

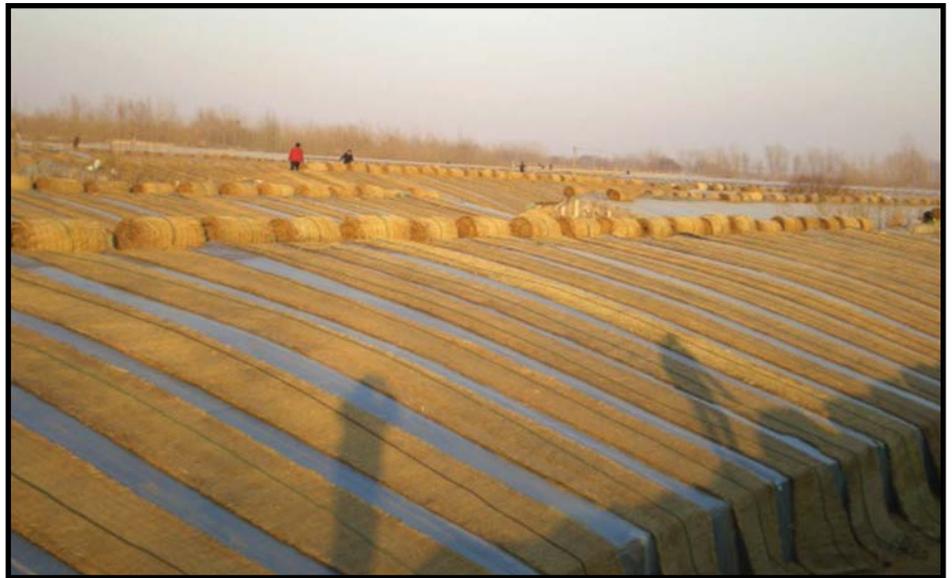
The Commonalities and Differences between Chinese and US Agriculture

by Wendong Zhang
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WITH ONE in four rows of soybeans planted in Iowa exported to China, it is almost impossible to overstate the importance of the Chinese economy and its consumers have for US agricultural producers and the farm sector in general. However, there is a lack of understanding of China's agricultural industry and, in particular, the life and work of a typical Chinese agricultural producer. Having been born and raised in a rural Chinese county, I want to share some of my observations regarding the commonalities and differences between Chinese and US agriculture.

China and the US have a lot in common when it comes to agriculture. First, agriculture is a multi-billion dollar industry in both countries, as shown in Table 1, despite various forms of government policies and distortions, market prices remain the key signal both Chinese and US producers respond to when making production decisions, and individual producers in both countries are free to choose whatever crops and inputs they wish.

Second, the agricultural sectors in both countries face similar challenges and opportunities: farmers in both countries are aging; farm succession and access to land are common concerns; phosphorus-induced algal blooms occur in both the United States and China—in fact, as shown in Table 2, Chinese farmers apply more fertilizers and pesticides than their US counterparts. However, innovations, such as the big-data revolution, GPS, the internet, and unmanned aerial vehicles are providing US and Chinese farmers with new opportunities to combine technology and agriculture.



Vegetable greenhouses are partially covered with rice straw to aid in temperature control.

Third, the agricultural industries in both countries are heavily involved in international trade. In that sense, the well-being of the countries are interconnected—the United States is the leading supplier of many commodities in China, especially soybean and pork, and US imports of vegetables and fruits from China more than doubled from 2000 to 2010.

Due to historical and political reasons, you could easily find many sharp contrasts for the agricultural industries in the United States and China, the four major differences are:

First, natural conditions for agriculture are better in the United States. As shown in Table 3, the population of agricultural producers in China is 75 times larger than the United States, but China has less than half the arable land available for farming. A typical US farm of 400–500 acres is equivalent to the total farmland for a 200-household village in China.

