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*Food, Peace and Oil – The Transition of the Role
of Grain for the United States, 1860-Present*

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*Food, Peace and Oil –
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1860-Present*

*By Andreas Huber**

Hillary Clinton dreamed in one of her speeches in the run-up of the presidential elections 08 of 60 billion gallons of ethanol production by 2030 and the independence from evil oil-rich countries. Looking at the history of grain during the last 150 years, it would have definitely had the potential to fulfill those expectations, particularly considering the political role it took in during the twentieth century. However, as this paper concludes, the political and economic constraints are too strong to back up a future of grain with such a powerful role.

Introduction

The world population is still growing and many parts are getting richer, demanding more high protein food than ever. Therefore nutritional resources are under strict observation. As the United States is the biggest global grain¹ exporter, the U.S. grain industry is particularly important. Reason for writing this paper, was the current media presence around corn-produced ethanol. The historical approach in this research has a special emphasis, as most of today's economists have forgotten the importance of looking back at history. This research paper is divided into three main parts. Firstly, the role of grain for the United States in the nineteenth century will be analyzed. After the fundamental developments are clarified, corn in the twentieth century is examined in the second part. Finally the current situation of corn in the United States is approached in the last chapter.

How to feed a rising nation – Grain production in the nineteenth century

To start this historical approach on grain in the United States, we will begin the timeline in the mid nineteenth century at the end of the civil war. This was the time when the United States started to become industrialized and by the end of the century rose to one of the richest nations on the globe.² To feed a fast increasing population of 76 million people in 1900 with an even higher increasing standard of living, considerable amounts of animal protein had to be produced.³ Therefore the economic rise of the United States was strongly dependent on their agricultural industry and grain. From the first half of the 19th century to the beginning of the 20th century grain production experienced a significant increase. Two main occurrences were responsible for the increase in production, an increase in productivity and agricultural land expansion. Unique soil and climate, an increasingly good transportation system in the Midwest and West, R&D in new grain crops, new machinery and fertilizer and immigrants from Western Europe helped the United States to become the most productive agricultural civilization in the world.

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¹ This paper defines the term grain primarily containing corn (maize) and wheat, as those are the main crops in the U.S.

² Maddison, "Statistics on World Population, GDP and Per Capita GDP."

³ U.S. Census Bureau, *Population: 1900 to 2002*.

During the agricultural history of the 19th century grain production moved from east to the Midwest, whereas cotton plantations dominated the south. Farmers started to produce not only for their personal consumption, but also for selling their grains to buy manufacturing goods.⁴ Then, in the 1860s, American growth had been fueled by a tremendous expansion in railroads and with the expansion towards the Midwest states, farming developed in this promising area.⁵ Figure 1 and 2 illustrates the expansion of the railway network in the USA comparing 1860 and 1890. In the Midwest area alone the railroad network increased from 230 miles in 1840 to 88,000 miles in 1900.⁶ The cultivation of the Midwest was only possible

Figure 1: U.S. railroad network in 1860



Source: Wallace, "Corn and the Midwestern Farmer," p. 458.

because of the railway expansion. As the accessibility of the Midwest states increased, due to the railroad expansion in combination with the Erie Canal, the area developed to the dominant producer of corn and grain products in general. By 1900 the Midwest or Great Plains developed to the corn belt⁷ of the United States, as it is known until today.⁸ Technological change and mechanization was one of the main factors to increase productivity. The Civil War facilitated a transition from a hand-powered to a horse-powered agricultural economy.⁹ It took a farmer three hours and forty minutes to harvest one bushel of wheat prior to the mechanization, by the 1880s it took only 10 minutes.¹⁰ The wide use of tractors at the beginning of

⁴ Hurt, *American Agriculture*, pp. 127, 165.

⁵ Salsbury, "Economic History," p. 799; Hurt, *American Agriculture*, p. 117. Actually, farmers pushed the expansion of the railroad network (and not implicitly vice-versa) and therefore they played an important role for the future economic rise of the mid-states.

⁶ Wallace, "Corn and the Midwestern Farmer," p. 456. Note: It is hardly replicable where the author got his information from, as very few sources are stated.

⁷ "Corn Belt." The Corn Belt is an area in the Midwestern United States, covering Indiana, Illinois, Iowa, Missouri, Eastern Nebraska and eastern Kansas. Characterized by very fertile soil and ideal weather conditions, corn and soybeans are the main crops.

⁸ Wallace, "Corn and the Midwestern Farmer," p. 457

⁹ For further reading on technological improvements in the second half of the 19th century see Hurt, *American Agriculture*, pp. 194-203.

¹⁰ Welch, "From Manpower to Horsepower."

Figure 2: U.S. railroad network in 1890



Source: Wallace, "Corn and the Midwestern Farmer," p. 459.

the 20th century gave the productivity growth another big boost.¹¹ Further, according to Wallace in his paper *Corn and the Midwestern Farmer*, immigrants from Western Europe were the most important factor for the high productivity increase.¹² The Germans, as an example, revolutionized wheat production by introducing a new wheat crop.¹³ Starting from the mid 19th century the United States experienced a boom in immigration from Europe.¹⁴ People from Germany, Ireland, Scandinavia, Holland and England tried to escape from political unrest and bad conditions in farming, which made it more and more difficult to earn a living as a farmer. After the abolishment of the Corn Laws in England in 1846, English farmers were confronted with a free market and cheap grain imports from continental Europe and the United States.¹⁵ The situation in continental Europe was similar. They needed to live with even lower prices for grain until the 1890s, when France and Germany introduced wheat duties to protect their farmers.¹⁶ The situation for farmers in Europe was dire, which encouraged many of them to immigrate to the United States, where they could find plenty of fertile land.

