The Ethanolization of Agriculture and the Roles of Agricultural Economists

Cary W. "Bill" Herndon, Jr.

First, please permit me the latitude to use a bit of poetic license in coining the term, "ethanolization," which attempts to describe the upheaval and chaos witnessed across the agricultural sector attributed to the booming corn-based ethanol industry. Ethanolization has focused its impact on agriculture and, in particular, the U.S. agricultural sector as a combination of market-induced and policy-induced factors have created a "perfect storm" that is causing dramatic shocks to virtually every crop and livestock producer and agribusiness. Coining the term ethanolization also borrows from past eras in agriculture described as the "mechanization" of agriculture in the 1940s and 1950s and the "industrialization" of agriculture in the 1990s. Mechanization described a period when widespread adoption of farm machinery occurred across the United States. Then, industrialization, accredited to a body of writings by Drabenstott and Barkema, portrayed a "quiet revolution" of ever-increasing size and specialization of U.S. farms, ranches, and agribusinesses. Now, ethanolization attempts to characterize a similar revolution that is affecting essentially every facet of American agriculture.

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Thank you for giving me this opportunity to offer my ideas in addressing these challenging issues and for allowing me to use the vehicle of my Presidential Address to coin a word to describe this phenomenon (i.e., ethanolization). I am truly excited to be serving the SAEA in this role and capacity. Thanks for your time and patience.

Second, I ask for your forgiveness in selecting a topic that is "the lowest of the low-hanging fruit." No matter where you go or whom you speak with—professional colleagues, farmers and ranchers, folks at church, friends and family—everyone wants to talk about the impacts of ethanolization on prices of food, fuel, electricity, fertilizer, and everything else. The conversation that ultimately triggered the selection of this issue as my Presidential Address occurred when several colleagues were discussing the amazingly high grain prices as we drove across Mississippi to attend a recent extension outlook meeting. One of us posed the question, "What would happen if there is a weather-related event that caused grain production to decline?" It was then that John Anderson made a statement that was at first very funny but then unsettling and chilling when he said, "Life would end as we know it today!" When Hard Red Spring wheat prices approached and exceeded $20 per bushel on the Minneapolis Grain Exchange during late February, many of us may have thought that John's worst fear was already taking place and without any obvious market fundamentals to justify these price movements. As a result, many of us are in a near state of shock as we struggle to understand how the ethanol boom is affecting us today and where this incredible journey may take us next week, next month, next year, and over the decades to come.

Last, let me state very openly that I certainly do not have answers for many of the questions being posed by our clientele groups as they strive to understand this

ethanol boom. But what I strongly contend is that agricultural economists have vital and critically important roles in striving to comprehend the impacts of the ethanolization on agriculture. Not only should our profession be involved in analyzing the wide-ranging impacts on supply, demand, prices, costs, market structures, and performance, but we also need to be identifying the questions that should be addressed when describing the impacts of the ethanolization phenomenon. Whether our expertise as agricultural economists is in the areas of production/farm management, agricultural policy analyses, natural resource/environmental economics, rural development, international trade, agricultural marketing, or other subjects, we all must become engaged in this investigation. Most importantly, no matter whether our appointment is teaching, research, and/or extension, we should be actively working together to grasp the breadth and complexity of this ethanol boom. As scientists, we need and must remain objective and offer common sense answers and solutions via empirical analyses by cutting through the very strong emotions of those who may have been either positively or negatively affected by the ethanolization of agriculture.

Evidence of the passions being evoked can be found almost everywhere—from the halls of Congress and state capitals to local grocery stores, rural coffee shops, and every form of news media. Ethanolization is being blamed for almost everything from increasing food, fuel, electricity, fertilizer, and other input costs to the downturn in the U.S. economy. In a Cato Institute publication written by Taylor and Van Doren called *The Ethanol Boondoggle*, the current ethanol boom was described as, "The closest thing to a state religion in America today isn't Christianity — it's corn." The authors then go on to attribute the origins of this new religion to a " . . . dizzying array of federal, state, and local subsidies, preferences and mandates for ethanol fuel." The report states rather emphatically that "If ethanol had economic merit, no government assistance would be needed." The general purpose of this article was to describe how corn-based ethanol policies have created an unlevel playing field that transfers monies from urban voters to corn farmers and ethanol industry investors in the guise of energy independence.

