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Giving an Inch and Keeping a Mile: Why the Corn Lobby Let the Ethanol Tax Credit Expire

Aaron Smith

Ten percent of motor gasoline in the United States is comprised of ethanol produced from corn. This production level is required by law, a requirement that confers large benefits on corn producers by keeping corn demand and prices high. In comparison, the recently expired ethanol tax credit was a small perk.

Also in this issue

With growing concerns about gridlock in Washington and greed on Wall Street, Americans are wondering whether anyone with a stake in public policies is willing to sacrifice their short-term advantage for a greater good. Well, someone just did. Without any opposition from the biofuels sector, the tax credit for ethanol blenders (the Volumetric Ethanol Excise Tax Credit –VEETC) expired on January 1.

Bob Dinneen, President and CEO, Renewable Fuels Association, 1/5/12. RFA press release.

On January 1 of this year, deficit hawks, environmentalists, livestock producers, and food processors celebrated the expiration of the Volumetric Ethanol Excise Tax credit (VEETC). This federal program, which had existed in various forms since 1978, gave $0.45 to ethanol producers for every gallon they produced and cost taxpayers $6 billion in 2011. So why did the corn-ethanol lobby let it expire without an apparent fight? Did they really "sacrifice their short-term advantage for the public good" as suggested by the above quote from the CEO of the national trade association for the U.S. ethanol industry?

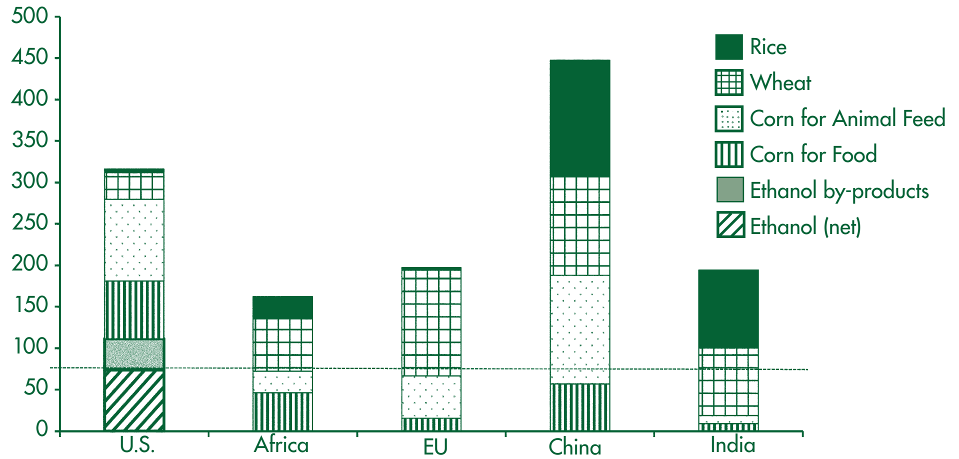
In this article, I argue that the VEETC generated small benefits relative to the benefits the ethanol industry reaps from legislation known as the Renewable Fuel Standard (RFS). As such, the industry was willing to let the VEETC expire so as to earn political points in its fight to preserve the RFS.

The RFS mandates that a minimum quantity of ethanol be blended into gasoline each year. It was first introduced in the U.S. Energy Policy Act of 2005, and then expanded in the U.S. Energy Independence and Security Act of 2007. Under the expanded RFS, corn ethanol now comprises 10% of finished motor gasoline in the United States, up from 3% in 2005. In a recent paper, Colin Carter, Gordon Rausser, and I estimate that the 2007 expansion in the RFS caused a persistent 30% increase in the price of corn. Moreover, the RFS has created a vulnerable corn market in which even the slightest production disturbance in 2012 will have devastating consequences for the world's poor.

In 2011, about 15% of global corn production, or about 5% of global grain production, was used in U.S. corn-ethanol production. One-third of this quantity returns to the food system in the form of ethanol by-products that can be used as animal feed, so the net loss to the food system is 3.3% of global grain production. Figure 1 shows that this volume of grain is substantial: it exceeds total corn consumption on the African continent. It also exceeds total rice consumption in all countries other than China and India.

The price effects from turning food into fuel have particularly devastating consequences for consumers in less-developed countries, where a relatively large percentage of income is spent on

Figure 1. Grain Consumption in 2011/2012



Data Source: USDA FAS, PS&D Database. Outside the U.S., the corn-for-food category includes industrial use.

food, and where grains, rather than processed foods, constitute the major portion of the diet. According to the Food and Agriculture Organization (FAO) of the United Nations, grains comprised 57% of calories consumed in least-developed countries in 2007 but only 22% in the U.S. and 27% in the European Union. World Bank economists Maros Ivanic and Will Martin estimate that when the World Bank's food-price index jumped by approximately 30% in 2010, 44 million people were forced below the extreme poverty line of $US 1.25 per day.

History

Ethanol, also known as ethyl alcohol, is the type of alcohol in alcoholic beverages. It became a significant motor-fuel ingredient in the United States only recently, but it has a long history as a prospective motor fuel. This history has been punctuated by government action. The first such action came in 1862, when the Lincoln administration imposed a large excise tax on alcohol to help fund the Civil War. This tax quadrupled the price of both drinkable and fuel alcohol and persisted until 1906, when the Free Alcohol Act made industrial alcohol exempt from the alcohol excise tax.