The adoption of the Homestead Act in 1862 by Abraham Lincoln was one of the most influential laws in American history. It encouraged western immigrants among others to become farmer in the Midwest and the West, as the law provided them with 160 acres of farmland virtually for free. In this former Indian Territory, which was then in public ownership, farmland development was pushed on.¹⁷ By 1910 almost 120 million acres of public land was distributed mostly to immigrants

¹¹ Hurt, *American Agriculture*, pp. 245-252.

¹² Wallace, "Corn and the Midwestern Farmer," p. 466.

¹³ Hurt, *American Agriculture*, p. 181.

¹⁴ Wallace, "Corn and the Midwestern Farmer," p. 466.

¹⁵ Van Vugt, "Running from Ruin," pp. 414-416. The hypernym *agriculturalists* includes farmers, agricultural labourers, gardeners, shepherds, stablemen, horse-trainers among others.

¹⁶ Fairlie, "The Corn Laws," pp. 92-93.

¹⁷ Hurt, *American Agriculture*, pp. 181, 187-188.

from Western Europe, in particular Germans and Norwegians.¹⁸ Mainly due to immigration and the Homestead Act the number of farms increased from two million in 1860 to way above five million in 1910.¹⁹

Considering the generous resources the United States provided for farmers, unsatisfied farmers in Europe and laws to receive land for free might have been the basis for the United States to become the world's biggest agricultural exporter in the 20th century.²⁰

The take-off of an grain exporting country

In the 1870s the United States grain exports started to accelerate as Europe faced some serious food shortages from 1878 to 1881. At the same time dramatic improvements to conserve and transport grain over long distances, removed one of the main barriers to transatlantic corn exports. As a result grain exports in 1880 were fifty times larger than in the 1870s. By the end of the nineteenth century wheat and flour exports reached 224 million bushels and corn over 200 million bushels mainly to Europe and Central America. During this time, agricultural exports were responsible for over 60% of the total U.S. trade. Large and a very limited number of trading companies developed to keep the cost of distribution low, which gave them significant market power.²¹ This structure of grain trading and distribution in the U.S. has been preserved until today and made it easier for the U.S. to become a global player in grain exports.²²

The beginning of the new century marked a stiffer market for grain exports. New competition from Australia, Argentina, Russia and Canada set pressure on world prices and Europe adopted new tariffs to protect their farmers.²³ But this situation was not of long duration. The years 1910-1914 were called in the U.S. the "Golden Age" for farming, as agricultural prices moved up more than farm costs and heaved farmers to a rich social group.²⁴ Globalization, driven by the steam engine and the telegraph, and rising demand on the world market helped to boost grain exports.²⁵ Over the period 1909 to 1913 the United States produced about one fifth of the world's wheat.²⁶ With the beginning of the First World War (WW1) in 1914 grain export boomed. The campaign "wheat will win the war" made farmers to increase production even more and made grain already a political factor.²⁷ The high demand from the Allied Powers held on until the end of the war.²⁸

However in the 1920s massive overproduction, intensified by productivity increases, due to the general use in tractors, and decreasing demand from Europe led to falling grain prices. Export amounts were at records high, but U.S. farmers had to export the overproduction at prices, which were even lower than production

¹⁸ Shannon, "The Homestead Act and the Labor Surplus," p. 638; Oyangen, *European Immigrants*.

¹⁹ Knowles, *Economic Development*, p. 100.

²⁰ Jerardo, "The U.S. Ag Trade Balance," p. 36.

²¹ Fornari, "U.S. Grain Exports," pp. 141-143.

²² NACLA, *Weizen als Waffe*, p. 50. Note: This book was written in the heights of the 1970s where U.S. politics were under great criticism, due to the Vietnam War among others. This can be noticed very strongly, when reading this book. Therefore those extremely critical reports might have been politically motivated. This should be kept in mind.

²³ Fornari, "U.S. Grain Exports," p. 143.

²⁴ Hurt, *American Agriculture*, p. 221.

²⁵ Conklin et al., *Transformation of US agriculture*, p. 7.

²⁶ Davis et al., "Harvests and Business Cycles," p. 11.

²⁷ Davis et al., "Harvests and Business Cycles," p. 11; Hurt, *American Agriculture*, p. 221, 232.

²⁸ Fornari, "U.S. Grain Exports," p. 144.

costs.²⁹ The U.S. farming industry entered their Great Depression already at the beginning of the 1920s a decade before the rest of the nation. The economic situation for farmers was harder then ever before and voices for higher import tariffs and protectionist means became louder. Further, the great depression in the 1930s let prices fall even more and due to intensive and non-sustainable farming, erosion led to the Dust Bowl, which made some farmland infertile.³⁰ In 1930 the cumulated effort of farmers to increase tariffs, resulted in the passage of the Smoot-Hawley Tariff Act³¹. All-time high tariffs consequently led to plunging grain exports and imports, which were more or less non-existent anymore.³² With this Act, countries all over the world started to raise their tariffs as well, and world trade plunged from 5.3\$ billion in 1929 to 1.8\$ billion in 1933.³³ From the interwar period until the mid 1950s grain exports remained flat, although the political role of grain emerged, what will be discussed in the next chapter.³⁴

Grain receives a political role

In the wake of high agricultural surplus production after WW1 president Hoover installed the Grain Stabilization Corporation in 1930, which bought up surplus volumes of wheat to support the market. Soon this program failed as grain stocks held by the Grain Stabilization Corporation accelerated too fast and prices plunged again.³⁵ American politics had to react with different means to fight against the farming crisis and developed two important governmental vehicles to support the farming industry, the Commodity Credit Corporation (CCC) and the Agricultural Trade Development Assistance Act, commonly referred to as Public Law 480 (P.L. 480), in 1933 and 1954 respectively.³⁶