The fuel versus food debate has also characterized the emotions surrounding the ethanolization issue. For example, a recent press release by a U.S. senator (who will remain unnamed) indicates just how distorted the arguments against the ethanol boom have become when it stated, "By artificially stimulating the domestic ethanol industry, the program has created an insatiable demand for corn, driving up feed grain costs for dairy farmers, leading to higher prices for milk." You do not need to be an economist to refute this claim because common sense tells us that supply of and demand for milk dictates the level of milk prices and not feed costs. It is true that increased use of corn for ethanol has produced much higher feed costs, which have lowered net revenues for dairy farmers. But dairy farmers simply can't adjust their aggregate level of milk production over a short period of time. Numerous empirical studies have shown that increasing dairy feed costs will cause milk production to decline, but this decline is gradual and requires several years to transpire. Therefore, the contention that policies promoting corn-based ethanol production have lead to higher milk prices, over the short term, is simply not valid. As a dairy economist, the extremely high milk prices witnessed since mid-2007 have been attributed to increased U.S. dairy product exports instigated by reduced global dairy supplies and the lower value of the U.S. dollar.

Another news article found in the December 27, 2007 issue of the *Chicago Tribune* demonstrates unambiguously just how strong the words used in food versus fuel debate have become. This article states, "Americans are swallowing an increase of more than 4% in food price this year" and then provides this statement . . . "The Grocery Manufacturing Association pins the blame squarely on federal laws that promote ethanol as an alternative fuel." This news story concludes with this

inflammatory quote from a grocery industry lobbyist, ''The government has intervened in the market in a way that would make Stalin blush.'' These three reports and news releases symbolize the types and breadth of the opposition to policies promoting ethanol production by those people and industries perceived harmed by this boom.

However, those sectors garnering benefits from these policies have not been silent and have been just as vocal in defending why these inducements are needed by and justified for the ethanol industry. The Renewable Fuels Association (RFA) sponsored a survey during 2006 that found that, ''Nearly three out of four Americans want increased renewable fuel use, production and . . . a national poll shows strong bipartisan support for renewable fuels like ethanol. In addition, 87% of Americans maintain that the federal government should actively support the development of a renewable fuels industry in this country, and 77% think Congress should encourage oil refiners to blend more ethanol into their gasoline products.''

Grain farmers, who are reaping the lion's share of the benefits, have been vocal in defending policies promoting corn-based ethanol production. The National Corn Growers Association (NCGA) has responded to the mounting criticisms against escalating corn prices in the midst of the food versus fuel debate. A NCGA report titled, *U.S. Corn Growers: Producing Food and Fuel* states: ''Many have also alleged competing uses for grains will drive corn prices—and, in turn, retail food prices—to abnormally high levels. This contrived 'food versus fuel' argument is fraught with misguided logic, hyperbole and scare tactics.'' This report also maintains ''Retail food products . . . contain very little corn. Therefore, fluctuations in the prices of corn are not often reflected in retail prices for these items. As an example, a standard box of corn flakes contains approximately 10 ounces of corn . . . when corn is priced at $4 per bushel, a box of corn flakes contains less than a nickel's worth of corn.'' This NCGA report contends that U.S. corn growers are capable of producing enough corn and grain to adequately supply both the food and fuels markets without causing substantial increases in corn and food prices.

As the food versus fuel debate rages on, there are tremendous needs for agricultural economists to enter into these discussions. Our profession possesses the knowledge needed to understand the structure, conduct, and performance of the various components of the agricultural product supply chain. Agricultural economists are equipped with the techniques and tools to conduct science-based analyses capable of cutting through these emotional arguments and the endless rhetoric offered by the various special interests groups. Once again, I encourage and urge all of us to embrace these difficult questions in determining whether renewable bioenergy and biofuel systems are sustainable.

Ethanolization: Is It a Shock or Shift?

It is my opinion that one of the most important questions to answer first is: Is the ethanol boom a temporary shock or does it represent a fundamental shift altering the basic tenets of U.S. agriculture? Some of us may contend that this phenomenon is merely a short-lived, temporary shock and just as soon as the policies promoting this boom are eliminated, then the agricultural sector will return to normal with grain prices similar to historical averages. Others believe that if and when crude oil prices fall to more moderate levels, which will challenge the profitability of corn-based ethanol production, then this boom will quickly transform itself into a bust. A growing number of our profession assert that this boom represents a basic shift and sea change event in the history of U.S. agriculture. This point of view is reinforced by: (1) $100-plus crude oil prices; (2) lack of new technological developments, like breakthroughs in cellulousic ethanol production; and (3) a continued strong political base supporting corn-based ethanol production. Finally, some of us are simply not sure. Despite these different camps of belief, almost all of us would readily agree that ethanolization has been induced by a combination of renewable

energy policies and escalating crude oil prices.