The 1862–1906 period coincided with the development of the internal combustion engine and the automobile. In the mid-1800s, some early internal combustion engines were fueled by ethanol, and ethanol was used extensively for lighting. One may wonder whether ethanol could have established itself as a viable motor fuel if it had not been subject to the alcohol excise tax. However, after industrial alcohol was made exempt from the excise tax and the price of ethanol consequently dropped by at least 75%, it still remained double the price of gasoline. Abundant petroleum supplies, especially in Pennsylvania, made gasoline inexpensive and it seems unlikely that ethanol could have established itself as a motor fuel even if it had not been subject to the alcohol excise tax.

By 1920, the picture looked different. The Pennsylvania oilfields were in decline and the U.S. Geological Survey estimated that peak petroleum production would be reached within a few years. This assessment raised expectations that ethanol distilled from grains and potatoes would become the dominant motor fuel. Articles expressing this expectation appeared regularly in major newspapers such as the *Los Angeles Times* and the *New York Times*.

At about this same time, European agricultural production recovered from World War I, which led U.S. agricultural prices to drop. These lower prices motivated U.S. agricultural producers to look to ethanol as an alternative market for their crops. However, the attempt to make ethanol profitable failed because newly discovered oil reserves in the U.S. Southwest kept petroleum production high and prices low.

After 50 years of low oil prices, the Arab oil embargo and the associated oil price spikes in the 1970s gave new hope to ethanol advocates. However, ethanol production remained far from cost effective; even when oil prices peaked in 1980, the cost of producing ethanol was double that of gasoline.

The 1978 Energy Tax Act marked the beginning of the current wave of federal programs to support ethanol production; it included a subsidy that exempted ethanol/gasoline blends from the gasoline excise tax. This subsidy existed until the end of 2011, although its magnitude and form changed somewhat. In its last four years, the subsidy took the form of a 45 cent per gallon tax credit to firms that blend ethanol with gasoline (the VEETC). This program cost taxpayers about $30 billion between 2005 and 2011.

Although the RFS was not enacted until 2005, bills containing variants of the RFS entered the U.S. Congress regularly between 1978 and 2004. In chronological order, these bills were the Gasohol Motor Fuel Act of 1978 (S.2533), the Ethanol Motor Fuel Act of 1987 (H.R.2052, S.1304), Amendment to the Energy Policy Act of 1992 (H.AMDT.554), Renewable Fuels Acts of 2000 and 2001 (S.2503 and S.670.IS), and the Energy Policy Acts of 2003 and 2004 (H.R.4503, S.2095). However, declining oil prices throughout the 1980s meant that large-scale ethanol production remained unprofitable. Ethanol comprised less than 1% of finished motor gasoline in 1990.

The 1990 amendments to the Clean Air Act provided the next opportunity for the corn ethanol industry to lobby for favorable legislation. The amendments required that, in regions prone to poor air quality, oxygenate additives be blended into gasoline to make it burn more cleanly. When the amendments were first introduced to Congress in 1987, ethanol and methyl tertiary butyl ether (MTBE), a natural-gas derivative, were the main contenders to fulfill the oxygenate requirement.

Johnson and Libecap documented the lobbying battle between advocates for ethanol and those for MTBE. MTBE became the dominant additive because it was less expensive, but subsequent leaks in underground storage tanks caused MTBE to contaminate drinking water supplies and it was consequently banned in at least 25 states.

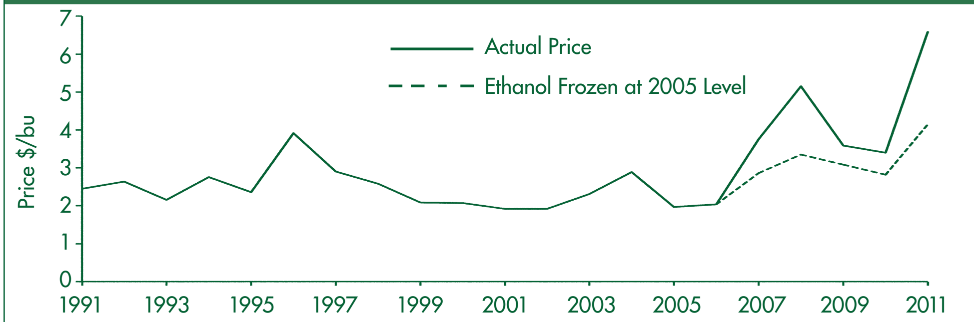
The demise of MTBE allowed ethanol to establish itself as a fuel additive in the 2005 Energy Policy Act, which essentially replaced the oxygenate requirement with the Renewable Fuel Standard. Legislation to increase the RFS entered Congress even before the 2005 Energy Policy Act had passed, and more bills followed in 2006 (the 20/20 Biofuels Challenge Act of 2005 (S.1609), BOLD Energy Act of 2006 (S.2571.IS, H.R.5331.IH)).

These proposals led to the 2007 expansion of the RFS, which specified minimum renewable-fuel production each calendar year from 2007 through 2022. It required 9 billion gallons in 2008, with annual increases to 15.2 billion gallons in 2012 and 36 billion gallons in 2022. However, no more than 13.2 billion gallons of corn ethanol may be used to satisfy the RFS in 2012, and no more than 15 billion gallons of ethanol may be used after 2015.

Effect of the RFS on Corn Prices

The 2007 RFS expansion caused ethanol plants to sprout across the country and especially in the Midwest. Firms could enter the ethanol industry secure in the knowledge that the government had guaranteed demand for their product. At the end of 2005, 4.3 billion gallons of ethanol-producing capacity existed and 1.8 billion gallons of capacity was under construction. One year later capacity under construction had tripled and represented more production than existed at the time.