After stocks of wheat at the Grain Stabilization Corporation cumulated to 257 million bushels only a year after introducing the program, the newly elected 32nd president Roosevelt introduced the CCC.³⁷ In general the CCC is responsible for supporting farmers through loans, purchases, payments and helps farmers to produce and distribute agricultural commodities. Further the CCC is authorized to sale grains to foreign governments and to donate food to domestic, foreign and international relief agencies.³⁸ This corporation was the first attempt to provide grain with a political role, but still had as the main objective to support and protect the agricultural market. The Second World War (WW2) decompressed the situation for grain prices and supporting the Allied Powers with food aid could reduce accumulated government stocks. Hence, agricultural products worth USD 6 billion were granted to the Allied powers during WW2.³⁹ Even after WW2 and due

²⁹ Conklin et al., *Transformation of US agriculture*, p. 7; Fornari, “U.S. Grain Exports,” pp. 144-145; Hurt, *American Agriculture*, pp. 221.

³⁰ Hurt, *American Agriculture*, pp. 221-222, 287-295, 300.

³¹ U.S. Department of State, “Smoot-Hawley Tariff.” The Smoot-Hawley Tariff Act from 1930 was intended to protect U.S. farmers from falling prices for agricultural products. As the negotiation process for agricultural tariffs started, more and more industries joined to call for increasing protection. In the end the Smoot-Hawley Tariff Act raised tariffs in nearly all sectors of the economy and with this Act passed, the Great Depression in the 1930s started to show his impact on the economy.

³² Fornari, “U.S. Grain Exports,” p. 145; Conklin et al., *Transformation of US agriculture*, p. 7.

³³ “The battle of Smoot-Hawley,” *The Economist* (18 December 2008).

³⁴ Conklin et al., *Transformation of US agriculture*, p. 8. Agricultural exports reached their bottom in 1940 and didn’t increase much until 1955.

³⁵ Fornari, “U.S. Grain Exports,” pp. 145-146.

³⁶ Amended versions for those two programs still exist by today.

³⁷ Fornari, “U.S. Grain Exports,” p. 145.

³⁸ USDA, “About the Commodity Credit Corporation.”

³⁹ Jennings et al., *Food aid*, p. 19.

to the Korean War grain exports revived until 1952 and grain prices were kept stable. For the first time grain was used as food aid, as Europe couldn't pay for those food purchases, due to the severe economic situation.⁴⁰ The years after WW2 Europe was highly dependent on U.S. food supply. But reason for giving such generous food aid to Europe was not only of humanitarian origin. Strategic issues were raised when deciding where the aid should go. The Marshall Plan was designed having in mind the military expansion of the communist Soviet Union and future markets for American goods in Europe.⁴¹

1952 marked again a slump in grain exports and at the same time a period of record harvests in America. The CCC held wheat stocks of 25 million tons, which were equal to the level of world trade in wheat at this time. With the support of the farm lobby P.L. 480 was adopted in 1954 to distribute excess commodities held by the CCC as food aid to developing countries.⁴² Even John F. Kennedy recognized the political importance of food aid under P.L. 480. In one of his famous speeches he said: "*I think the farmers can bring more credit, more lasting goodwill, more chance of peace, than almost any other group of Americans in the next ten years, if we recognize that food is strength, and food is peace and food is freedom, and food is a helping hand to people around the world whose goodwill and friendship we want.*"⁴³ Senator Hubert Humphrey, who played a key role in establishing P.L. 480, commented on the importance of food aid as a political factor even more direct: "*...in a world of want and hunger what is more powerful than food and fiber?*"⁴⁴ In a different speech he even emphasized on the importance of making countries dependent on American grain, so the US can get those countries to support their political will.⁴⁵

Before continuing with the illustration of the political role of grain in terms of food aid, some definitions about P.L. 480 and its titles have to be given. When P.L. 480 was adopted in 1954 it basically consisted of three titles. Title I grants long-term loans at low interest to needy countries, so they can buy U.S. agricultural commodities. Those loans can be repaid in the local currency. Title II allows donating U.S. agricultural products to meet humanitarian food needs. A minor role takes in Title III, which is also known as Food for Development and is a government-to-government grant to least developed countries to support development.⁴⁶

It seems a primary target of U.S. politics was, to be the dominant food aid provider to create dependence and therefore political power. Giving some figures of this dominance, from the early 1950s to the mid 1960s the U.S. share of total food aid was 98.5 percent.⁴⁷ Until June 1958 the U.S. spent USD 6.8 billion on food aid under P.L. 480.⁴⁸ Somehow this had to be politically justified.

⁴⁰ Fornari, "U.S. Grain Exports," p. 147.

⁴¹ Jennings, et al., *Food aid*, p. 21.

⁴² Jennings, et al., *Food aid*, p. 22; Swanson, "Fighting World Hunger", p. 6.

⁴³ Quotes from Jennings et al., *Food aid*, p. 22.

⁴⁴ Quotes from Jennings, et al., *Food aid*, p. 22.

⁴⁵ NACLA, *Weizen als Waffe*, p 36.

⁴⁶ Swanson, "Fighting World Hunger," pp. 5-6. Note: This article, written by the governmental organization USDA, which is responsible for distributing P.L. 480 Title I food aid, spares any critical voice on their food aid politics. But using it for a general definition of the Titles of P.L. 480 is just straight forward.

⁴⁷ Jennings, et al., *Food aid*, p. 24.

