



**Meat vs Fuel: Grain use in the U.S. and China,  
1995-2008**

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## **Introduction**

The impact of rising Chinese food demand and the potential for impact on the global economy was raised into popular consciousness by a 1994 article by Lester Brown, founder of the Worldwatch Institute, titled “Who Will Feed China?”

The article was translated into five languages, syndicated internationally, and eventually expanded into a book. Brown wrote in 1995 that the article attracted more attention than anything else he had ever written. His analysis drew inspiration from a review of the World Grain Database he initially conducted in 1988. In assessing the impact of industrialization on countries, Brown wrote:

“If industrialization is rapid, the loss of cropland quickly overrides the rise in land productivity, leading to a decline in grain production. The same industrialization that shrinks the cropland area also raises income, and with it the consumption of livestock products and the demand for grain. Ironically, the faster industrialization proceeds, the more rapidly the gap widens between rising demand and falling production.”

Such is the starting point for this study, which looks at a specific aspect of China’s industrialization: the impact of China’s growing consumption of livestock products and the impact on global grain demand.

By 2007, it was becoming obvious to analysts that global grain use was on the rise, as a function of rising incomes and populations. By 2007, CIS noted in a study that global grain reserves had declined in six of the previous eight years, and had reached a low of 56.7 days of reserves, the lowest point since an intense period of grain purchasing by the Soviet Union in the 1970s.

“The rush to biofuels promises to tighten global grain supplies even more” was a warning issued in CIS’s study of tightness in global grain reserves. By spring 2008, the global

grain shortage had spilled over into the pages of mass media such as the New York Times, which noted that commodity prices had spiked faster than any period since the Nixon Administration. The Times and other media noted a myriad of causes, which included a rising demand for food from China and “a diversion of food resources to make biofuels”.

Much of the criticism in this period has been aimed at US government policy with respect to subsidizing the production of biofuels, and in particular the production of ethanol from field corn, used primarily hitherto to feed livestock. Since field corn can be used for livestock as well as biofuels, and corn itself is used for a wide variety of products, such as corn syrup or edible corn, the use of corn for biofuels has attracted enormous attention in the popular press. Much of the coverage has been negative, with critics such as Jean Ziegler, UN Special Rapporteur on the Right to Food, calling the practice of using food crops for fuel production a “crime against humanity”.

This study has focused on the period since 1995, the year in which the book version of “Who Will Feed China?” was published. The study analyzes the impact of the rising consumption of meat products in China, the impact of biofuels, and US crop production. In particular it looks at the potential for US policymakers to address global grain shortages and rising corn prices by reducing, or eliminating, the production of ethanol from corn.

### **US Corn Production, 1995-2007**

According to the U.S. Department of Agriculture, in 1995 US corn production stood at 7.2 billion bushels, or 192 million metric tonnes. An estimated 14.7 million tonnes were used to make ethanol, based on the Department of Energy ethanol production figures for 1995, and allowing for a conversion rate of 2.8 gallons per bushel. 4.9 million tons of dried distillers grains, based on a 33 percent conversion rate, would have been returned from ethanol producers to the grain markets. This left 182 million tonnes available for US consumption and export.

