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ECONOMICS & MARKETING

Ethanol's Effect on the U.S. Cotton Industry

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ABSTRACT

A rapidly expanding ethanol industry is significantly impacting agricultural markets in the United States. While the most direct effects of this biofuel boom are being seen in corn and soybean markets, the objective of this study is to estimate the effects on the U.S. cotton industry. Using a partial equilibrium econometric model of the world fiber market developed at Texas Tech University and projections of grain and oilseed markets by the Food and Agricultural Policy Research Institute, estimates are made of how the ethanol boom is changing: 1) cotton prices, 2) U.S. cotton production acreage, and 3) U.S. cotton net farm income. The results show that increasing returns from competing crops will impact net returns from cotton production. While current U.S. farm policy moderates the effects of rising prices for cotton lint, returns from the seed portion of cotton production increase significantly. These findings highlight the contribution that cottonseed makes to the overall profitability of U.S. cotton production.

INTRODUCTION

Rising oil prices, global instability in the world petroleum market, and concern over greenhouse gas emissions are all factors contributing to the rapid expansion of the ethanol industry in the United States (Semple, 2006). Public and political support for the development of alternative fuel sources can be seen in the mandates of The Energy Policy Act of 2005 and the rate at which ethanol production capacity is expanding in the U.S. Since 2001, the number of ethanol plants in the U.S. has doubled (from 56 to 115), and production capacity has tripled (1.9 billion gallons per year to 5.7 billion). An additional 86 plants with over 6 billion gallons per year capacity are under construction (RFA, 2007).

One of the principal components of The Energy Policy Act establishes a national renewable fuel standard (RFS) requiring that gasoline sold in the U.S. contains specific amounts of biofuel. The law requires that the annual volume of renewable fuels increase from 4 billion gallons per year in 2006 to 7.5 billion gallons in 2012 (Neff, 2005). Ethanol, principally derived from corn, is the dominant biofuel used in the United States. However, with the current rate of investment and development in the U.S. ethanol industry, the Food and Agricultural Policy Research Institute (FAPRI) projects ethanol production to exceed that required by the Energy Policy Act. Figure 1 shows that by 2010, the mandated RFS is 6.8 billion gallons per year, while FAPRI projects corn ethanol production at 9.2 billion gallons.

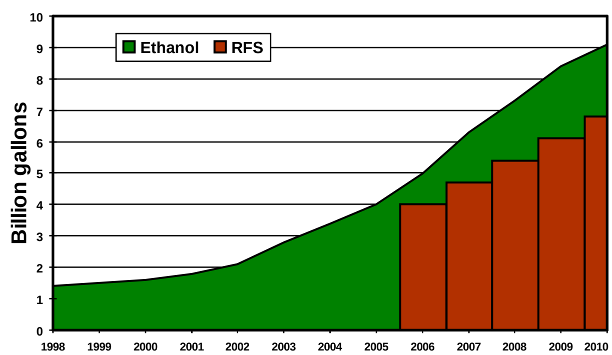

Figure 1. U.S. Ethanol Production and the Renewable Fuel Standard Mandate. Source: FAPRI 2006b

Increased demand by the ethanol industry for biomass feedstock is projected to considerably alter agriculture markets in the U.S. Higher prices for grains and oilseeds will cause significant adjustments in the supply and demand conditions of crops used directly for fuel. Another question is how these changes will affect crops not directly tied to the ethanol industry, such as cotton. Cotton may be impacted by increased plantings of corn as it competes with other crops for planted area. Additionally, cotton biproducts do not currently contribute substantially to

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the ethanol industry, but changes in the vegetable oil market may impact the demand for cottonseed oil. Changes in the feed grain market will likely impact the demand for whole cottonseed as a feed source for livestock.

Revised Projections of Major Agricultural Markets. In July of 2006, FAPRI announced that they had revised their January 2006 projections of U.S. agricultural markets. According to FAPRI, three developments caused their previous estimates to be out of date: 1) higher petroleum and gasoline prices; 2) much stronger growth in ethanol production; and 3) higher corn prices, higher corn acreage, reduced corn exports, and increased feed use of corn co-products (FAPRI, 2006b and 2006c) [1].

In the revised FAPRI report, projected corn usage for fuel is increased by over 30 percent in the year 2010 compared to the January baseline. Average corn prices are up 11 percent, soybean prices up 6 percent, wheat prices up 8 percent, soybean oil prices up 18 percent, and soybean meal prices down 4 percent.

