The Implications of the Increasing Global Demand for Corn

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ABSTRACT

The purpose of this report is to determine how global corn prices at the manufacturing level affect retail corn-based products sold by major food companies. This report describes the history of the farming industry and how it has evolved over time. It focuses on the major factors that affect supply and demand levels in order to determine what specifically causes price fluctuations. Some of these factors include global population growth, diminishing oil reserves, less agricultural yields due to weather, increasing meat demand, international political factors and global trade. The goal of this report is to determine how the end consumer and the final retail products will be affected as global corn prices increase. It touches on the likelihood of food companies being able to remain profitable and sustainable through difficult market and agricultural conditions.

INTRODUCTION

The United State's corn production and acreage has increased over time due to the growing global demand. Corn is being utilized for food, feed, industrial uses and ethanol production, but there are many factors that affect the global levels of supply and demand. Because of these factors, the corn industry has had to evolve over the past several decades to meet the increasing demand.

Between the years of 1961-1990, there were exceptionally good food yields in relation to the population growth. This period in history is known as "The Green Revolution". There were new and improved farming techniques introduced that allowed seeds to absorb more fertilizer and water than ever before. The vast amount of land that was available for farming allowed new crops to be planted at relatively low costs and water was an abundant, low-cost resource. However, from 1990 to 2007, the population growth surpassed agricultural productivity, reducing the land available for new crops. Some pesticides and fertilizers in developed countries were banned, and there was a scarcity of water in some regions. This slowed the productivity growth that the agricultural industry was expecting and had experienced in previous decades ("Agricultural Commodities-Part 1").

One major event that led to the evolution of the agricultural industry was The Federal Agriculture Improvement and Reform Act of 1996. This act redesigned income support and supply management programs for agricultural producers. It allowed the farmers to decide what crops they would plant based on which ones would be most profitable in a given year. This planting flexibility and the improved corn varieties permitted farmers to shift their production away from other crops such as wheat, sorghum, barley and oats. This resulted in high competition between farmers because corn provides farmers with higher returns than other crops (Chambers, "Forecasting Feed Grain").

Today, research for alterations of corn is more intensive than for any other feed grain. Agricultural biotechnology has been used to offer enhanced end-use characteristics for consumers and has designed corn to be insect resistant and herbicide tolerant. Because of these corn varieties, corn yields have further increased. Corn accounted for 93 percent of all feed grains produced in the United States while sorghum accounted for four percent, barley for two percent, and oats for less than one percent. In 2000-2002, there was over 9.5 billion bushels of corn produced (Chambers, "Forecasting Feed Grain").

CURRENT CORN INDUSTRY

The majority of corn production takes place in the Heartland region, which includes Illinois, Iowa, Indiana, Eastern South Dakota and Nebraska, Western Kentucky and Ohio, and Northern Missouri. Although corn is grown in most states, the majority comes from this region, with Iowa and Illinois being the top corn-producers, accounting for about one-third of the crop ("Corn: Background"). Corn is planted on almost 80 million acres every year in the United States (Chambers, "Forecasting Feed Grain").

Corn is used for multiple purposes, but food, seed, and industrial uses account for about one-third of the national operations. During the processing stage, corn is either wet or dry milled depending on the desired end product. According to the USDA, "wet millers process corn into high-fructose corn syrup (HFCS), glucose and dextrose, starch, corn oil, beverage alcohol, industrial alcohol, and fuel ethanol. Dry millers process corn into flakes for cereal, corn flour, corn grits, corn meal, and brewers grits for beer production" ("Corn: Background").

The United State's corn production dropped by four percent in the 2010/2011 season due to poor weather, which weakened yields. This resulted in the largest deficit in over a decade because as global demand rose and the United States is the largest producer and exporter in the world. Currently, the long-term risks in the corn industry are seen as being quite balanced. It is possible, however, that livestock production could decrease next year because of the increasing feed costs and the decreased government subsidies provided for the United States ethanol sector. This would lead to a lower demand for corn. But, if China, the United State's major exports competitors, fails to meet their expected production levels, their import demand could drive future production in the United States ("Global Corn Outlook: US Focus").

