



How different is Chinese agriculture from the United States?

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Wendong came to Iowa State University in August of 2015 as an assistant professor of economics and extension economist, leading the Iowa Land Value Survey and the Soil Management and Land Valuation Conference – the longest running conference at Iowa State. The goal of his research and extension program is to promote the long-term sustainability of the agro-ecosystem, and improve the well-being of farmers and the farm sector. Born in China, he also has an interest in the similarities and differences between Chinese and United States agriculture. This article will be the first of a series of Ag Decision Maker articles he will write to compare and contrast various aspects of the agricultural sector in China and the United States.

With one in four rows of soybeans planted in Iowa exported to China, it is hard to overstate the importance of the Chinese economy and its consumers have for United States 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 United States agriculture.

Before I dive into the comparisons, I first want to share what it looks like growing up in a Chinese rural county and occasionally working on a farm. In some ways, my grandfather’s farm in Shandong province in Northeastern China, where Confucius is also from, was 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. Over the past 20 years, I have witnessed grand transformation in what, and how, crops are grown in my county. When I was a child, wheat dominated the crop production and I still remember riding a small tractor

grinding wheat because my uncle, who took over the farm from my grandfather, could not afford machines to separate grain and chaff. But now, only 20 years later, you cannot find a single wheat field in that same village. The farmers switched from wheat and corn to consumption grape farms, 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 same, or less, land area to grow larger amounts of vegetables in greenhouses. That is the first thing that China and United States agriculture have in common. Despite various forms of government policies and distortions, market prices remain the key signal both Chinese and United States producers respond to when making production decisions; and, individual producers in both countries are free to choose whatever crops and inputs they wish. As shown in Table 1, agriculture is a multi-billion dollar industry in both countries.

Table 1. Economic comparison of the agricultural sector in China and the United States

		China	U.S.	Iowa
Total Population	Million	1,350.4	318.9	3.1
Gross agricultural production	Billion dollars	\$ 555.2	\$ 232.4	\$ 35.5
Share of Agriculture in Total GDP	Percentage	10.0	1.3	6.7
Share of Agriculture in Employment	Percentage	35.0	2.0	8.5

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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; and 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 United States counterparts. However, innovations, such as the big-data revolution, GPS, the Internet, and unmanned aerial vehicles are providing United States and Chinese farmers with new opportunities to combine technology and agriculture. Growing up in a rural county, I became interested in how humans interacted with nature and especially the human dimensions of environmental problems. Because of this, I pursued an environmental science major at Fudan University in Shanghai and later a Ph.D. in agricultural, environmental, and developmental economics in 2015 from Ohio State University.

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 soybeans and pork. The United States imports of vegetables and fruits from China more than doubled from 2000 to 2010. The economy in my home country relies heavily on the exports of honeydews and mushrooms to South Korea, Japan and even the U.S.

How agriculture is different

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

1. Natural conditions for agriculture are better in the United States. As shown in Table 3, the population of agricultural producers in

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

		China	U.S.
Herbicide consumption in 2007	Million pounds	228.4	531
Insecticide consumption in 2007	Million pounds	241.6	93
Fungicide consumption in 2007	Million pounds	169.4	70.0
Total pesticide consumption in 2007	Million pounds	2,040	1,133
Pesticide application rate per farm	Pounds	5.01	1.24
Nitrogen fertilizer consumption	Million pounds	47,884	23,568
Phosphorus fertilizer consumption	Million pounds	16,612	7,936
Potash fertilizer consumption	Million pounds	12,548	8,480
Total fertilizer consumption	Million pounds	118,238	39,984
Fertilizer application rates per farm	Pounds	290.7	43.7

Table 3. Agricultural population and production in China and the United States

		China	U.S.	Iowa
Number of farmers	Million	241.7	3.2	0.13
Number of farms	Million	200.2	2.1	0.089
Total farmland area	Million acres	406.8	914.5	30.62
Corn production area	Million acres	89.7	87.4	13.7
Soybean production area	Million acres	16.9	76.3	10.0
Wheat production area	Million acres	59.6	45.3	0.024
Total size of vegetable/herb greenhouses in 2006-2007	Million sq. ft.	83.6	61.8	0.91
Average farm size	Acre	2.0	433.6	345

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China is 75 times larger than the United States, but China has less than half the arable land available for farming. A typical Iowa farm of 300-400 acres is equivalent to the total farmland for a 200-household village in China.

2. 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 United States 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.
3. 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 recently, China abolished its agricultural tax system in 2003. The average government payment per farm Chinese farmers receive is only \$113, compared to \$11,262 for an Iowa 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 the 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, Iowa; College Station, Texas; Ithaca, New York, and Champaign-Urbana, Illinois.

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

		China	U.S.	Iowa
Net cash income from farm	U.S. dollar	\$4,954	\$37,241	\$110,329
Average government payments per farm	U.S. dollar	\$113	\$9,925	\$11,262
Total enrollment in crop insurance programs	Million acres	181.2	282.0	20.9
Cropland in crop insurance programs	Percentage	68%	84%	83%
Average machinery value per farm	U.S. dollar	\$10,623	\$115,706	\$213,856
Number of trucks	Million	17.52	3.30	0.14
Number of tractors	Million	5.27	4.18	0.23
Number of combines	Million	1.42	0.35	0.04

Table 5. Demographic characteristics for Chinese and American farmers

		China	U.S.	Iowa
Percent of women farmers	Percentage	53.2	30.9	25.7
Farmers completed high degree or above	Percentage	15.6	91.0	91.6
Farmers with bachelor's degree or above	Percentage	0.2	25.7	26.4
Farmers with Internet access	Percentage	2.2	69.6	74.3
Age - Under 34 (U.S.); Under 30 (China)	Percentage	20.2	5.4	8.8
Age - 35-54 (U.S.); 31-50 (China)	Percentage	47.3	37.8	42.5
Age - 55 or above (U.S.); 51 or above (China)	Percentage	32.5	56.8	48.7

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4. Agriculture 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 recently enacted several policies and pilot trials for rural land reform aimed at encouraging consolidation of small plots and improving agricultural productivity. China is learning from the United States and Europe about setting up 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 youth are opening online shops to sell agricultural and non-agricultural products. While the United States 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 farm households and the farm sector are of perennial significance in China and the United States. Despite significant differences and even disputes, Chinese and United States agricultural industries have a lot in common and most importantly have a lot to learn from each other. And perhaps more importantly,

almost every Iowa farmer knows that what happens in China, just one Pacific Ocean away, could have profound effects on his or her pocket.

Data sources

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Updates, continued from page 1

Estimated Returns by Farm Lease Arrangement – C2-01 (Decision Tool)

Farmland Purchase Analysis – C2-70 (Decision Tool)

Evaluating a Land Purchase Decision: Economic Analysis – C2-76 (6 pages)

Evaluating a Land Purchase Decision: Financial Analysis – C2-77 (6 pages)

Current Profitability

The following tools have been updated on www.extension.iastate.edu/agdm/info/outlook.html.

Corn Profitability – A1-85

Soybean Profitability – A1-86

Iowa Cash Corn and Soybean Prices – A2-11

Season Average Price Calculator – A2-15

Ethanol Profitability – D1-10

Biodiesel Profitability – D1-15

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