The objective of this paper is to estimate the impact of rising ethanol production on the U.S. cotton industry. By comparing cotton production and price projections based on the January FAPRI baseline with projections based on FAPRI's revised numbers, we can: 1) estimate how changes in the supply and demand conditions for crops directly impacted by increased energy production from agricultural commodities will affect the production of raw cotton; and 2) estimate the impact of increased ethanol production on the cottonseed market. The combination of these factors will enable us to estimate changes in U.S. net farm cotton income. We refer to these changes as the 'ethanol effect'.

The Effect of the Ethanol Boom on U.S. Agriculture. The surge in ethanol plant investment and biofuel production is having a significant impact on the U.S. economy. The combination of spending for annual operations, ethanol transportation, and capital spending for plant construction and expansion added $41.9 billion of gross output in 2006 and accounted for the creation of over 163,000 jobs (Urbanchuk, 2007).

The primary feedstock for biofuel production in the U.S. is corn. With the rapid expansion of this industry, the share of U.S. corn production that is used for fuel is projected to increase from 14 percent in 2005 to 28% by 2010 (Figure 2). Increased demand for corn by the ethanol industry has far reaching effects throughout U.S. agriculture. The supply and demand for crops that compete with corn for acreage will be effected as well as sectors of the livestock industry that depend on corn for feed.

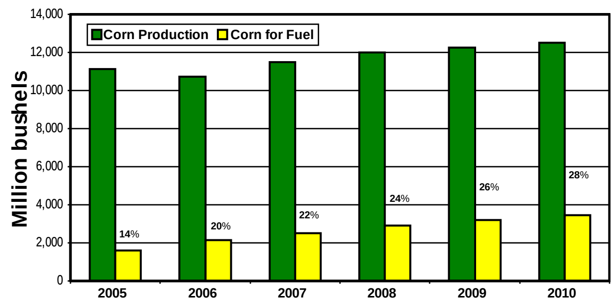

Figure 2. U.S. Corn Production and Corn Used for Fuel . Source: FAPRI, 2006a and 2006b

Increased demand for corn results in substantially higher prices. The average farm price in 2005/06 was $2.00 per bushel. This increased to $3.05 per bushel in 2006/07 and is projected to be $3.50 per bushel in 2007/08. Prior to 2007, the all-time record corn price in the U.S. was $3.24 in the 1995/96 marketing year. USDA projects an average corn price of $3.75 per bushel by 2009/10 (ERS, 2007b)[2].

Higher corn prices result in higher returns for corn production which increases the incentives to plant more acres. Corn planted acreage increased by 21 percent in 2007 over 2006 plantings (from 78 million acres to 94 million) and is projected to remain around 90 million acres for the next five years (ERS, 2007b). Much of the expansion in corn area comes at the expense of soybeans. Soybean acres are down more than 8 million acres in 2007 compared to 2006. Soybean acres are projected to remain in the 68 to 69 million range for the next several years, well below the recent five-year average of 74 million acres (ERS, 2007b). Fewer soybean acres mean higher prices for soybeans, soybean meal, and soybean oil. Soybean

1 The FAPRI revised baseline was modified with updated forecasts from Global Insight for the refiner's acquisition price for petroleum, an increase in the pace of ethanol plant construction, and updated crop acreage and production estimates reported by the U.S. Department of Agriculture in the July 2006 *World Agricultural Supply and Demand Estimates* (FAPRI, 2006b).

2 A weakening U.S. dollar, production shortfalls, increased commodity demand, and speculative investment are among other factors that combined with the ethanol boom to escalate prices much above those forecast by USDA.

prices are projected around $7.00 per bushel through 2010 compared to $5.56 per bushel in 2005/06 (Westcott, 2007)[2]. Increased ethanol production has fueled increased interest in biodiesel as well. With soybean oil serving as the primary raw material for biodiesel in the U.S., higher soybean oil prices are projected.

USDA's projections for cotton and wheat show little change compared to corn and soybeans. Cotton acres range from 13.5 to 13.7 million acres from 2007 to 2011 and wheat acres range from 58.5 to 60 million acres over the same time frame. Cotton prices increase from 55 cents per pound in 2007 to 58.50 cents in 2011. Wheat prices are projected to decrease from $4.45 per bushel in 2007 to $4.40 per bushel in 2011 (ERS, 2007b) [2].