Figure 2. Actual and Predicted Corn Price



Note: The price is the average daily cash bid in Central Illinois during March of each year. Counterfactual prediction taken from Carter, Rausser, and Smith (2012).

The ethanol construction boom gave the corn market fair warning of an impending increase in demand and enabled it to absorb the initial onslaught. Inventories accumulated and a record number of corn acres were planted in 2007. However, production has not kept up with demand. According to the most recent USDA estimates, carryover stocks into the 2012 crop year will be only 6.7% of annual use. Carryover stocks have only been this low once since 1950. In 1995 poor weather caused low crop yield and low inventory, but the effect was temporary because inventory was replenished by the next harvest. In contrast, the market shock that caused low inventory this year is a legislated permanent increase in demand.

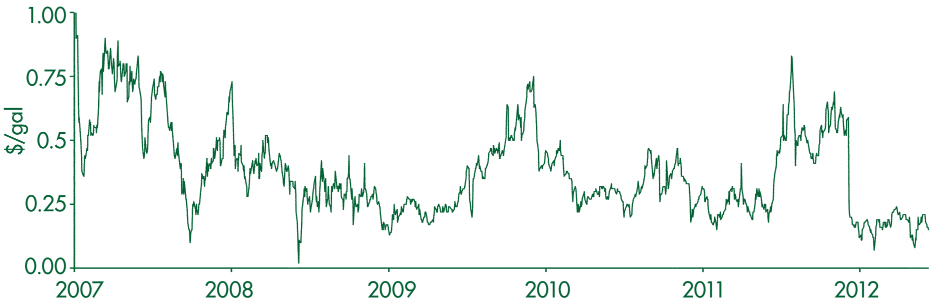
The current price of corn on the Chicago Mercantile Exchange is about $6.00 per bushel—almost triple the pre-mandate levels. What would the price be if ethanol production had been frozen at 2005 levels? In the 2005–06 crop year, 1.6 billion bushels of corn were used to produce ethanol; in the 2011–12 crop year, 5.0 billion bushels. When corn is processed into ethanol, approximately one third of its caloric value is retained in a by-product known as distiller's grains that is fed to animals. Thus, an increase of 3.4 billion bushels of corn used for ethanol production implies a loss of 2.3 billion bushels to the food system, equivalent to about 16% of the total U.S. supply of corn.

If these 2.3 billion bushels were returned to the food system, users would increase consumption and farmers would reduce production until prices had declined enough to absorb the excess supply. A simple calculation can give a ballpark estimate of how much prices would decline. In recent research, Michael Adjemian and I estimate that in recent years corn users would be willing to consume 2% more corn for every 10% reduction in price.

Nathan Hendricks, a 2011 UC Davis graduate, estimated in his PhD dissertation that U.S. farmers would plant 3% fewer acres to corn for every 10% reduction in price. Summing these effects implies that the market could absorb 5% more corn for every 10% price reduction. Thus, returning 16% of supply to the food system would reduce corn prices by about 32%

This simple calculation is consistent with the dynamic analysis in my recent work with Colin Carter and Gordon Rausser. In that paper, we isolate three main effects of the 2007 RFS expansion, each of which are apparent in Figure 2. First, the corn market anticipated the forthcoming ethanol boom and increased inventory demand accordingly. As a result, prices increased in 2006 in advance of the ethanol-production jump in 2007 and 2008. Second, we estimate that corn prices would have been, on average, 30% lower from 2006 through

Figure 3. Ethanol Operating Margin



Note: Data from the Center for Agricultural and Rural Development, Iowa State University, www.card.iastate.edu/research/bio/tools/hist_eth_gm.aspx.

2010 had no increase in the demand for corn from ethanol producers occurred. Our third finding is that a below-average harvest in 2010 caused inventory to be run down and prices to be about 50% above where they would have been if ethanol production had been frozen at 2005 levels. These results show that the effect of ethanol on corn prices gets magnified when inventory is low.

Effect of Removing the Tax Credit

At most, removing the VEETC could have caused ethanol production to drop to mandated levels. In 2011, ethanol production exceeded the mandate by 1.3 billion gallons. Most of this excess was exported to Brazil, Canada, the United Kingdom, and the Netherlands to meet biofuel mandates in those countries. A bushel of corn produces about 2.7 gallons of ethanol, so above-mandate ethanol production used 0.48 billion bushels of corn and, after accounting for distiller's grains, it removed 0.32 billion bushels from the food system or 2.2% of total U.S. supply. Thus, if all above-mandate ethanol production became unprofitable upon removal of the tax credit, the calculations above imply that corn prices would have dropped by only 4.4%

However, ethanol production has declined little, if at all, since the removal of the tax credit. In the first quarter of 2012, the United States exported about a quarter of a billion gallons of ethanol, and so it is on pace to produce about the same amount of ethanol as last year. Figure 3 shows that the return to ethanol producers over operating costs declined by the amount of the tax credit at the end of 2011. This drop erased the large operating margins that ethanol refiners had enjoyed in the last half of 2011 when strong export demand kept ethanol prices high. Moreover, it explains why ethanol production has not declined in 2012: after removing the tax credit, ethanol production at 2011 levels remains profitable.

Outlook for the Future

Removal of the ethanol tax credit has had a negligible effect on corn prices because high export demand is holding up ethanol prices, which makes above-mandate ethanol production profitable. Even if export demand declines, the RFS guarantees that ethanol production could only drop by a small amount this year and would have to increase in the next few years as the RFS increases to its long-term level of 15 billion gallons per year. By keeping ethanol production high, the RFS places a high floor under the corn price; corn prices will remain high as long as the RFS is in place. It is for this reason that Jon Doggett, vice president of public policy for the National Corn Growers Association, commented recently that his members "view the RFS as more important than the farm bill."