Because of the stability in oil prices and the strength of the United State's dollar, global corn prices were fairly stable for the first half of 2010. However, from August to the end of the year, the United State's dollar was weaker, and there was a greater demand for crude oil in Asian economies. This resulted in monthly average prices increasing by 43%. There were declining corn yields in Argentina and South Africa because of weather and production factors but higher yields in Brazil, keeping the global corn output unchanged in the 2010-2011 season. Corn consumption was expected to grow by four percent in 2011, from 815 million tonnes to 845 million tonnes (See Figure 1), because of a rising demand from producers of ethanol and for high-fructose corn syrup ("Grain Futures Unshaken").

Global Corn Production, Trade, Consumption and Ending Stocks 2006-2011

All Corn	2006/2007 Million Tonnes	2007/2008 Million Tonnes	2008/2009 Million Tonnes	2009/2010 Million Tonnes	2010/2011 Million Tonnes (Forecast)
Production	710	795	799	813	811
Trade	87	101	84	86	93
Consumption	725	775	781	815	845
Ending stocks	117	137	155	153	119

Source: International Grains Council, 24 February 2011 statistical update

Figure 1: Global Corn Production, Trade, Consumption and Ending Stocks ("Grain Futures Unshaken")

Typically, farmers, elevators, and end users view the corn market as bearish. They estimate that current corn prices are high compared to the expected prices in the months ahead. Commercials take this stance for several reasons, but the reasoning is never fully known until months later when corn prices may have already substantially increased. They currently, however, a bullish stance on the corn market because of the disappointing corn yields, confirmation of large Chinese purchases of United State's corn, greater domestic ethanol demand, and a drop in the quality of corn produced (Hackett, "Corn May be Ready"). Corn prices in April 2011 reached the highest price since July 2008 at $7.73 a bushel (McFerron & Bjerga, "U.S. Corn-Supply").

SUPPLY AND DEMAND:

Prices of key agricultural commodities such as corn, wheat, soybeans, and cocoa are very difficult to accurately predict long-term because they are heavily influenced by several factors. Global population growth, diminishing oil reserves, weaker agricultural yields due to weather, increasing meat demand, international political factors and global trade all affects the supply and demand levels. Prices are linked to underlying market fundamentals and should not be analyzed separately, but as part of a wide market view.

Ethanol

In 1980, less than one percent of domestic corn was used for ethanol, but by 2003 more than 13% (Chambers, "Forecasting Feed Grain"). According to the USDA, in 2010/2011, 36% of corn produced in the United States was used to manufacture ethanol ("Agricultural Commodities-Part 1"). As shown in Figure 2, as the oil

supply dwindles and oil prices increase, food input prices will increase as well. Corn-based food product's prices are estimated to increase directly with the oil prices (Donnan & Peterson, "Food Price Volatility").

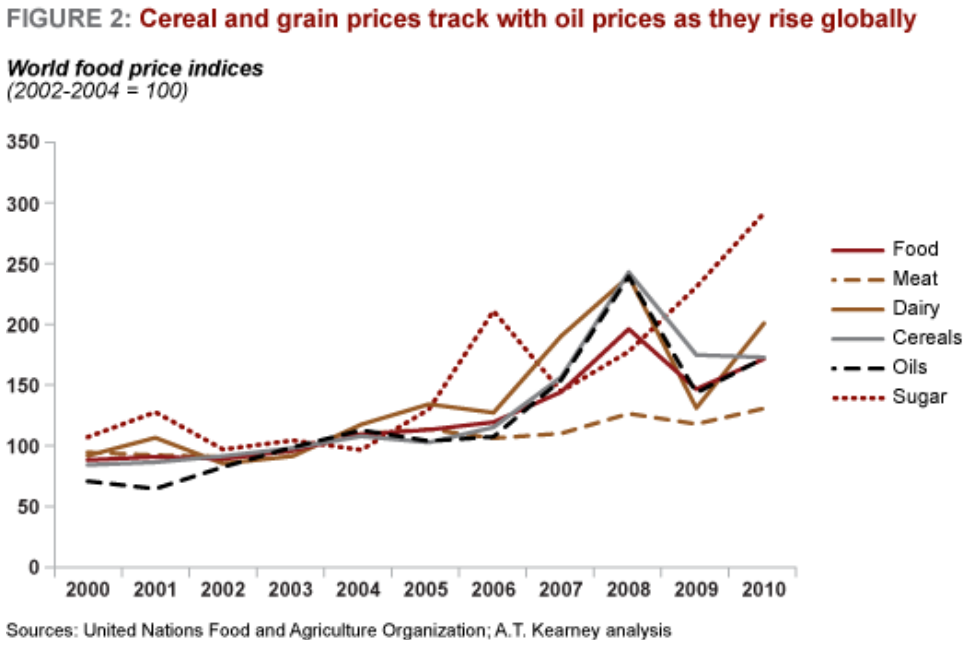

Figure 2: Cereal and grain prices track with oil prices as they rise globally (Donnan & Peterson, "Food Price Volatility").

