**Forecasting Crop Input Costs for 2001**

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Farm profitability is determined by the subtracting variable and fixed costs from gross revenue. There has been considerable interest in developing tools, e.g., futures/options/contracts, for stabilizing output prices; however, changes in input costs can have a significant impact on overall farm profitability. In a 1999 publication, Nivens, Kastens, and Dhuyvetter concluded that the single greatest factor affecting farm profitability over time was cost management. Yet, for the most part little consideration is given to a change in input costs, i.e., generally producers set a target (maximum) yield goal and apply inputs accordingly. Changes in fuel prices are often times considered the major factor affecting a few of the major inputs such as diesel, fertilizer, and drying costs. The objective of this publication is to provide a short-term price input price forecast for the 2001 crop year. Knowing input costs ahead of time is important for: 1) accurately providing your lender an estimate of your required operating capital requirements for the upcoming year; 2) you may change crop mix should there be a considerable difference in expected costs between crops; and 3) if corn is produced, changes in drying costs may cause the crop to be harvested closer to the required moisture level to save on drying costs.

Figure 1 is used to graphically depict the historical nearby crude oil futures price over the past 15 years. The crude oil futures price has been fairly stable other than during the mid 1980s, during the Gulf war, and the past 3 years. Obviously, diesel and propane price move together with crude oil price as an energy product. Also, fertilizers and chemicals require a certain level of crude by-product in their production and in processing the goods. Thus, the crude oil futures is used as an explanatory variable in forecasting input prices. The inputs analyzed here are diesel, propone, anhydrous, UAN, and Urea.

**Methodology**

Forecasting prices can be complex or simple. For this analysis a simple forecast is made. That is, a complex forecast would include changes in supply and demand factors for each product. For this analysis, a “simple” monthly forecast is developed based on seasonality and the crude oil futures price. Specifically, the form of each model, for month \( t \), is:

\[
\text{Product Price}_t = f(\text{Product Price}_{t-1}, \text{Nearby Crude Oil Futures}_t, \text{Month Variables to capture change in seasonal supply-demand factors})
\]

It should be noted that this is part of an ongoing project to build short-term forecasts of crop input costs. The results presented here are in the process of being improved upon; however, the information presented indicates the best information available at this time. I would like to acknowledge Kevin Dhuyvetter for help in assimilating the data and for vital comments during the model specification stage. I would also like to acknowledge Mary Albright, Koch Industries, and Blue, Johnson, & Associates for some of the data used.
The process used to estimate these relationships was multivariate regression analysis. Parameters were estimated so that a forecast could be made using the monthly crude oil futures price, lagged own price, and seasonal values. Upon estimating the price several months in the future, the lagged price used was the estimated price from the previous month. For example, the forecasted April 2001 diesel price today was computed as:

\[
\text{Diesel Price}_{\text{April,2001}} = \text{Constant} + \text{coef1} \times \text{April,2001 Crude Oil Futures in August 2000} + \text{coef2} \times \text{Forecasted Diesel Price}_{\text{March, 2001}} + \text{coef3} \times \text{April Seasonal Variable}
\]

\[
\text{Diesel Price}_{\text{April,2001}} = 0.0254 + 0.0253 \times 29.23/\text{barrel} + 0.188 \times 1.295/\text{gallon} + (-0.129) \times 1
\]

**Data**

Data used for the forecasting of input prices is monthly. Data used in this study covered the period 1989 through July 2000. Crude oil futures price data was obtained from Bridge. The cash prices for the products analyzed here were provided by Marty Albright, Koch Industries, Wichita, KS, and Blue, Johnson, & Associates (energy consultants), California. Cost of production data for corn and soybean was taken from a University of Missouri Farm Management Newsletter titled (FM 2000-1), 1998 *Missouri Crop Costs and 2000 Crop Cost of Production Estimates*, authored by Ray Massey.

