China's New Nationwide E10 Ethanol Mandate and Its Global Implications

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IN SEPTEMBER 2017, the Chinese government announced a new nationwide ethanol mandate (NEA 2017) that expands the mandatory use of E10 fuel (gasoline containing 10 percent ethanol) from 11 trial provinces to the entire country by 2020. This measure would require ethanol consumption in China, the largest motor vehicle market in the world, to at least quadruple within the next three years. For US producers, this recent development fuels interest in whether China is going to import ethanol and/or corn (the main feedstock for ethanol production in China) to meet the mandate.

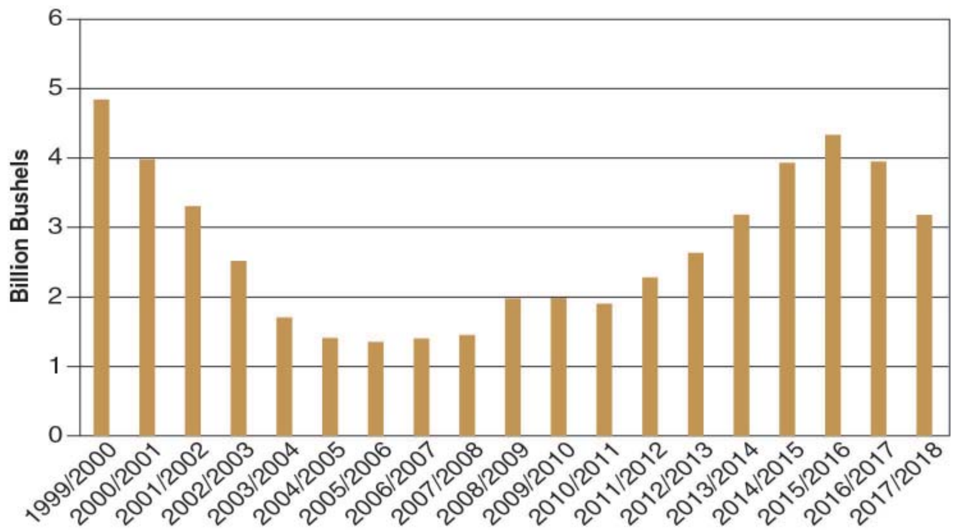

Figure 1. China's end-of-year corn stock estimates (2017/2018 values forecasted)
Source: USDA FAS: world market and trade

Background

Beyond environmental benefits, a key motivation for the E10 mandate is to reduce China's large corn stockpiles, which peaked in 2015/2016 at over four billion bushels (Figure 1, sources from China estimate the stockpile to be much larger). This is about half of the world ending stocks and enough for China's domestic consumption for half a year (Wu and Zhang 2016). The stockpile is the result of a corn price support policy that was paying Chinese corn producers more than twice the international price level until 2016 (Wu and Zhang 2016). Burdened by high storage cost, food safety risks, and potential waste, China recently adopted multiple measures to cut supply and increase demand. These measures include replacing the support price with a producer support based on planted area and financial assistance for corn processors. These measures have been effective—since 2015, China's corn consumption has caught up with production, the price for corn dropped to the lowest point in six years, and ending stock has been decreasing (USDA 2017b). The E10 mandate will further increase the demand for corn and speed up reduction of the stockpile.