The RFS has caused carryover stocks to be run down and has placed the corn market in a perilous position. If the 2012 crop is even slightly smaller than expected, then prices will rise even further and plunge millions more people into extreme poverty. If they weren't constrained by mandates, then ethanol producers would respond to high prices by reducing their use of corn. Jim Costa (D-Fresno) and Bob Goodlatte (R-Va.) recently introduced legislation that would allow such a response; under their proposal the mandate would be reduced when corn stockpiles are low. This proposal is a small step in the right direction, but any proposed weakening of the RFS will be met by strong opposition from lobbying organizations such as Renewable Fuels Association, the National Corn Growers Association, and Growth Energy.

An abbreviated version of this article appeared in American.com magazine on January 4, 2012. See www.american.com/archive/2012/january/children-of-the-corn-the-renewable-fuels-disaster.

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The Logic and Consequences of Labeling Genetically Modified Organisms

David Zilberman

The choice facing California is not whether consumers should have information regarding consuming GMOs because non-GM food can be labeled as such, but what will be the benchmark for labeling requirements. Scientific research findings have not found GM food to be riskier to health or the environment than other foods. Furthermore, there is evidence that GM food improves both human and environmental health, increases yield and significantly reduces food prices.

GMOs (genetically modified organisms) in agriculture have been a source of controversy since their introduction in the mid-1990s. On the one hand, the planting of GM varieties has spread rapidly. In the case of soybeans, more than 70% of total acreage used for their cultivation is of some type of GM variety. However, GM varieties have not been adopted in major crops like wheat, rice, and potatoes, and are banned in the EU and most African countries. There has been continuous debate over the regulation of GM varieties, and California voters now face a proposition that will require the labeling of food that contains genetically modified ingredients.

On the surface, the main argument behind the proposition is the right of individuals to know the true makeup of the food they eat. I agree with this in principle, but in the case of this particular proposition, the crux of this issue has little to do with freedom of choice. In fact, voluntary labeling of GMO-free products can meet the informational needs of people who want to avoid GMOs. Anyone who is strongly opposed to buying GM products is free to do so, as USDA "certified organic" products do not contain GMOs.

The real issue of the proposition is the *benchmark* required for mandatory labeling. Right now, the benchmark is proven toxicity or meaningful health effects; thus, the government has rightly required the labeling of cigarettes and caloric contents. GM products are not required to be labeled because regulatory research has found them to be as safe as conventional foods. People who have additional requirements about food intake rely on voluntary labels such as "kosher" and "halal." But society does not use 'kosher' as the benchmark and require all "non-kosher" foods to be labeled as such.

From an economic perspective, labeling GMOs makes sense if the net benefit from having it outweighs the cost. While some people may feel strongly against GMOs and may vote for the proposition because their perceived benefits from labeling are very high, I suspect that there are many others who are indifferent or only slightly concerned about GM varieties, yet may be unaware of the environmental and social benefits of GMOs and the potential negative consequences of labeling. The purpose of this article is to provide research results on the benefits of GM products and some of the implications of constraining the growth and development of this technology.

On GMOs and Crop Breeding

Most of the food we eat today has been bred for humans and modified through a variety of techniques. They include traditional selective breeding, as well as induced mutations through radiation or other chemicals. The discovery of DNA and advances in modern molecular biology have allowed the development of more refined and precise crop breeding techniques where varieties are slightly modified by adding specific traits.

Obviously, GMO technologies are still in their infancy, but the cost of obtaining genomic knowledge is declining exponentially and new techniques for taking advantage of this knowledge are improving. Researchers have already discovered a wide array of genetic manipulations that can improve pest control, enhance nutritional quality, extend shelf life, and advance other aspects of crop quality and productivity.

The early commercial applications of GMOs, namely traits to control pests, are the "low hanging fruits" of research efforts and, as experience with transgenic tools is accumulated, it is likely that more appealing traits (i.e., drought tolerance, nitrogen fixation, etc.) will be developed. The application of genetic engineering techniques in agriculture has been advancing more slowly relative to that of medicine, but as we will show, even the existing traits have made an immense difference.

How Have GMOs Made a Difference?

A large body of literature has been accumulated to assess the impact of GMOs on agricultural productivity and food prices. The major applications thus far (Bt varieties or Round-up Ready varieties) reduce insect and weed damage. The impact on yield depends on whether the specific pest damage was controlled by an alternative method. In many cases, Bt varieties are replacing toxic pesticides, and the main gain is not in yield, but in improved health

Country	Insecticide Reduction (%)	Increase in Effective Yield (%)	Increase in Gross Margin (%)	References
Bt Cotton				
Argentina	47	33	23	Qaim & de Janvry 2003, 2005
Australia	48	0	66	Fitt,2003
China	65	24	470	Pray et al. 2002
India	41	37	135	Qaim et al. 2006, Sadashivappa & Qaim2009
Mexico	77	9	295	Traxler et al. 2003
South Africa	33	22	91	Thurtle et al. 2003, Gouse et al. 2006
United States	36	10	58	Falck-Zepeda et al. 2006, Carpenter et al. 2002
Bt Maize				
Argentina	0	9	20	Brookes & Barfoot 2005
Philippines	5	34	53	Brookes & Barfoot 2005, Yorobe & Quicoy 2006
South Africa	10	11	42	Brookes & Barfoot 2005, Gouse et al. 2006
Spain	63	6	70	Gomez-Barbero et al.2008
United States	8	5	12	Naseem & Pray 2004, Fernandez-Cornejo & Li 2005

Table 1. Yield, Costs, and Profitability Effects of Adopting Bt Cotton and Maize

Source: Qaim 2009.

and environmental sustainability. On the other hand, in cases where transgenic varieties address pest problems that haven't been treated before, yield tends to increase. As a rule, adoption of Bt varieties tends to have a higher yield effect in developing countries that face severe pest problems and have relatively limited access to technologies than in developed countries.

