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Energy agriculture - where's the nitrogen?

Don Hofstrand
Iowa State University, dhof@iastate.edu

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Energy agriculture - where's the nitrogen?

by Don Hofstrand, value-added agriculture specialist, co-director AgMRC, Iowa State University Extension, 641-423-0844, dhof@iastate.edu

Ninth in a series

The ethanol industry requires large amounts of corn as a feedstock. A hundred million gallon ethanol plant will require about 35 million bushels of corn annually. By comparison, the average Iowa corn production per county last year was slightly over 20 million bushels.

As the ethanol industry expands there will be a strong incentive to expand corn acreage. This will create a substantial increase in the demand for nitrogen fertilizer. Corn is the largest consumer of nitrogen fertilizer accounting for close to half of the total U.S. agricultural usage. Moreover, an increase in corn acreage usually results in a decrease in soybean acreage. Because soybeans are a legume, they symbiotically fix nitrogen with rhizobia bacteria and do not need nitrogen fertilization.

As shown in Table 1, U.S. corn acreage increased by 15.3 million acres in 2007 while soybean acreage decreased by 11.8 million acres. Moving this large number of acres away from soybeans to a crop that consumes large amounts of nitrogen will increase U.S. nitrogen fertilizer usage.

Table 1. U.S. Corn and Soybean Acreage (2006 & 2007)

	Acres (million)		
	2006	2007	Change
Corn	78.3	93.6	+15.3
Soybeans	75.5	63.7	-11.8

Source: USDA

There are currently about 100 ethanol plants under construction in the U.S. that will consume about 2.8 billion more bushels or 18 million more acres of corn when they are completed. So we can expect significant growth in the demand for nitrogen fertilizer to continue over the next few years.

Nitrogen fertilizer prices have increased significantly over the last 35 years as shown in Figure 1. Because nitrogen is a major input

continued on page 2

Handbook updates

For those of you subscribing to the handbook, the following updates are included.

Deductible Livestock Costs for Adjusting 2007 Income Tax Returns – B1-15 (1 page)

2006 Farm Cost & Returns – C1-10 (14 pages)

Please add these files to your handbook and remove the out-of-date material.

continued on page 6

Inside . . .

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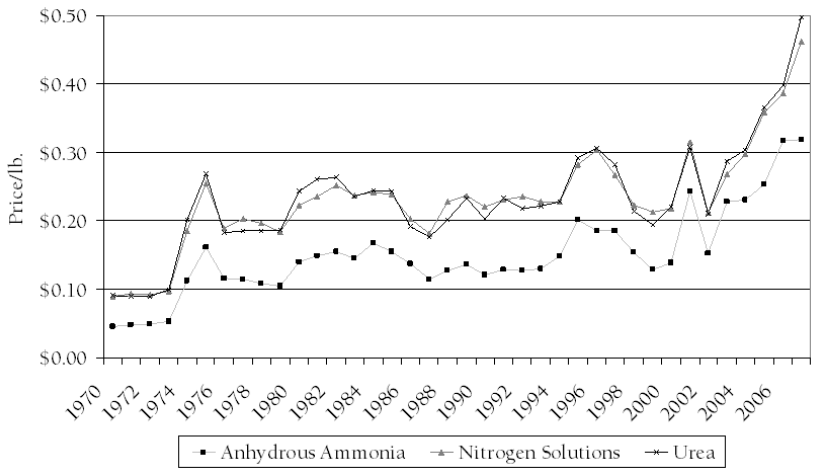
Ag Decision Maker is compiled by:
Don Hofstrand, dhof@iastate.edu
Extension Value-added Specialist and
Co-director of the Agricultural Marketing Resource Center

Energy agriculture - where's the nitrogen?, continued from page 1

Figure 1. U.S. Nitrogen Fertilizer Prices ($ per nutrient pound)



Source: USDA

for producing corn, a large increase in nitrogen fertilizer price has a significant impact on the cost of raising corn. The supply and price of nitrogen fertilizer over the next several years will greatly impact the economics of increasing corn production to meet the needs of the burgeoning ethanol industry while continuing to supply the livestock sector and corn export markets.

