Consolidation in the California Fresh Stone Fruit Industry

J. S. McClarty, J. Ahern, and E. Qenani-Petela

Many agricultural industries in the U.S. have undergone structural change, evolving from small family farms into larger corporate operators. In California’s fresh stone fruit industry, average farm size has increased while real fruit prices have decreased. Consequently, farm numbers have decreased. This study examines the relationship between fruit prices, average farm size, and farm numbers by commodity in three San Joaquin Valley counties. Pooled cross-section observations were used to assess price shock influences on average farm size and farm numbers. Long-run fruit-price levels were correlated to changing farm sizes and numbers.

California is the largest producer of “stone fruits,” which includes peaches, plums, and nectarines. Half of the U.S. peach acreage, 90 percent of nectarine acreage, and over 90 percent of plum acreage are in California. California produces stone fruit for both the processed market and for the fresh market (USDA 2002). Most of California’s stone fruit is grown in the San Joaquin Valley (Johnston 2003; McFarland 1996; USDA 2002). Since these crops traditionally have generated reasonable incomes per acre, relatively small farms remained viable (Hall and L.Veen 1978).

The rate of increase in bearing acreage of fresh peaches and nectarines has slowed substantially since 2000, and plum acreage, while larger than thirty years ago, has decreased since a 1988 peak (CTFA 2003). Even though bearing acreage of these three “high-valued” products increased, industry structure changed as farms numbers declined and average farm size increased (USDA 2002). The structural changes were concurrent with decreased real prices paid to farmers (see Figures 1 and 2).

Are periods of decreased prices responsible for accelerating farmer exit levels in the California fresh stone fruit industry? Did other farmers absorb the acreage of recent exits? Did this leave the remaining farmers with larger farms and larger shares of production? Does a relationship exist between price deterioration and a changing industry structure in terms of average farm size and number of farms?

Consolidation in American Agriculture and Commodity Crops

The family farm institution has eroded with a change from family farms to larger-scale industrial farming (Strane 1988). Halberg (2001) found consolidations, productivity increases, and rising nominal prices caused mid-size family-farm bracket creep. The average farm household income was higher than average non-family household income by 1999 (USDA - ERS 2005) and had been decreasing from 1950 through 1990 (Gardner 2002). California agricultural production, by contrast, had not increased in concentration: the average farm increased acreage by 1 percent from 1954 to 2002 (Sunner, Bervejillo, and Kuminoft 2003).

Ahern and Yee (2004) examined five physical and financial measures of farm size from 1960–1996. They found most state measurements—especially Midwestern states—displayed similar trends to the U.S. as a whole; however, California was different, with 1996 real cash receipts nearly three times as high as 1960 levels, and imputed rental flow and real property values up 40 percent and 125 percent.

---

McClarty is a marketing professor at HMC Group, Kingsberg, CA. Ahern and Qenani-Petela are professor and assistant professor, respectively, Department of Agribusiness, California Polytechnic State University, San Luis Obispo. The authors thank Sean Hurley providing comments.
Farmer Profit Expectation Drivers

Hall and LeVeen (1978) found California farms increased efficiency with size. They found crop long-run average-cost curves decreased rapidly with increased volume, but at some point further cost savings were minimal. They examined vegetable, tree fruit, and grain farms and found that large farms had production cost advantages of 0 to 15 percent over medium-size farms. Almost all farms larger than eighty acres, including vegetable and cling peach farms, produced one dollar of revenue for less than one dollar of cost. They found the technical cost per acre (including land, labor, operating expenses, and other physical capital) was inversely related to size; however, the larger farms gained the most efficiency from advantages not size contingent: superior management and skilled farm labor, which should be size neutral. Another reason to increase acreage is that farmers integrated up the supply chain—in packing or marketing—have other revenue sources. Day et al. (2004) examined the cost of producing peaches where packing and marketing can account for up to 60 percent of post-cultural costs. Some farmers may also be fruit packers, and even further integrated into wholesale marketing services. Such forward-integrated operations regularly earn additional margins from these non-growing operations or activities. These farmer-packer-marketers (or called grower-packer-shippers) may be more inclined to increase acreage than an entity that only farms.

