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Demand for California Agricultural Commodities

by Richard D. Green

UC Research shows that demand for many California agricultural commodities is quite unresponsive to price changes.

Agricultural producers, policy makers and other decision makers can benefit from understanding the concepts of "demand" and being aware of the nature of demand for commodities. Studies of the demand for individual commodities are an important part of the research conducted in the Department of Agricultural and Resource Economics at UC Davis. This paper explains demand concepts and the economic implications of changes in demand. The focus of the paper is on policy analysis. Results are presented for selected commodities from applied demand studies by researchers from our department. These research findings illustrate the effects of changes in supply and demand on prices and revenues. Several commodities are mentioned but the paper focuses on two rather different commodities to illustrate some important demand concepts: a tree crop, almonds, and a field crop, lettuce. Almonds are a perennial crop that is storable, and lettuce is a perishable crop that must be refrigerated immediately after harvest.

First, consider the demand for almonds. The demand for California almonds depends upon their price, the price of substitutes for almonds (for example, filberts, pecans, walnuts, and imported almonds), per capita income of consumers, and many other demographic, social and economic factors. If the price of almonds increases, given all other factors remain the same, then the quantity demanded of almonds will decrease.

This result is known as the **law of demand**. Changes in the price of almonds result in movements up and down the demand curve. Changes in per capita income, advertising and promotional campaigns and prices of substitutes cause shifts in the demand function. If an effective advertising and promotional campaign for almonds is conducted domestically or if new foreign markets for almonds are created, then the demand curve for almonds will shift outward and,

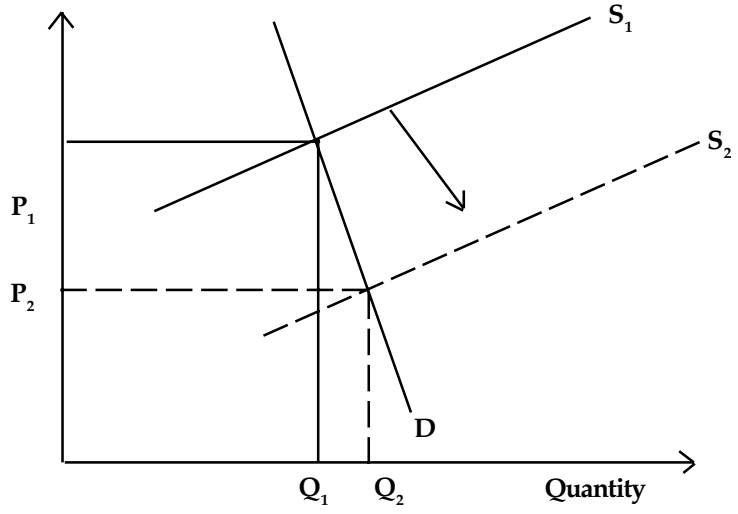
DEMAND—continued on page 2

In this issue...

In the next issue...

Agricultural Commodity Policy in an Historical Context
Daniel A. Sumner

Figure 1. Effects of a Shift in Supply on Equilibrium Price Given an Inelastic Demand



Demand—*continued from page 1*

for a given supply, this means a higher equilibrium price and quantity for almonds in the short run. This benefits almond producers.

Researchers in the Department of ARE at UC Davis have estimated the own-price elasticity of demand for U.S. almonds to be approximately -0.83. An own-price elasticity is the percentage change in the quantity demanded of a commodity resulting from a one percent change in the price of the commodity. For example, if the price of almonds increases by 10 percent, then the quantity demanded of almonds would decrease by 8.3 percent. If the value of the own-price elasticity for a commodity is less than one in absolute value, then the demand curve associated with that commodity is said to be inelastic. What are the economic implications of an inelastic demand? Changes in the supply of almonds due to weather or other factors will have a significant effect on the price of almonds. An increase in the supply of almonds (from S_1 to S_2), given the inelastic or steep demand function (D) for almonds, will significantly decrease the price of almonds (Figure 1). Supply reductions will enhance the price of almonds. These short-run gains in supply restrictions dissipate in the long-run as increased prices will attract new producers of almonds, increasing supply, and thereby reducing the equilibrium price of almonds. With respect to revenues, an inelastic demand means that revenue rises (falls) as the quantity marketed falls (rises).

Since almonds can be stored, an inelastic demand has important reserve policy implications. Marketing strategies for California almonds may consist of diverting supply from the edible market in large-crop years, thereby increasing industry revenues.