It is the mixture of these energy policies and high crude oil prices that have promoted and supported this ethanol boom. But, it is this same concoction of policies, oil prices, and lack of new bioenergy technologies that point to the fragility of the expansion of the corn-based ethanol industry. This biofuel industry could very quickly disintegrate if any one of the supporting policies were eliminated or reduced, such as the blender's tax credit or the ethanol import tariff (described below). Just as rapidly, this boom would evolve into a bust if crude oil prices declined as the result of any number of reasons, such as increased crude oil production, reversals of economic growth in developing countries like China and India, and/or a general economic slowdown in the U.S. and world economies. Ultimately, the continued existence of a corn-based ethanol industry depends on the continuing failures of the many engineers and entrepreneurs' efforts to discover major breakthroughs in alternative bioenergy production systems. The vulnerability of the corn-based ethanol industry to any of these bioenergy policy and oil price inducements, as well as technological innovations, point to just how abruptly this boom could collapse.

Despite the susceptibilities described above, I will contend that the ethanolization of the U.S. agricultural sector is not temporary but represents a fundamental shift in the structure and behavior of farms, agribusinesses, and policy makers at the local, state, and federal levels. The basis of my judgment is the continuation of political support for renewable energy policies, which have existed in various forms for 30 years. For example, the ''blender's tax credits'' have been in place since 1978 when a 10% ethanol blend was called gasohol. The current blender's credits could amount to a total of 66.4 cents per gallon if a producer was eligible for all three of the tax incentives, which are: (1) a 51-cent-per-gallon blender's tax credit; (2) a 5.4-cent-per-gallon tax exemption for alcohol-based fuels; and, (3) a 10-cent-per-gallon tax credit for small producers making less than 15 million gallons of ethanol per year. Given the long history of incentives provided to ethanol producers, there is no reason to believe that this political support and the public's positive perceptions for renewable biofuels and environmental benefits derived from ethanol will wane now or in the future.

The lynchpin that will maintain and expand the U.S. ethanol industry is an indispensable federal policy called the Renewal Fuel Standard (RFS), which is a complex assortment of guidelines and requirements pertaining to the use of ethanol and other alternative energy sources. President Bush signed the Energy Independence and Security Act of 2007 on December 19, which dramatically increases the amounts of renewable fuels used in the United States from the current amount of about 7.5 billion gallons to 36 billion gallons per year (BGY) by 2022. This revised RFS increases the amount of Conventional Biofuel (defined as ethanol derived from corn starch) use from 9 BGY in 2008 to 15 BGY by 2015 and maintains that level until 2022 (see Table 1). It is this ambitious renewable fuels and ethanol use federal mandate that supports the conclusion that an ethanol industry in the United States will be supported and that corn-based ethanol will survive as long as there is an absence of any major technological advances.

Finally, the momentum and positive image enjoyed by the corn-based ethanol industry lends and adds to its continued political support. Automobile industry giants like General Motors have joined forces to promote the environmental benefits of ethanol use by producing ''green, flex-fuel'' vehicles capable of using 85% ethanol blend gasoline products. General Motors created an advertising campaign promoting ethanol use with its ''Live Green Go Yellow'' slogan. Environmental groups support ethanol use as the method to reduce greenhouse gases. Venture capitalists, ethanol plant owners, and manufacturers of corn-based ethanol equipment and plant facilities also have large investments to protect and have the most to gain during this ethanolization era. Obviously, the people and firms most influenced are the row crop grain farmers and

Table 1. Renewable Fuel Standard Revised under the Energy Independence and Security Act of 2007, by Source and Year from 2008 to 2022 (Billions of Gallons per Year)

Year	Conventional Biofuel	Advanced Biofuel	Cellulousic Biofuel	Biomass Diesel	Undifferentiated Advanced Biofuel	Total Renewable Fuel Standard
2008	9	–	–	–	–	9
2009	10.5	0.6	–	0.5	0.1	11.1
2010	12	0.95	0.1	0.65	0.2	12.95
2011	12.6	1.35	0.25	0.8	0.3	13.95
2012	13.2	2	0.5	1	0.5	15.2
2013	13.8	2.75	1	–	1.75	16.55
2014	14.4	3.75	1.75	–	2	18.15
2015	15	5.5	3	–	2.5	20.5
2016	15	7.25	4.25	–	3	22.25
2017	15	9	5.5	–	3.5	24
2018	15	11	7	–	4	26
2019	15	13	8.5	–	4.5	28
2020	15	15	10.5	–	4.5	30
2021	15	18	13.5	–	4.5	33
2022	15	21	16	–	5	36