The higher corn and soybean prices outlined above will negatively impact the livestock sector. Higher feed prices will result in lower red meat production and a decline in the growth rate of the poultry industry. The effects will differ across industries as ruminants are better able to substitute corn in their rations with distillers grains (a primary bi-product of the ethanol process) compared to hogs and broilers (Westcott, 2007). As more distiller grains are produced, they will compete with other feed ingredients such as soybean meal as a protein supplement for the livestock feeding industry (Klopfenstein, 2001).

Overall, expansion of the ethanol industry is projected to boost U.S. net farm income. Higher crop prices, primarily corn and soybeans, offset increased production expenses (such as fertilizer, feed, and seed) and lower government payments. Figure 3 shows the growth USDA projects in net farm income through 2011. A significant feature of these income projections is the increasing amount of income that comes from the marketplace and the declining level of governmental income support.

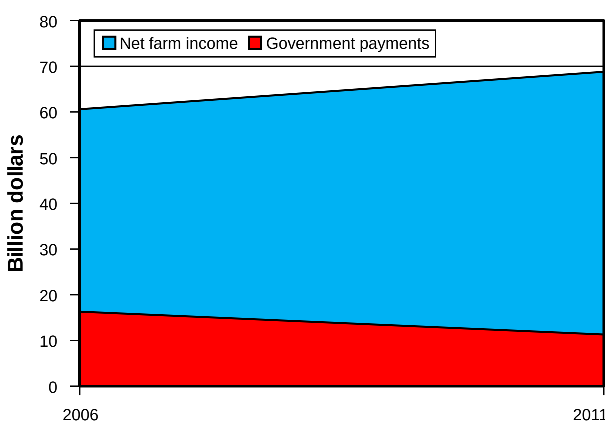

Figure 3. U.S. Net Farm Income and Government Payments. Source: ERS, 2007

CONCEPTUAL FRAMEWORK

A primary shifter in the supply curve for a commodity (with its concurrent change in commodity price), is a change in returns from commodities that compete for the same resources. As competing crops become more profitable, the supply curve shifts left; as competing crops become less profitable, the supply curve shifts right (Tomek and Robinson, 1990). Increased returns from corn production will reduce the quantity of crops planted that compete with corn, and increase the market prices of competing crops.

Cotton is a special case. Provisions of the U.S. farm program provide an effective minimum per unit price for major commodities regardless of how low market prices fall. Market prices for corn, soybeans, and wheat have reached levels well above levels of minimum support such that shifts in supply and demand as discussed here have a direct effect on market prices. The market price for cotton is well below the minimum support price. It would take a radical change in supply or significant increase in demand to bring market prices for U.S. cotton above the mandated support price (a brief exposition of current cotton policy is presented in the Appendix).

Another aspect of the cotton market warranting consideration is the income to the farmer from cottonseed. This joint product of cotton lint is produced in an approximate fixed proportion to seed cotton (harvested raw cotton prior to conversion into fiber and seed). In the U.S., revenue from cottonseed accounts for about fifteen percent of the total return from cotton production (Misra and Bondurant, 2000).

A model of the supply and demand situation for cotton lint and cottonseed in response to increased returns for corn is presented in Figure 4. For cotton lint, the market price (P_1) is determined by the intersection of the demand (D_1) and supply (S_1) curves. But the effective cotton price received by farmers is the minimum support price (P_M) which is well above the current market price. This policy results in a quantity supplied (Q_1) in excess of what it would be under free market conditions by effectively creating a perfectly inelastic supply function up to the established minimum price. Cottonseed is produced in a fixed proportion to cotton lint and is modeled in the lower portion of Figure 5. The cottonseed price (P_1) is derived from the supply (S_1) and demand (D_1) curves for cottonseed.