Some are estimating that "peak oil" could be reached by 2020 leaving few agricultural commodities left to produce products besides ethanol and biofuel production ("Packaged Food 2011 (Part 3)"). The United States is the world's largest ethanol producer and the global ethanol production is estimated to continue to increase each year (Figure 3).

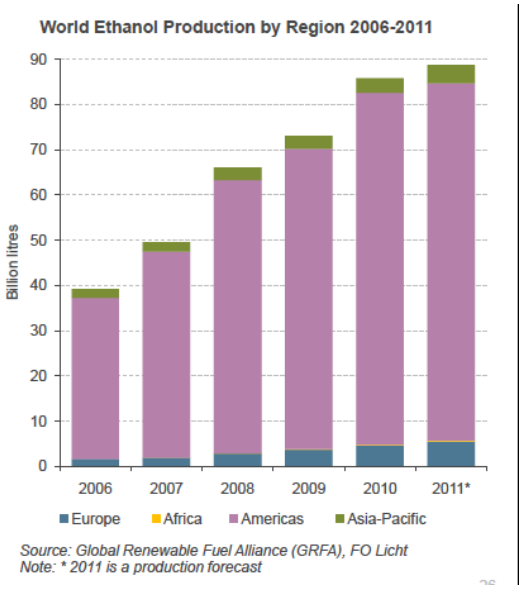

Figure 3: World Ethanol Production by Region 2006-2011 ("Agricultural Commodities-Part 1")

In 2010, production increased by 17% and in 2011 by 15% ("Grain Futures Unshaken by OECD"). Because of this strong demand for ethanol, higher corn prices have resulted, which has increased farmer's incentives to boost corn acreage. They do this by crop rotations, decreasing other commodity plantings ("Corn: Background").

Meat Demand

Global corn demand is driven by many factors; the most common being ethanol production, but the rising demand for meat in emerging economies also has a great impact. Corn, a derived demand, is a major component of livestock feed so the demand is dependent on the number of animals that are being fed corn. In 2000-2002, feed and residual use of corn accounted for 60% of total corn use, averaging about 5.8 billion bushels (Chambers, "Forecasting Feed Grain"). The amount of corn used for feed depends on the available supply and its price, the amount of other ingredients used in the feed, and the prices of competing ingredients ("Corn: Background"). In 2011, fresh meat sales in China were expected to rise by 3.5 tons alone ("Grain Futures Unshaken by OECD"). This is a result of the millions of people in China, India, Brazil and Southwest Asia that are earning a per-capita income of $3,000 to $5,000, which allows people to upgrade to richer diets (Tanzer, "Something's up").

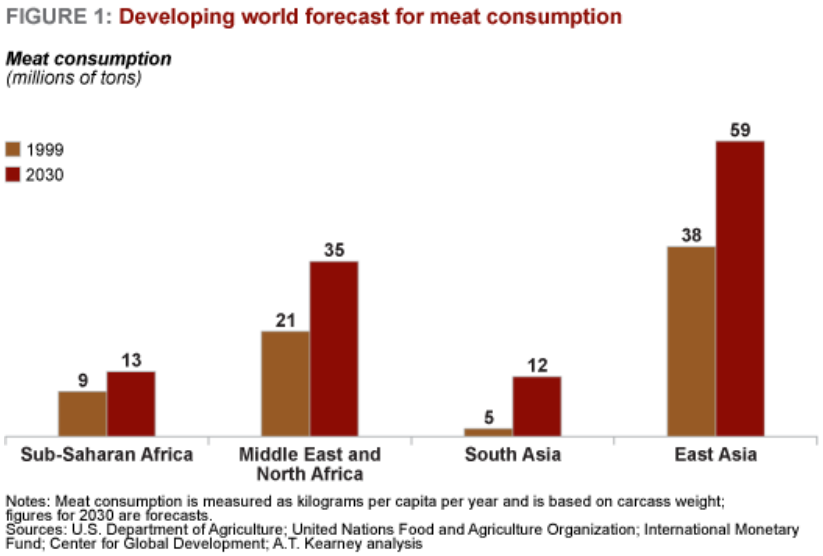

Figure 4: Developing World Forecast for Meat Consumption (Donnan & Peterson, "Food Price Volatility")

This shift in meat consumption increases the demand for corn and soybeans drastically because it takes about 2.6 pounds of corn to produce a pound of beef and about 3.6 pounds of corn to produce a pound of pork ("Grain Futures Unshaken by OECD").