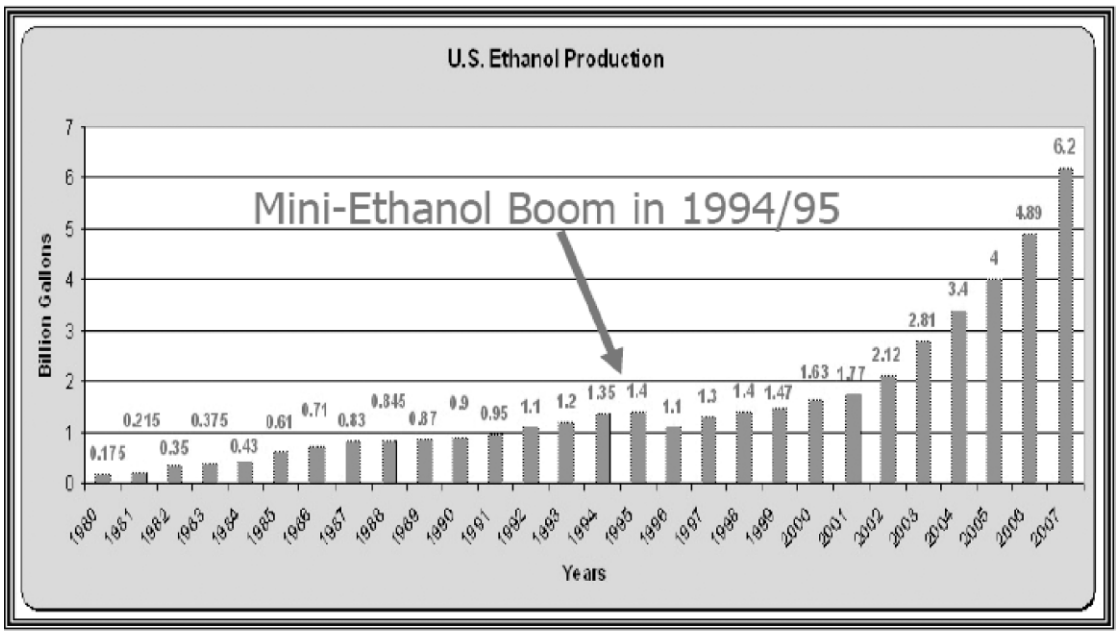
Source: Renewable Fuels Association (http://www.ethanolrfa.org/resources/statndard/).

their supporting agribusinesses producing and selling seed, fertilizers, chemicals, row crop tractors and equipment as they reap most of the economic benefits from these policies.

A review of the evidence surrounding the ethanol boom is compelling and has led many participants in agricultural sectors and across all walks of life to believe that this revolution is real and here to stay. The ethanolization of U.S. agriculture has and will continue to alter the basic tenets guiding the manner in which farmers, ranchers, and agribusinesses conduct their activities and make decisions. Let's look at some of the factors that are producing this sea change.

Brief Historical Review of Grain Prices

Before we delve into analyzing the current environment surrounding this recent shift, let's first review a brief history of grain markets that may provide some insights. As the saying goes, "We need to review where we have been to gain an understanding of where we are going." The current chaos and uncertainty rampaging through the U.S. grain markets and agricultural sector is not unprecedented over the past three decades. Looking back to the early 1970s, the United States sold about 30% of its average annual wheat crop to the Soviet Union during July and August 1972 in what has been known as the Russian Wheat Deal, or the Soviet Grain Robbery. Luttrell reported that these huge purchases caused shockwaves throughout agriculture when grain prices rose dramatically. For instance, between August 1972 and August 1973, wheat prices increased from $1.51 to $4.45 per bushel, corn prices rose from $1.15 to $2.68 per bushel, and soybean prices increased from $3.36 to $8.99 per bushel (Luttrell). The Soviets continued to purchase U.S. feed grains over the next three years and drove corn prices up to a then-record annual average price of $2.54 per bushel during the 1975–76 crop year. Luttrell also noted that other factors contributed to these remarkable increases in grain prices, and these causes sound all too similar. Several of these contributing features were: (1) a decline in production of grain crops in other parts of the world; (2) a realignment of world currency values; and (3) sharp increases in export demand for U.S. wheat. This period of high grain prices ended in 1976–77 when the Soviet Union's purchases of U.S. grains declined sharply, and during the late 1970s agricultural prices quickly returned to historical averages.



Source: American Coalition for Ethanol (http://www.ethanol.org)

Figure 1. U.S. Fuel Ethanol Production in Billion of Gallons per Year, 1980–2007

The mid-1980s produced another phase of skyrocketing grain prices when a shift in agricultural policy caused significant acreage reduction for most major row crops. The policy mechanism responsible for these acreage shifts was the Payment-In-Kind (PIK) program that was announced by Secretary of Agriculture John Block in January 1983 (USDA). The PIK program was implemented to reduce government-owned grain surpluses by limiting row crop production and PIK was successful in generating the third-largest acreage reduction in U.S. history. However, the combination of shifting millions of acres out of production with dismal crop growing conditions in 1983 created a huge supply deficit and drove up grain prices. In fact, corn prices averaged $3.21 per bushel during the 1983–84 crop year. The elimination of PIK and attractive grain prices provided ample incentives for farmers to increase plantings, which caused grain prices to return to normal ranges in the subsequent year.