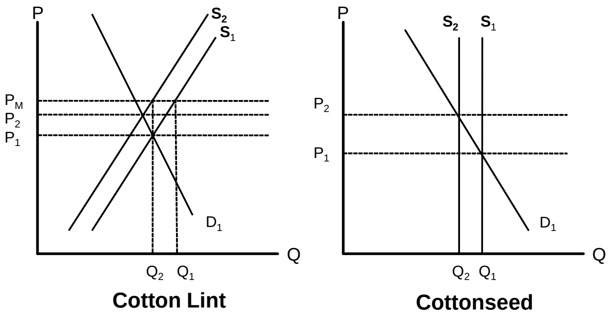

Figure 4. Joint Product Supply and Demand Curves for Cotton Lint and Cottonseed

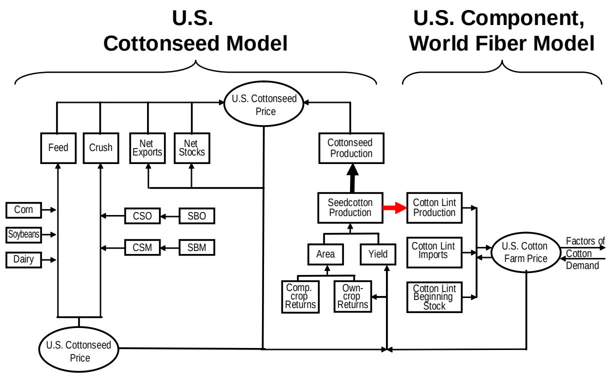

Figure 5. U.S. Cottonseed Model with Linkage to the World Fiber Model

An increase in returns for corn causes a shift in the cotton lint supply curve to the left (S_2) reducing the quantity supplied (Q_2) and raising the market price (P_2). However, the new market price is still below the minimum price leaving the effective per unit price of the commodity unchanged. A decrease in cotton lint supply (S_2) reduces the quantity (Q_2) of cottonseed which increases the cottonseed price (P_2). Even though the shift in the cotton lint supply curve is insufficient to change the price, cotton farm income is affected by the change in the price of cottonseed.

Implications for the Cotton Industry. The situation outlined above has several implications for the cotton industry. Increased production of ethanol will result in increased net returns for corn and soybean producers. Producers of cotton that have the productive flexibility to grow alternative crops may switch their planting intentions towards corn or soybeans and plant fewer cotton acres. Fewer cotton acres will mean less cotton production and likely higher market prices but not necessarily higher gross returns from cotton lint. If gross returns are taken to include the market returns plus government support payments, production would have to fall dramatically for the market price (currently about 48 cents per pound) to increase beyond the current target price (72.40 cents per pound). For moderate changes in supply and demand of cotton lint, higher (lower) market prices would decrease (increase) government benefits leaving gross returns largely unchanged.

But returns from cotton include more than just cotton lint. Cottonseed prices may increase not only on tighter supplies given less production described above, but also from increased demand as the prices of competing products increase. Rising prices for soybean oil mean higher prices for substitute vegetable oils such as cottonseed oil which means higher cottonseed prices. Higher corn prices mean higher prices for substitute feed products such as whole cottonseed and cottonseed meal. With the contribution cottonseed makes to the gross income from cotton production, the lack of consideration of this important product from other studies is a significant deficiency.

MATERIALS AND METHODS

The World Fiber Model developed by the Cotton Economics Research Institute (CERI) at Texas Tech University is used to estimate the effects of changes in cotton policy on the world's raw cotton and fiber markets. These estimations provide the basis of CERI's annual Global Cotton Outlook (CERI, 2007). The Model is a partial equilibrium econometric model that has also been used to analyze such cases as the Brazilian and West African complaints against U.S. farm policy in the dispute panels of the World Trade Organization (Pan et al., 2006), a comparison of U.S. farm policy and China's tariff rate quota system (Pan et al., 2005), the effect of revaluation of China's currency on world fiber markets (Pan et al., 2007b), and the effect of complete trade liberalization in the world cotton market (Pan et al., 2007a). Pan et al. (2004) provides a complete model explanation.

In brief, the World Fiber Model includes 24 major cotton importers and exporters: Asia (Greater China, India, Pakistan, Taiwan, South Korea, Japan, and Other Asia); Africa (West Africa, Egypt, and Other Africa); North America (Mexico, United States, and Canada); Latin America (Brazil, Argentina, and Other Latin America); Oceania (Australia); Middle East (Turkey and Other Middle East); Former Soviet Union (Uzbekistan, Russia, and Other FSU); and Europe (European Union-25 and other Western Europe).