Impact of Retail Power on Produce Prices

The California fresh stone fruit industry has seen buyer concentration increase dramatically (Richards and Patterson 2001) while prices paid to growers continued a downward trend (CTFA 2003). Not only have prices decreased for growers, but the retail prices for stone fruit increased concurrently, resulting in higher retail profit margins. Increases in retail concentration likely have facilitated price cooperation by buyers (retailers). Previous studies have shown that retail consolidation has had an adverse impact on an array commodity groups.

Richards and Patterson (2003) examined retailer profit margins, retailer pricing strategy, and interactions between shipper prices and retail prices for four fruits in six metro markets. They found retail prices responded more rapidly to shipping-point price increases than to shipping-point price reductions, but the response was not uniform across commodities. Retail prices were relatively fixed in comparison to price at shipper level. Retailer profit margins by commodity and market area found retailers possessed an ability to keep consumer prices above a perfectly competitive level in all commodities. Retailers possessed the ability to keep costs paid for Florida grapefruit and Washington Red Delicious apples below perfectly competitive levels, but paid competitive prices for the other crops.

 Sexton, Zhang, and Chaflint (2003) examined retailer-scanner vegetable price and sales data, evaluating retail prices as a function of elasticity of demand and the extent of retailer-exercised market power concluding that retailers did not fully exploit their market power. They found retailers captured 80 percent of market surplus (retail price minus harvest costs) in iceberg lettuce, which suggested retailers’ ability to capture such a large percentage of rents in lettuce was related to low seller concentration relative to buyer concentration and the perishability of iceberg lettuce, which necessitated quick movement in the market.

Data

The California fresh stone fruit industry may be similar to other commodity growths (Roberts and Key 2002), where large entities may be less capital constrained and therefore able to buy land at decreased prices when negative price or income shocks occur. Data for California shows that during 2002, 49 counties grew peaches, 43 counties grew nectarines, 50 counties grew plums and 41 counties reported growing all three crops. The study examined Fresno, Kern, and Tulare Counties, as they composed from 68 to 89 percent of the state’s nectarine, freestone peach, and fresh plum acreage (USDA 2002). Fresno County produced more stone fruit than any other county in the United States. Tulare County was California’s second-largest producer of fresh plums, while Kern County’s stone fruit volume was not dominated by a specific commodity. Data from other counties were not included due either to production emphasis in processed fruit utilization or to the small amount of production for fresh market.

The fruit-price variable used is the annual aver-

---

1 Roberts and Key examined 765 counties from over 25 states for major program-supported crops.
age of fruit prices by county, by commodity and adjusted for inflation, for the five years preceding each census. The price variable created is similar to the income-shock variable created by Roberts and Key (2002). Because such a large percentage of the total cost is for post growing operations (e.g., harvesting, packing charges, and shipping), increased income from yield boosts does not over vary variable costs incurred and thus distorts income variations as a measure of profitability. Post-cultural costs do not have volume or scale economies when compared to grains with a substantially smaller proportion of their total cost as variable costs thus making total income a better predictor of net returns. Nine observations per census period reflect the commodities and counties, for each of four census periods, resulting in 35 observations. Annual price information come from Fresno, Tulare, and Kern County Agricultural Commissioners’ data (USDA - NASS 2006), reflecting county total value by commodity divided by county total tons shipped for all forms of utilization.

*AFS* and *NF* are created or taken from the *Census of Agriculture* every five years from 1987 to 2002, utilizing county total acres by commodity and number of farms, regardless of fruit utilization form. Dummy variables for commodity and county are assigned. Price effects on each farm size class would be desirable, but sufficient data are not available.