**Historical and Projected Input Prices**

Figures 2 through 6 are used to provide a graphical synopsis of historical and projected prices using the methodology described above. The dark line indicates the historical trend and the lighter line indicates the monthly projected price between August 2000 and December 2001. As would be expected, the two most effected inputs from an increase in oil prices are diesel and propane (Figures 2 and 3). Both prices are expected to remain above the historical level during the next 16 months. Of primary importance for this fall is the cost of propane for drying grain.

Given the large supply of grain, there could be greater than expected demand for propane should the crop come out the field high in moisture. This would drive up the cost of drying grain considerably. However, early planting and good drying weather will likely provide many producers the opportunity to let mother nature pick up the bill for drying corn in the field this fall.

The three fertilizer prices graphed indicate prices will remain above where they were a couple years ago, but in terms of historical levels the price of Urea, Anhydrous, and UAN should stay below those levels. The price increase will amount to a few pennies per bushel in additional cost, but a few pennies is a big deal on a larger number of bushels and when prices are as low as they are today.
Chemical Costs

Figures 11 and 12 graphically depict the annual per gallon price paid by producers for 2,4-D and Atrazine, respectively. Annual data was only available for chemicals. Therefore, it was not possible to estimate the relationship between chemicals and crude oil price. The figures, however, indicate that the price of chemicals has trended upward over time, which is likely in proportion to the rate of inflation. One interesting point is that during the last few years the price has remained flat. A possibility for this is that the development of Roundup Ready® seed has allowed for greater demand for Roundup™, which in conjunction with Roundup™ coming off patent has caused the price of substitute chemicals to remain flat.

Per Bushel Cost Sensitivity

Figures 7 and 8 indicate the per bushel cost of corn and soybean for alternative levels of oil price. The yields used are 112 bushel for corn and 36 bushel for soybean. The change in per bushel corn cost is much greater than the change in per bushel soybean cost. Why? Because of greater fertilizer use for corn and corn drying costs. Two years ago the crude oil price was around $16/barrel, and the expected spring 2001 prices about $28/barrel. Currently, we are looking at a $0.10/bushel increase in the corn per bushel cost of production in 2001 compared to 1999. For soybean, the change in per bushel cost is expected to be closer to $0.04/bushel.

Change in Operating Finance Requirements

Of particular concern to producers is obtaining adequate operating finance to produce the crop. Thus, producers will need to make lenders aware of the anticipated additional funding requirements due to increased production costs. Figures 9 and 10 show the additional production costs required due to an increase in oil costs from $16/barrel to $28/barrel. This change in value approximates the change in oil price that occurred between 1999 and that expected for 2001. The change in operating monies required is listed for alternative acreage levels. For a producer with 400 acres of corn, an additional $4000 in operating money may be required. For a 400 acre soybean producer, around $1000 extra operating money may be required.
Figure 1. Historical Crude Oil Nearby Futures Price

Figure 2. Historical and Short-term Diesel Price Projection
Figure 3. Historical and Short-term Propane Price Projection

Figure 4. Historical and Short-term Anhydrous Price Projection
Figure 5. Historical and Short-term UAN Price Projection

Figure 6. Historical and Short-term Urea Price Projection
Figure 7. Difference in per Bushel Cost of Production for Corn for various Crude Oil Prices (diesel, propane, and UAN prices effected).

Figure 8. Difference in per Bushel Cost of Production for Soybean for various Crude Oil Prices (diesel price effected).
Figure 9. Additional Operating Monies required for Varying Levels of Corn Acreage due to an increase in the Crude Oil Price from $16 to $28 per Barrel

Figure 10. Additional Operating Monies required for Varying Levels of Soybean Acreage due to an increase in the Crude Oil Price from $16 to $28 per Barrel
Figure 11. Historical Price of 2,4-D (source: USDA)

![Graph showing historical price of 2,4-D](image_url)

Figure 12. Historical Price of Atrazine (source: USDA)

![Graph showing historical price of Atrazine](image_url)