



Seasonal Prices and Supply-Side Adjustments in the California Strawberry Industry

by Frank M. Han, Colin A. Carter and Rachael E. Goodhue

The strawberry market, like other markets for perishable agricultural commodities, is characterized by boom-bust price cycles resulting from seasonal variability in production and uncertain weather conditions. For individual producers, there are large payoffs to participating in the peak points of the annual cycle, which typically occur during the months of December, January, and February. However, agronomic constraints on the timing of production, and technical constraints on transportation and storage, limit producers' ability to market during high price periods. For the industry as a whole, the aggregate results of individuals' efforts to respond to seasonally-based price fluctuations can be self-defeating. For example, with innovations such as the breeding of heartier varieties, or improving storage and transport, changes in industry price patterns often follow. Producers' attempts to benefit

from predictable components of price seasonality may dampen such cycles. This article examines some current production trends in the national strawberry industry and identifies some important economic issues associated with seasonal price patterns.

California has dominated strawberry production in the United States over the last three decades. Concurrently, California's major competitors, such as Florida, Oregon and Mexico, have scaled back their production and/or targeted their production to supply niche markets. Over this time period, national sales to the processed strawberry market have also steadily given way to sales on the higher valued fresh strawberry market. Currently, California sales into both the fresh and processed markets total between \$500-600 million annually, making strawberries the 11th most valuable crop in the state (CA Dept. of Food and Agriculture).

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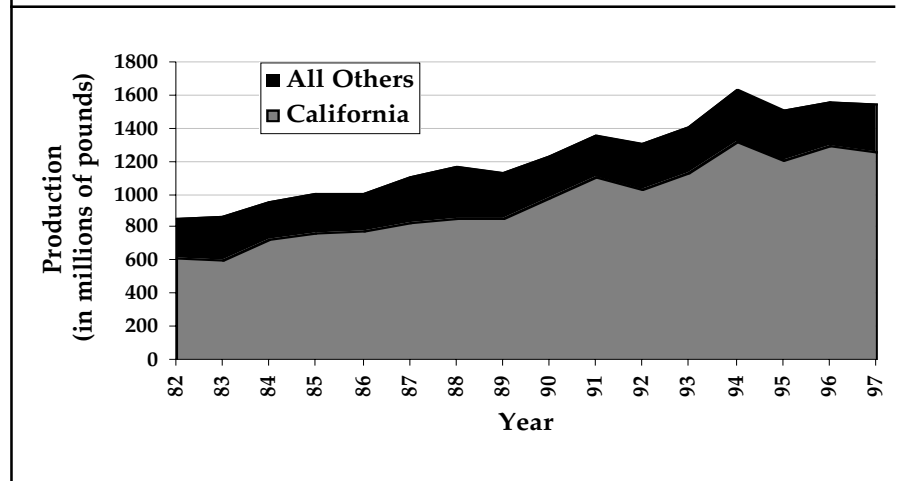
California dominates its nearest competitors in the national strawberry market, accounting for over 80% of national production (Figure 1). This is due to the combination of three factors: (1) a greater number of planted acres; (2) substantially higher yields, and (3) a significantly longer harvest season. Historically, while yields have fluctuated between 25 and 28 tons per acre over the last 15 years, California's share of national acreage has risen steadily from 28% in 1982 to 50% in 1997.

Yield improvements and acreage increases are the result of public and private investment and research efforts to maximize the advantage provided by California's favorable climate. Year-round production is possible because there are growing regions in both the northern and southern parts of the state, but the majority of California's volume is harvested from February through October. Growing areas in Southern California are traditionally harvested during the first half of the calendar year. Florida and Mexico are the primary competitors during the high-value winter months of November, December, January and February, but these fringe suppliers drop out of the market by mid-March when the warm weather in Florida and Mexico lowers quality. In the spring, harvests from Southern California overlap with harvests from Northern California, where the season is just beginning. During the summer months and into the fall, volumes from Northern California account for approximately 90% of the fresh strawberries sold nationally.

The recent introduction of new strawberry varieties extends California's harvest season into the high market price periods of early January and February. Due to increased production of the Camarosa strawberry, which is better adapted to cold weather, Southern California growers now harvest about 4 weeks earlier in the year. Introduced in 1995, the Camarosa variety produces a bigger, firmer berry over a longer period than the next most planted variety, the Chandler strawberry. Plantings of the Camarosa strawberry now account for 80% of the acreage in Southern California.