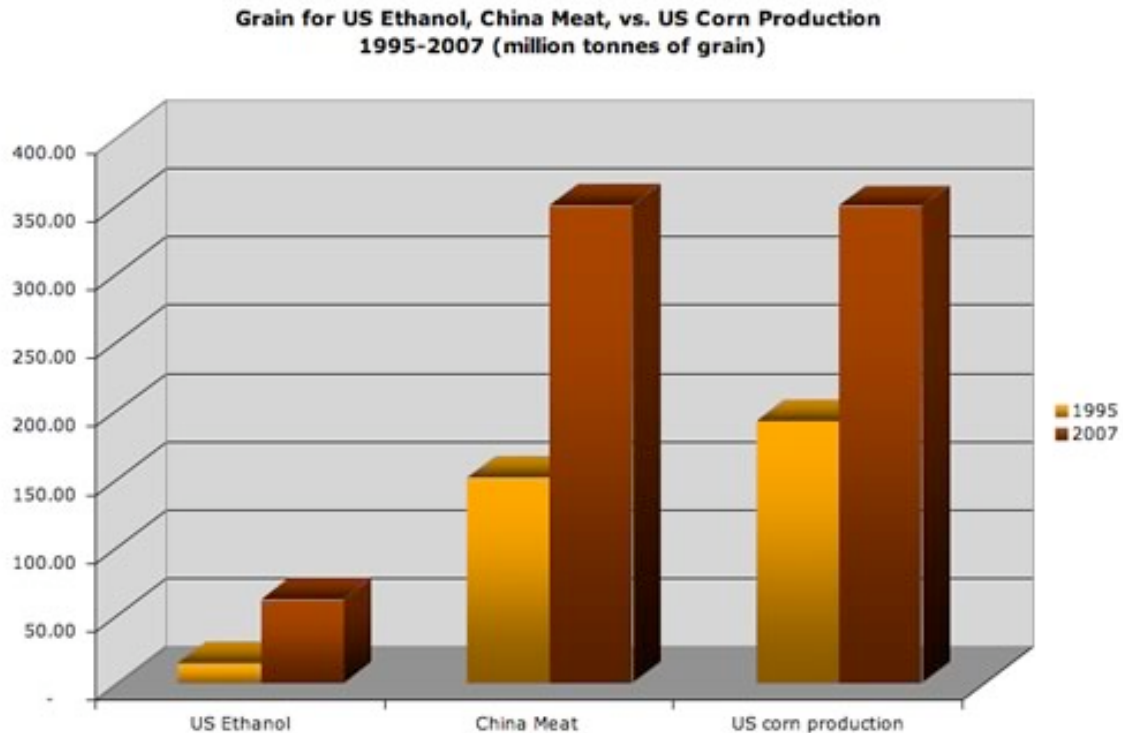
In 2007, US corn production rose to 13.1 billion bushels, or 349 million tonnes. An estimated 62 million tonnes were used to produce ethanol, based on DOE ethanol production figures and a conversion rate of 2.8 gallons per bushel. 21 million tons of dried distillers grains, based on a 33 percent conversion rate, would have been returned from ethanol producers to the grain markets. This left 308 million tonnes available for US consumption and export.

The total production of corn available for domestic, non-ethanol consumption and/or export, increased 126 million metric tonnes from 1995 to 2007. Ethanol consumption increased during this period by 31 million metric tonnes. Overall production increased by 82 percent, and overall non-ethanol production available for domestic consumption and export rose by 69 percent.

### **US Population, 1995-2007 and impact on domestic consumption**

The US population was increasing throughout this period, from 264 million in 1995 to 301 million in 2007. By applying the 14 percent increase in population to the US corn production figures, the US would have required an additional 25 million tonnes of corn to meet rising domestic, non-ethanol, consumption needs (as well as providing an additional 14 percent for export purposes).

With US production increasing by 157 million tonnes, after 31 million net metric tonnes are subtracted for the change in ethanol consumption, and 25 million tonnes are subtracted for a 14 percent increase for other domestic uses and export (to keep pace with population change), the US produced 101 million metric tonnes more corn in 2007 than required for its 1995 pattern of domestic production, export, and for ethanol.



**Figure 1.** US corn production increased dramatically in the 1995-2007 period, but even more spectacular was the rise in grain demand for Chinese meat consumption. In this context, US ethanol production can be seen as an insignificant sideshow event in terms of impact on grain usage.