⁴⁸ Davis, "Agricultural Surpluses and Foreign Aid," p. 232. Note: It is hardly replicable where the author got his information from, as very few sources are stated.

*Grain – the strongest weapon for the U.S.*⁴⁹

Richard Ball and Christopher Johnson statistically proved the evidence of the political power of grain in their paper. They found that the allocation of food aid among African countries was highly correlated with the geopolitical interests of the U.S.⁵⁰ But Africa is only a minor example for use of P.L. 480 in the 1960s and 1970s. The political focus lied on Latin America and Asia as will be discussed in the following.

Making countries highly dependent on U.S. food aid might have been one of the most effective ways the United States could use the political power of grain. Therefore one of the main critics of P.L. 480 was that it destroyed the local farming industry or prevented it from development in the recipient country. As a result those countries would become even more dependent on U.S. food aid. Probably one of the first papers, which raised this point, was *Agricultural Surpluses and Foreign Aid* from 1958, which was published just four years after the introduction of P.L. 480.⁵¹ In the following decades a decent amount of research was done on the impact of food aid on the local farming industry and many economists agree, that the way P.L. 480 was conducted from the 1950s to the 1970s, had led to the destruction of the local farming industry and in some cases to a welfare loss for the society in the recipient country.⁵² Even though Deaton in his paper from 1980 argues against the price disincentives, a case about food aid in Columbia tells a different story.⁵³

Table 1: Production, Imports, and Consumption of Wheat in Colombia, 1951-71, Annual Averages

Period	Production		Imports		Consumption (Tons)
	Consumption (%)	Tons	Tons	Consumption (%)	
1951-54	139,750	78	38,900	22	178,700
1955-62	145,400	60	97,200	40	242,600
1963-70	99,000	33	205,500	67	304,500
1971	49,000	11	384,900	89	433,900

Source: Dudley and Sandilands, "The Side Effects of Foreign Aid," p. 331.

Table 2 Price Received by Producers and Import Price of Wheat, 1951-71, Annual Averages (in 1958 Pesos)

Period	Price Received by Producers (A)	c.if. Price of Imports (B)	A / B
1951-54	1,031	464	2.22
1955-62	841	453	1.86
1963-70	709	390	1.82
1971	514	345	1.49

Source: Dudley and Sandilands, "The Side Effects of Foreign Aid," p. 332.

⁴⁹ NACLA, *Weizen als Waffe*, p. 34.

⁵⁰ Ball and Johnson, "Motivations for PL 480," p. 530.

⁵¹ Davis, "Agricultural Surpluses and Foreign Aid," p. 235.

⁵² For further reading see Dudley, Sandilands, "The Side Effects of Foreign Aid," NACLA, *Weizen als Waffe*, pp. 35-38.

⁵³ NACLA, *Weizen als Waffe*, p. 37; Deaton, "Public Law 480," p. 991. One of the natural market forces to shrink the farming industry was the price. As food aid meant cheap grain imports, it could let to a significant price decrease in the recipient country. As a result local producers got into economic trouble.

As can be seen in Table 1 and 2, in 1971 Columbia's wheat production was only one-third of its peak in the 1950s. At the same time Columbia imported almost 90 percent of its domestic wheat demand. This can be traced back to a gradual decline in wheat production, which was accompanied by a constant increase in U.S. food aid under P.L. 480.⁵⁴ The sharp increase in U.S. wheat imports led to a collapse in domestic market prices. The U.S. argued for this development, as it was only the invisible hand of the market, where the U.S. had a comparative advantage of producing grain and therefore the shift in production would lead to a well-fare gain in both countries.⁵⁵ As Dudley and Sandilands showed in their paper, the government tried to keep a price level, which maximizes government revenues but not social welfare.⁵⁶ At the same time the National Front regime was established and it was in the interest of the United States to support them, as pressure from Marxist guerilla groups was strong.⁵⁷ One could say the way the local government made money with food aid from P.L. 480 might have been on behalf of the United States. A few other cases show how the U.S. promoted the free market and with it their comparative advantage in producing grain.⁵⁸ Consequently those countries increased their dependency on U.S. grain imports.

Another striking example of how the U.S. used P.L. 480 and food dependency to change the political landscape of a country is Chile in the 1970s. When Salvador Allende Gossens was elected as President of Chile in 1970, he followed a socialist ideology by nationalizing the economy among others. By the time Allende and his Popular Unity party announced the nationalization of the major copper mines⁵⁹, the Nixon administration tried to destabilize Allende's government by drying up food aid under P.L. 480.⁶⁰ Chile had no foreign currency reserves to buy grain from the open market. Consequently food shortage and the resulting economic devastation led to slumping public support. In 1973 the military Junta under Augusto Pinochet Ugarte and with the support of the U.S. overturned the government of Allende. For years to come Pinochet's military dictatorship used revenues from P.L. 480 to buy weapons from the U.S. among others.⁶¹

A similar very prominent case, where a country used P.L. 480 revenues to buy weapons or even finance a war, was during the war in Cambodia and South Vietnam in the 1970s. The U.S. indirectly financed those wars by misusing food aid under Title I of P.L. 480. In 1974 over 66 percent of U.S. food aid under Title I went to those two countries, which was worth almost USD 500 million.⁶² As a special provision they could even use 100 percent of the food aid revenues to finance their wars. At the same time much more populous Bangladesh suffered severe food shortage and received only 41 million US dollars.⁶³ Due to the great amount of grain exports under P.L. 480 the U.S. experienced increasing food prices

⁵⁴ Dudley and Sandilands, "The Side Effects of Foreign Aid," p. 326.

