more and agriculture education would become more accessible and suitable for the rice industry.

China supports 1.4 billion people through the production of rice (China Population, n.d). The problem with this industry lies in the production rates and yields. With the risk of a flattening yield, many groups would be affected. The factors that affect rice negatively would need to become more controlled; this includes water scarcity or how much water is used. China's ever-changing climate also needs to be taken into consideration and carefully examined. Three major things to be done that could improve the production of rice are: influencing farmers to use more progressive methods of harvesting, paying closer attention to the use of fertilizers and/or genetically modifying the crop, and educating the population to encourage more people to become farmers. The production of rice is very important to the prosperity of China and to the sustenance of the world.

Appendix

References

- Agriculture in China. (2017). Retrieved July 18, 2017, from https://en.wikipedia.org/wiki/Agriculture_in_China
- China Population (LIVE). (n.d.). Retrieved July 19, 2017, from <http://www.worldometers.info/world-population/China-population/>
- Harvesting. (n.d.). Retrieved July 18, 2017, from <http://www.knowledgebank.irri.org/step-by-step-production/postharvest/harvesting>
- Krishnamurthi , K., & Khandelwal, S. (2011). Agriculture Journal: China Versus India by the Numbers. Retrieved July 18, 2017, from <https://blogs.wsj.com/indiarealtime/2011/09/20/agriculture-journal-China-versus-india-by-the-numbers/>
- Krishnamurthi , K., & Khandelwal, S. (2011). Agriculture Journal: China Versus India by the Numbers. Retrieved July 18, 2017, from <https://blogs.wsj.com/indiarealtime/2011/09/20/agriculture-journal-China-versus-india-by-the-numbers/>
- “Livestock”, (n.d.). Retrieved July 18, 2017, from http://svc007.wic008p.server-web.com/English/ind_sectors/livestock.htm
- McCornick, P. (2016). Feeding the World: Asia's prospect of plenty. Retrieved July 19, 2017, from <https://wle.cgiar.org/thrive/2012/09/25/feeding-world-asias-prospect-plenty>
- Messer, A. (2017). Study shows China's severe weather patterns changing drastically since 1960. Retrieved July 19, 2017, from <https://phys.org/news/2017-02-China-severe-weather-patterns-drastically.html>
- Nguyen, V. (n.d.). Factors affecting wetland rice production and the classification of wetlands for agricultural production. Retrieved July 18, 2017, from <http://www.fao.org/docrep/003/x6611e/x6611e03c.htm>
- Riesselman, A. (n.d.). China: Subsistence Farming and the Implications of Environmental Degradation. https://www.worldfoodprize.org/documents/filelibrary/images/youth_programs/research_papers/2009_papers/ArWeVaHS_ARiesselman_0103772739F45.pdf

Bibliography

Japan. (n.d.). Retrieved July 18, 2017, from <http://ricepedia.org/japan>

China. (n.d.). Retrieved July 18, 2017, from <http://ricepedia.org/index.php/China>