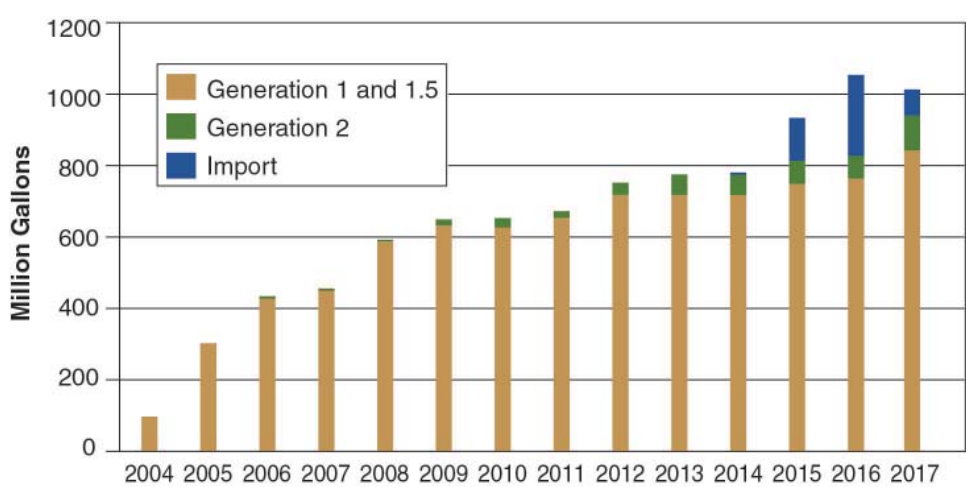

Figure 2. China's ethanol supply (2017 value forecasted)
Source: USDA: China biofuel annual, 2017

Current Situation of China's Ethanol Industry

In 2016, China produced over one billion gallons of ethanol (Figure 2), making it the fourth-largest ethanol producing country/region in the world,

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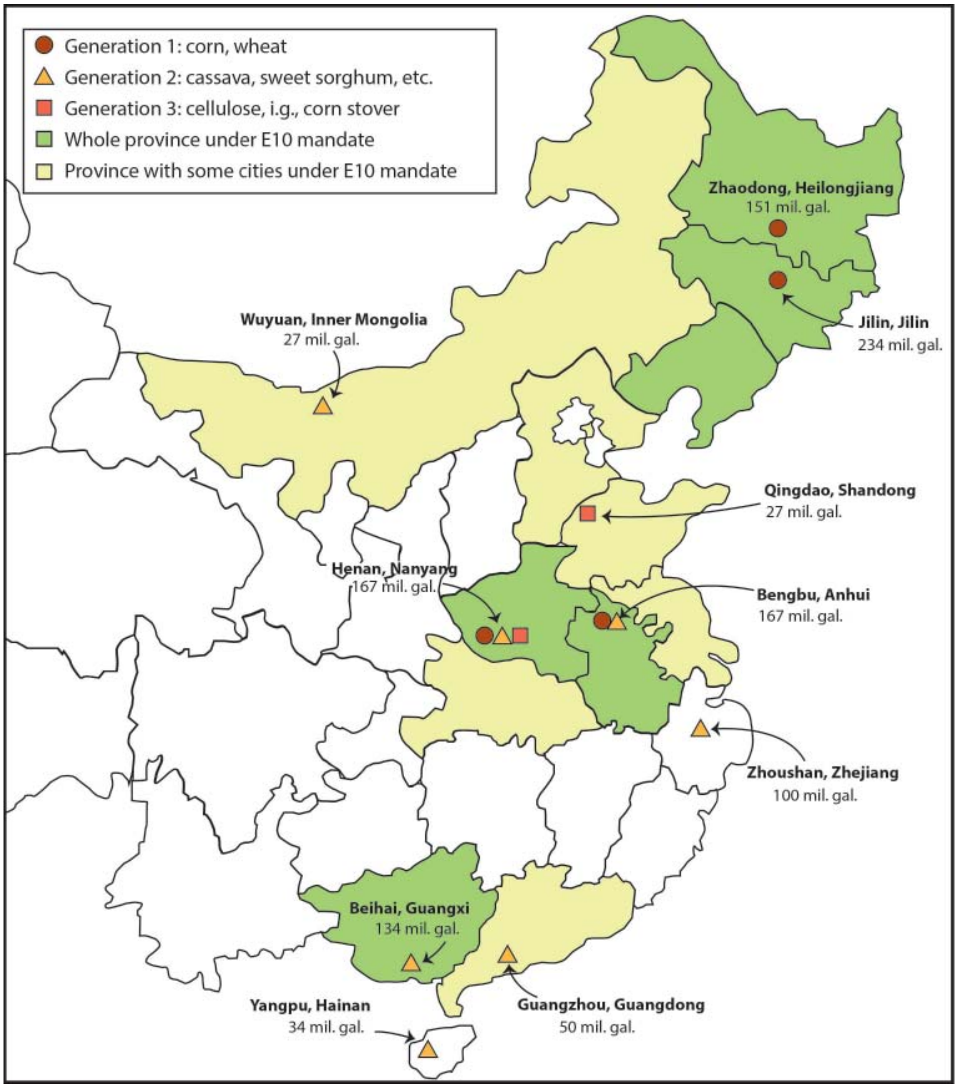

Figure 3. China's regional E10 mandate trial areas and ethanol refineries (annual production capacity is under location name)

after the United States, Brazil, and the European Union. From 2004 to 2016, the average annual production growth rate was 16.8 percent.