Seed cotton production is modeled using separate acreage and yield equations. Current production is specified as a function of the previous year's net returns for cotton and the relative net returns of competing crops. The share of seed cotton that is lint is then allocated to the fiber market while the seed component enters the cottonseed marketing channel. In the U.S. model, cotton production is divided into four regions: Delta, Southeast, West, and Southwest. Figure 5 offers a schematic representation of the U.S. cottonseed model and its linkage to the U.S. cotton sector in the World Fiber Model (see Welch et al., 2005 for a complete schematic of the U.S. and world fiber markets).

As previously discussed, increased production of corn and soybeans in the U.S. effects raw cotton production. These changes are reflected in the World Fiber Model by the way planted acres are estimated based on own- and competing-crop net returns. Increased demand in the biofuel industry has significant ramifications in the cottonseed market as well. Higher soybean oil prices mean higher prices for cottonseed oil. Higher feed grain prices mean higher bids for feed substitutes such as whole cottonseed, cottonseed meal, and cottonseed hulls. Figure 6 gives an example of the marketing flows for U.S. cottonseed products projected by the United States Department of Agriculture for the 2006/07 marketing year. Heavier lines indicate channels of higher use. Values within circles are in billion pounds. Numbers between circles indicate percent of total volume.

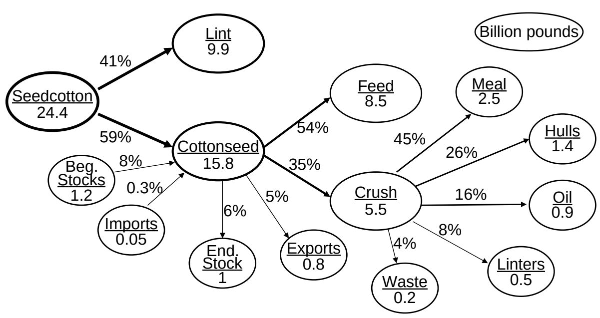

Figure 6. Supply and Demand Components of the U.S. Cottonseed Market, 2006/2007 Marketing Year. Sources: NASS, 2007 and ERS, 2007a

The World Fiber Model was used to create a five-year baseline of projections for cotton and cottonseed production and prices from 2007/06 through the 2011/12 marketing year. Baseline projections are based on normal weather conditions and exogenous macroeconomic estimates. The baseline estimate assumes continuation of all current governmental policies and programs. After establishing a baseline, the model was run with an alternative set of assumptions allowing for a comparison to be made of alternate outcomes.

Baseline estimates were derived from economic data included in FAPRI's January 2006 projections and supply and demand conditions in the world fiber markets as derived by the World Fiber Model. This included projections for the production levels and net returns for corn, soybeans, and other major crops. The alternative scenario estimated the ethanol effect: changes in these markets due primarily to increased ethanol production. Among the agricultural markets affected were corn, soybeans, cotton, and their co-products as previously discussed.

Data used in this study was compiled from various sources: Global Insight for historical and projected macroeconomic variables (real GDP, exchange rate, population, and GDP deflator); FAPRI for the production and returns for competing crops; Production, Supply & Demand (PS&D) database of the Foreign Agricultural Service (FAS) for cotton acreage, yield, production, mill use, ending stocks, and trade; and the FAO World Fiber Consumption Survey and Fiber Organon for fiber mill consumption and man-made fiber statistics.

RESULTS AND DISCUSSION

The effects of increased biofuel production on the U.S. cotton industry are reported in Tables 1 and 2. As expected, increased returns for competing crops such as corn, wheat, and soybeans lowers plantings for U.S. cotton (Table 1). The largest declines (just over 2 percent on average) occurred in the Delta and the Southwest areas. In the Delta, cotton acres likely shift to soybeans while in the Southwest, producers shift acreage from cotton to feed grains in response to higher grain prices. In the Southwest, the region with the greatest number of cotton acres in the U.S., potential planting reductions near 100,000 acres. For the U.S. as a whole, cotton plantings are projected to decline by 255,000 acres compared to the baseline.

While U.S. cotton area declined by 2.1 percent in the ethanol scenario, total production of seed cotton, lint, and cottonseed declined by about 2.8 percent (Table 1). Production declines in excess of area reductions are attributed to a decline in seed cotton yield which is a function of crop prices. Under present farm policy, market prices can increase while the effective price received by farmers decreases. With market prices below the loan rate, farmers receive as an effective price for cotton, the sum of the direct payment, plus a full counter cyclical payment, plus loan deficiency payments. When the market price increases up to the loan rate, the effective price is the direct payment plus the full counter-cyclical payment and no loan deficiency payments are collected. Above the loan rate, the increase in market price is offset by a decrease in counter-cyclical payments and the effective price is unchanged. Thus, at present price levels, an increase in market prices actually decreases the per unit effective price to the farmer. Under these circumstances, higher cotton prices actually reduce the net revenue U.S. cotton producers receive from cotton lint production on their base acres.