Table 1 represents outcomes of multiple studies that demonstrate this point for Bt cotton and Bt maize. The results suggest that yields may grow by more than 30% in developing countries such as India and the Philippines, while pesticide use may decrease up to 70%. Furthermore, the studies also compute that under plausible price ranges, farmer profitability per hectare is increasing and the range of gain varies across countries and crops.

One of the main concerns about GM varieties was that they mostly benefited technology providers, like Monsanto. However, GM varieties increase supply and, as a result, prices tend to decline which makes consumers better off. While farmers may have received lower prices, they also experience lower costs and higher yields. Thus, seed companies, farmers, and consumers may all share the economic benefit resulting from the adoption of GM varieties.

Several studies address the distribution of benefits from GM varieties during the early stages of the adoption of different traits in various crops from 1999 to 2005 in the United States, and the results are presented in table 2. These findings suggest that the overall gains from these early stages was very high. For example, the annual gain from adoption of herbicide tolerant soybean varieties in 1999 was between $500 million and $1.1 billion and the gain in 2001 was $1.25 billion.

In some cases, the consumer share was found to be greater than 50%, while in others, the innovator or the farmer share was very high. Altogether, the table shows that the benefits are shared among farmers, consumers, and the technology provider. Studies in other countries also confirm these results.

Studies that investigated the benefits of adoption of GMOs around the world have identified a wide variety of benefits, from increased yield and reduced cost as mentioned above, reduced financial risk associated with farming, as well as non-monetary benefits like reduced pesticide exposure for farm workers and reduced effort associated with monitoring pests and application of pesticides.

GM varieties also have significant environmental and health impacts, and a recent National Research Council (NRC) report found them to be at least as safe as conventional food. Studies from India and China suggest that adoption of Bt cotton led to a reduction in the application of pesticides and actually saved a significant number of lives of individuals who otherwise would have been exposed to toxic chemicals. Studies suggest that Bt traits in cotton reduce vulnerability to toxins that emerge in storage, and thus improve food safety.

The use of herbicide tolerant varieties led to increased use of Round-up, which the EPA considers to be low in toxicity. But at the same time, it enabled reduced tillage practices that in turn led to reductions in soil erosion, as well as runoff of water and chemicals. These GM varieties also contribute to soil carbon sequestration.

Aggregate Impacts

Most of the existing literature on the impacts of GMOs considers specific case studies and documents increasing yields, reduction in costs, and some environmental benefits. Recently, there have been attempts to assess the aggregate effects of GMOs on agricultural supplies and agricultural commodity prices.

Estimates based on aggregate data (annual national output of corn, cotton, soybeans and rapeseed, as well as acreage of GM and non-GM varieties for

Table 2. Benefits of the Adoption of Genetically Engineered Crops and Their Distribution						
		Total Benefits	Share of Total Benefits (%)			
Study	Year	($ Million)	U.S. Farmers	Innovators	U.S. Consumers	Net ROW
Bt Cotton						
Falck-Zepeda et al. 1999	1996	134	43	47	6	
Falck-Zepeda et al. 2000a	1996	240	59	26	9	6
Falck-Zepeda et al. 2000b	1997	190	43	44	7	6
Falck-Zepeda et al. 1999	1998	213	46	43	7	4
Frisvold et al. 2000	1996-98	131-164	5-6	46	33	18
U.S.-EPA 2001[a]	1996-99	16-46	NA	NA	NA	NA
Price et al. 2003	1997	210	29	35	14	22
Herbicide-Resistant Cotton						
Price et al. 2003	1997	232	4	6	57	33
Herbicide-Resistant Soybeans						
Falck-Zepeda et al. 2000b	1997-LE[b]	1,100	77	10	4	9
	1997-HE[c]	437	29	18	17	28
Moschini et al. 2000	1999	804	20	45	10	26
Price et al. 2003	1997	310	20	68	5	6
Qaim & Traxler 2005	1997	206	16[d]	49	35	NA[e]
Qaim & Traxler 2005	2001	1230	13[d]	34	53	NA[e]

NA= Not applicable
ROW= Rest of the world (includes consumers and producers
[a] Limited to U.S. farmers
[b]LE= Low elasticity; assumes a U.S. soybean supply elasticity of 0.22
[c]HE= High elasticity; assumes a U.S. soybean supply elasticity of 0.92
[d] Includes all soybean producers
[e] Included in consumers and producers
Source: NRC 2010.

different countries over time) confirmed that GM varieties tend to have higher yield increases in developing rather than developed countries. The average per acre yield increase associated with GM cotton in developing countries is above 50%, and it is above 35% for GM corn varieties. Conversely, the impacts of GM varieties on cotton and corn in developed countries are around 15%.

The impacts of GMOs on soybean yields are smaller; however, the availability of herbicide tolerant soybean varieties has contributed to a near doubling of the total acreage of soybeans globally in the last twenty years. Much of this increase can be attributed to double-cropping of soybeans with corn and wheat, so the increase in the agricultural footprint was much smaller.