⁵⁵ NACLA, *Weizen als Waffe*, pp. 10-23.

⁵⁶ Dudley and Sandilands, "The Side Effects of Foreign Aid," pp. 333-336. As the government held the import monopoly on wheat, they could raise substantial revenues by selling the cheaply imported U.S. wheat at a higher price for the domestic market.

⁵⁷ "Columbia;" "History of Colombia."

⁵⁸ NACLA, *Weizen als Waffe*, pp.13-23.

⁵⁹ "History of Chile," The U.S. held interests in those mines.

⁶⁰ "History of Chile;" NACLA, *Weizen als Waffe*, p. 43. During this time Chile was highly dependent on grain import and food aid, due to food shortage and revolting farmers, which opposed a socialist regime.

⁶¹ "History of Chile;" NACLA, *Weizen als Waffe*, pp. 42-44.

⁶² Jennings, et al., *Food aid*, p. 23; NACLA, *Weizen als Waffe*, p. 41. In 1973 the total volume of P.L. 480 reached a record 1.1 billion U.S. dollars, although an agricultural surplus, which was the fundamental reason for having introduced P.L. 480, didn't exist anymore.

⁶³ NACLA, *Weizen als Waffe*, p. 40.

and food scarcity in the 1970s. As Nixon's *Food for War* campaign got out to the U.S. public the administration faced hard critiques. This and the food scarcity was the initiation for a fundamental modification of P.L. 480 and therefore marked the end of grain as a major political force in foreign affairs. Gradually P.L. 480 turned more to humanitarian needs, as U.S. agricultural surplus declined and international political factors like the Cold War waned.⁶⁴ To restate this shift according to today's food aid situation: A direction to more humanitarian needs means the government is pulling off political focus from food aid, as food aid is currently at its lowest level since 1973.⁶⁵

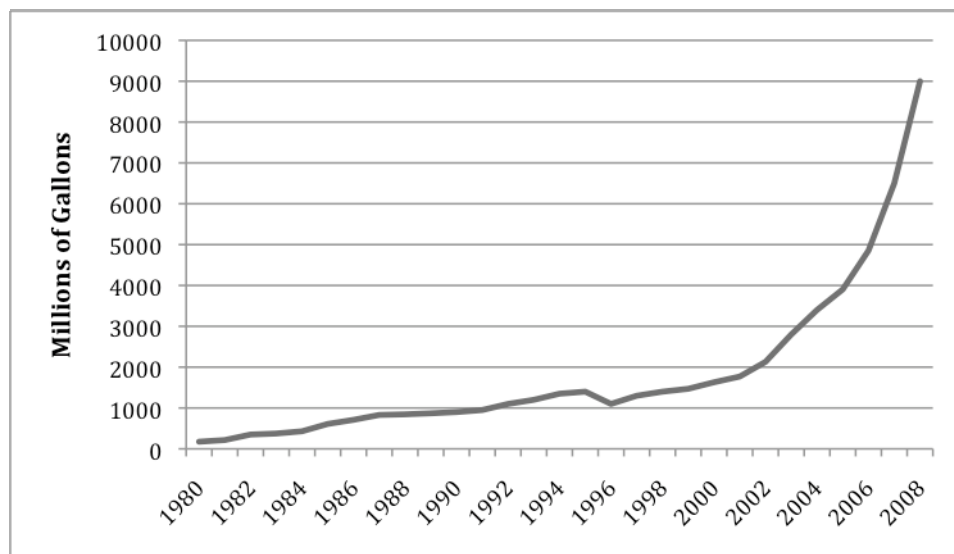
As a last note to this chapter, it would be hard to imagine grain with so much political power, without having the U.S. in such a dominant position in the grain export market and food aid.⁶⁶

Ethanol – the new role of grain

Having examined the historical transition of grain from a staple food, which was economically essential for a rising nation in the nineteenth century, to a political heavyweight, this paper will outline the most recent role of grain for the U.S. and its future perspective in the current chapter.

With the introduction of federal tax credit for refiners and marketers of gasoline that contains ethanol in 1978, the commercial use of ethanol was born. Nevertheless low crude prices and high production costs kept ethanol production at low levels.⁶⁷ As the oil price reached US\$ 140 in summer 2008, ethanol production literally exploded. Figure 3 shows this impressive development from 1980 to 2008.

Figure 3: Historic U.S. Fuel Ethanol Production



Source: RFA, "Statistics."

After six years of average annual growth rates of almost 25 percent, ethanol production reached a record volume of nine billion gallons in 2008 or an increase of almost forty percent with respect to 2007. This replaced about six billion gallons

⁶⁴ NACLA, *Weizen als Waffe*, pp. 41-42; Ball, Johnson, "Motivations for PL 480," pp. 530-531; Jennings et al., *Food aid*, pp. 23-24.

⁶⁵ "Cheap no more," *The Economist* (06 December 2007).

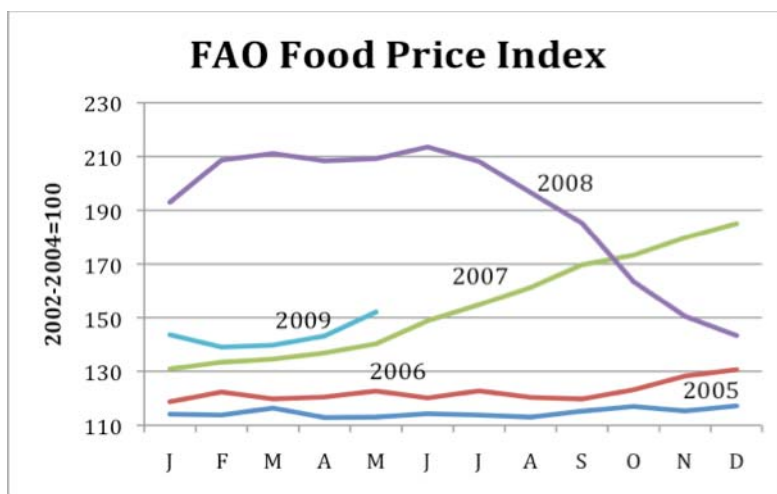
⁶⁶ Duncan and Mitchell, "Market Behavior of Grains Exporters," p. 4. The U.S. represented 65.3 and 45.3 percent of total corn and wheat exports from 1979 to 1981 respectively.