Cottonseed revenue increased in the ethanol scenario as much higher prices (+18 percent on average) overwhelm slight production decreases (- 3 percent). When cottonseed gross revenue is included in the net farm income calculation, net farm income from cotton production (lint + seed) increases about $120 million per year due to the ethanol boom, an increase of 2.4 percent per year.

CONCLUSIONS

The increased size and importance of the U.S. ethanol industry is changing agricultural markets. While much has been made of projected changes in the U.S. food, feed, and fuel markets, we estimate the effects on the fiber market as well. While the impacts on the cotton industry are less direct, they are still of significance.

The ethanol effect on what is most commonly viewed as the U.S. cotton sector, cotton lint, is small but mostly negative. While decreased plantings and lower production estimates result in higher cotton market prices, net farm income from cotton lint goes down. Under current farm policy, higher market prices reduce government support payments resulting in an effective price for lint that is lower than in the baseline. As producers respond to lower effective prices by reducing fertilizer and other non-fixed input use, lower yields per acre can result. With both price and yield reduced, the fiber portion of net farm income declines.Income from cottonseed, however, makes up for lower cotton lint revenue. Decreased supplies and increased demand combine to significantly boost the price of cottonseed.

Production and price information for the 2007/08 marketing year to date (August 1, 2007 to March 31, 2008) show that our model correctly estimated the direction of changes in cotton plantings and cotton lint and cottonseed prices, but underestimated the magnitude of the ethanol effect (see Table 3). Our model estimated that the ethanol effect would reduce nationwide cotton plantings from 12.4 million acres to 12.1 million, a decrease of just over 2 percent. Actual U.S. cotton plantings for 2007/08 were 10.8 million acres. Fewer acres supported prices in the 2007/08 crop year with the season average farm price averaging 55.67 cents per pound thus far. Our model estimated that the ethanol effect would result in a farm price of 52.89 cents per pound. The baseline cottonseed price was $103 per ton, the estimated ethanol effect price was $128 and the actual price to date is $160. The higher cotton lint price is offset by lower government payments leaving net returns from lint unchanged[3]. But cottonseed revenue was higher. In the baseline, cottonseed added $69 per acre to cotton returns, the ethanol effect estimated returns of $86 per acre, while actual returns averaged $101 per acre.

This study shows that even though cotton may not participate directly in the current ethanol boom, it will feel the effects. While farm policy provisions moderate the overall impact, especially in fiber markets, producers will benefit as returns for cottonseed become an increasingly important source of revenue. The ethanol impact has driven grain and oilseed prices well above target levels. Safety net policies such as minimum support payments are not relevant to these commodities at current prices. Cotton however continues to draw heavily on public support as prices remain well below the target price. Under the current system, government support for cotton will be greatly disproportionate to that of the other major commodities. Policy makers interested in maintaining balance in government spending for farm commodities will be motivated to implement farm policy aimed at supporting the development and marketing of biofuels over traditional price support programs.

3 Counter-cyclical payments will be reduced with higher cash prices as discussed previously and in the Appendix. The LDP payment rate was zero the first two weeks of the marketing year, averaged 1.65 cents per pound the next 5 weeks, and has been zero from week 8 forward (9/20/07 to date). The National Agricultural Statistics Service estimated that 13 percent of the crop had been harvested by September 23, 2007. Therefore, the bulk of the 2007/08 cotton crop will receive no LDP payment.