### The Model

The empirical model expresses average farm size and number of farms as a function of several independent variables of price, commodity, and county location. The basic model consists of two equations:

\[
AFS_{ct} = \beta_0 + \beta_1 P_{ct} + \beta_2 D_{ct} + \ldots + \beta_k D_{ct} + \epsilon_{ct}
\]

and

\[
NF_{ct} = \beta_0 + \beta_1 P_{ct} + \beta_2 D_{ct} + \ldots + \beta_k D_{ct} + \epsilon_{ct}
\]

where \(AFS_{ct}\) is the average farm size for fruit \(f\) in county \(c\) in year \(t\); \(NF_{ct}\) is the number of fruit farms in county \(c\) in year \(t\); \(P_{ct}\) is the five-year-average price variable of fruit \(f\) by county \(c\), in dollars per ton; \(D_i\) is a dummy variable for nectarine, \(D_o\) is dummy variable for peaches, and \(D_p\) and \(D_r\) are location dummies respectively for Fresno and Kern county; and \(\epsilon_{ct}\) and \(\epsilon_{ct}\) are error terms.

In order to explore the effect of urban development pressures on *AFS* and *NF* variables, the basic model was expanded to include a “land price” variable, \(P_{pl}\), which measures the average value of land and buildings per acre, by county, for all agricultural commodities grown in the county \(c\) (USDA). So the expanded model includes the \(P_{pl}\) variable in addition to all the variables of our basic model.

Would unequal weightings of prices for different years be a more appropriate structure for modeling price influences on possible consolidation? Farmers may discount less-recent prices or experience lagged reactions, or prices of particular years might have a heavier influence than others. To consider these possible mechanisms, fruit prices were adjusted using various five-year polynomial lag structures. The model is estimated using the ordinary least squares method.

### Assumptions and Limitations

Counties selected in this study grow predominantly for the fresh market and were assumed to be representative of the California fresh stone fruit industry. Prices for both fresh and processed fruit were used to create aggregate prices by commodity and county. Processing peach prices are known to be tied to the fresh market (CTFA), and we assume price changes were driven by the dominant fresh-market use. Data from the *Census of Agriculture* did not differentiate between freestone and cling peach acreage, nor did they separate revenue or prices by fruit use. We assume farm-consolidation patterns in processed fruit to be comparable to those of the fresh market. Given the data limitations, we use *AFS* and *NF* as proxy measures for industry consolidation.

### Results

Table 1 reports descriptive statistics for counties included in the study. The data show that Kern County has far less acreage in stone fruit than do either Fresno or Tulare counties. The average farm size in Kern County therefore is much more sen-

<table>
<thead>
<tr>
<th>Statistics</th>
<th>AFS</th>
<th>Total acreage</th>
<th>Number of farms</th>
<th>Price</th>
<th>Production (tons)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mean</td>
<td>44.62</td>
<td>12,581</td>
<td>356.7</td>
<td>537.50</td>
<td>90,183</td>
</tr>
<tr>
<td>Median</td>
<td>37.90</td>
<td>13,792</td>
<td>361.5</td>
<td>528.88</td>
<td>116,000</td>
</tr>
<tr>
<td>Std dev</td>
<td>24.85</td>
<td>8,391</td>
<td>263.3</td>
<td>118.31</td>
<td>57,630</td>
</tr>
<tr>
<td>Max</td>
<td>138.74</td>
<td>26,033</td>
<td>864.0</td>
<td>884.96</td>
<td>164,000</td>
</tr>
<tr>
<td>Min</td>
<td>13.17</td>
<td>632</td>
<td>18.0</td>
<td>273.92</td>
<td>6,920</td>
</tr>
</tbody>
</table>

Table 1. Descriptive Statistics Stone Fruit in the Selected California Counties, 1987–2002.