The next spectacular run-up in U.S. grain prices occurred during the mid-1990s, when there were back-to-back years of disappointing grain production across the globe. Adding upward pressure on grain prices was the first "mini" ethanol boom that was facilitated by rising crude oil prices that exceeded $50 per barrel for the first time in history along with the various tax and tariff policies supporting the ethanol industry. Figure 1 depicts this "mini boom" when U.S. ethanol output climbed to 1.4 BGY in 1995 before declining over the next several years (Busby). During this spike in grain prices, futures contract prices for corn peaked at more than $5.50 in July 1996 and averaged $3.24 per bushel during the 1995–96 crop year (Anderson). The market viewed these circumstances as a short-run situation because while the July 1996 contract topped $5.50, the December 1996 (new crop contract) futures prices never rose above $3.90 per bushel. Once again, improved growing conditions coupled with a decline in crude oil prices forced grain prices to plummet to below historical averages in less than two years.

Table 2. Chicago Board of Trade Selected Corn, Soybeans, and Wheat Futures Contracts Settlement Prices on February 28, 2008

Chicago Board of Trade Futures Contracts	Corn ($ per bushel)	Soybeans ($ per bushel)	Wheat ($ per bushel)
July 2008	5.68	15.24	10.57
July 2009	5.78	14.34	9.80
July 2010	5.51	13.45	9.65

Source: FutureSource.com (http://futuresource.quote.com).

Evidence of Ethanolization

What is unique and very revealing about the current escalation in grain prices is that these record levels of corn, soybean, and wheat prices are expected to linger for three years or longer. In fact, futures contract prices for all three of these grain crops are significantly higher than historical averages out to 2010 (maximum time horizon for futures contracts). Table 2 displays the February 28, 2008 Chicago Board of Trade closing futures contract prices for corn, soybeans, and wheat for the corresponding July 2008, July 2009, and July 2010 contracts. Clearly, the market believes that grain prices will remain at or near these record levels because corn futures prices for these selected contracts are all above $5.50 per bushel while these contracts were being traded within a 30-cent price range. Table 3 divulges some of the reasons that are contributing to this recent surge in grain prices (Anderson). For instance, one of the most shocking statistics found in Table 3 is that total corn production during 2007–08 was forecast to be 13.074 billion bushels, which is the largest corn crop ever produced in the United States, while total use was expected to be 12.955 billion bushels. Corn use for ethanol was predicted to total 3.200 billion bushels in 2007–08, or double the amount used just two years ago. Despite having the largest corn crop in history with ending stocks estimated to increase, the corn stocks to use ratio was anticipated to decline from 11.6% in 2006–07 to 11.1% during 2007–08. Total use of corn was expected to grow by 1.745 billion bushels between 2006–07 and 2007–08, while greater use of corn for ethanol made up 62% of this increase (rising 1.083 billion bushels).

Table 3. Corn Supply and Demand Balance Sheet: 2004/05–2007/08 Forecast

	2004–05	2005–06	2006–07	2007–08F
Planted acres (millions)	80.9	81.8	78.3	93.6
Harvested acres (millions)	73.6	75.1	70.6	86.5
Yield (bushel/harvested acre)	160.4	148.0	149.1	151.1
Total production	11.807	11.114	10.535	13.074
Imports	0.011	0.009	0.012	0.015
Total supply	12.776	13.237	12.514	14.393
Feed and residual	6.158	6.155	5.598	5.950
Ethanol	1.323	1.603	2.117	3.200
Other industrial	1.363	1.378	1.371	1.355
Exports	1.818	2.134	2.125	2.450
Total use	10.662	11.270	11.210	12.955
Ending stocks	2.114	1.967	1.304	1.438
Stocks/use	19.8%	17.5%	11.6%	11.1%
Farm price	$2.06	$2.00	$3.04	$3.75–$4.25

Note: Supply and use figures in billion bushels.
Source: USDA World Agricultural Outlook Board.