Role of ammonia in nitrogen fertilizers

Ammonia is the major feedstock for production of nitrogen fertilizers. Anhydrous ammonia (ammonia without water) consists of 82 percent nitrogen and 18 percent hydrogen. When ammonia (NH_3) is manufactured, the nitrogen (N_2) comes from the air and the hydrogen (H) comes from natural gas. Also, the large amount of energy required to combine N_2 gas and H comes from natural gas.

Although anhydrous ammonia can be applied directly to the field for crop use, ammonia is also the feedstock for other nitrogen fertilizers such as urea, nitrogen solutions, ammonium nitrate, and for the nitrogen contained in di- and mono-ammonium phosphate fertilizers. So the cost of ammonia is a major factor in determining the price of nitrogen fertilizers.

Role of natural gas in ammonia production

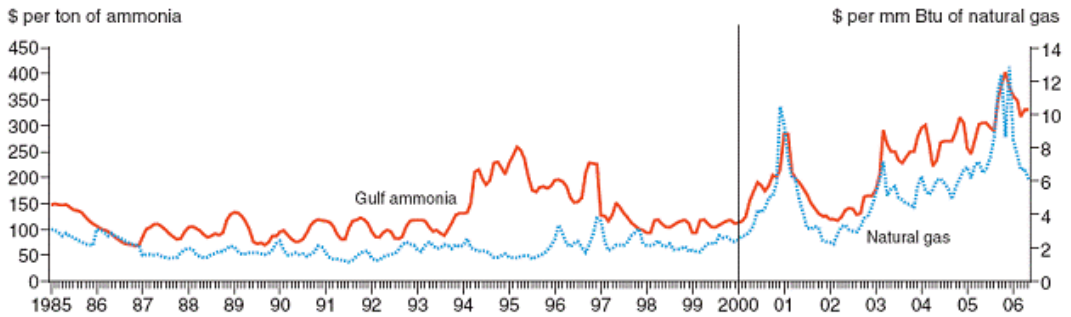
Natural gas is the major ingredient used in making ammonia. It accounts for 80 percent or more of the cost of producing ammonia. Ammonia prices have been closely correlated with natural gas prices, especially since 2000, as shown in Figure 2. It also shows that price increases of natural gas have driven ammonia price.

So, the cost of natural gas is the major factor in determining the price of ammonia and the cost of ammonia is a major factor in determining the price of nitrogen fertilizer.

Changes in the U.S. ammonia industry

After many years of expansion, the ammonia industry has recently gone through difficult times. As shown in Figure 3, U.S. ammonia production capacity increased gradually until 2000 when it started to decline. Up until 1998, production capacity was fully utilized. After 1998, production started to drop and production capacity was idled. From 2000 to 2006, ammonia production declined from 18 million tons to 10 million tons, a 44 percent decline. During the same period, the

Figure 2. Monthly U.S. Prices of natural gas and ammonia



Source: USDA, Economic Research Services using data from TFI (b)

continued on page 3

Energy agriculture - where's the nitrogen?, continued from page 2

number of ammonia plants declined from 40 to 25 and production capacity declined from 20 million tons to 13 million tons.

Increased imports of nitrogen fertilizers

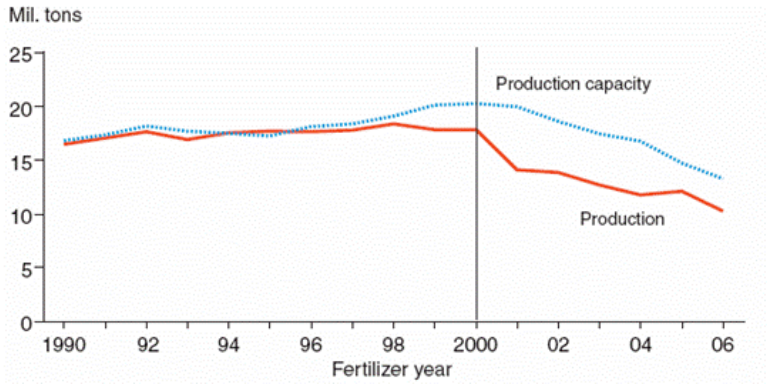
The deficit in nitrogen fertilizers during this period was filled with imported fertilizer. As shown in Figure 4, the percentage of the nitrogen fertilizer that we import has increased substantially during recent years. Ten years ago we imported 35 percent of our usage. In 2005 we reached a high of almost 80 percent.