Political Factors

Political factors can greatly influence supply and demand for agricultural commodities. For example, the political turmoil in Tunisia, Egypt, and Libya in 2011 impacted the demand for corn and wheat across their region. Their governments began buying large quantities of corn and wheat in order to maintain food security, which put pressure on prices ("Agricultural Commodities-Part 1"). Egypt bought 120,000 tons of United State's corn in mid-February ("Grain Futures Unshaken by OECD"). Due to the oil stemming concerns in Libya, there was a greater demand for ethanol, which has had effects on corn but also on wheat and sugar ("Agricultural Commodities-Part 1"). Although political events can play a significant role in short-term supply and demand levels, trends should be analyzed in a wider market landscape because of the many factors involved globally.

Weather

Weather is a major, uncontrollable factor in the global corn industry. It affects the entire process of growth; from planting, to the crop condition, to harvest, and to yield. Weather forecasts can only give a glimpse of what weather may come, making it nearly impossible to predict the yields for a given year. The affect of

unfavorable weather conditions are less damaging if there are strong inventories from the previous growing season, whereas low inventories will make the market more sensitive to even small changes in the weather (McFarlin, "Grain Trading Basics").

Natural disasters play a role in predicting the global supply and demand as well. For example, the earthquake and tsunami in Japan resulted in a rush to sell agricultural commodities in order to invest in safer equities. Even though Japan is the largest importer of corn, traders predicted lower import demands due to the damage done to livestock operations in the country, and this resulted in a strong decline in corn prices of ten percent in the beginning of March ("Grain Futures Unshaken by OECD").

Population Growth

In October 2011, the seven billionth human was born ("New Global Report: Agricultural Commodities"). The world's population is predicted to increase by 374 million people from 2010 to 2015 ("Agricultural Commodities-Part 1"). It has been estimated that the world's population will reach nine billion people by 2050. As global population continues to grow, the amount of arable land is declining, causing supply and demand imbalances ("New Global Report: Agricultural Commodities"). Innovation has been essential in meeting the increased food demand challenges, and more efficiency is still required for the future. Larger quantities of food being produced on fewer acres of land and effectively managing resources are the only solutions to cope with the global population as it increases by millions. The per-acre production of corn has doubled since 1970, and 144 people are fed by the average American farmer, which is an eight-fold increase since 1940. But the industry will need to continue developing better products and plants that can tolerate more stress in order to keep up with the population growth (Smith, "Population growth demands"). Figure 5 shows the growth in agricultural yield percentage vs. the population for the years 1961-2007. This graph demonstrates that the years 1990-2007 had much lower percentages of growth for wheat, corn, and rice as compared to 1961-1990.

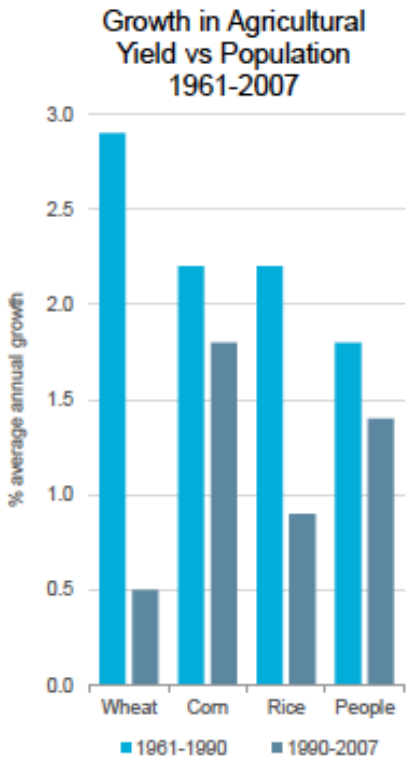

Figure 5: Growth in Agricultural Yield vs Population ("Packaged Food 2011 (Part 3)")

World Trade

Since the United States is the world's largest producer of corn, it is also the largest exporter. Corn exports are extremely important to the United State's economy because they make up the largest total contribution to the agricultural trade balance in the United States. They represent a source of demand for United States producers and

account for over 12% of the United State's agricultural export value. In 2008, American corn exports reached a record high of 61 million metric tons because of the high demand along with the increased production levels. Most of the corn that is traded is used for feed which means that the future population growth and consumer demand for meat products will continue to drive feed grain exports ("Corn: Trade").