Second, there are key differences in the paramount objectives of agricultural policies in the United States and China. Supporting and maintaining net farm income for a rural household is arguably the most important goal of US farm policy, however, the Chinese government views the national food security as a much more important goal in making agricultural policy decisions. In other words, China pays much more attention to the total acreage of cropland, as opposed to the well-being of the farmers.

Third, the support system for Chinese agricultural producers is not nearly as well-structured or effective as the American system. Since the start of communist rule in 1949, farmers have been marginalized in China's economic and political system. Before China opened up to a market economy in the late 1970s, a sizeable portion of agricultural proceeds were taken from farmers to support the development of heavy industries. Despite the rapid

growth in agricultural subsidies in the recently, China only abolished its agricultural tax system in 2003. The average government payment per farm Chinese farmers receive is only \$113, compared to \$9,925 for an American farm, as shown in Table 4. Chinese farmers are far behind their American counterparts in terms of both educational achievements and access to resources, such as machinery and internet, as shown in Table 5. In addition, China lacks a strong extension program that helps farmers, especially those in poorer areas, to improve yields, mitigate environmental impacts, and master modern agricultural technologies. The best agricultural universities in China are often located in mega-cities such as Beijing, Shanghai, and Nanjing, as opposed to Ames, IA, College Station, TX, Ithaca, NY, and Urbana-Champaign, IL.

Fourth, agricultural is far more volatile in China than it is in the United States. In the foreseeable future—within 10 years—China expects to see another 100 million agricultural producers move to cities in the largest urbanization movement in the history of the world. China has recently enacted several policies and pilot trials for rural land reform aimed at encouraging consolidation of small plots and improving productivity. China is learning from the United States and Europe about setting up massive agricultural subsidy, crop insurance, and agri-environmental conservation programs. With the development of the Internet and Alibaba—a Chinese e-commerce company that has a sales portal larger than Amazon and eBay combined—more and more rural youths are opening online shops to sell agricultural and non-agricultural products. While the US agricultural industry is much more mature and stable, things could change very quickly for Chinese agriculture, as is true in almost every industry in China.

As one Chinese saying goes, ‘bread always comes first,’ and the well-being of

Table 1. Summary statistics of the agricultural sector in China and the United States

	China	US
Total Population	1350.4 million	318.9 million
Gross agricultural production	555.2 billion \$	232.4 billion \$
Share of Agriculture in Total GDP	10.0%	1.3%
Share of Agriculture in Employment	35.0%	2.0%

Table 2. Fertilizer and pesticide use in China and the United States

	China	US
Herbicide consumption (2007)	228.4 million lbs.	531 million lbs.
Insecticide consumption (2007)	241.6 million lbs.	93 million lbs.
Fungicide consumption (2007)	169.42 million lbs.	70 million lbs.
Total pesticide consumption (2007)	2,040 million lbs.	1,133 million lbs.
Pesticide application rate per farm	5.01 lbs.	1.24 lbs
Nitrogen fertilizer consumption	47,884 million lbs.	23,568 million lbs.
Phosphorus fertilizer consumption	16,612 million lbs.	7,936 million lbs.
Potash fertilizer consumption	12,548 million lbs.	8,480 million lbs.
Total fertilizer consumption	118,238 million lbs.	39,984 million lbs.
Fertilizer application rates per farm	290.7 lbs.	43.7 lbs.

Table 3. Summary statistics of the agricultural sector in China and the United States

	China	US
Number of Farmers	241.7 million	3.2 million
Number of Farms	200.2 million	2.1 million
Total Farmland Area	406.8 million acres	914.5 million acres
Corn Production Area	89.7 million acres	87.4 million acres
Soybean Production Area	16.9 million acres	76.3 million acres
Wheat Production Area	59.6 million acres	45.3 million acres
Total Size of Vegetable/Herb Greenhouses	83.6 million sq.ft.	61.8 sq.ft
Average Farm Size	2.0 acres	433.6 acres

Table 4. Government programs and machinery use in Chinese and American agriculture

