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Hybrid Rice: Feeding China

The room was filled with excited chatter. I took my place at the long, glossy conference table beside eleven other Iowa high school students and eight adults. Outside, it was just another hot August afternoon in Changsha, China. But inside it wasn't a typical day. It was exactly the opposite. The members of the Iowa Global Youth Excellence Program were eagerly awaiting the arrival of a very important guest.

As the double doors opened, a hush fell across the room and all eyes turned to the stream of people entering. Walking in the midst of the crowd was a petite man. It was evident, from the moment he sat at the head of the table, he was who we had been waiting to meet.

A slight smile softened his face as he surveyed his guests. Leaning forward in his chair, he cleared his throat and spoke directly into the microphone.

"You are all students?" he asked in a quiet, yet assertive voice. The Global Youth participants enthusiastically answered yes.

"High school students?" the man questioned. Once again, the twelve of us agreed with him. He grinned, leaned over and whispered something in hushed Chinese to Sok Leng Tan, our coordinator and translator. She laughed and looked at all of her students.

"He says he like students very much," she told all of us. We smiled, delighted by the compliment we received. A compliment from a man of his stature was an honor.

The plaid-shirted gentleman seemed perfectly ordinary. Nothing about his appearance made hints to the incredible things he had accomplished. Sitting before us was the "Father of Hybrid Rice", the Chinese Norman Borlaug, the man who put food on China's dinner table. A man who has devoted his lifetime to feeding the world: Yuan Longping.

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Although his success has now provided Longping with a comfortable life, his achievements were inspired by a very trying time for the people of China. As a young man, Longping experienced, first hand, the effects of the disastrous Great Leap Forward. A movement initiated by the communist government, the Great Leap Forward was a push to change the agrarian society of China to one that was modern and industry-focused. Promised future years of prosperity and abundance, the rural people satisfied their immediate hunger with large amounts of grain.

But the government demanded more and more produce, and soon the Chinese farmers were without enough to feed their own families, let alone sell and make a profit. When the rural communities began to make public their hunger to the government, the Communists insisted they had secret stores of rice and were lying in order to claim more supplies. Nothing was done to alleviate the worsening conditions.

Because of this distrust, the Great Leap Forward created a famine that could have been avoided. This catastrophe claimed the lives of as many as 30 million Chinese people between the years of 1959 and 1961, at which point the Great Leap Forward was abandoned (See *Eberstadt*). But from this desperate time came the motivation that drove Longping to find a new way of growing rice: more, better, and faster.

In 1949, Longping's dream of obtaining an education became a reality when he enrolled at the Southwestern Agricultural College in Chongqing, majoring in agronomy. The Communist government had a heavy influence on the subject of agriculture, requiring students to study Soviet scientists and farming methods. The idea of studying Western techniques was simply taboo. In secret, Longping read forbidden agriculture magazines such as *Crop Science* and was able to learn approaches to growing grain that were completely different from what he was learning in school.

From the beginning, Longping's research was discouraged. His peers did not believe that the goal of creating varieties of hybrid rice could be achieved. Government officials were enraged by his ventures and at one point even destroyed his experiments by throwing his seedlings down a well. When talk of his work caught wind and was discussed among group of Western scientists, they doubted the probability of success of the experiment. In their opinion, it was an established fact that rice was a poor choice for hybridization.

The long history of rice in China began far before Longping started his work. The Chinese people began growing rice at least 4,000 years ago, first cultivating it sometime around 2,500 B.C. This makes rice the crop that has fed more people over time than any other. Rice quickly became a staple in the diet of Asians and led to the creation of an economic lifestyle which revolved around crop production.

Given the immense amount of rice being planted in China today, surprisingly 87% of the world's 500 million farm small holders, two hectare or less, are on the continent of Asia. China alone accounts for 193 million small farms of the 500 million total. (See *Gansesh*). The owners of these small farms make meager livings. With the entire country owned by the government, the income of rural farmers is roughly one-fourth of those living in urban areas (See *Nicolette*). Approximately ¥15,000 (\$2350) can be earned from a restaurant in a city, while agricultural families only earn from a few thousand Yuan to as little as a few hundred Yuan per year (See *Langguth*).

Traveling outside of Beijing during the course of my trip in China, I had the opportunity to personally observe the smallholders in Chinese agriculture. Little houses and farmsteads dotted the countryside next to small fields green with growth. On each plot of land, it was evident they used as much space as possible, with fruit trees and vegetables planted alongside rows of corn. In rural China, a high percentage of the labor is done manually, leaving no need for heavy equipment.

"Rice is a major food crop that feeds more than half of the world's population," according to Longping (See "*China Daily*"). For millions of people all over the world, rice is three-fourths of their daily diet.