Because the United States dominates the world corn trade, and exports only account for a small percentage of the demand for the United State's corn, the prices are mostly determined by the supply-and-demand relationships in the United States market. The rest of the world has no choice but to adjust to the prices that are set. The world corn trade is ultimately dependent on the weather in the United States Corn Belt. However, the second-largest corn exporter, Argentina (Figure 6), plants their crop after the amount of United State's corn is known. This provides a supply that is directly related to the needs in the market when output levels are lower than expected.

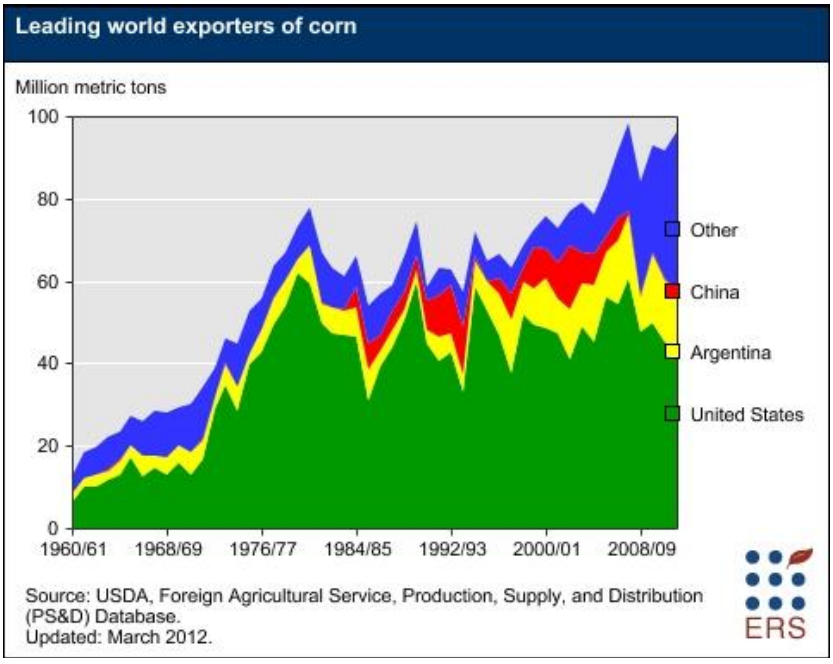

Figure 6: Leading world exports of corn ("Corn: Trade")

China is often the source of uncertainty in the demand of exports because it is changing from being the second-largest exporter to being a significant importer. This is due to China's government export subsidies and tax rebates, as well as the lack of fluctuation in the export policy when the country's production levels change. Japan is the world's largest importer because they produce almost no grains and produce a large amount of meat. South Korea is the second-largest importer of corn, but they are very price sensitive, willing to switch to other comparable commodities or buy corn from the cheapest source ("Corn: Trade").

CORPORATE PRICING STRATEGIES:

Because of the rising input costs for food manufacturers, it is becoming harder to offset rising costs by merely charging the consumer more, and retailers are demanding low prices. Manufacturer's margins are being pinched at both ends of the supply chain, but there is still hope through using added value techniques ("New Global Report: Agricultural Commodities").

As crop prices rise, manufacturers need a strategic response in order to maintain profits and continued to be sustainable in the future. In order to be successful, manufacturers must utilize a variety of strategies to keep from being affected by the swings in the market. Such strategies include raw material substitution, simplifying the manufacturing processes, shifting into higher-margin segments, reducing package sizes, increasing branding activities, targeting lower income consumers, reorganizing production facilities, and/or targeting export markets ("Global Packaged Food: Strategic Implications").

Some packaged food companies have simplified the manufacturing process by simplifying their products and reducing production in some categories. For example, General Mills reduced the number of pretzel shapes they made in the snack mixes from 14 to 3, which reduced the annual production costs by $1 million. Kraft Foods followed suit by changing their recipe and the packaging of Miracle Whip by replacing its soya oil with water and switching the glass to a plastic container ("Global Packaged Food: Strategic Implications").