Corn is China's main feedstock (called generation 1, see Figure 1) for ethanol production, currently accounting for 64 percent of total output.[1] The four state-owned corn ethanol producers, located in corn producing regions in northern China (see Figure 3), were established after the regional trial started in 2002, following a historical peak in corn stockpile. As the stockpile decreased and refineries started to use newly harvested corn for feedstock, the government stopped approving additional generation 1 ethanol refineries in 2007 (CDRC 2007). By calling for "appropriate development of grain-based ethanol," the current national E10 mandate relaxes the government's previous stance against corn-based ethanol.

After China halted the development of generation 1 ethanol in 2006, it shifted support to "generation 1.5" feedstock, such as cassava and sweet sorghum. Cassava, a tuberous starchy root commonly grown in tropical and sub-tropical areas, became the second-largest source of feedstock, currently accounting for 23 percent of total output. However, it is challenging to grow enough generation 1.5 feedstock domestically, and cassava refineries in China still heavily rely on imports (IEA Bioenergy 2016). Cassava refineries are located in southern China, close to domestic and foreign cassava production regions (Figure 3). Recently, China has been encouraging ethanol production using cellulosic feedstock (called generation 2). However, cellulosic ethanol production is not expected to reach large scale production until 2025 (NEA 2017).

The production and distribution of ethanol in China is integral to the regional E10 trial program. Trial areas, selected based on proximity to production, expanded from several cities in 2002 to six provinces and more than 30 cities today. State-approved ethanol refineries are exclusive suppliers in the nearby trial areas. They sell ethanol to designated state-owned fuel companies at 91.11 percent of market gasoline wholesale price. The fuel companies then blend ethanol with gasoline, and distribute the resulting E10 fuel in the trial areas where only E10 fuel is allowed to be sold.

Since the ethanol price is proportional to the gasoline price, ethanol producers in China have suffered due to low oil prices. Before 2015, corn based ethanol producers also experienced high input price caused by the corn price support program. Moreover, China has gradually

[1]In 2016, Generation 1 and Generation 1.5 made up 92 percent of total output, while Generation 2 made up 8 percent (USDA 2017a, table 5). In the previous year, corn and cassava made up 70 percent and 25 percent of Gen 1 + Gen 1.5 output, respectively.

removed subsidies for ethanol refineries, especially those using first generation feed stocks. Although the policy details are not clear yet, the new national mandate is likely to good news for the embattled ethanol industry.

China has been importing substantial quantities of ethanol in the past two years. Before 2015, even though the imported ethanol was much cheaper than domestic ethanol, very little ethanol was imported. This is due to government forbidding distributors to handle imported ethanol in order to protect the domestic ethanol industry. Starting in 2015, imports rapidly increased and reached almost a quarter of total supply in 2016 (225 million gallons), with 95 percent from the United States (in that year, China was the third-largest export destination of US ethanol, encompassing 17 percent of total US ethanol exports). However, at the end of 2016, China increased the import tariff from 5 percent to the WTO bound rate of 30 percent, causing the 2017 import forecast to drop to only 35 percent of 2016 levels (USDA 2017a).

Potential implications of China's National E10 Mandate

Currently, China consumes 40 billion gallons of gasoline and one billion gallons of ethanol. Projections show that by 2020 gasoline consumption will reach 46 billion gallons (USDA 2017). Meeting the national E10 mandate would require an extra 3.6 billion gallons of ethanol, putting China ahead of the European Union to become the world's third-largest ethanol consumer.

