

---

# NEWSLETTER

---

Issue 06-2

April 2006

## Let's Produce More Bio-energy

*Richard Taylor, Jeremy Mattson, and Won W. Koo*

Ethanol production has increased substantially over the last few years. Production more than doubled from 1.6 billion gallons in 2000 to 3.9 billion gallons in 2005. The rapid increase in ethanol production has been driven to a large extent by government policy. Ethanol has historically cost more per gallon than gasoline; however, federal subsidies have helped the ethanol industry overcome its price disadvantage, thereby encouraging production. The ethanol industry benefits from a production tax credit of \$0.51 per gallon of pure (100%) ethanol, in addition to a small producer income tax credit of \$0.10 per gallon for the first 15 million gallons of production. This tax credit is limited to ethanol producers whose total plant output does not exceed 60 million gallons of ethanol per year.

The ethanol industry also benefits from other government policies. Certain areas of the country are required by federal policy to blend an oxygenate into gasoline in order to help the fuel burn cleaner and reduce air pollution. Methyl tertiary butyl ether (MTBE) has been the primary oxygenate added to gasoline, but ethanol, which is also an oxygenate, can be used. A growing list of states has banned the use of MTBE after it was found to pollute ground water. This has also increased the demand for ethanol.

Several states also have policies promoting ethanol use, besides their MTBE bans. Minnesota, for example, requires all gasoline in the state to consist of 10% ethanol. Recent legislation requires this level to increase to 20% by 2013. In 2005, North Dakota temporarily reduced the state tax on ethanol blended gasoline fuel containing 85% ethanol (E85), from \$0.23 to \$0.01 per gallon.

The renewable fuels standard in the federal energy bill of 2005 also assures increased ethanol demand for several years in the future. This legislation requires that the combined use of ethanol and biodiesel must equal at least 4 billion gallons in 2006, and this requirement will increase each year to 7.5 billion gallons in 2012.

Federal and state governments have supported ethanol production for economic, environmental, and national security reasons. Ethanol production helps farmers by increasing industrial demand for corn, thereby raising its price. It adds value to corn and could be beneficial to rural economies by creating jobs. Ethanol production is also supported for environmental reasons, because it is cleaner than gasoline. In addition, production may benefit national security because it could help lessen U.S. dependence on foreign oil, although corn-based ethanol could replace only a small percentage of U.S. gasoline consumption.

Nearly all ethanol produced in the United States is made from corn, but it can also be made from a number of other sources of biomass including grasses, corn stover, and wheat straw. These sources of biomass, referred to as cellulosic materials, can be converted into ethanol through either enzymatic or chemical hydrolysis or synthetic gas fermentation. The cellulose molecules in plant matter consist of long chains of glucose. In the hydrolysis process, the cellulose molecules are broken down using enzymes or chemicals to free the sugar. The sugar is separated and then fermented to produce alcohol. In the synthetic gas process, biomass is converted into ethanol using a two-step process where the cellulose, hemi-cellulose, and lignin from grass and other biomass sources are converted to carbon monoxide, carbon dioxide, and hydrogen in a gasifier. The synthesis gas is then converted to ethanol, inert gases, and water in a bio-reactor.

Currently, there is no commercial production of ethanol from cellulosic materials. The cost of producing ethanol from cellulose in a large-scale commercial plant is not known, but it has been estimated to cost between \$1.00 and \$1.50 per gallon. The technology involved in producing ethanol from this process is much more advanced than that for corn ethanol, so it is more expensive. However, the cost has fallen substantially during the last two decades and is expected to continue decreasing with new advances in technology. Researchers at the University of Nebraska-Lincoln estimated the cost of cellulosic ethanol in 1982 was \$3.60 per gallon; by 1992, the cost had fallen to \$1.35, and by 2010, they estimate that the cost would be \$0.60 per gallon.<sup>1</sup> Ethanol at that price is equivalent to \$25 per barrel crude oil. Other, more conservative, estimates are that the cost could drop to between \$0.69 and \$0.98 per gallon

---

<sup>1</sup> University of Nebraska-Lincoln, Agricultural Research Division. "It's Grass, Grass, Grass for Biofuel". Research Nebraska. September 2000.

within the next decade or two. If costs continue to drop due to advances in technology, producing ethanol from cellulose could become a viable commercial industry, and by using a number of sources of biomass, U.S. ethanol production could increase substantially. Plans are currently underway for the world's first commercial-scale cellulosic ethanol plant to be built in Spain.