Increasing prices of retail items is one way to cover costs, but it has a huge impact on markets where participating firms have close substitutes. Food companies have to be extremely competitive in order for their products to win since the top five food companies offer many similar products. One solution to this problem is to alter product mixes to markets that are less competitive and where margins are higher. An example of this is Nestle becoming increasingly involved in the clinical nutrition and baby food sectors, both of which have potential for higher margins than traditional lines ("Global Packaged Food: Strategic Implications").

Although there is a long-term risk that consumers will lose trust in the brand, reducing package sizes is one strategy that manufactures may use to cover increasing costs. Manufacturers can increase unit prices while being less noticeable to consumers in order to achieve short-term payoff. An example of this was in 2007 when General Mills announced it was going to sell its cereals in smaller boxes, but at the same prices, allowing them to charge more per unit. The company's shares initially lost six percent in value, but soon over half of supermarkets surveyed had adopted the new sizes and had received very few customer complaints ("Global Packaged Food: Strategic Implications").

Despite the difficult market conditions, brand equity may simply be the best protection against profit loss. Branding allows manufacturers to increase prices to consumers without losing significant market share because the brand is recognizable and trusted. Another strategy is for manufacturers to focus on inferior goods, meaning goods where the demand rises as income levels fall. With many families having less disposable incomes, many consumers may be tempted to downgrade to cheaper products ("Global Packaged Food: Strategic Implications").

Economies of scale and centralized production can help reduce operating costs. According to an article found in Euromonitor International, "The US Department of Agriculture estimates that labor accounts for 39% of retail food costs, so improved labor efficiencies offer one of the best strategies for food processors to reduce their costs" ("Global Packaged Food: Strategic Implications"). Although these strategies may be viable in certain circumstances, adding value will be key to future retail success. Manufacturers will need to focus more on getting customers to eat more packaged food, as well as spending more on those items ("New Global Report: Agricultural Commodities").

A.T. Kearney developed five strategies for companies to use to reduce the impact of commodity price changes. These strategies are: to take the hit, deflect the risk, transfer the risk, hedge the risk, and operate the risk. These strategies include reducing margins, changing product specifications, negotiating with vendors, and buying in advance before price increases. All of the strategies recommended above involve planning ahead and beating the market (Donnan & Peterson, "Food Price Volatility").

FORECASTING FOOD COMPANIES' SUSTAINABILITY:

Because there are many factors that affect agricultural commodity prices, future prices are extremely challenging to predict beyond three months. This may be one of the reasons for the significant lack of information and research done on future corn prices. There is little information on how future corn prices and supply will affect retail corn-based food products. It is extremely important to forecast future prices and to understand the possible impacts they can have on the general public's food costs as well as food corporation's abilities to remain profitable. Based on research found, the following are predictions of food companies' abilities to remain sustainable throughout the next decade.

Taking the supply and demand factors discussed previously into consideration, there is no doubt that there is an increasing demand for corn globally and a decreasing supply available. The growing popularity of ethanol production and the increased demand for meat in developing countries uses a significant percentage of the global corn. The corn supply must keep up with the world's growing population, but it is extremely dependent on weather conditions and world trade. As most agricultural commodity prices are rising, corporations need to continue learning to use added-value techniques and to manage their supply chains more efficiently in order to cover costs. Even if food corporations strategize wisely, the question is if they can remain sustainable into the future with the current and future agricultural conditions.

Most of the corn grown in the United States is field corn, which is primarily used for animal feed. According to Amber Waves, less than ten percent of the United States corn crop is used for direct domestic human consumption in corn-based foods. The rest of domestic corn is used for feed, exports, ethanol production, seed, and industrial uses. Even for products containing larger amounts of field corn, the effect of rising corn prices is minimal compared to other market factors such as packaging, processing, advertising, and transportation. According to Leibtag,

> For example, an 18-ounce box of corn flakes contains about 12.9 ounces of milled field corn. When field corn is priced at $2.28 per bushel (the 20-year average), the actual value of corn represented in the box of corn flakes is about 3.3 cents. At $3.40 per bushel, the average price in 2007, the value is about 4.9 cents. This 49-percent increase in corn prices would be expected to raise the price of a box of corn flakes by about 1.6 cents, or 0.5 percent, assuming no other cost increases (Leibtag, "Corn Prices Near Record High").

As global corn prices increase, retail prices may increase slightly, but it doesn't appear that it will greatly affect consumer's ability or willingness to purchase these products. Despite the augmented input costs, and economic and environmental factors, global retail packaged food prices in general have actually decreased steadily from 2006 to 2011 according to Figure 7.

