

Lemon Industry in California

market interactions among fresh lemons and lemon products affect consumer purchase behavior, grower prices, and returns

Sidney Hoos

The following article is the second of a series on the economic situation and marketing problems of the California lemon industry.

One of the major links between the production-marketing of lemons—and the income received by the grower—is the nature of the demands for fresh lemons and lemon products.

How the demands are affected by the quantities of lemons—fresh and products—the market will absorb at various prices and how the money income from the crop varies in response to changes in the volumes marketed are important.

Demand is a term representative of various quantities of a product that would be purchased at various corresponding prices in a given market, at a given time, and under given conditions. The given conditions include tastes and preferences of buyers, amounts of buyer-money available, and prices of other goods and services.

Among the problems in lemon marketing, the nature of the demand for lemons is of crucial importance for two reasons. First, there is the question of how changes in quantity are related to changes in price for a given lemon demand situation represented by that situation's corresponding demand schedule. Second, there is the question of how the demand schedule—as a whole—responds to changes in the level of factors such as income and temperatures.

The relation between price changes and quantity changes—price elasticity—at a specific point on the demand schedule measures the percentage change in quantity which occurs in response to the corresponding percentage change in price. Price elasticity equals the percentage change in quantity, divided by the corresponding percentage change in price. The changes considered should be small, and the price elasticity pertains to the relationship at the price quantity point from which the changes are considered. The price-elasticity may, and usually does, vary from point to point on a given demand schedule.

When the absolute value of the price elasticity is greater than one, at a certain point on the demand schedule, the demand is elastic at the price quantity combination at that point; when the absolute value is less than one, at a certain point, the demand is inelastic at that point; and

when the price elasticity is equal to one, the demand is said to be of unit-elasticity.

Whether the demand is elastic or inelastic with respect to price is of prime importance to marketing plans and decisions. The price elasticity demands reflect the behavior of gross money revenue from sales as they are increased or decreased. When the price and the quantity change, on a given schedule, the resulting gross revenue increases or decreases depending upon the price elasticity. When the demand is elastic at a given price quantity combination on the demand schedule, a small decline in price results in an increase in total money revenue from sales; but when the demand is inelastic, a small decline in price results in a decrease in total revenue. Conversely, a small increase in price from an elastic point on the demand schedule results in a decrease in total revenue, and a small increase in price from an inelastic point results in an increase in total revenue. Knowledge about the values of the price elasticities permits inferences as to the money effects associated with marketing different quantities of lemons.

The demand for fresh lemons tends to be inelastic; somewhat decreased shipments to market not only bring a somewhat higher price per unit but total returns are increased. It is for this reason that the entire lemon crop is not shipped to the fresh market.

Economic-statistical analyses of fresh lemons—both summer and winter, when considered separately—generally indicate an inelastic demand at the f.o.b. level of the marketing system. The degree of inelasticity may vary from season to season, but in most seasons price inelasticity prevails at the f.o.b. level.

When the retail and on-tree levels of marketing are considered—along with the f.o.b. level—the tendency for price inelasticity is characteristic of the demand for fresh summer lemons. The earlier the marketing stage considered, the greater is the inelasticity of demand; demand at the on-tree level is less elastic than the f.o.b. demand level which—in turn—is less elastic than the demand at the retail level. Such interrelations for the price elasticities at the various marketing stages are connected with the behavior of marketing margins and costs.

The volume of lemons and processed

products taken by the market during the year as a whole is undoubtedly determined by a large number of factors. Among the many influences, several—prices, income, and extreme variations in weather temperature—stand out as the more important. They are not the only significant influences but they are among the major factors which can be measured. From an economic-statistical view, they serve as a basis for estimating market demands for lemons and lemon products.

The influences of both the fresh and products markets should be reflected in the demands, and therefore measurable relations may be used to obtain an approximation of the degree of consumption-competition between the markets.

When fresh lemon shipments are related—to their on-tree price, the on-tree price of processed lemons, a temperature index, and a time trend—it is found that a 10% change in the on-tree price of fresh shipments, by itself and with other factors constant, is associated with an average change in the opposite direction of about 2.3% in the marketing-year total fresh shipments.

Furthermore, a 10% change in the on-tree price of processed lemons, by itself and with other factors constant, is associated with an average change in the opposite direction of about 0.1% in the marketing-year total fresh shipments.

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LEMON INDUSTRY

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Also, a 10% change in the winter temperature index, by itself and with other factors held constant, is associated with an average change in the opposite direction of about 6% in the marketing-year total fresh shipments. On the other hand, changes in the summer temperature tend to be associated with changes in the same direction in the marketing year total fresh shipments.

Over the past three decades, as a whole, the market demand for fresh lemons has reflected an upward trend. But if the post-war years by themselves are considered, the market demand for fresh lemons has decreased, has increased for lemon products, and total lemon usage—fresh and processed—has remained about stable.

The results of such statistical analyses provide a basis for the inference that not only is the seasonal market demand for fresh lemons inelastic but also for the inference that an increase in the on-tree price of processed lemons tends to be associated with a decrease in the seasonal total volume of fresh shipments, indicating that the fresh and processed uses are competitive. Further, such competition for fresh and processed uses has increased in recent years along with the expanded manufacture and sale of lemon juice products.