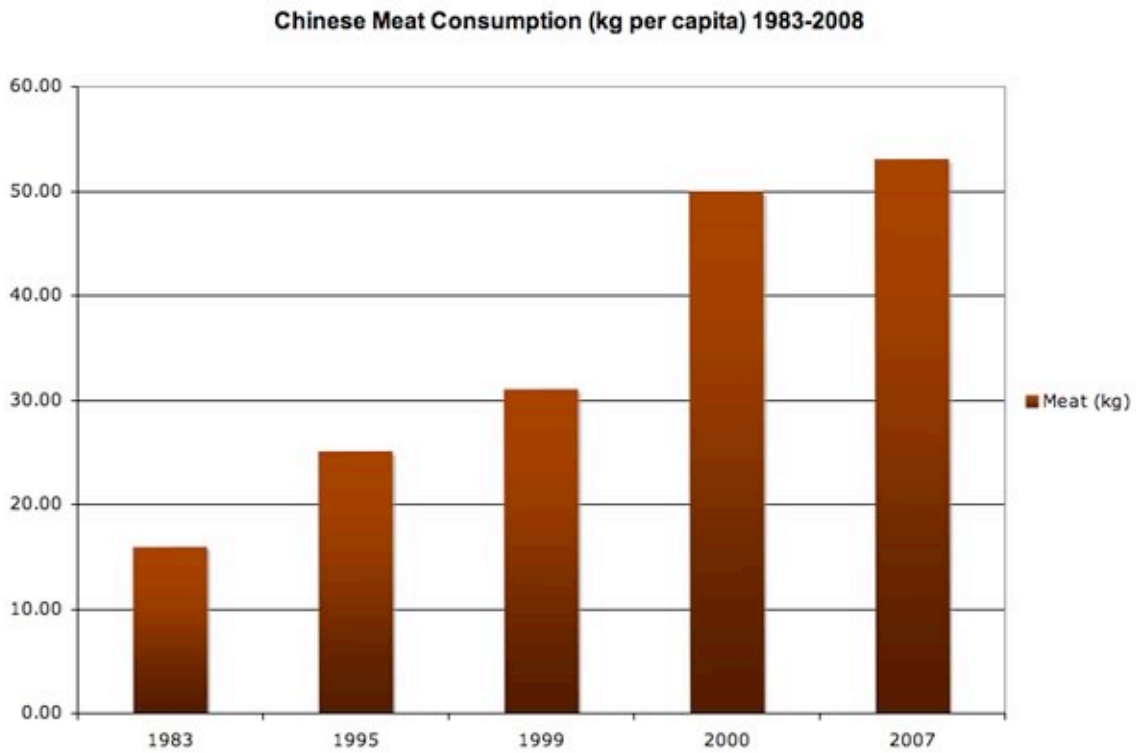
### **Chinese meat consumption, population and grain use, 1995**

In 1995, the population of China was 1.203 billion, and the Chinese people consumed, according to the FAO, 25 kilograms of meat per person. Overall meat consumption was 30.075 million metric tonnes. It takes an average of five kilograms of grain to produce one kilogram of meat. Applying grain needs to meat consumption, China would have required 150.4 million metric tonnes of grain in 1995 to supply livestock for its meat demands.

### **Chinese meat consumption, population and grain use, 2007**

In 2007, the population of China was 1.321 billion, and the Chinese people consumed, according to the World Resources Institute, 53 kilograms of meat per person. Overall

meat consumption was 70.013 million metric tonnes. Applying grain needs to meat consumption, China would have required 350.1 million metric tonnes of grain in 1995 to supply livestock for its meat demands. This represents an increase of 199 million metric tonnes, or 7.8 billion bushels.



**Figure 2.** Although this study focuses on the 1995-2007 period, meat consumption has been rising at a rapid pace in China for 25 year or more. Consumption was 16 kilograms of meat per capita as recently as 1983 according to the World Resources Institute, rising to a figure more than three times as high by 2007. Overall consumption has been increasing as fast as 12 percent per year on a per capita basis.

### **Impact of rising Chinese demand on grain reserves**

According to Ethanol Market, “corn stocks in all positions on September 1, 2007 totaled 1.30 billion bushels”. According to recent media reports, and the cancellation of all corn ethanol production development in China, we believe that China does not have a material existing reserve of corn and is experiencing a corn production deficit that will require it to satisfy future needs through imports.