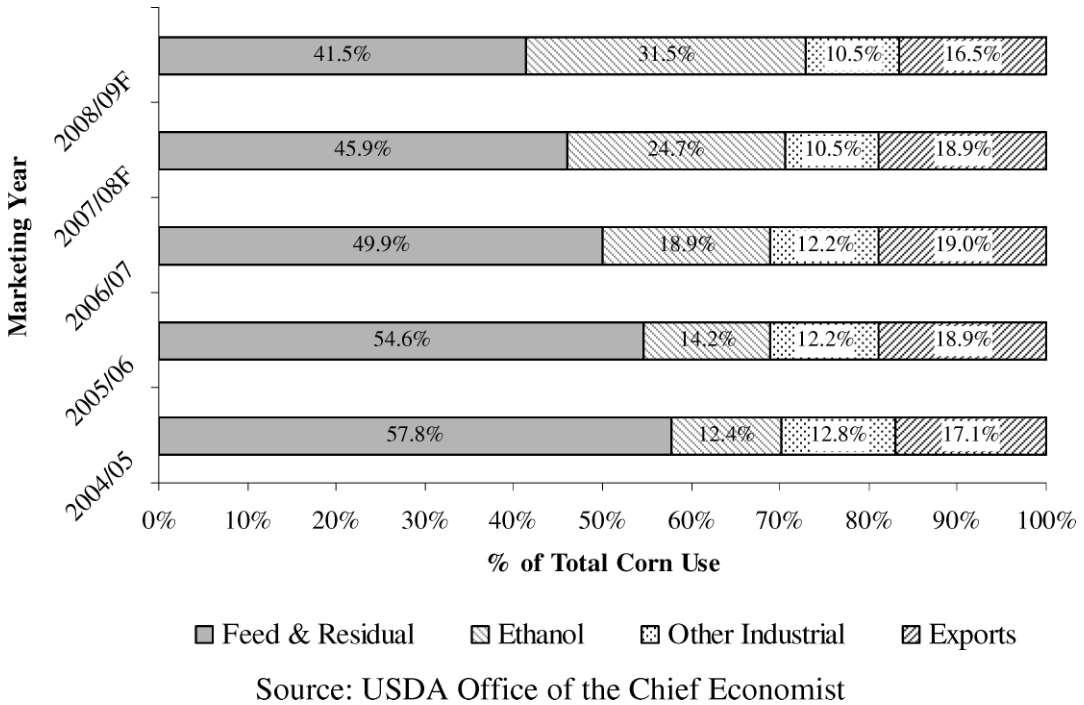


Figure 2. Key Components of Corn Use as a Percentage of Total Use from 2004 through 2008

Figure 2 demonstrates very clearly how ethanolization has and will impact the corn market by depicting the percentages of corn devoted to the various use categories (Anderson). This graphic produced from the USDA's Office of the Chief Economist data indicates just how quickly ethanol use has grown and was anticipated to expand in percentage terms over a five-year period from 2004–05 to 2008–09. Ethanol's percentage of total corn use is expected to increase 2.5-fold during this time frame, swelling from 12.4% in 2004–05 to a predicted 31.5% by 2008–09. It does not require training in economics to understand how mounting ethanol demands on corn use have pressured livestock producers. Figure 3 shows that feed and residual use of corn is no longer dominating the corn market, as the percentage use for this category was predicted to fall from 57.8% to only 41.5% during this five-year period.

Ethanolization and its thirst for corn have created a bidding war among the major grain and row crops for acres to be planted in the various crops. Table 2 reveals how soybeans and wheat prices have followed corn prices up to where all three grains are reported at all-time record high prices. This table illustrates that soybean prices have increased incredibly and are expected to remain near or above $13.50 per bushel until 2010. Similarly, wheat prices have risen sharply and are predicted by traders to stay near $10 per bushel over the next three years. The primary reason attributed to these record high prices for soybeans and wheat is to "buy back" the 15.3 million acres of land that shifted from other major row crops to corn production in 2007–08 (see

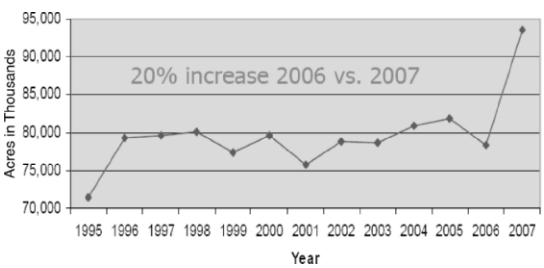


Figure 3. Planted Acreages of Corn in the U.S. from 1995 through 2007, in Thousands of Acres

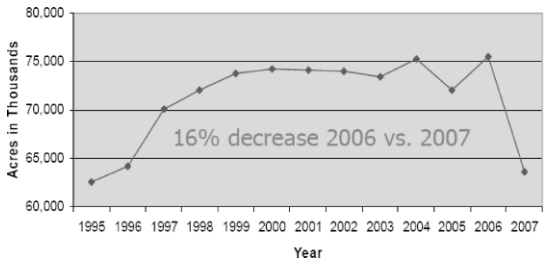


Figure 4. Planted Acreages of Soybeans in U.S. from 1995 through 2007, in Thousands of Acres

Table 3). Figures 3 through 5 demonstrate the dramatic shifts in corn, soybean, and cotton acreage witnessed in 2007 that were caused by the ethanolization of agriculture. Figure 3 shows there was an amazing 20% increase in corn acreage between 2006 and 2007. Figure 4 reveals soybean acreage fell by 16%, or almost 12 million of the 15.3 million increase in corn acreage was derived from soybean land. Figure 5 confirms U.S. cotton acreage dropped by 30%, or 4.4 million acres between 2006 and 2007. Thus, those industries using soybeans and wheat have been obligated to drive up the prices for these grains in an effort to attract land away from corn. Unquestionably, this bidding war has created pandemonium and confusion in the agricultural sector as farmers and livestock producers strive to understand this very different market setting. Once more, I will assert that agricultural economists possess the capabilities to analyze the factors influencing these markets. However, the chaotic conditions of these grain, land, and input markets may require a year or more