The estimation results for Equation (2) are presented in Table 2. There were no major violations of the classical assumptions of the linear model. No evidence of first-order autoregressive error terms exists and the variance inflation factors (VIF) were all under ten, which minimized concern for multicollinearity. In examination of the plot of residuals against fitted values, heteroskedasticity was not apparent. The signs and magnitudes of the estimated coefficients are as expected (except for \(D_o\), the Kern County coefficient, being relatively large and positive). Results show that \(P\), \(D_o\) and \(D_r\) are all important variables in explaining variations in *AFS*.

Nectarine production and Fresno County effects were not significantly different from Tulare plums *AFS*. The base *AFS* (Tulare County plums) was estimated at 135 acres; this is a proxy, as the intercept term collects other unidentified influences that overinflate or under-inflate this value. On average, for every dollar-per-ton increase in price received, AFS decreases by 0.164 acre. Peach farms \(D_p\) reduced AFS by 39.7 acres, while Kern County \(D_o\) farms were 56.4 acres larger than Tulare County plum farms. This might reflect Kern’s larger average farm size. As expected, plum farms had been larger on average than either nectarine or peach farms (negative signs for \(D_p\) and \(D_o\) were expected), as many plum farmers specialize in growing large blocks of plums in Fresno and Tulare County. However, it was unexpected that Kern County would have had larger plum operations. Kern County had the lowest total production, at roughly one-tenth or less of the production of Tulare or Fresno for all three commodities, and yet had the most consolidated production on a smaller base. The model explains about 65 percent of the variation occurring in average farm size.

### Farm Numbers: Consolidation Evidence

The estimation results for Equation (3) are presented in Table 3. There were no major violations of the classical assumptions of the linear model. No evidence of first-order autoregressive error terms exists and VIF were all under ten, which minimized concern for multicollinearity. In examination of the plot of residuals against fitted values, heteroskedasticity was not apparent. The signs and magnitudes of the estimated coefficients are as expected. Results show that \(P\), \(D_o\), \(D_p\) and \(D_r\) are all important variables in explaining variations in *NF*.

All explanatory variables (except \(D_p\)) are statistically significant in explaining variation in the number of farms. Results show that for every $1/10 increase in the commodity price \(P\), the estimated coefficient was $1/10 increase in the commodity price \(P\), NF increased on average by 68 farms, indicating a positive relationship between prices and the number of farms in the industry, so when real fruit prices decline,
so does the number of farms. By examining the relationship between crop and number of farms, we observe that nectarines $(D_r)$ negatively impact the NF (for nectarines, NF decreases by 120). In Fresno County $(D_r)$ the number of farms rose by 102 farms, but in Kern County $(D_r)$ the number of farms decreased by 516 farms. These results make intuitive sense, as there were more plum operations than nectarine or peach farms, and these numbers would change slowly. Also, Fresno County produces more stone fruit and Kern County produces substantially less stone fruit than does Tulare County, but Kern County is a newer production area. Theoretically and statistically this is a sound model that explains 87.8 percent of the variation in the number of farms in California.

As mentioned above, we added land prices $(P_r)$ by county to examine if high California land values were adding to the demise of agricultural land-use by development as effects on AFs and NF. Results of estimation, however, show that $P_r$ is not a statistically significant variable in explaining AFs or NF.

Various attempts were made to estimate the model with modified price shocks. Results indicated that the simple average price $(P)$ was the best variable to estimate both AFs and NF in terms of the signs and magnitudes of coefficients, the measures of the overall fit, and predictive ability of the model.

**Forecasting Changes in Farm Structures**

Using the five-year average price variable for 1999–2003 in equations, AF and NF were estimated for year 2004 (see Table 4). Out-of-sample linear projections left two NF values negative (meaning, essentially, that production stops) in Kern County: the marginal producers. The rationale fits, as Kern County growers produce many early varieties, which have far lower production and higher prices, and are thus more susceptible to negative price shocks. The large decreases in fruit prices from 1999 to 2003 in conjunction with negative Kern County slope shifts in the NF equation resulted in negative forecasts for Kern County nectarine- and plum-farm numbers.