When the volume of processed lemons is related—to their on-tree price, the on-tree price for fresh lemons, a measure of national income, and a time trend—a 10% change in the on-tree price of processed lemons, by itself and with other factors constant, is associated with an average change in the opposite direction of about 1% in the marketing-year total volume processed. Also, a 10% change in the on-tree price of fresh lemons, by itself and other factors constant, is associated with an average change in the opposite direction of about 20% in the marketing-year total volume processed.

As the index of national income changes, other factors held constant, the volume of processed lemons tends to change in the same direction; and—over time—there is a slight upward shift in the market absorption of processed lemons, although the upward shift has been more pronounced in recent years.

These results again provide analytical grounds for the inference that the processed and fresh outlets of lemons are competitive and also suggest the existence of some degree of inelasticity in the market demand structure for processed lemons.

The interrelations of fresh lemons and lemon products are important because it is only when growers and marketers have an understanding of the interactions between the two outlets that they can take

the best advantage of those interrelations in the marketing of a lemon crop.

Monthly data on consumer household purchases of fresh lemons and canned lemon juice were used in relating household purchases of canned lemon juice to the retail store price of canned lemon juice, the retail price of fresh lemons, and the level of summer temperature.

A 10% change in the retail store price of fresh lemons, by itself and with other factors constant, is on the average associated with a change in the same direction of about 20% in the consumer household purchases of canned lemon juice. At the same time, a 10% change in the retail store price of canned lemon juice, by itself and with other factors constant, is on the average associated with a change in the opposite direction of about 4% in the consumer household purchases of canned lemon juice. Also, a 10% change in the summer—May–October—mean maximum temperature, by itself and with other factors constant, is on the average associated with a change in the same direction of about 39% in the consumer household purchases of canned lemon juice.

These findings suggest the existence of consumption competition between fresh lemons and canned lemon juice during the May–October period when so-called summer lemons are marketed.

As the retail price of fresh lemons advances—other conditions given and fixed—the consumers tend to shift from fresh lemons to canned lemon juice; and as the price of fresh lemons declines, the shift is from canned lemon juice to fresh lemons. These tendencies reflect market experience for the country at large.

In an analysis of the market-behavior relations between fresh lemons and frozen concentrated lemonade, the per-capita household purchases of fresh lemons were related to the retail price of fresh lemons, the retail price and availability in retail outlets of frozen concentrated lemonade, and the average summer temperature. The time unit consisted of the three-month period—April–June—followed by the second three-month period—July–September.

A change of 10¢ per dozen in the retail store price of fresh lemons, by itself and with the other factors constant, is associated with an average change in the opposite direction of about 1.5 boxes of fresh lemons per 1,000 capita per three-month summer period.

A 3¢ change in the retail store price of frozen concentrated lemonade—6-ounce can—by itself and other factors constant, is associated with an average change in the opposite direction of about 2.5 boxes of fresh lemons per 1,000 capita per three-month summer period.

A change of 10°F in the average summer temperature, by itself and other fac-

tors constant, is associated with an average change in the same direction of about 1.4 boxes of fresh lemons per 1,000 capita per three-month period.

A change of 10 points in the measure of retail store availability of frozen concentrated lemonade, by itself and other factors constant, is associated with an average change in the opposite direction of about 0.75 box of fresh lemons per 1,000 capita per three-month summer period.

The results of the analyses confirm the view that under average market conditions and for the country at large, consumer purchases of fresh summer lemons are inversely related to their retail store price and are directly related to the level of summer temperature. Also, the results suggest two additional market-behavior characteristics: 1, consumer household purchases of fresh summer lemons and frozen concentrated lemonade are competitive in consumption demand; and, 2, as the availability of the frozen concentrated lemonade increases—or decreases—in retail stores, there occurs a decrease—or increase—in the consumer household purchases of fresh lemons. Thus, from a market distribution as well as a price view, there appears to exist a tendency toward competitive interaction between fresh summer lemons and frozen concentrated lemonade.

The results of these market-statistical studies do not prove the existence of certain economic tendencies but they do provide evidence that—during the summer months at least—fresh lemons and frozen concentrated lemonade are competitive in consumer purchase behavior. The evidence also suggests that careful consideration should be given to the effects of both the short-run and long-run market interactions between fresh lemons and lemon-juice products.

The economic-statistical relationships reported reflect the average situation during the period investigated. The results—generated by past market developments—reflect average tendencies from a mixture of short-run seasonal and long-run changing trend influences. For short-run projections—as well as for analyzing current situations—statistical relationships of the type used in these studies can be helpful. But for long-term projections, those results should be supplemented by other investigations, particularly when a new product—such as frozen concentrated lemonade—is subject to an accelerated market and consumer acceptance.

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The section on Products includes some unpublished results developed by Dr. G. M. Kuznets, Professor of Agricultural Economics, University of California, Berkeley.

The third article in this series will appear in the October issue.