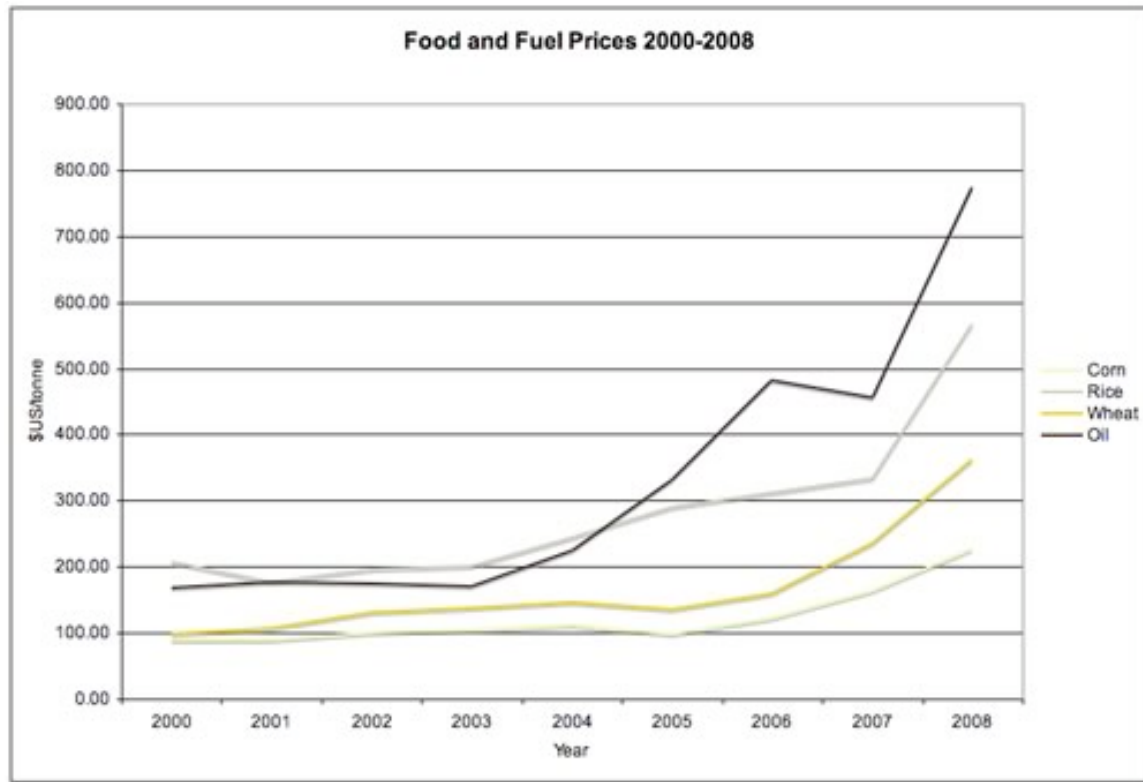
Eliminating all other factors, including the potential for increases in domestic production in the US and China and changes in corn demand from other sources, US grain reserves would be depleted by rising Chinese demand as soon as September 2009.

### **Impact of ethanol scale back on grain reserves**

As noted above, the US ethanol industry utilizes a net of 41 million metric tonnes of corn, or 2.3 billion bushels in 2007. Eliminating all other factors, including the potential for increases in domestic production in the US and China and changes in corn demand from other sources, US grain reserves would be depleted by rising Chinese demand as soon as fall 2013, even if the entire US corn ethanol industry were eliminated overnight and all corn was made available for export to China to meet rising demand for livestock feed.

### **Price increases in commodity markets, 2000-2008**

It has been noted by many critics and published in most US newspapers that US ethanol production is causing a rapid escalation in corn prices. Comparing the rise in corn, oil, wheat and rice prices since 2000, using the World Resource Institute and DOE price tables, it can clearly be seen that corn prices, while escalating rapidly, are rising slower than any of the three other food and fuel commodities. In fact, the intensity of price increases is in inverse proportion to the conversion rate into ethanol. Corn, which is used the most among the four commodities as a biofuel, has the lowest price increase. Rice and crude oil, which are not used to make ethanol, have experienced the fastest price increases.



**Figure 3.** Food and fuel commodity prices have been rapidly escalating, but since the beginning of the decade, corn has been experiencing a slower rate of price increase than the other major food stocks, and crude oil.

## Conclusions

1. Rising demand for grain in China, stemming from an increase in meat consumption, is overwhelmingly the cause of supply and demand imbalances in corn production.
2. Given that the US population has grown 15 percent in the past 13 years, the 82 percent increase in US corn production left plenty for people, plenty for livestock, and plenty for ethanol.
3. Chinese meat consumption is still 45 percent less than the average consumption in the US. An additional 277 million tonnes of grain would be needed to support China at parity with the US. That would take 68 million acres to grow.

4. If the Chinese people had consumed the same amount of meat, per person, in 2007 as in 1995, there would have been enough grain left over to support 927 million hungry people with enough grain for an entire year,” said Lane.

5. The growth rate for grain in China is so intense that, even if the US ethanol industry were completely shut down tomorrow, increased Chinese demand would soak up the excess grain by 2011.

### **Sources**

*Who Will Feed China?*, Lester Brown, Worldwatch Institute Books, 1995

UN Food and Agriculture Organization

Energy Information Administration, US Department of Energy

Commodity Information Service, “Global grain shortage of historic proportions ahead”,  
Feb 2007

*New York Times*, 4/18/08, “Across Globe, Empty Bellies Bring Rising Anger”

World Resource Institute

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