This is clearly evident in China's need to maintain an annual grain output of 500 million tons in order to feed the nation's 1.3 billion people (See "*China Daily*"). Longping also went on to say that "If 50% of the world's rice paddies were planted with hybrids, rice population could be increased by another 150 million tons, and 400 to 500 million more people could be fed."

China is currently planting 29 million hectares of rice every year, and the average rice output per hectare is 6.3 tons. Hybrid rice accounts for about 57% of that total, the output close to 7.2 tons per hectare. For the past six years, China's summer grain output rose every year to arrive at 123.35 million tons in 2009, which was a staggering 2.6 million more tons than the previous year (See "*China Daily*").

To keep up with the current food needs of the world, Longping, who stresses the collaborative nature of his work, has vowed to improve rice yields to 15 tons per hectare by 2020. Longping announced in June 2010 that his team of researchers were developing a new hybrid variety of rice. The new rice strain is to be released in 2012 and is expected to yield 13.5 tons of rice per hectare (about 2.5 acres). Called "Phase-III Super Hybrid Rice", the new rice surpasses its predecessor by leaps and bounds. The previous strain, which was released in 2006, on average yields only nine tons of rice per hectare. On September 19, it was reported that China had set a new world record for rice output with hybrid rice breed yielding 13.9 tons a hectare in Longhui county in Hunan province. This hybrid rice breed was also created by Longping. His research team previously set world records for reaching the target unit yields of 10.5 tons a hectare in 2000 and 12 tons a hectare in 2004 (See "*Black Sea Grain*").

Although hybrid rice was developed for use in China, it has also been successful in other areas of the world. Commercialized in countries such as India, Vietnam, the Philippines, and Bangladesh, the rice hybrids fare well due to their adaptable nature. During our group's meeting with Longping, he said that "not only does the hybrid rice perform well in China, but outside China...even in your super country, the United States!" He stated that last year, 400,000 hectares of hybrid rice were planted in the US alone. Also, during the 2006 Africa-China Summit, China agreed to establish ten agricultural centers on the African continent, and delegations of Chinese rice experts and businessmen have already been in Guinea, Sierra Leone, and Mozambique to begin projects for the production of Chinese hybrid rice varieties (See "*GRAIN*").

Our Iowa Global Youth Excellence Program was also granted the opportunity to tour the Longping High-Tech research facility, where scientists breed new varieties of rice to be tested and eventually sold to the public producers. Even at this top research site, there was a stark display of the different technology found in today's China. In one part of the building, we saw a rice-sorting machine that was said to be the most advanced of its kind within the country of China. Looking at the complicated wires and machinery attached to it, it was easy to believe that this was accurate. But continuing to another room, we visited with several women hand packaging and sewing sacks of rice seed in an impromptu-style assembly line. To see such advanced equipment juxtaposition with old-fashioned methods demonstrated how varied agricultural technology is in today's China.

Once outside the research facility, the group was invited to see several rice paddy test plots growing with Longping High-Tech experimental rice. Seeing a rice paddy in the shadow of a towering high-rise, it is evident that modernization is slowly encroaching on the precious remaining farmland in eastern China.

Between 1997 and 2007, roughly 755,000 hectares (1,865,645 acres) were lost each year to development, erosion, and desertification (See *Colvin*). Facing these struggles, astoundingly, China is still able to feed twenty percent of the world's population with only seven percent of the world's farmland. But China's arable land has already fallen below the 120 million hectare threshold and could decrease to 117 million hectares by 2015 (See *Colvin*). This loss of farmland will push scientists and agronomists to develop

better strains of rice that can produce more grain with increasingly less land in order to feed an ever growing population.

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China's agricultural challenges are significant, and those of us who participated in the Iowa Global Youth Excellence Program saw first hand how the work of Yuan Longping is making a difference. However, rice hybridization is just a start. With a deeper understanding of China, our own nation will be able to participate in the new global marketplace in which China is a significant agricultural partner.

For agriculture to prosper, producers in both the US and China need strong markets for farm commodities, a continued stream of technological advances, and stable economic conditions. If all three of these needs can be achieved in trade between China and the United States, then each country will thrive and the future of agriculture will benefit.

Strong markets encourage the surplus revenue available to be reinvested in farms and infrastructure, resulting in sustained productivity. A stable, robust economy with minimal barriers to international trade allows each trading partner to focus on what it does best, and encourages each country's markets to grow with confidence. Uncertain market conditions and artificial trade barriers, such as caps, quotas and tariffs, threaten this stable growth. If the China-US market relationship is strong and deep, then producers and consumers in both economies can enjoy the benefits of trade in a thriving economy.

Longping helped us see how hybridized rice can meet China's own food needs and also be part of China's contribution to global agricultural trade. Before concluding our meeting, Longping expressed to us how he has devoted an entire lifetime to helping feed a hungry world; "One of my lifelong wishes is to develop hybrid rice for the welfare of the people all over the world."

Because of Yuan Longping's contributions, there will food on China's dinner table tonight.

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