Table 1. Ethanol's Effects on Cotton Acreage and Production

	2007/08	2008/09	2009/10	2010/11	2011/12	Avg.
Planted Area			000 acres			
Delta						
Baseline	3,847	3,760	3,706	3,698	3,694	3,741
Ethanol Effect	3,755	3,650	3,653	3,607	3,602	3,654
Percent Change	-2.40%	-2.92%	-1.42%	-2.46%	-2.48%	-2.34%
Southeast						
Baseline	3,099	3,048	3,015	2,996	2,991	3,030
Ethanol Effect	3,045	2,969	2,972	2,944	2,940	2,974
Percent Change	-1.76%	-2.61%	-1.43%	-1.74%	-1.69%	-1.85%
Southwest						
Baseline	4,747	4,717	4,688	4,652	4,621	4,685
Ethanol Effect	4,640	4,579	4,587	4,573	4,554	4,586
Percent Change	-2.26%	-2.92%	-2.16%	-1.69%	-1.46%	-2.10%
West						
Baseline	664	684	701	715	724	698
Ethanol Effect	654	672	687	699	708	684
Percent Change	-1.47%	-1.75%	-2.04%	-2.19%	-2.22%	-1.93%
Total						
Baseline	12,357.70	12,209.63	12,110.06	12,060.48	12,030.02	12,154
Ethanol Effect	12,093.45	11,870.30	11,899.03	11,823.36	11,804.36	11,898
Percent Change	-2.14%	-2.78%	-1.74%	-1.97%	-1.88%	-2.10%
Production						
Seedcotton			000 short tons			
Baseline	12,926	12,820	12,786	12,837	12,907	12,855
Ethanol Effect	12,561	12,359	12,496	12,495	12,574	12,497
Percent Change	-2.82%	-3.60%	-2.27%	-2.67%	-2.58%	-2.79%
Cotton Lint						000 bales
Baseline	20,887	20,303	19,977	20,228	20,455	20,370
Ethanol Effect	20,291	19,562	19,511	19,676	19,913	19,791
Percent Change	-2.85%	-3.65%	-2.33%	-2.73%	-2.65%	-2.84%
Cottonseed			000 short tons			
Baseline	8,378	8,400	8,437	8,433	8,454	8,420
Ethanol Effect	8,143	8,100	8,248	8,211	8,238	8,188
Percent Change	-2.81%	-3.57%	-2.24%	-2.63%	-2.55%	-2.76%
Yield			Pounds per Planted Acre			
Baseline	811	798	792	805	816	804
Ethanol Effect	805	791	787	799	810	798
Percent Change	-0.74%	-0.88%	-0.63%	-0.75%	-0.74%	-0.75%

Table 2. Ethanol's Effects on Cotton Lint and Cottonseed Prices and Income

	2007/08	2008/09	2009/10	2010/11	2011/12	Avg.
A-index			Cents per pound			
Baseline	59.28	60.14	61.47	62.54	62.95	61.28
Ethanol Effect	61.91	62.75	62.10	63.34	63.30	62.68
Percent Change	4.45%	4.34%	1.03%	1.28%	0.55%	2.29%
U.S. Cotton Farm Price			Cents per pound			
Baseline	49.56	51.31	52.35	53.29	54.29	52.16
Ethanol Effect	52.89	55.49	54.77	55.68	56.47	55.06
Percent Change	6.72%	8.13%	4.62%	4.49%	4.02%	5.56%
Cottonseed Price			$ per ton			
Baseline	103.30	109.52	114.38	119.03	125.15	114.28
Ethanol Effect	127.66	135.35	130.76	138.94	144.24	135.39
Percent Change	23.58%	23.59%	14.32%	16.72%	15.25%	18.47%
Net Farm Income from Cotton Lint			$ million			
Baseline	4246.12	4156.42	4010.20	4002.37	4119.18	4106.86
Ethanol Effect	4294.51	4097.46	3984.61	3951.67	4081.96	4082.04
Percent Change	1.14%	-1.42%	-0.64%	-1.27%	-0.90%	-0.60%
Gross Income from Cottonseed			$ million			
Baseline	865.48	919.89	965.06	1003.74	1058.00	962.43
Ethanol Effect	1039.56	1096.35	1078.51	1140.77	1188.32	1108.70
Percent Change	20.11%	19.18%	11.76%	13.65%	12.32%	15.20%
Net Farm Income from Lint and Seed			$ million			
Baseline	5111.61	5076.31	4975.26	5006.11	5177.17	5069.29
Ethanol Effect	5334.07	5193.81	5063.12	5092.44	5270.27	5190.74
Percent Change	4.35%	2.31%	1.77%	1.72%	1.80%	2.40%

Table 3. Comparison of Model Estimates to Actual Production and Prices

2007/08 Crop Year to Date	Model Baseline	Ethanol Effect	Actual
Cotton Planted Area (million acres)	12.4	12.1	10.8
Cotton Production (million bales)	20.9	20.2	19.0
Cottonseed Production (thousand tons)	8,378	8,143	6,596
Average Farm Price, Cotton Lint (cents per pound)	49.56	52.89	55.67
Average Cottonseed Price (dollars per ton)	103	128	160
Revenue from Cottonseed (dollars per acre)	69.83	86.19	100.51

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APPENDIX

Major Components of U.S. Cotton Programs

The Farm Security and Rural Investment Act of 2002 provides support to U.S. producers of cotton under three primary types of government payments: direct payments, counter cyclical payments, and loan deficiency payments (FSA, 2003).