**Conclusions**

High food-retail-buyer concentration (oligopsony) may be the driving market rents, which are reflected in lower grower-packager-shopper prices, and may continue to keep farm prices low. This leads to the question of how to make it difficult for smaller farmers, and likely will cause further consolidation in the California fresh stone fruit industry. It appears the industry may have been forced to become more efficient, and larger farms may be one way of contending with lower farm-level prices in stone fruit. Continued changes in food retailing augur further changes at the farm-level aggregate. More precise separation of fresh versus processed fruit acreage and their respective prices may further validate the relationship between prices and industry structure. Examination of industry expansion, entry and exit by farm size, and the identification of farm size patterns from census to census might pinpoint farm sizes benefiting from price increases and those hurt the most during periods of poor prices.

**References**


Assessing the Effectiveness of Consumers’ Rankings of Selected Meat Attributes in Expanding Goat Meat Consumption in the Southern United States

Patricia E. McLean-Meynisse

Results suggest that consumers of goat meat are more likely to rank taste, freshness, and cooking time as very important attributes when buying fresh meat. Those who have never eaten goat meat are more likely to regard appearance, presence of USDA label, and being boneless as very important drivers of their purchase decisions.

On a worldwide basis, more people eat goat meat than beef, chicken, or pork (Warner 2005). Research also suggests that goat meat is leaner, higher in iron, and lower in cholesterol than beef, pork, or skinless poultry. It also has a balanced proportion of saturated to unsaturated fatty acids and is a rich source of conjugated linoleic acid, which has been linked to reducing cancer, heart disease, and onset of diabetes (Warner 2005). Historically, U.S. demand for goat meat has been small, but in recent years domestic demand has been growing because of the meat’s popularity in the African, Latin American, Caribbean, Chinese, Indian, and Middle Eastern communities; interest by other consumer groups; expanding goat production in California, Texas, North and South Carolina, Oklahoma, Tennessee, and the Northeast; rising imports of goat meat; greater coverage by mainstream media; ready access to recipes for preparing goat meat; and increased willingness by chefs to offer goat meat at ethnic and upscale restaurants (ABC 7 News 2005; Nathan 2005; Warner 2005). The American Meat Goat Association contends that the U.S. market could support a herd of 15 million animals compared to the 2 million goats currently being raised (ABC 7 News 2005).

Scientists at Southern University have had goat projects for more than 20 years. Their research objectives are to find out if goats can become a viable enterprise for limited-resource farmers and to measure consumers’ receptiveness to several value-added forms of goat meat. Despite goat meat’s desirable health benefits, marketers must know consumers’ attitudes toward the product in order for it to make a successful transition into the U.S. consumer-driven food industry. In general, consumption of a good or service will rise if current users expand consumption and/or nonusers increase their consumption. To expand a product’s market share, marketers often examine current users and nonusers’ assessments of similar products’ characteristics and their receptiveness to additional product lines. To our knowledge, there has been no comprehensive study linking attributes used by consumers in purchasing meat to their decisions on whether to eat goat meat. This knowledge is critical if goat meat use is to expand beyond current consumers.

Objectives

The study assesses whether users and nonusers differ in their importance rankings of selected meat attributes and in their willingness to buy value-added forms of goat meat, and examines the extent to which demographic, socioeconomic, and regional (DSR) factors, hierarchal rankings of the selected meat attributes, and buying intentions influence goat meat consumption. Because of the study’s comprehensive approach to goat meat marketing, it will provide valuable insights on goat meat’s growth potential in the United States.

Materials and Methods

Consumer Survey

The study’s data were compiled from a stratified random sample of 1,421 telephone subscribers in Alabama, Arkansas, Florida, Georgia, Kentucky,