The conversion of biomass to ethanol was analyzed by Oklahoma State University.<sup>2</sup> They estimated that a processing plant needed to have a capacity of 100 million gallons of ethanol per year to reach efficiency. They calculated that the cost of producing ethanol could be \$0.98 per gallon with a yield of 91 gallons of ethanol per ton of biomass. The researchers at Oklahoma State University estimated that 40% of the total cost would be generated by plant operations. Producer/grower returns would be 30% of the total cost. Transportation would cost \$15.7 million per year per plant. Other costs would amount to \$13.7 million. With the current price of ethanol at \$1.25 per gallon, the gross return of the plant would be \$125 million, allowing for a net return of \$27 million for debt servicing and investor returns. In addition, there is a \$0.51 subsidy for the production of ethanol, which would bring the net return to \$78 million per year.

Ethanol could be produced in North Dakota from hay, wheat straw, corn stover, and switch grass. Hay production in North Dakota yields about 1.5 tons per acre, dry matter. Average wheat straw yields 0.75 tons per acre, and corn stover yields 2.1 tons per acre. Other grasses have the potential for higher yields than traditional forages. For example, switch grass has the potential to yield 5 to 6 tons per acre with proper management.

Table 1 shows potential producer returns for various biomass sources if the production cost is \$0.98 per gallon and the price of ethanol is \$1.25 per gallon. Wheat straw and corn stover, being residue, could provide additional income for producers. Tame hay biomass would provide a second market for hay in addition to livestock feed. Switch grass or other high yielding grass could become another cash crop in areas near a biomass ethanol plant. Returns to producers for switch grass would be very competitive compared to other cash crops.

Crop	Biomass yield (Tons/acre)	Ethanol production (Gallons/acre)	Return* (Dollars/acre)
Wheat straw	0.75	63.75	23.91
Corn stover	2.10	178.5	66.94
Tame hay	1.50	127.5	47.81
Switch grass	5.00	425	159.38

\*Producer returns assuming 30% share of plant operating returns, 85 gallons of ethanol per one ton of biomass, production cost of \$0.98 per gallon, and ethanol price of \$1.25 per gallon.

Using the conversion factors from Table 1, it is estimated the North Dakota could produce 763 million gallons of ethanol from wheat straw and corn stover from the 8.2 million acres of wheat and 1.8 million acres of corn in the state. Likewise, the United States could produce 17 billion gallons of ethanol from wheat and corn acres.

A major factor limiting ethanol production from cellulosic biomass is the area needed to maintain an efficiently sized plant. Assuming a high-yielding grass like switch grass, two hundred thousand acres in a 60 mile radius of the plant would be required to provide biomass to the plant. Converting wheat straw or corn stover would require between 0.48 million and 1.6 million acres.

## Export Credits and the WTO

*Paul Rienstra-Munnicha, Jeremy Mattson, and Won W. Koo*

The use of officially supported export credits for financing and stimulating export sales of agricultural products has been a source of ongoing negotiation at the World Trade Organization (WTO). Article 10.2 of the Agreement on Agriculture, which was agreed upon at the Uruguay Round, requires WTO member countries to develop disciplines to govern the provision of export credits, export credit guarantees, and insurance programs. Its implementation has not yet been finalized, even after the conclusion of the sixth WTO Ministerial Conference in Hong Kong in December 2005. In April 2004, without final agreements regarding the use of officially supported export credits for agricultural trade, the Dispute Settlement Body of the WTO ruled against the U.S. export credit program in favor of Brazil in the cotton case. The Appellate Body also upheld the finding by the WTO panel and concluded that the U.S. export credit guarantee programs provided under the U.S. Department of Agriculture's Commodity Credit Corporation (CCC), including the General Service Management (GSM)-102 and GSM-103 programs, and the Supplier Credit Guarantee Program (SCGP), constitute an export subsidy. It is unclear whether, in the future, the Dispute Settlement Body of the WTO will make similar rulings to discipline the use of officially supported export credits for other agricultural commodities as it did to the U.S. cotton exports.