Historically during January and February, limited fresh substitutes and low U.S. production of strawberries have resulted in high fresh market prices. As these conditions change, prices for fresh strawberries

Figure 1. U.S. Strawberry Production



during these periods are likely to decline. For instance, California's season-maximum price (typically occurring in early February) fell in the early 1990s – coincident with the time when treefruits, table grapes and berries from the Southern Hemisphere producers, such as Chile and New Zealand, were first imported to the U.S.

As California strawberry producers increase production during high valued portions of the season, further declines in price should be expected. Lower prices in the early season due to expanded Southern California production have important implications for growers across the United States. In Florida, production costs per unit are higher and yields are lower than in California. Thus, increased California production and lower prices diminish the competitiveness of Florida strawberries. The increase in volume in the earliest weeks of the Southern California growing season may depress per-unit prices for both California and Florida growers. Figure 2 (shown on page 8) plots the seasonal price index for Southern California growers, showing that average fresh market prices during February and March have declined relative to the levels that existed before the widespread adoption of the Camarosa strawberry. Specifically, average fresh market prices in February declined from 2 times the yearly average price to 1.7 times. By expanding their season, Southern California growers will increase their total quantities sold. However, the evidence suggests that increased volumes have depressed prices in traditionally high priced periods, making the net effect on Southern California growers' revenues and profits unclear.

STRAWBERRIES—continued on page 8

International and Regional Issues in African Elephant Management

by Lovell Jarvis and Douglas Larson

African elephants have been the focus of international attention for more than a decade, since it became known that their numbers had declined sharply during the 1980s, largely due to poaching for ivory. Humans generally have great affection for elephants because of their size, strength, and intelligence. Elephant populations are a major attraction that bring foreign visitors into several African countries, notably Kenya, Tanzania, Zambia, Botswana, South Africa, and Namibia, for both wildlife viewing and trophy hunting.

What is less appreciated, especially by people in countries without wild elephant populations, is that elephants can and do cause substantial damage to agriculture, infrastructure, and (on occasion) people in local villages. Elephants are widely recognized to be keystone species, capable of altering (or maintaining) specific ecosystems. Their great appetites, diet, size, strength, intelligence and mobility make them formidable competitors for many of the resources that are also used by humans. The types of damage incurred by local villagers include, for example, crop trampling and eating as well as uprooting piping and pumping equipment for “bore holes” (wells) dug to provide water supplies for villages.

Therein lie some interesting dilemmas in wildlife management, as countries in southern and eastern Africa seek to balance competing pressures regarding “optimal” sizes of elephant and other wildlife populations. Foreign visitors, who provide valuable foreign currency and revenues for some domestic firms, prefer more elephants than less; but those who live and farm in and near elephant habitats suffer more harm as elephant populations increase. Add to this mix the fact that many products made from elephants, notably ivory, are quite valuable commercially, and poaching becomes quite central to the elephant management issue.

These topics were the focus of a workshop on African elephant and wildlife management held on the Davis campus in mid-August. Attended by scholars and managers from Namibia, Zimbabwe, Australia, and the Davis and Berkeley campuses of the University of California, workshop attendees discussed obstacles to, and possibilities for, regional and international cooperation in African wildlife management. Elephants, and thus their social costs and benefits,

often span national boundaries. For example, important areas in Namibia (Caprivi), Botswana (Chobe) and Zimbabwe (Matabeleland) constitute one large elephant habitat with substantial potential for elephant migration in response to food availability and protection. Elephants move freely across national borders, creating a need to consider coordination of government activities related to elephant management.

Although cooperation can be advantageous, it need not result in larger elephant populations, particularly in southern Africa. An interesting observation echoed by several at the workshop was that in southern Africa, unlike eastern Africa, there may be *too many*, rather than *too few*, elephants. Populations are generally robust, and with no natural predators, herds numbering in the thousands or even tens of thousands of elephants can wreak tremendous havoc on habitat for other species, in addition to the other damages noted earlier. Thus the nature of the problems with, and solutions to, African elephant management are likely to vary regionally.

In the remainder of this article, we briefly survey the main dimensions of the southern African elephant management problems, where the issues tend to be somewhat different from those publicized widely in the 1980s for eastern Africa. We note the areas where countries of the region have found scope to cooperate, issues over which there is conflict, and some areas for potential further cooperation.

