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Impacts of Increased Demand on the U.S. Soybean Sector

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The Food and Agricultural Policy Research Institute (FAPRI) located at the University of Missouri and Iowa State University maintains structural econometric models for the major crop and livestock commodities. The scope of these models covers not only the United States but also the major importing and exporting countries and regions around the world.

Models for both the U.S. and international soybean sectors are maintained by FAPRI. These models include both soybeans and the products, soybean meal and oil. Equations are estimated for the major supply and demand components of the soybean sector. In addition, by closing the markets with the market-clearing identity, equilibrium prices for beans, meal, and oil can be generated.

The detail in the FAPRI modeling system has been steadily enhanced. For example, acreage response in the U.S. is currently estimated at the regional level. Acreage and yield equations are maintained for the four major production regions: the Corn Belt, Northern Plains, Delta States, and Other U.S. (primarily the Southeast). This better allows the incorporation of different production practices such as the ability to double-crop soybeans with another crop such as wheat. In addition, the impacts of different competing crops can be handled in a better fashion.

The primary use for soybeans is crushing to produce the co-products, soybean meal and oil. The quantity of soybeans crushed is estimated as a function of the crushing margin. Once soybean crush is determined, meal and oil production follow directly given some crushing yields. In estimating the demand for soybean meal, both relative feed prices as well as livestock prices and numbers are incorporated. Livestock numbers appear as an aggregate animal index which weights the individual livestock categories together based on feed requirements. A similar index has been developed for livestock prices. Soybean oil demand takes into account relative prices of vegetable oils, population, and income.

U.S. exports of soybeans, meal, and oil are determined through interaction with the international models. In the FAPRI modeling system, the U.S. is viewed as the residual supplier. As a result, the response of U.S. exports incorporates the responsiveness of production and consumption decisions in other countries. The international oilseeds model contains approximately twenty countries and regions. The structure is similar to the U.S. model with equations estimated for the major supply and demand components. Where appropriate, the models incorporate relevant policy parameters. Also, the impacts of competing oilseeds such as rapeseed and sunflowers are included.

Econometric models provide a useful tool for analyzing agricultural markets. Of particular interest are the impacts of an exogenous shock on prices and quantities. These shocks embody the supply and demand elasticities in the model.

One such example of these shocks would be to increase U.S. soybean export demand by 100 million bushels. This could be caused by a number of factors such as an income change or changes in exchange rates. If the U.S. market experienced the full impact of this demand in one year, the short-run price impact would be an increase of $0.60-$0.70 per bushel. If we assume that this is a
sustained shock, the long-run impacts can also be analyzed. In later years, producers would respond to the higher prices with increased plantings. This additional supply would dampen the initial price increase, and the long-run effect would be a $0.25-$0.30 increase in price. It should be reiterated that the short-run price increase assumed the full demand shock was seen in period one. If the demand increase was more gradual, the industry could adjust and the long-run price effect of $0.25-$0.30 would be more relevant.

The increased soybean prices would pressure crush margins, and a marginal decline in soybean crush would occur. The result would be higher soybean meal and oil prices. The increased meal prices would translate into higher feed costs for the livestock sector.

The price impacts discussed so far have assumed a shock which directly changes soybean exports. There are a number of other sources that can generate the additional demand. For example, the increased export demand could come in the form of higher meal or oil exports. Also, the size of the livestock industry has a direct bearing on soybean sector prices. Increased feed demand due to increased livestock production would also translate into an increase on soybean prices.