As part of the ongoing WTO negotiations, the European Union (EU) has stated that they are willing to reduce their direct export subsidies if the United States and other countries are willing to reduce their export credits, food aid, and state trading enterprises. On August 1, 2004, the WTO General Council reached a decision on the framework to

<sup>2</sup> Browning, C.B., B.J. Barfield, et al. Pilot System: Biogas to Ethanol and Feedstock Analysis. Oklahoma State University. Stillwater. 2000.

**CAPTS Recent Publications**

*Analysis of the 2002 Farm Bill and New Farm Bill Alternatives*, by Richard D. Taylor and Won W. Koo, Agribusiness & Applied Economics Report No. 578, March 2006.

This report evaluates the 2002 farm bill and the effects of the individual programs within the bill on North Dakota net farm income. A stochastic simulation model was developed, using @Risk by Palisade. @Risk replaces the mean values for price and yield with a distribution of values for the eight major commodities grown in North Dakota. The counter-cyclical (target price) program, marketing loan program, and federal crop insurance benefits were separated and analyzed to determine which components were the most important to North Dakota producers. The U.S. Trade Representative offered to decrease the country's trade distorting subsidies by 60% if the European Union would lower its export subsidies 75%. The study estimates the impact of that plan. Two additional scenarios, a revenue insurance plan and an income insurance plan, were evaluated. Both plans were compared to the scenarios of no government support and the current legislation. The insurance plans support either revenue or income at the 70% level, as suggested by the World Trade Organization.

*The Mexican Sweeteners Market and Sugar Exports to the United States*, by Jose Andino and Richard D. Taylor, Agribusiness & Applied Economics Report No. 579, March 2006.

This study analyzes the effect of a potential increase in sugar imports from Mexico on the U.S. sugar price, and its consequences for producers and consumers. Additional sugar imports would cause a substantial reduction of sugar prices in the United States and consequently an increase in consumption. Due to low commodity prices, acreage and total production of beet and cane sugar in the United States are expected to fall. Under these circumstances, social welfare in the United States may increase; however, welfare benefits may go to food processors rather than consumer households. By contrast, increases in sugar imports would substantially hurt sugar beet and cane producers.

*Ethanol's Impact on the U.S. Corn Industry*, by Richard D. Taylor, Jeremy W. Mattson, Jose Andino, and Won W. Koo, Agribusiness & Applied Economics Report No. 580, March 2006.

This report evaluates the U.S. corn sector, especially changes in ethanol production. This analysis is based on a series of assumptions about general economic conditions, agricultural policies, weather conditions, and technological change. Changes in ethanol production will impact the production, feed use, and exports of corn, as well as the general price level. Federally mandated ethanol usage dictates the growth of ethanol production in the United States. Other factors have limited impact on corn price.

*21st Century Farm Policy: Challenges and Opportunities (Executive Summary)*, edited by Jeremy W. Mattson and Won W. Koo, Special Report 06-1, March 2006.

This publication covers the conference held last October by CAPTS, in collaboration with U.S. Senator Kent Conrad, entitled "21st Century Agricultural Policy: Challenges and Opportunities." The event featured discussion by nationally renowned experts on agriculture and trade, including former representative Larry Combest, who was Chairman of the House of Representatives Agricultural Committee during the 2002 Farm Bill debate. Speakers engaged conference participants in discussion on topics which included WTO negotiations, trade disputes, and other international trade issues and their impacts on U.S. farm policy; the implications of the growing federal budget deficit for U.S. farm programs; and the creation of innovative farm policy to meet these challenges.

*Progress of WTO Negotiations and their Potential Impacts on U.S. Agricultural Policy*, by Jeremy W. Mattson and Won W. Koo, Agricultural Policy Brief No. 11, March 2006.

Future U.S. agricultural policy could be influenced significantly by the World Trade Organization (WTO). The current round of WTO negotiations calls for cuts in permitted levels of domestic subsidies, export subsidies, and tariffs. While there was little progress at the Hong Kong ministerial meeting in December 2005, WTO members have committed themselves to finishing negotiations by the end of 2006. The Hong Kong talks grew out of an agreement the members reached on July 31, 2004, on the framework for the final phase of the Doha Development Agenda of global trade talks. The 2004 agreement provided a number of objectives and a framework for the final agreement, but much was left to be negotiated. Some additional progress was made at Hong Kong, but many details are still to be negotiated in 2006. This report is a summary of the agreements already made, the current status of negotiations, and the potential impact of an agreement on U.S. agricultural policy.