Since details of the mandate have not been disclosed, it is not yet clear how China will generate more than four-fold output growth within three years (assuming domestic production is to keep up with consumption). Currently, production capacity utilization rate is about 85 percent (USDA 2017), therefore a short-term production spur can be achieved with existing facilities. Beyond that, a dramatic increase in capacity is needed. Since it takes one to two years to build a large scale generation 1 or 1.5 refinery in China, it is possible that China will be able to construct the physical facilities in time.

However, if the current trends in consumption and production continue, China's corn stock will fall quickly, opening up potential opportunities for more imports. If we assume that consumption growth follows the same trend it has shown 2010, and that production decreases at its recent pace for one more year (to 2017/2018), and then stabilizes (Figure 4), the ending stock will be used by the end of the 2020/2021 crop year, even in the absence of the ethanol mandate.

The ethanol mandate will further speed up the stockpile reduction. It will require between roughly 0.65 billion and 1.35 billion bushels of corn per

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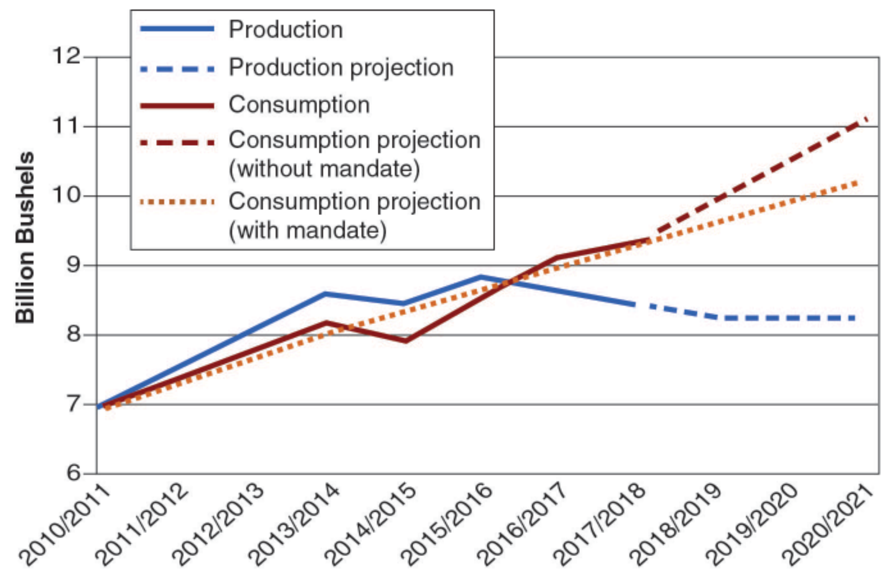

Figure 4. China's corn production and consumption, history and projections

Source: USDA FAS data

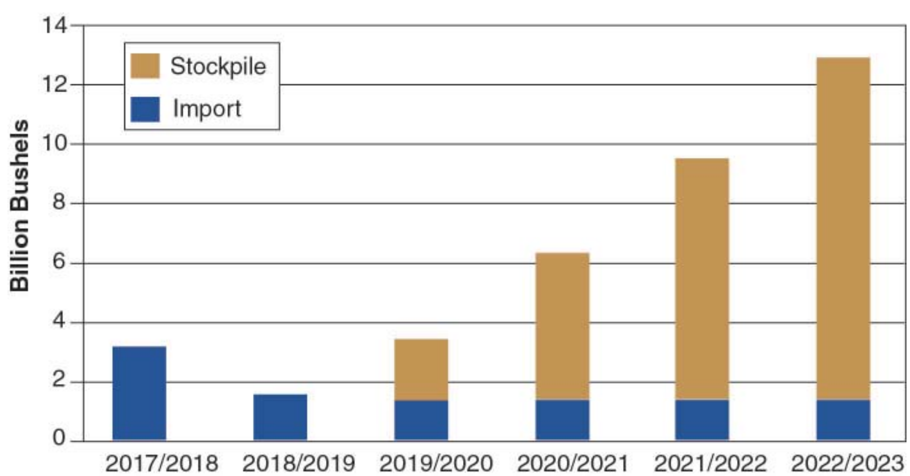

Figure 5. Projected corn stockpile with ethanol mandate and import needed to maintain a minimum stockpile of 1.39 billion bushels