The increase in agricultural production due to the introduction of GMOs has significantly affected food prices. The growing population and growing incomes in the developing world has led to increases in the demand for meats and, as a result, increased demand for feed grains. This, combined with the introduction of biofuel, led to significant pressure on food prices and the rising prices of food after 2006 had adversely affected the well-being of the poor. The food price inflation would have been even more severe without GMOs.

Biotechnology has been one of the most dominant sources of the increase in supply of agricultural commodities and thus has contributed to a reduction in agricultural commodity prices. The increase in supply of soybeans in Argentina was of the same order of magnitude as the increased consumption of soybeans in China after 2004, thereby neutralizing potential price hikes.

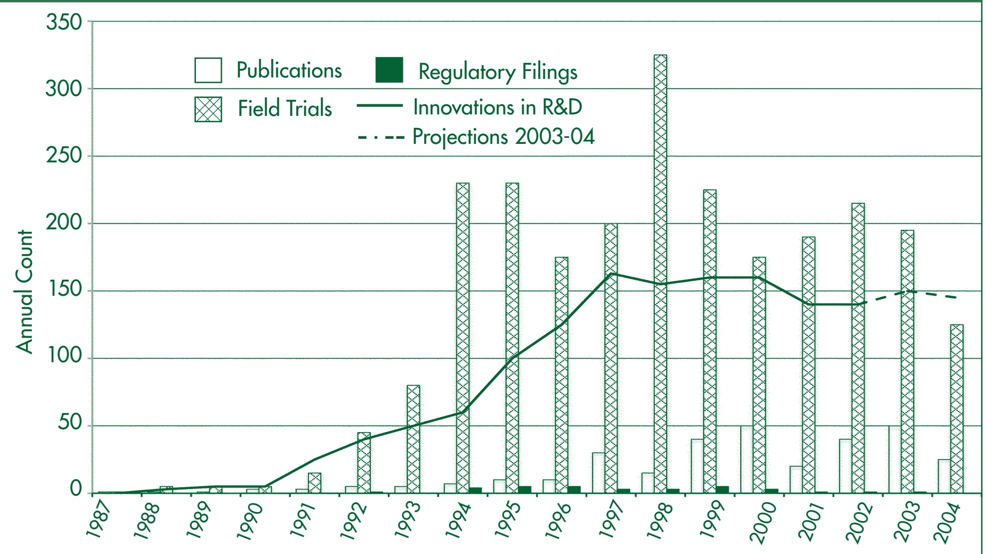
Using the same methodologies that assessed the impact of biofuel on food prices, it was found that GMOs have reduced food prices by the same order of magnitude (25% or more for corn and soybeans). Furthermore, studies suggest that if the European nations (and the African countries influenced by them) had adopted GMOs in their production of corn, soybeans and other crops, the prices of these commodities would have been substantially lower.

Moreover, existing regulations have prevented the introduction of GM varieties in the production of rice and wheat. Field studies suggest that their impact, especially in rice, can be as impressive as in corn—increasing yield and saving lives. Thus, the introduction of GM varieties to these crops would further reduce the pressure on agricultural commodity prices and improve economic well-being globally.

GMOs and the Environment

The increase in agricultural productivity and reduction in toxic pesticide use associated with GM varieties can make a difference in addressing the challenges of climate change. Higher yields mean that less land is required

Figure 1. Contractions in Agricultural Biotechnology R&D Associated with European GMO Restrictions of 1999



Source: Graff, G. et al. 2009 "The Contraction of Agbiotech Product Quality Innovation." Nature Biotechnology 27(8).

for agricultural production; thus, the increase in output due to GMOs has already contributed to reduced conversion of non-agricultural land for agricultural use, e.g., deforestation. Furthermore, through soil carbon sequestration and the reduction in use of inputs, production with GMOs has contributed to significant decreases in greenhouse gas emissions.

The ability of transgenic technologies to identify traits that can address disease and other issues suggests that these technologies can play a major role in adaptation to climate change and development of crop systems that respond to changes in weather conditions. Thus, transgenic technologies have contributed and can contribute even further to improved economic and environmental well being.

GMOs are a new technology and they have their own limitations. Obviously, pest resistance has and will continue to emerge with the use of GM varieties. The only way to sustain and improve agricultural productivity is to continue to conduct research and stay ahead of emerging challenges.

Sustainability is not a state of nirvana; rather, evolution occurs and advanced scientific knowledge and technology is the key to keeping up and improving welfare. Of course, biotechnology is one of many agricultural technologies that can play a pivotal role in our future. Integrating agricultural biotechnology with ecological farming as well as precision agriculture can lead to a much stronger and more stable system that will allow more sound utilization of agricultural resources with less environmental damages.

Many may be concerned that technological developments are frequently subject to human error, and thus reassessment and improvement of these technologies are essential. Yet, studies suggest that while there are cases of under-regulation, there are also frequent cases of over-regulation that may hamper technological change and innovation. Thus, design of efficient regimes for biotechnology is a challenge.

Conclusion

The main question is not whether consumers should have a choice regarding their own consumption of GMOs, but rather whether GM foods will be the norm and non-GM food labeled, or vice versa. Mainstream scientific research findings have not found GM food to be riskier to health or the environment than other foods. Furthermore, there is evidence that GM food improves both human and environmental well-being.

Labeling of GMOs will make GM food less attractive to some consumers, reduce demand, and make investment in this technology less appealing. We have the experience of the European ban of GM varieties in 1999, which was associated with significant contraction in investment and patenting of GM traits.