*The Relationship Between Prices of Natural Gas and Nitrogen Fertilizer*, by Richard D. Taylor and Won W. Koo, Agricultural Policy Brief No. 12, April 2006.

The price of nitrogen fertilizer has changed during the past 40 years. From 1960 to the mid 1990s, the price was related to the demand for fertilizer. After natural gas was deregulated in 1993, its price became volatile. After 1999, the price of nitrogen fertilizer became similarly volatile and followed the price of natural gas. There has been an increase in imports of nitrogen fertilizer, mainly due to lower-priced natural gas overseas. Meanwhile, although producers have increased fertilizer purchases, from \$1.4 billion in 1960 to \$11.4 billion in 2004, the share of fertilizer as a percentage of total farm expense has remained about the same (8.3%). This study develops a multiple regression model to estimate the relationship between fertilizer price, natural gas price, and the crop price index.

**To download these publications free of charge, please visit the CAPTS website ([www.ag.ndsu.nodak.edu/capts](http://www.ag.ndsu.nodak.edu/capts)).  
Questions? Contact Beth Ambrosio by telephone (701-231-7334) or email ([beth.ambrosio@ndsu.edu](mailto:beth.ambrosio@ndsu.edu)).**

**North Dakota State University**  
**Dept. of Agribusiness & Applied Economics**  
**P.O. Box 5636**  
**Fargo, ND 58105-5636**



---

continue with "multilateral" trade negotiations under the Doha Development Agenda. With respect to export competition, this framework agreement, also referred to as the "July Package," calls for the future elimination of all forms of export subsidies and better disciplines on export credits, state trading enterprises, and food aid.

Additionally, the July Package gives further instruction to the WTO Committee on Agriculture to establish consensual agreements on terms and conditions of officially supported export credits. These terms and conditions include maximum repayment terms, a minimum cash payment, payment of interest rates, minimum interest rates, repayment of principal, premiums in respect of coverage of risks under export insurance, reinsurance and export credit guarantees, foreign exchange risk, and the period of validity of export financing. For instance, to reflect the duration-life of agricultural products, the maximum repayment time of an export credit for most agricultural products has been negotiated for a period not exceeding 180 days.

If the WTO agreement is finalized, the maximum required repayment periods for the United States' GSM-102 and GSM-103 programs will need to be reduced. GSM-102 and GSM-103 currently have maximum repayment periods of 3 years and 7 years, respectively. These would have to be reduced to 180 days. Of the current programs, only the SCGP, which has a maximum repayment period of 180 days, would be allowed to assist U.S. agricultural exporters.

Table 2 shows the amount of funding allocated and approved in recent years for the three U.S. export credit programs. Whether or not the United States is heading toward restructuring its export credit programs due to the Cotton Ruling and/or WTO negotiations, the CCC did not allocate any funding to the GSM-103 program for fiscal year 2005. Only the GSM-102 and SCGP are still active. The table shows that since 1998, the CCC has increased its fund allocation to the SCGP and significantly approved export financing under this program. Regarding the GSM-102, the amount of allocation has been relatively constant, at about \$4.5 billion in most years, and the approved amount for export financing under this program is also relatively stable, usually just under \$3 billion. The GSM-102 is the most-used export credit program. (Table 2 is located on attached page.)

Table 2. Funding for U.S. Export Credit Programs

FY	GSM-102 (Million)		GSM-103 (Million)		SCGP (Million)	
	Allocations	Approval	Allocations	Approval	Allocations	Approval
1998	\$5793.00	\$3962.52	\$310.00	\$56.00	\$293.00	\$18.18
1999	\$5121.00	\$2955.10	\$377.00	\$44.20	\$361.00	\$46.02
2000	\$4550.00	\$2927.79	\$188.00	\$32.60	\$466.00	\$116.37
2001	\$4653.00	\$2958.63	\$193.00	\$42.30	\$720.00	\$225.98
2002	\$4581.00	\$2935.99	\$165.00	\$0.00	\$1127.00	\$452.14
2003	\$4528.00	\$2545.19	\$125.00	\$7.60	\$1372.00	\$669.97
2004	\$4484.00	\$2926.17	\$99.00	\$0.00	\$1542.00	\$790.38
2005	\$4546.50	\$2169.81	\$0.00	\$0.00	\$1370.00	\$454.71