⁶⁷ Baker and Zahniser, "Ethanol Reshapes the Corn Market," p. 69.

of gasoline or five percent of U.S. gasoline demand in 2008.⁶⁸ Even as the current economic crisis has depressed crude oil prices, production for 2009 is expected to expand far above ten billion gallons.⁶⁹ But those whopping numbers didn't come at no cost. In the last couple of years U.S. politicians have been overoptimistic about ethanol. In ethanol they see the solution for crude oil independency and mitigation of climate change. But recently they cut back on expectations due to concerns of the impact on the food supply. As long as ethanol is produced of corn, the impact on food supplies has to be considered.⁷⁰ Corn used for ethanol production expanded by one billion bushels to three billion bushels in 2008, which represents about a quarter of the total U.S. corn harvest.⁷¹ Exactly this is the dilemma with U.S. made ethanol and therefore politicians have to face hard critiques.

As can be seen on the FAO Food Price Index (Figure 4 below) world food prices increased on average by more than 15 percent p.a. between 2003 and its peak in June 2008.⁷² U.S. Corn prices increased during the same period by nearly

Figure 4: FAO Food Price Index



Source: FAO, "Food Price Indices."

20 percent p.a. After falling corn prices since its peak in June 2008, it has to be noticed that since February 2009 corn prices as well as the food price index are again on an upward move.⁷³ Economists and politicians are arguing whether ethanol has led to this dramatic price increase. The points of views are very different and so are the results. Before examining the reasons for the food price increase into deep, a short historical review will be given to better understand the current situation.

As Figure 5 illustrates two food price spikes occurred in the twentieth century, one in 1971-74 and the other one in 1994-96. Three main events marked those two food price spikes; dollar depreciation, increasing world demand for food and a production shortfall. The food price spike from 2006-2008 showed the same

⁶⁸ Congressional Budget Office, *The Impact of Ethanol Use*, pp. VII-VIII; RFA, *2009 Ethanol Industry Outlook*, p. 2; RFA, "Statistics."

⁶⁹ RFA, *2009 Ethanol Industry Outlook*, pp. 2-3. As the Midwest was a major player in the rise of the U.S. agricultural business in the nineteenth century, it is the core of today's development of corn-produced ethanol, hosting the biggest production capacity by far.

⁷⁰ Holzman, "The Carbon Footprint of Biofuels," p. A247.

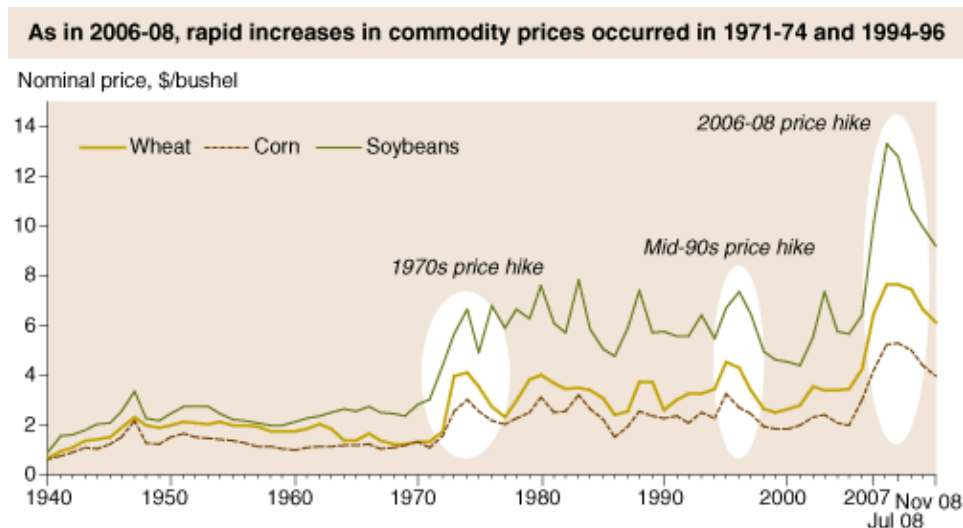
⁷¹ Congressional Budget Office, *The Impact of Ethanol Use*, pp. 1-2. Almost all the ethanol produced in the U.S. is made of corn.

⁷² FAO, "Food Price Indices."

⁷³ FAO, "International Commodity Prices."

characteristics. A weak dollar, which bottomed out in summer 2008, pushed U.S. grain exports. An increasing standard of living in big developing nations like China and India, increases meat consumption and pushes global demand for food now and in the foreseeable future.⁷⁴ Lastly a global production shortfall in 2006-07 decreased supply and low stocks-to-use ratios of grain intensified the volatility in the market. After the two preceding food spikes in the twentieth century, food prices came down due to slowing world consumption and increasing production. Although the current global economic crisis brought down food prices as well, there is still one major difference to the preceding food spikes, the additional high demand for food due to ethanol production.⁷⁵ Therefore a further increase in traditional ethanol production in the U.S. will intensify the world food situation, as the U.S. produces 60-70 percent of the world corn export.⁷⁶ As mentioned earlier food prices are again on an upward move and therefore it is very uncertain if prices will come back to pre-spike levels. Additionally after a record harvest in 2007, *The Economist* predicts that global warming could harm world farm output by one-sixth by 2020.⁷⁷

Figure 5: Food Price Spikes in the twentieth and twenty-first century



Source: Langley, "Agricultural Commodity Price Spikes."