Exports of almonds accounted for about 60 percent of California industry's sales during the 1991/92 crop year. Exports have exceeded domestic sales for almonds annually since the 1973/74 crop year. The own-price elasticity of the total demand for almonds is a weighted average of domestic and foreign demand elasticities. Some export markets for almonds have elastic demands; however, the overall demand for almonds is still inelastic.

A second example of demand analysis includes a farm price determination model for produce commodities developed by Sexton and Zhang, agricultural economists at the University of California, Davis. Their results yield an estimate of the elasticity of demand for California iceberg lettuce of about -0.16, which is consistent with previous estimates of between -0.14 and -0.54. Given the highly inelastic demand and perishable nature of produce commodities, what are the economic implications for these products? First, there are dramatic swings in the price of these commodities given a variable supply. Second, since fresh produce is perishable, there does not exist the potential for reserve marketing strategies such as those for storable commodities like grains and tree nuts. Marketing efforts must be directed toward expanding demand and opening new markets. For example, ready-to-eat salads have emerged as an important "processing" market outlet for lettuce, with upwards of 25 percent of the crop now used in processing.

Most agricultural commodities have inelastic demands; see Table 1 for examples from selected commodities. All of the estimated own-price elasticities for the commodities are inelastic. Some of the economic implications for inelastic demands of agricultural commodities have already been discussed. Efforts to promote domestic or expand export markets can result in increases in both prices and output. When short run supply is inelastic, demand shifts can be effective in raising prices. Changes on the supply side can reap large benefits, especially in the short run. The long-run effects are less dramatic because of competition.

DEMAND—continued on page 9

Demand—*continued from page 2*

Table 1. Estimates of Own – Price Elasticities for Selected Commodities

Commodity	Own - Price Elasticity
Food (in general)	–0.42
Almonds	–0.83
California Iceberg Lettuce	–0.16
California Table Grapes	–0.28
California Prunes	–0.44
Dried Fruits	
Figs	–0.23
Raisins	–0.67
Prunes	–0.35
California Avocados	–0.86
California Fresh Lemons	–0.34
Meats	
Beef	–0.84
Pork	–0.79
Poultry	–0.58
Fish	–0.57
California Residential Water	–0.16

Sources: All of these empirical estimates are reported in research publications by faculty of the Department of ARE at UC Davis. The exact references can be obtained by writing the author.

An important policy implication follows from an inelastic demand for a commodity. For example, the own-price elasticity for residential water in California was found to be about -0.16. Thus, consumers are not very responsive to changes in the price of water. In order to reduce the demand for water, new conservation policies may need to be implemented such as more efficient toilets that use less water. In fact, several measures are already being used in conjunction with pricing policies to reduce the demand for water.

Cross-price effects enter in the demand equation when analyzing the effects of changes of prices of substitutes on the quantities demanded of the commodity under consideration. If the price of, say, walnuts decreases relative to the price of almonds, then some consumers will switch from buying almonds to buying more walnuts. In addition, an analysis of advertising and promotion expenditures needs to take into account the effects of the promotion of substitutes of the commodity being investigated. For example, increasing the promotional expenditures for beef may not result in much change in beef prices and sales if the pork industry matches or spends more in promoting pork. On net, advertising and promotion in the meat industry over the long run may not increase sales overall, but advertising may cause significant changes in market shares of various meat products.

In conclusion, an understanding of demand concepts is essential in order to understand the economic implications of changes in agricultural markets. With most agricultural commodities characterized by inelastic demands, changes in supply can have large impacts on prices and revenues. These effects can be mitigated by restricting supply in certain years, expanding domestic and export markets, and responding to changes in consumers' preferences. One of the major policy implications from an inelastic demand combined with public research efforts enhancing production, is that consumers have been the primary beneficiaries of public research efforts in agriculture. Consumers have benefited tremendously from lower food prices and currently only about 14 percent of consumers' disposable income is devoted to food expenditures.

Richard D. Green is a professor of agricultural and resource economics at UC Davis. His current research focuses on econometrics, demand analysis, price analysis, advertising and promotion. To obtain additional information on this subject, contact Dr. Green at (530) 752-1534 or send an e-mail to green@primal.ucdavis.edu. *Visit Dr. Green's Web page at* http://www.agecon.ucdavis.edu/Faculty/Richard.G/Green.html.