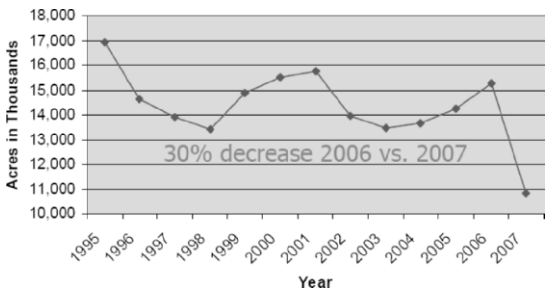


Figure 5. Planted Acreages of Cotton in U.S. from 1995 through 2007, in Thousands of Acres

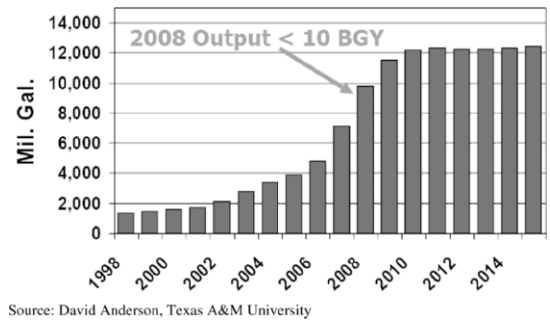


Figure 6. U.S. Ethanol Production from 1999 through 2105, in Millions of Gallons per Year

to stabilize before economists will be able to understand this new market and sector environment.

The final piece of evidence offered to support the assertion that the ethanolization of U.S. agriculture is not a short-lived, temporary fad can be found in plans for expanding the corn-based ethanol industry. Statistics reported by the American Coalition for Ethanol indicate that in 2007 there were 142 existing ethanol plants with the capacity to produce 8.9 BGY (RFA). This same report identified another 67 corn-based plants were under construction with an additional 5.1 BGY capacity scheduled to come on-line during 2008 and 2009. Figure 6 illustrates planned output of this industry until 2015 and shows output derived from these plants will exceed 12 BGY in 2010. Assuming a conversion rate of 2.75 gallons of ethanol produced from one bushel of corn, the use of corn for ethanol will exceed 4.35 billion bushels by 2010. Thus, it becomes rather obvious that ethanolization of agriculture will likely and easily sustain itself over the next 5 to 10 years.

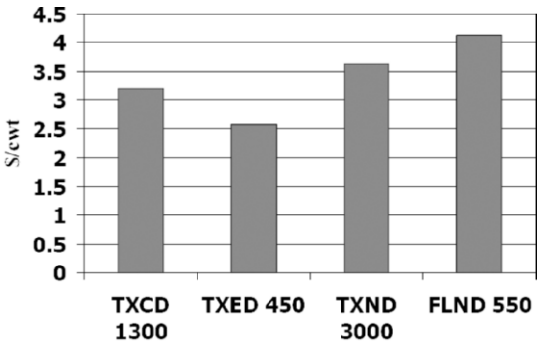
Impacts on Inputs and Livestock Sectors

Increasing crude oil and energy prices promoting the ethanolization of agriculture have also altered conditions and created havoc in the agricultural inputs and livestock markets. The costs of virtually all of the inputs used in crop and livestock production have risen

relentlessly during the past two years, and in particular for fuel, fertilizer, and feed. We have all heard horror stories from producers about the astonishing escalation of fertilizer prices, where anhydrous ammonia has jumped from $300 to $580 per ton over the past year. A dairy farmer told me during February that he had to pay $825 per ton for diammonium phosphate (DAP) to fertilize his ryegrass pastures. These rising input costs are affecting the break-even prices needed to cover the costs of producing crops and livestock products. For example, a quick review of the Mississippi enterprise budgets for corn finds that a corn price of $2.25 per bushel was needed in 2007 to cover all production costs with an assumed yield of 185 bushels per year. During 2008, this same corn yield and cropping cultural practices would require a break-even corn price of $2.85 per bushel.