Direct Payments

Under the 2002 Farm Act, farmers and eligible landowners receive annual fixed payments. The amount of the direct payment is equal to the product of the payment rate, payment acres, and payment yield. The 2002 Farm Act sets the payment rate for upland cotton at 6.67 cents per pound for crop years 2002-2007. Payment acreage is set at 85% of base acreage. Payment yields for direct payments remain at levels specified by the 1996 Farm Act.

Counter-Cyclical Payments

Counter-cyclical income support payments (CCP) were developed to provide a counter-cyclical income safety net to replace most ad hoc market loan assistance payments that were provided to farmers during 1998-2001. Payments are based on historical production and are not tied to current production. CCPs are available for covered commodities whenever the effective price is less than the target price. The payment amount is equal to the product of the payment rate, the payment acres (85% of base acres), and the payment yield. Counter-cyclical payments are available to contract holders whenever a program crop's target price is greater than the effective price. The effective price is equal to the sum of: 1) the higher of the national average farm price for the marketing year, or the national loan rate for the commodity and 2) the direct payment rate for the commodity. The payment amount for a farmer is the product of the payment rate, the payment acres, and the payment yield. The upland cotton target price is 72.4 cents per pound for the duration of the farm bill. The payment for an individual cotton farmer is determined as

Payment rate_{cotton} = $(\text{target price})_{cotton}$ – (direct payment $\text{rate})_{cotton}$ – (higher of commodity price or loan $\text{rate})_{cotton}$

CCP_{cotton} = ([Base $\text{acres}]_{cotton}$ x 0.85) x (payment $\text{yield})_{cotton}$ x (payment $\text{rate})_{cotton}$

Marketing Loan Benefits or Loan Deficiency Payments (LDPs)

The Farm Service Agency (FSA) administers commodity loan programs with marketing loan provisions for upland cotton through the Commodity Credit Corporation (CCC). The CCC loan programs allow producers of designated crops to receive a loan from the government at a commodity-specific loan rate per unit of production by pledging production as loan collateral. After harvest, a farmer may obtain a loan for all or part of the new production. These loans may be repaid in three ways: at the loan rate plus interest costs (CCC interest cost of borrowing from the U.S. Treasury plus 1%), by forfeiting the pledged crop to the CCC at loan maturity, or at the alternative loan repayment rate. The marketing loan rate for upland cotton is 52 cents per pound for 2002-2007.

Producers may choose to forego a marketing loan and receive a loan deficiency payment (LDP). The LDP is the difference between the loan rate and the lower effective market price. The effective price is called the Adjusted World Price (AWP) and is calculated by the U.S. Department of Agriculture. LDPs are calculated on current production and are designed to assure that producers receive at minimum the 52 cent loan rate for their upland cotton.

Figure A.1. illustrates how producer payments would be affected when market prices are below the loan rate, between the loan rate and the target price, and above the target price.

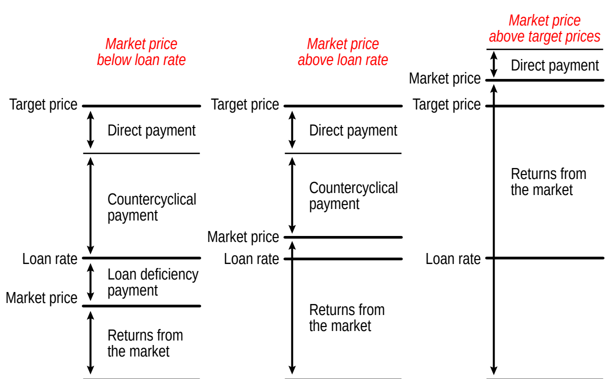

Figure A.1. Commodity Returns under U.S. Price Support Provisions. Source: McDonald et al., 2006