Areas of Recent Regional Cooperation

International marketing of (listed) animal products such as ivory, skins, and hides. Following the rapid decline of East African elephant stocks in the 1980s, widely associated with poaching for ivory, many countries agreed to a ban on international marketing of ivory to reduce the incentive to poach. Southern Africa countries had fewer poaching problems, in part because of more effective anti-poaching programs that were financed by ivory sales. They jointly appealed for temporary release from the ivory ban and were able to market part of their ivory stocks. Since southern African countries may control as much as 40% of the world’s elephant stocks, cooperative marketing strategies could be beneficial.

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Areas of Regional Conflict

Poaching. Angolan citizens are reported to poach elephants in Namibia, while Namibians are reported to poach elephants in Botswana. While not as widespread as in East Africa before the ivory ban, better cooperation between countries should improve poaching deterrence.

Animal disease control. Botswana was forced to kill 300,000 head of cattle last year due to the introduction of Bovine pleural pneumonia, which it believes was carried via wildlife from Namibia. Namibia has poor animal health control in the northern part of the country due to a low level of veterinary care and the ease of wildlife movement across its border with Angola. Animal disease transmission via wildlife and elephants destruction of disease control infrastructure are important issues needing regional cooperation.

Infrastructure development (fencing). In response to the Bovine pleural pneumonia outbreak, Botswana constructed a 70 km double steel girder-cable fence to stop wildlife migration across its border with Namibia along the western part of the Caprivi Region. This disrupted traditional wildlife migration routes, resulting in deaths of thousands of (wildlife) animals and causing higher elephant densities in the populated Caprivi Region. This allegedly increased forest destruction and on-farm damage. After lengthy negotiations, Botswana has agreed to remove part of this fence. Given that wildlife naturally migrate across national boundaries, coordination of fencing decisions is essential.

Areas For Further Regional and International Cooperation

Tourist promotion. Each country in southern Africa is seeking to develop its tourism infrastructure, including its national parks and its stock of wildlife, and to attract larger numbers of tourists. Countries are potentially rival sellers of tourist services. Nonetheless, it appears possible that countries in the region have sufficiently different types of wildlife environments that they might benefit from cooperative advertising. Combining resources could more effectively market a tourist promotion program in Europe, North America, and elsewhere.

Hunting, especially trophy hunting. Hunting, especially trophy hunting, has high economic returns per tourist attracted. An average tourist visiting Namibia for photo safaris might spend U.S. \$50-200 per day during a 10-14 day stay, while hunters seeking elephant trophies probably spend more per day and premiums of as much as U.S. \$10,000 for trophies, if obtained. Although relatively few animals are taken as trophies, the total return from trophy hunting is a significant component of potential tourist revenues.

An especially interesting observation to emerge from the wildlife workshop was that cooperative strategies for managing trophy hunting may be a very important ingredient in assuring the long-term survival of elephant populations faced with development pressures, increased conflict with human populations, and shrinking habitat. The reason is that trophy animals are older, typically forty years old or more, and

ELEPHANTS—continued on page 10



African elephants grazing in the Mahongo Game Reserve on the Caprivi Strip, Namibia. Photo by Doug Larson.

Agricultural Policy Reform in an Historical Context

by Daniel A. Sumner

Agricultural policy in the United States is being reconsidered. Despite significant reforms, commodity programs remain controversial both within and outside the farm community. This article provides some historical perspective on farm policy reform. The aim is to show historical lessons that may be useful in considering a farm program for the new millennium.

Agricultural policy in what is now the United States actually began well before there was a United States. In the early days, when most people were farm people, most economic policy was agricultural policy. Of course, the American Revolution itself was driven largely by agricultural land and trade policy imposed from England.

In the 19th century, policy specifically targeted toward agriculture encompassed mainly tariffs, the distribution of government land and efforts to encourage agricultural science. But even during this period, many major historical events were largely agricultural. For example, one cause of the Civil War, in part, was a struggle over the organization of agriculture and access to farm labor.

In 1862, the year before the Emancipation Proclamation, Lincoln signed the Homestead Act and created the United States Department of Agriculture. But these acts did not lead to farm programs as we now know them. In the latter 19th century several agricultural depressions created great political ferment on farms, but did not lead to direct subsidy from the government.

Farmer unrest over high interest rates and low prices in the post-bellum period often focused on political struggles over money and banking policy. The famous “Cross of Gold” speech presented by Williams Jennings Bryant at the 1896 Democratic convention was but one example of how farmers’ concerns were reflected in the national debate, if not in national policy.