The volatility of relative crop prices has also caused tremendous uncertainty in the seed, fertilizer, chemical, equipment, and other input industries. As discussed above and shown in Figures 3, 4, and 5, wild fluctuations in acreages devoted to the major row crops have caused and continue to cause havoc in the sectors that supply the required materials needed to produce crops. These wide swings in land areas have created enormous difficulties and challenges for these input suppliers because they must anticipate one, two, or more years ahead to provide adequate quantities of seed and other ingredients. For example, recent conversations with former students working for various input supply firms describe the difficulties of acquiring seed for the anticipated expansion in soybean acreage during the 2008–09 crop year. One seed supplier tells the story that his firm had farmers signed up to purchase more than 5,000 bags of a particular variety of soybean seed and then was told by the soybean seed breeding/distribution company that only 500 bags were available to their customers. This is only one of countless accounts recounting the anxiety and challenges created by ethanolization of agriculture.

Cattle, swine, poultry, catfish, dairy, and other livestock producers are facing extremely



Source: David Anderson, Texas A&M University

Figure 7. Estimated Increases in Purchased Feed Costs on Selected Representative Dairy Farms from 2007 to 2008

dire conditions. Unlike row crop farmers, these agricultural producers do not have the luxury of record-high prices for their livestock products to offset these drastically higher feed costs. For example, prices for all feed products have skyrocketed and are forcing livestock producers and the industries that process and market these products to severely alter their business operations and curtail output of these products. Thanks to David Anderson at Texas A&M University, Figure 7 demonstrates the gravity of the impacts of much higher feeds cost on dairy farmers. This bar chart indicates that purchased feed costs increased over the past year from $2.50 per hundredweight (cwt.) to more than $4.00 per cwt. of milk produced on these selected representative dairy farms. Livestock producers and their supporting agribusinesses are facing a desperate situation and need the assistance of agricultural economists to develop decision aids and other tools as they strive to endure the ethanolization of agriculture.

Impacts on Environment and Rural Infrastructure

Ethanolization of agriculture certainly has been a controversial issue among the environmental and natural resource communities. One camp of environmentalists claims ethanol use improves air quality through reduced automobile emissions. Another camp con-

tends the energy and natural resources required to produce corn for ethanol are harming our environment as the result of increased fertilizer use and runoff of nitrogen into our waterways while also requiring excessive amounts of water to produce ethanol from corn. In fact, millions of gallons of water are required by ethanol plants daily in converting corn into ethanol. Clearly, natural resource economists are needed to evaluate these ethanol-from-corn systems and analyze and estimate the short- and long-term impacts of the ethanolization of agriculture.

The changes in crop mixes demonstrated in Figures 3, 4, and 5 also reveal the vulnerability of rural communities to the ethanol boom. Cotton gins, grain elevators, meat and dairy processors, and essentially every business and person located in rural communities are dependent on agriculture for their continued survival. Thus, these communities have a huge stake in how the ethanol revolution may affect their local tax base. Revenues and business activities associated with agricultural production and processing influence the ability to provide needed school, health, police, and utility services to their rural communities. The temporary shift in acreage devoted to a particular crop or a decline in livestock production could threaten the ability of support businesses such as equipment suppliers and repair shops, feed stores, veterinarians, banks, and a host of other firms to continue serving the community. If these support enterprises disappear, then the local community may not be able to reacquire these services when the related agricultural sector returns to the region. Thus, rural economists and economic development specialists need to be engaged to appraise the potential impacts and develop recommendations for community leaders and policy makers.

Impacts on International Trade and Marketing

The ethanol boom has certainly altered the mechanisms and decision tolls used to manage price risks. The chaos created by wildly fluctuating crop prices and huge increases in input costs has caused most of the traditional rules of thumb and decision aids to become meaningless and irrelevant. Agricultural market analysts and marketing specialists should be engaged to determine how markets have been altered by the ethanol boom and to develop new tools, mechanisms, and guidelines that will be effective in this new, difficult market environment. Finally, international trade and policy have also been impacted by the revolution created by the ethanolization of agriculture. Trade economists are necessary if we are to comprehend how trade flows and relationships among long-established trading partners may be altered and to develop policy tools to sustain agricultural trade under these changing market conditions.

Summary and Take-Home Message

The evidence is compelling, if not overwhelming, that corn-based ethanol production and its policy-induced tax incentives and tariff protection in combination with much higher crude oil prices have created a revolution in U.S. agriculture. The ethanolization of agriculture has created huge opportunities and challenges for virtually every industry and person in America. But, in particular, it has been farmers, ranchers, agribusinesses, rural communities, and policy makers who have been challenged with a very complex and difficult set of problems and issues. In addressing these concerns, I contend that agricultural economists have the necessary understanding of agricultural markets and the unique training and skills to tackle many of the complicated questions associated with the upheaval created by this ethanol boom. Furthermore, I will be so bold as to claim that agricultural economists are the *only* discipline possessing the tools, insights, and understanding to effectively evaluate these issues. So, my plea is: Step up and become actively engaged no matter what your area(s) of expertise, interest, or whether your appointment is teaching, research, or extension. Last but not least, please be willing to be flexible as the environment, challenges, and problems evolve!

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