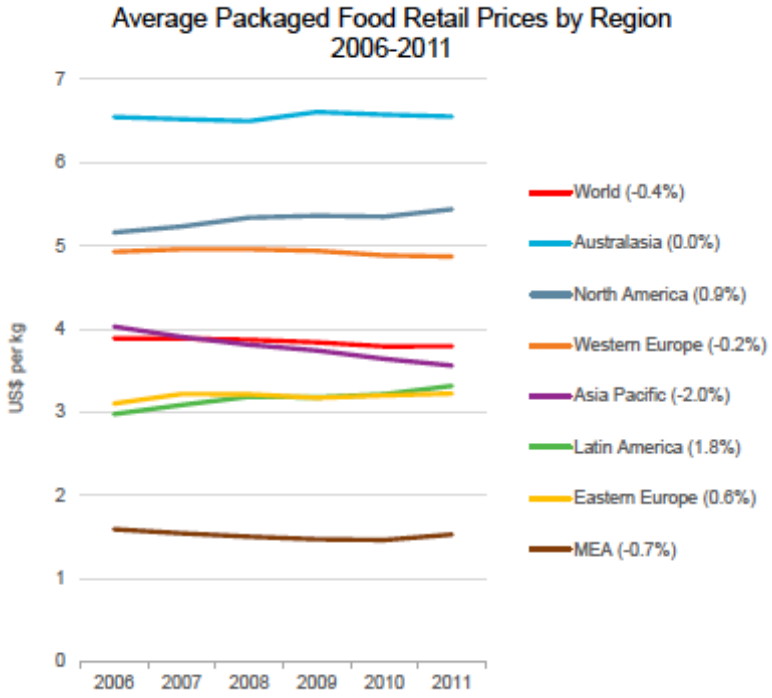

Figure 7: Average Packaged Food Retail Prices by Region ("Packaged Food 2011 (Part 3)")

Asia Pacific, the Middle East, and Africa had the largest overall price decline, while Western Europe also experienced a downward trend. Eastern Europe and Australia have been somewhat steady, and Latin and North America had the most significant retail price increases for packaged food with a 1.8% and .09% increase, respectively. While those increases may have been from higher input costs, especially in 2010 to 2011, the main reason could have been consumers choosing to spend more money on food ("New Global Report: Agricultural Commodities").

Based on these facts and research, it has been predicted that food companies will be able to remain sustainable into the future. Although global corn prices will continue to fluctuate and the demand will continue to increase in the next several years, it will have a small affect on retail consumers in the near future. Whether there will be continued elevated corn prices depends on if ethanol remains a sufficient source of energy and if corn remains the most resourceful feed ingredient. The ethanol and feed demands can indeed change as other alternatives develop in the years to come and as new innovations are created. If no alternatives for ethanol and animal feed are

created, food markets will need to adjust to the higher corn prices, and corn producers may need to increase their supplies by developing more efficient production methods and technologies. For example, in 1996, field corn prices peaked in price at $3.55 per bushel because of drought and stronger demand in Asia, but the effect on food prices was short lived. Retail prices rose for a few foods such as pork and poultry, but these increases only lasted for a little more than a year. If corn prices remain high in the future, producers, manufacturers, and retailers, will consider using substitute materials for corn because of strong retail competition, keeping retail food prices relatively stable (Leibtag, "Corn Prices Near Record High").

CONCLUSIONS:

Based on the research conducted for this paper, it was found that the increased global demand of corn will have small affects on final consumers and that food companies will be able to remain sustainable. The information and research available proves this viewpoint, yet it has only taken into consideration the near future. There is a lack of information on the distant future of the global supply of corn and the general impact it will have on corporations. There seems to be no concern that there is a steady increase of demand while the earth and its resources are extremely limited.

As a recent graduate and marketer entering the consumer packaged foods industry, I see the great importance of being a forward thinker and asking questions about whether the earth will be able to keep up with the world's never ending demand for resources. The supply has been able to meet the rising demand up until now, but there will be a time in the future where it will no longer will be able to do so. Food companies have been able to implement pricing strategies in order to keep prices low for consumers, but this will only last until corporations can no longer absorb the costs. Food companies, marketers, corn producers, and consumers must begin forecasting and taking into consideration the impending affects that are likely to result if corn continues to be demanded at this rate.

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