One of the main points is, whether ethanol production actually contributed to the current food price spike. Agricultural economist Jay O'Neil argues that rising prices were mainly caused by poor weather conditions in the Midwest, Australia, Russia and Eastern Europe.⁷⁸ Other analysts argue that the current food spike is a speculative bubble, where money was shifted from currently low yielding equity markets to commodities.⁷⁹ Contrary, World Bank economist Don Mitchell makes the point that the increasing demand from ethanol actually provoked the speculative bubble. Some others argue with higher food demand from developing

⁷⁴ "Cheap no more," *The Economist* (06 December 2007); Tenenbaum, "Food vs. Fuel," p. A256. Three kilos of grain are needed to produce a kilo of pork and eight kilos for a kilo of beef.

⁷⁵ For further reading see Langley et al., "Agricultural Commodity Price Spikes."

⁷⁶ Langley et al., "Agricultural Commodity Price Spikes," pp. 22-23; "Cheap no more," *The Economist* (06 December 2007); Tenenbaum, "Food vs. Fuel," p. A256.

⁷⁷ "Cheap no more," *The Economist* (06 December 2007).

⁷⁸ Tenenbaum, "Food vs. Fuel," p. A256.

⁷⁹ Nelson, "Ethanol and food price." Traders held 2.42 billion bushels of corn futures in February 2008.

countries.⁸⁰ But the broad agreement is that ethanol among others contributed to increasing world food prices. Estimates about the contribution are from 2-3 percent from the Bush Administration to 10-15 percent from the Congressional Budget Office (CBO) between April 2007 and April 2008 of the 5.1 percent increase in food prices.⁸¹ A recent World Bank working paper goes even as far as estimating the contribution between January 2002 and June 2008 to be 70 to 75 percent.⁸²

A second issue is the carbon footprint of ethanol, which gained attention due to global warming. Until recently it was widely believed that ethanol made of corn would reduce carbon emissions. If you consider only the production, distribution and combustion, ethanol emits about 20 percent less greenhouse-gas than gasoline.⁸³ But as ethanol production increases, cropland has to be increased and therefore changes in land use have to be added in the calculations. Unused grasslands and forests absorb much greater amounts of CO₂ than does cropland, which will be released when burning it down to get new arable land. Hence, over the *life cycle* ethanol carries a *carbon debt*, which has to be repaid with greenhouse-gas savings from production. Eroding grassland from the great basin would take 93 years to repay the carbon debt with corn-made ethanol.⁸⁴ However, not only unused land will be cultivated. According to the USDA planted areas for wheat and soybeans will decrease, due to high competition from corn. This will again lower export for those grains and will have impact on global food supply.⁸⁵ Consequently deforestation in countries like Brazil will increase.⁸⁶

Table 3: New RFS Schedule until 2022

NEW RENEWABLE FUELS STANDARD SCHEDULE (Billion Gallons Per Year)															
	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022
Renewable Biofuel	9.0	10.5	12.0	12.6	13.2	13.8	14.4	15.0	15.0	15.0	15.0	15.0	15.0	15.0	15.0
Advanced Biofuel		0.6	0.95	1.35	2.0	2.75	3.75	5.5	7.25	9.0	11.0	13.0	15.0	18.0	21.0
Cellulosic Biofuel			0.1	0.25	0.5	1.0	1.75	3.0	4.25	5.5	7.0	8.5	10.5	13.5	16.0
Biomass-base Diesel		0.5	0.65	0.8	1.0										
Undifferentiated adv. Biofuel		0.1	0.2	0.3	0.5	1.75	2.0	2.5	3.0	3.5	4.0	4.5	4.5	4.5	5.0
Total RFS	9.0	11.1	12.95	13.95	15.2	16.55	18.15	20.5	22.25	24.0	26.0	28.0	30.0	33.0	36.0

Source: RFA, 2009 *Ethanol Industry Outlook*, p. 2.

Before the food price spike boom and the new results about the carbon footprint came out, U.S. politicians were extremely optimistic about ethanol. The Energy Policy Act of 2005 had as a goal to increase the Renewable Fuel Standard

⁸⁰ Wroughton, "Biofuels major driver."

⁸¹ Wroughton, "Biofuels major driver;" Congressional Budget Office, *The Impact of Ethanol Use*, p. VII; "Cheap no more," *The Economist* (06 December 2007).

⁸² Mitchell, "A Note on Rising Food Prices," p. 17.

⁸³ Congressional Budget Office, *The Impact of Ethanol Use*, pp. 11-12; Holzman, "The Carbon Footprint of Biofuels," p. A248; Searchinger et al., "Use of U.S. Croplands for Biofuels Increases Greenhouse Gases Through Emissions from Land-Use Change," *Science* (February 2008), p. 1239.

⁸⁴ "The Carbon Footprint of Biofuels," pp. A248-A249.

⁸⁵ USDA, *USDA Agricultural Projections to 2016*, p. 21; Searchinger et al., "Use of U.S. Croplands for Biofuels Increases Greenhouse Gases Through Emissions from Land-Use Change," *Science* (February 2008), p. 1238.

⁸⁶ "The Carbon Footprint of Biofuels," p. A249.