The Trinidad and Tobago Republic (a group of islands in the southern Caribbean) is currently the largest exporter to the U.S. Canada, Russia and Ukraine also are major suppliers.

The types of imported nitrogen fertilizer are shown in Figure 5. The imports of each of the three major types of nitrogen fertilizer (anhydrous ammonia, urea and nitrogen solutions) have increased over the last ten years.

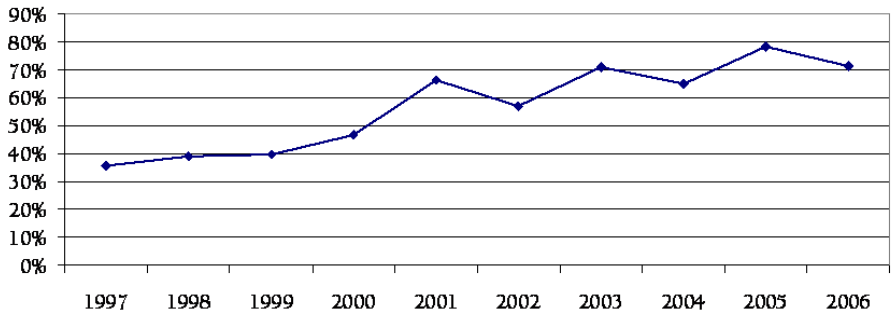
Because natural gas is such an important feedstock in producing ammonia, low cost natural gas provides a powerful economic advantage for ammonia production. As shown in Table 2, natural gas prices are substantially lower in many other parts of the world. Several of these locations

Figure 3. U.S. ammonia production and production capacity



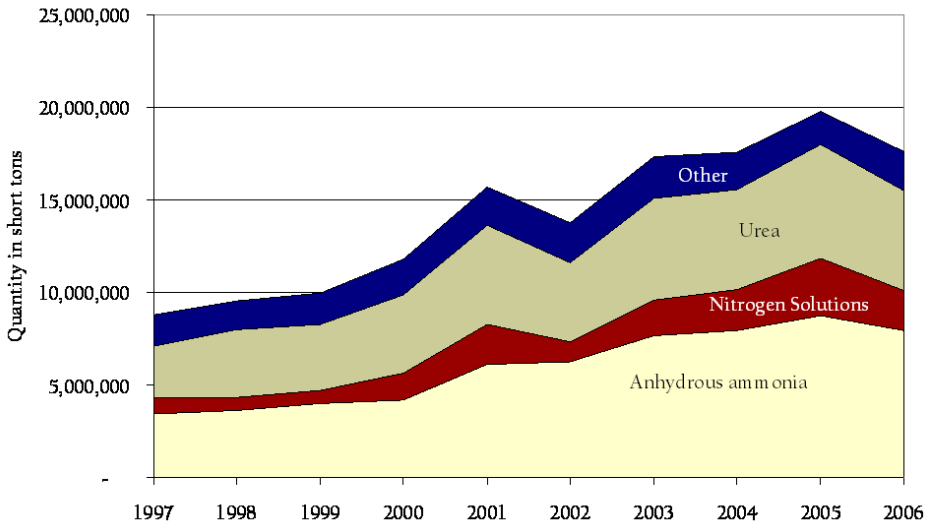
Note: Fertilizer year runs from July of the preceding year to June of the year indicated in the chart.
Source: USDA, Economic Research Service using capacity data from IFDC and production data from DOC.

Figure 4. Percent of Nitrogen Fertilizer Imported



Source: ERS,TVA, AAPFCO/TFI.

Figure 5. Nitrogen Fertilizer Imports



Source: USDA, Economic Research Services

continued on page 4

Energy agriculture - where's the nitrogen?, continued from page 3

Table 2. Natural Gas Prices by Country, 2003 *

Country	Price
United States	$5.50
Western Europe	3.70
Trinidad	1.85
Ukraine	1.50
Argentina	1.25
Indonesia	1.20
Russia	.80
Venezuela	.70
Middle East	.60
North Africa	.40

* U.S. Dollars per MMBtu (10,000 million British thermal units)
Source: PotashCorp: "Fertilizer Market Outlook 2004"

can produce ammonia, ship it to the U.S. and sell it at a lower price than that of domestic producers. So we are losing our ammonia industry to foreign suppliers.