As Figure 1 shows, publications, innovations, and investment in GMOs were growing throughout the 1990s but peaked just before the ban was implemented. This has slowed advancement of the technology in an era when we need it most.

Introduction of policies that require labeling and add any other obstacles to the evolution of GMOs may have a similar effect. Voters will have to ask whether the potential gain associated with labeling is worth the cost associated with technological stagnation and the resulting losses in economic and environmental welfare.

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The Alpaca Bubble Revisited

Tina L. Saitone and Richard J. Sexton

We revisit the U.S. alpaca industry six years after having conducted a study suggesting the industry was in the midst of an unsustainable speculative bubble. We show that in the aftermath the bubble has largely burst. We also offer some lessons intended to prevent the recurrence of such bubbles in agriculture.

Prices for alpacas sold at auction between 2005 through 2011 declined each year by several thousand dollars, with the largest annual decline of $8,000 occurring between 2007 and 2008.

In the January/February 2006 issue of *ARE Update,* we published an article on the burgeoning U.S. alpaca industry entitled "Do Alpacas Represent the Latest Speculative Bubble in Agriculture?" The research was motivated by the dramatic growth of the industry in the United States, the curious marketing practices (such as advertising the benefits of raising alpacas on cable television), and the remarkable prices paid for alpaca stock. We reported rapidly escalating prices at several alpaca auctions, with mean auction prices in 2004 of $26,000 and $31,000 for the two major breeds, Huacaya and Suri, respectively.

Our analysis strongly suggested that these prices were unsustainable and that alpacas represented the latest example of a speculative bubble in agriculture. The economic basis for our conclusion was rather straightforward. First, fiber, the single marketable product produced by an alpaca, was in most cases valued at less than the variable costs of maintaining an alpaca.

Second, alpacas are native to Peru, which is home to the world's largest alpaca herd of roughly 3.5 million animals. In contrast, by 2009 there were about 150,000 registered alpacas in the United States. Although precise statistics on the value of alpacas in Peru were difficult to obtain, nevertheless it was abundantly clear that Peruvian alpacas sold for, at most, a few hundred U.S. dollars.

Trade in live animals between the U.S. and Peru was prohibited because of concerns about animal disease transmission. But there were and still are no barriers to trade for alpaca fiber. Thus, a straightforward application of what economists call the "factor price equalization theorem" indicated that, in equilibrium, prices for live alpacas in the United States and Peru should equalize apart from some minor differences due to fiber quality and fiber shipping costs.

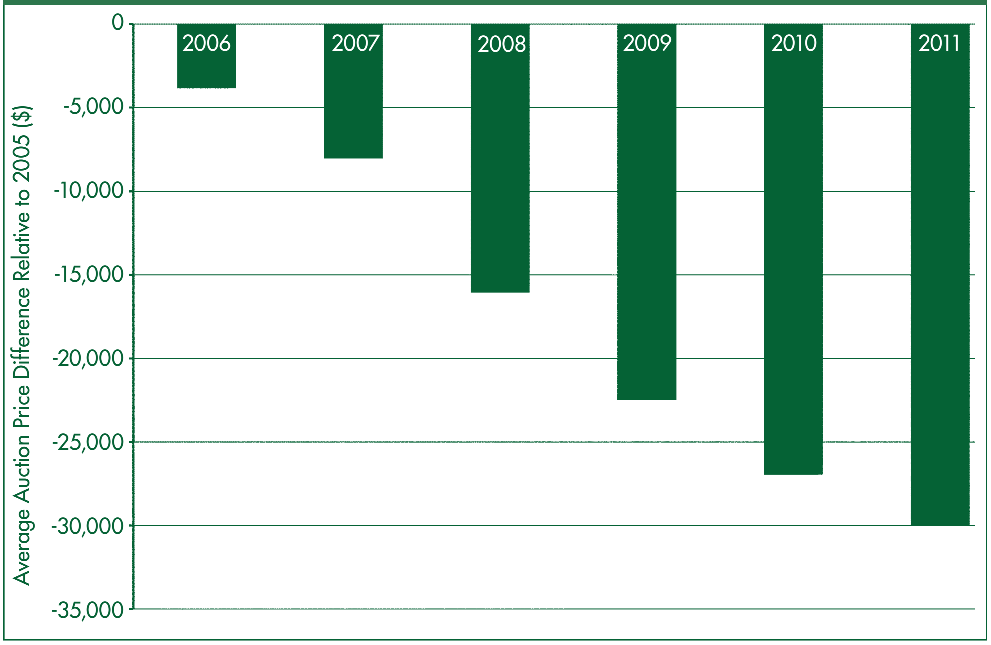
That point was important to our argument because industry proponents claimed that the market for alpaca fiber was poised to grow rapidly. Thus, the case could be made that the high alpaca prices observed at the time of our study were the product of rational investments in a high-growth industry.

Our analysis showed that an annual sustained growth rate in fiber prices of at least 20% was needed to justify the live-animal prices observed at the time. The demand growth needed to sustain such a rate of price increase would be almost unprecedented for an agricultural product. Moreover, the potential for fiber exports from the dominant Peruvian herd and production from a rapidly growing U.S. herd meant that supply could respond to rising prices to preclude dramatic and sustained price increases.