	China	US
Net cash income from farm	\$4,954.30	\$37,241.00
Average government payments per farm	\$113.00	\$9,925.00
Total enrollment in crop insurance programs	181.2 million acres	282 million acres
Cropland in crop insurance programs	67.9%	84.0%
Average machinery value per farm	\$10,622.50	\$115,706.00
Average farm house in 2006	1,378.0 sq.ft.	2,169.0 sq.ft.
Number of trucks	17.52 million	3.30 million
Number of tractors	5.27 million	4.18 million
Number of combines	1.42 million	0.35 million

Table 5. Demographic characteristics for Chinese and American farmers

	China	US
Percent of women farmers	53.2%	30.9%
Farmers completed high degree or above	15.6%	91%
Farmers with Bachelor's degree or above	0.2%	25.7%
Farmers with Internet Access	2.2%	69.6%
Age - Under 34 (US); Under 30 (China)	20.2%	5.4%
Age - 35-54 (US); 31-50 (China)	47.3%	37.8%
Age - 55 or above (US); 51 or above (China)	32.5%	56.8%

The Journey from a Farm in Shandong Province China to Ames Iowa

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As is typical of many Midwesterners, Wendong Zhang grew up with family ties to agriculture. In some ways, his grandfather's farm in Shandong province in Northeastern China would be similar to an Iowa farm. Located in the western portion of the province most of the family-run farms rotated crops between wheat and corn. The farming methods in the province, where, Wendong says, economic development lagged behind the rest of the country, lagged far behind the United States. "Back then, machinery was not widely adopted as it was cost-prohibitive for farmers," he said. "I remember as a kid riding a very small tractor and grinding wheat because there was no large machinery that could do both."

In his lifetime, the farms around his village started going through major changes. "Over the last 20 years there have been large changes in which crops are grown and the way in which they are grown," he said. Wendong said farmers in his village switched from grains like wheat and corn to consumption grapes, which later gave way to using small greenhouses to grow produce like honeydew melons, cucumbers, and tomatoes. There was an economic rationale for switching—at first, consumers were

willing to pay premiums for exotic varieties of grapes, making them more lucrative than grains, then eventually farmers realized they could use the land more intensively to grow larger amounts of vegetables in greenhouses. "The limiting constraint now is labor, not land. As long as you put in the labor you'll have a good crop," Wendong said.

The changes in agricultural practices had a positive economic effect in Shandong province—the average annual income of a farmer in Wendong's hometown has risen from about \$1,500 to \$10,500, outpacing the rate of overall inflation in China.

As Wendong watched the culture of farming change in Shandong Province, he became not only interested in the positive effects, but the negative effects as well. "I studied environmental science in college and I was interested in the massive problems that come along with economic development. Gradually, I became more interested in the human aspects of environmental problems," he said.

His interest in economic development and environmental science took him from Fudan University in Shanghai, which only admitted 40 students out of 750,000 high-school graduates in Shandong provinces,

to Ohio State University. Wendong earned his master's in economics in 2012, then through the advice of his academic advisor, he entered the environmental science graduate program and earned his PhD in agricultural, environmental, and developmental economics in 2015. "Looking back, I feel a complete arc—I still feel very connected to my agricultural and environmental background," he said.

Wendong came to Iowa State University in August of 2015 as an assistant professor of economics and an extension economist, leading the Iowa Land Value Survey and the Soil Management and Land Valuation Conference – the longest running conference at ISU. The goal of his research and extension program, he says, is to promote the long-term sustainability of the agro-ecosystem. He has also taken an interest in the similarities and differences in agricultural and environmental problems faced by the US and China. "Because of the different political and social systems, they could take very different approaches, but I think China has already learned a lot and are learning from Europe and the US," he said. ■

farm households and the farm sector are of perennial significance in China and the United States. Despite significant differences and even disputes, Chinese and US agricultural industries have a lot in common and most importantly have a lot to learn from each other. As China's president Xi puts it: the Pacific Ocean is vast enough to embrace both China and the United States.

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