(RFS)⁸⁷ to 7.5 billion gallons per year by 2012.⁸⁸ Just two years later, when this goal was very close to be surpassed, the Energy Independence and Security Act of 2007 was implemented. Table 3 shows the new RFS schedule until 2022. A major target is to increase RFS to 36 billion gallons of renewable biofuels by 2022, whereas no more than 15 billion gallons are allowed to be made of corn ethanol.⁸⁹ The residual would come from the next generation cellulosic biofuel or other advanced biofuels.⁹⁰ The expectations on cellulosic biofuels are huge and in a report by Holzman the biomass potential for the United States is 1.3 billion tons per year, which would be an equivalent of replacing 30% of current U.S. petroleum consumption.⁹¹ Anyway, the potential for corn ethanol is limited to 15 billion gallons. Even this target is currently under review, as politicians find it harder from day to day to justify ethanol production for increasing world food prices and the failed effort to reduce greenhouse-gas emissions. Under the new RFS target indirect carbon emissions will be included.⁹² Reports like expanding ethanol production as scheduled could reduce calorie intake by 4-8 percent in Africa and 2-5 percent in Asia by 2020 and that you can feed a person for one year with one ethanol fill up for a SUV, may smashes the popularity of ethanol very quickly.⁹³ Further, an estimate of the World Bank, that increasing food prices caused violent conflicts in 33 countries is devastating for the future of corn ethanol.⁹⁴

Just across the boarder Brazil is producing ethanol made of sugar cane, which outstrips corn ethanol by far. It's cheaper to produce has a higher output-input-ratio and since 2004 it is fully competitive with gasoline and doesn't need to be subsidized.⁹⁵ Added to that sugar cane ethanol could pay back the *carbon debt* at minimum in four years.⁹⁶ Hence there is a lot of competition coming up in the very near or foreseeable future. It only depends on U.S. politics to abandon high import tariffs, import restrictions and subsidies.⁹⁷

Conclusion

The amount of attributes the United States has been allotting to grain during 150 years of history is quite astonishing. During the economic rise of the United States in the second half of the nineteenth century, grain was essential to feed a more and more demanding growing population. As this paper points out, the high amount of fertile land the U.S. was provided with, gave them a comparative advantage over other countries to produce an high amount of grain. In combination

⁸⁷ Congressional Budget Office, *The Impact of Ethanol Use*, p. 3. RFS is the amount of biofuels used in the United States.

⁸⁸ USDA, *USDA Agricultural Projections to 2016*, p. 22.

⁸⁹ Congressional Budget Office, *The Impact of Ethanol Use*, p. 3. Interestingly current capacity for producing corn ethanol is already 12.4 billion gallons.

⁹⁰ "The Carbon Footprint of Biofuels," pp. A249-A250; RFA, *2009 Ethanol Industry Outlook*, p. 5. Cellulosic biofuel is made of cellulosic biomass, which can be anything from plywood to paper bags to corn crop waste, which would be carbon-neutral. It could reduce greenhouse gas emissions by up to 96% compared with gasoline and would not compete with food. However, a commercial success is uncertain to date.

⁹¹ "The Carbon Footprint of Biofuels," p. A251; Rampton, "Obama seeks growth."

⁹² Gardner, "White House finishes review," *UK Reuters* (May 2009).

⁹³ "Cheap no more," *The Economist* (06 December 2007).

⁹⁴ Tenenbaum, "Food vs. Fuel," p. A256.

⁹⁵ J. Goldemberg, "Ethanol for a Sustainable Energy Future," *Science* (February 2007), pp. 809-810.

⁹⁶ Searchinger et al., "Use of U.S. Croplands for Biofuels Increases Greenhouse Gases Through Emissions from Land-Use Change," *Science* (February 2008), p. 1240.

⁹⁷ For further reading see Congressional Budget Office, *The Impact of Ethanol Use*; J. Goldemberg, "Ethanol for a Sustainable Energy Future," *Science* (February 2007), pp. 808-810.

with some other factors, like mechanization and immigration, the grain industry could set the fundamental for becoming the leading grain producer and exporter in the world. This was fundamental to the U.S. for the coming centuries. The U.S. realized during the two World Wars how powerful grain can be. Human dependency on food made grain a perfect political force. P.L. 480 started out to reduce excess grain stocks. In the end it even brought down governments.

But the most important question at present is about the future of grain for the U.S. A couple of years ago corn ethanol was very promising to help the United States to become independent from external crude oil. This vision was shared by leading U.S. politicians. After having examined the current situation of corn ethanol, it is not that clear whether corn will be the future solution to replace gasoline. The economical and political constraints, under the assumption that technology for corn ethanol production will not change much, are becoming more intense. Increasing food prices and having hungry people in direct competition with empty gas tanks makes corn ethanol politically difficult to justify. Currently the situation with corn ethanol looks similar to the *Food for War* campaign under President Nixon in the 1970s. Back then public pressure was a big factor in significantly changing P.L. 480 and therefore brought down the era of grain as a political force. This is a good example of how strong public opinion can influence politics. If the public turns against corn ethanol, as they feel the food price pressure and probably the increasing amount of starving people and conflicts around the world have some influence as well, the vision of grain as a tool for energy independency could vanish very quickly. As it turned out that corn ethanol is even not carbon neutral, there is another advantage over gasoline gone. Hence, the economic and political constraints very strongly put pressure onto corn ethanol and more or less just around the corner are some promising and sustainable alternatives like sugar cane ethanol from Brazil and cellulosic biofuel. There are already some signs that politicians want to substitute corn ethanol for alternatives as soon as possible, as the limit of consuming a maximum of 15 billion gallons of corn ethanol is reached within the next years.

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