The Story Six Years Later

Our purpose in this paper is to examine what has happened in the intervening years since this study was published and to distill the lessons that can be learned. We recently gathered auction price data (1,493 observations) for alpacas, similar to those analyzed in the original study, for the intervening years since that study. The prices from alpaca auctions between 2005 and 2011 are likely not representative of all alpaca prices because the sampled auctions tend to attract the alpacas considered to be of the highest quality. The reported prices also

Figure 1. Average Decline in Alpaca Price, Relative to 2005



overstate actual sales values because owners can set a minimum reserve price in the auction; if no price is offered above the reserve, the auction records a sale at the reserve price to the original owner. Nonetheless, trends in prices in these auctions will reflect overall trends in the alpaca market.

Our approach was to specify a simple statistical model that expressed an alpaca's price as a function of its type (Huacaya or Suri), gender, the specific auction at which the animal was sold (Alpaca Owners and Breeders Association, Breeder's Choice, America's Choice, and Futurity), and the year in which the animal was sold. The primary focus of our interest was the effect of the sales year on auction price. All of these results were statistically significant at the 90% level or greater and are summarized in the chart in figure 1.

Figure 1 shows that prices declined in every year (relative to the base year of 2005). The decline in price in each year is several thousand dollars, with the largest annual decline of $8,000 occurring between 2007 and 2008. Figure 2 shows the mean annual male and female alpaca price in our dataset. The figure shows the male price fell by a factor of five between 2005–2011, while the female price declined by a factor of 3.5—leading to a near convergence of male and female prices by 2011. The uptick in male prices in 2007 is due largely to two sales recorded in excess of $200,000 in that year.

If indeed the 2011 figures represent actual sales and not just prospective sellers' hopes in the form of reserve prices, then they indicate that although most of the air has escaped from the alpaca bubble, some remains. Purchases at these prices must reflect the actions of those who hold out hope for the industry's recovery and are acquiring what they consider to be prime breeding stock.

A poignant story can also be told from perusing commercial websites such as Craigslist. Here, one can find offers to give away alpacas or to sell entire herds for a tiny fraction of what a single animal would have fetched several years ago. For an owner who doesn't attach an intrinsic value to owning alpacas as pets or "rural lawn mowers," the offer to give them away is economically rational, given that their marketable fiber is typically worth less than their maintenance cost. For example, we reported annual maintenance costs in the range of $169–$308 per animal in our 2006 study. Those costs are likely modestly higher today.

An informal examination of fiber sales offers on the Internet in a variety of locations revealed a wide range of offered sales prices, with $10–12 per lb. roughly representing the upper end of the sales price distribution. Thus, if the entire 6.5 lbs. of fleece yielded by a typical alpaca could be sold for this price (an unlikely proposition), its marketable product would be worth at most $65–78 per year, less than half the conservatively estimated maintenance costs.

Lessons to Be Learned

History suggests that speculative bubbles come along relatively regularly in agriculture, and they can cause much financial hardship to those who get caught up in them. In a longer version of our *ARE Update* paper (see the Further Reading box), we provide a brief history of such bubbles and some telltale warning signs. Bubbles are common for products that can be produced on relatively small parcels. In addition to alpacas, ostriches, chinchillas, Shetland ponies, emus, Berkshire hogs, and Merino sheep are examples of livestock that have experienced speculative bubbles.

The bubbles are also marked by a paucity of outside, objective information and a group of investors who communicate primarily among themselves. For example, when we first began work on the alpaca industry, we were surprised to find no objective economic studies, even though the U.S. alpaca herd was growing rapidly and was present to a degree in every state.

Bubbles are also characterized by the absence of what economists who study the phenomena refer to as the "smart money," i.e., sophisticated investors. In agriculture, among the "smart money" investors would be experienced agriculturalists or agribusiness firms, none of whom became involved in the alpaca industry. Inability to "short" an asset also makes it more vulnerable to a speculative bubble because informed investors have no way to arbitrage a price that is objectively too high through short sales.

Our own experience in the aftermath of conducting the first alpaca study is also instructive. Not surprisingly, it caused a considerable stir among alpaca owners but there was little attempt to address the economic content of our work. Instead, various "theories" abounded that served in the minds of many to debunk our work and discredit us. For example, one of us was claimed to be a disgruntled alpaca inseminator from Florida. In another case we were asserted to be UC Davis undergraduate students who conducted the study as part of a marketing class. Yet another claim is that our study was UC Davis' revenge for the Alpaca Registry no longer using UC Davis to conduct alpaca DNA tests.

An alternative form of critique was to focus on a single fact or assumption employed in the study, such as the price of a bale of hay, argue that it was incorrect, and thereby claim that the entire study and its conclusions could be summarily dismissed. Because there was considerable variability reported in production costs and fiber prices, we erred on the side of conservatism throughout the process of conducting the original study, conducting simulations for a wide range of values for fiber, alpaca costs of production, and discount rates. The inescapable conclusion was that no set of market conditions could sustain the alpaca prices prevailing at the time. Some of this interchange among industry participants, now several years old, is preserved on this website: www.alpacanation.com/forum/topic.asp?TOPIC_ID=2327.

Such reactions are readily predicted by the theory of cognitive dissonance from psychology. Our study's conclusions were dramatically at odds with beliefs alpaca owners held among themselves, and they were driven to find whatever devices they could to discredit the work in their minds and restore consonance among their beliefs. Had more heeded the warnings early on, they could have salvaged much of their investments but of course, in the process of doing so they would have collapsed the bubble even sooner.

Finally, as we noted, there is some evidence from the auction sales that a bit of air remains in the bubble. The harsh reality is that, whereas some may want to hold alpacas as pets or lawn mowers, an animal should not fetch more than a few hundred dollars, and they should not be held as investments.

Figure 2. Average Auction Prices for Male and Female Alpacas, 2005–2011

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For further reading, the authors recommend:

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