Future sources of ammonia and nitrogen fertilizers

As long as U.S natural gas prices remain at a substantial premium to world prices, the economic incentive to import nitrogen fertilizers and/or their major feedstock ammonia will be strong. Because crude oil and natural gas prices tend to move together, the recent rise in crude oil prices could be a precursor for higher natural gas prices.

These imports will come from countries with substantial unused natural gas reserves. The largest of these reserves tend to be located in countries with large crude oil reserves. The Middle East, Eastern Europe and the former USSR possess about 75 percent of the world's reserves of natural gas (Energy Information Administration). In the long-run, our efforts to wean ourselves from foreign energy sources with home-grown corn ethanol could be thwarted if we are dependent on foreign sources of ammonia and nitrogen fertilizers from unstable countries.

However, natural gas price is not the only factor to consider. The cost of shipping is another. Ammonia is a hazardous material and must be transferred in pressurized containers. An upgraded fertilizer like urea that is a low analysis product is also expensive to transport.

According to Wen-yuan Huang with USDA-ERS, countries geographically close to the U.S. with low natural gas prices have an advantage in being a major supplier of the U.S. Although located next to the U.S., Canada has relatively high natural gas prices. Russia and Ukraine have low natural gas prices but are limited by high transportation costs. The Middle East and North Africa have limited production capacity.

Increases in ammonia imports (and other nitrogen fertilizers like urea) are most likely to come from the Republic of Trinidad and Tobago due to its low natural gas prices and proximity to the U.S. (Wen-yuan Huang). However, the price of ammonia may need to be competitive with the alternative of exporting LNG (liquefied natural gas) to the U.S. High U.S. natural gas prices, combined with current efforts to develop the infrastructure in the U.S. to receive LNG, would be a viable alternative for the island republic.

Venezuela probably has the greatest advantage in supplying U.S. ammonia and nitrogen fertilizers. Its large reserves of natural gas (eight times larger than Trinidad and Tobago) and its proximity to the U.S. provide great potential. However, the production capacity is not developed in Venezuela. In addition, its instability may be a caution for relying on Venezuela as a dependable supplier of ammonia.

So, where will the nitrogen fertilizers come from to supply the increased needs for the growing U.S. corn ethanol industry? And what will it cost? This adds another element of uncertainty to an already uncertain agricultural production industry.

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continued on page 5

Energy agriculture - where's the nitrogen?, continued from page 4

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Deferring crop sales to reduce income tax liability

by Steven D. Johnson, Ph.D., Farm & Ag Business Management Field Specialist, Iowa State University Extension, (515) 261-4215, sdjohns@iastate.edu, www.extension.iastate.edu/polk/farmmanagement.htm

According to the USDA Economic Research Service, U.S. net farm income for 2007 is forecast to be $87 billion. If realized, that would be an increase of $26 billion over 2006 and $30 billion higher than the average for the previous 10 years. Most Iowa farms face good 2007 crop yield prospects, and now the challenge will likely be deferring a portion of their new crop sales until the following tax year to avoid paying higher income taxes.

Many row crop operations are now busy with harvest and may not be aware of their potential income tax liability.

A solution is to use a CCC (Commodity Credit Corporation) marketing loan. These loans can be established at the local USDA Farm Service Agency (FSA) office once the crop is harvested and beneficial interest is maintained. The proceeds are at a pre-established county loan rate (5.125% in November). Interest will accrue up to 9-months when the loan plus interest must be repaid and the interest deducted as an expense.

The loan proceeds would be made at the county loan rate, which is more than a $1 per bushel for corn and $3 per bushel on soybeans below the current cash price. Producers need to manage this difference on unpriced bushels, as the loan only protects price at the county loan rate. A producer could then use the loan proceeds to reduce interest costs on existing loans, pay some 2007 bills and prepay up to 1/2 of 2008 crop expenses. Use of the loan proceeds can thus be treated in one of two different ways for tax purposes, either as a "loan" or as "income."

Some farms choose to treat this loan like any other loan and not include the proceeds as income. When a producer treats the loan proceeds as a "loan" the actual loan repayment is not a deductible expense, but the interest when paid would be.

By electing the "income" method, the CCC loan is treated as income in the tax year the loan is received. The loan repayment and interest are deductible expenses.

With high net farm incomes likely beyond 2007, I recommend that producers contact their income tax preparer regarding the implications for CCC marketing loans and determine their own income tax strategies.