Until the early 1930s, when farming had fallen to less than 20% of the economy, there was still almost nothing of what we now call farm programs. But, within a few years, the federal government, and, in the case of dairy, the State of California, developed an array of programs that have lasted ever since. Important among these programs were import barriers and export subsidies. In addition, marketing orders created at that time continue to govern milk and several other commodities. Federal crop insurance and disaster assistance were also initiated or expanded. Table 1 (next page) shows the recent program composition of agricultural support in California in terms of policy instruments. Most of the government support indicated in Table 1 originated in the 1930s.

Figure 1 shows a timeline of major federal farm legislation over the past six decades. It indicates the regular reforms made to a core set of programs. The quintessential farm programs, misleadingly named “price and income support,” developed as a part of Roosevelt’s New Deal and apply to rice, cotton, feed

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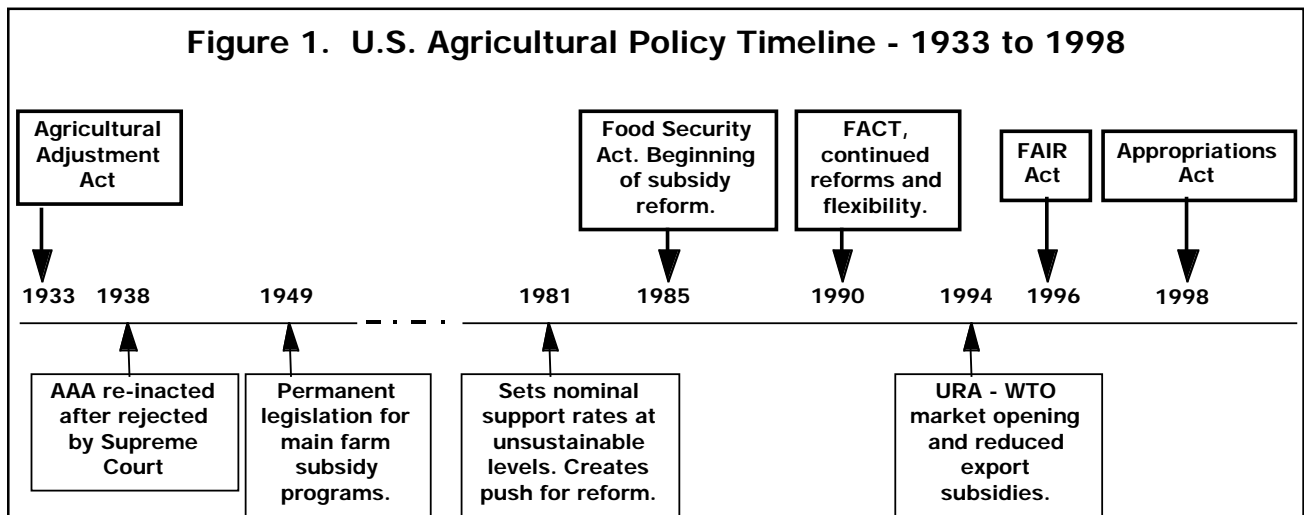


Table 1. California Producer Subsidy Equivalent Contributed by Each Policy Tool

Policy Tool	Value Million Dollars	Percent
Import Barriers (<i>mainly dairy</i>)	857	37
Export Assistance	88	4
Direct Government Payments	237	10
Input Assistance	456	19
<i>Water Subsidies</i>	236	10
<i>Other Inputs</i>	220	9
Other Marketing Support	265	11
Research	161	7
Dairy Marketing Order	154	7
Infrastructure / Land Improvements	34	1
Economy-wide Policies	92	4
TOTAL	2,254	100

Ag Policy—*continued from page 5*

grains and wheat. These programs are less dominant in California than in some major agricultural states but, even here, they are important for many farmers and rural regions. These programs underwent significant changes in recent years, and their evolution affects the reform path of all agricultural policy in the United States and, indeed, around the globe.

The prime mover behind the development of price and income support programs and their evolution has always been farm commodity prices. In the 1930s, farm prices were intolerably low and the government mandated higher prices through a series of complex programs. For example, in 1932 the price of wheat was only 44% of what it had been in the 1910 to 1914 period, which farmers considered a benchmark. Of course, low prices themselves were the consequence of the existing supply/demand balance (or imbalance). Government efforts to raise prices encouraged production and discouraged consumption, strengthening the market pressure on prices.

This tension between the wish that prices would be higher and the realities of the market remains the core intellectual conflict of farm policy. Beginning in the 1930s, a series of supplementary instruments were developed to deal with the contradiction created by required minimum prices. Supply controls included

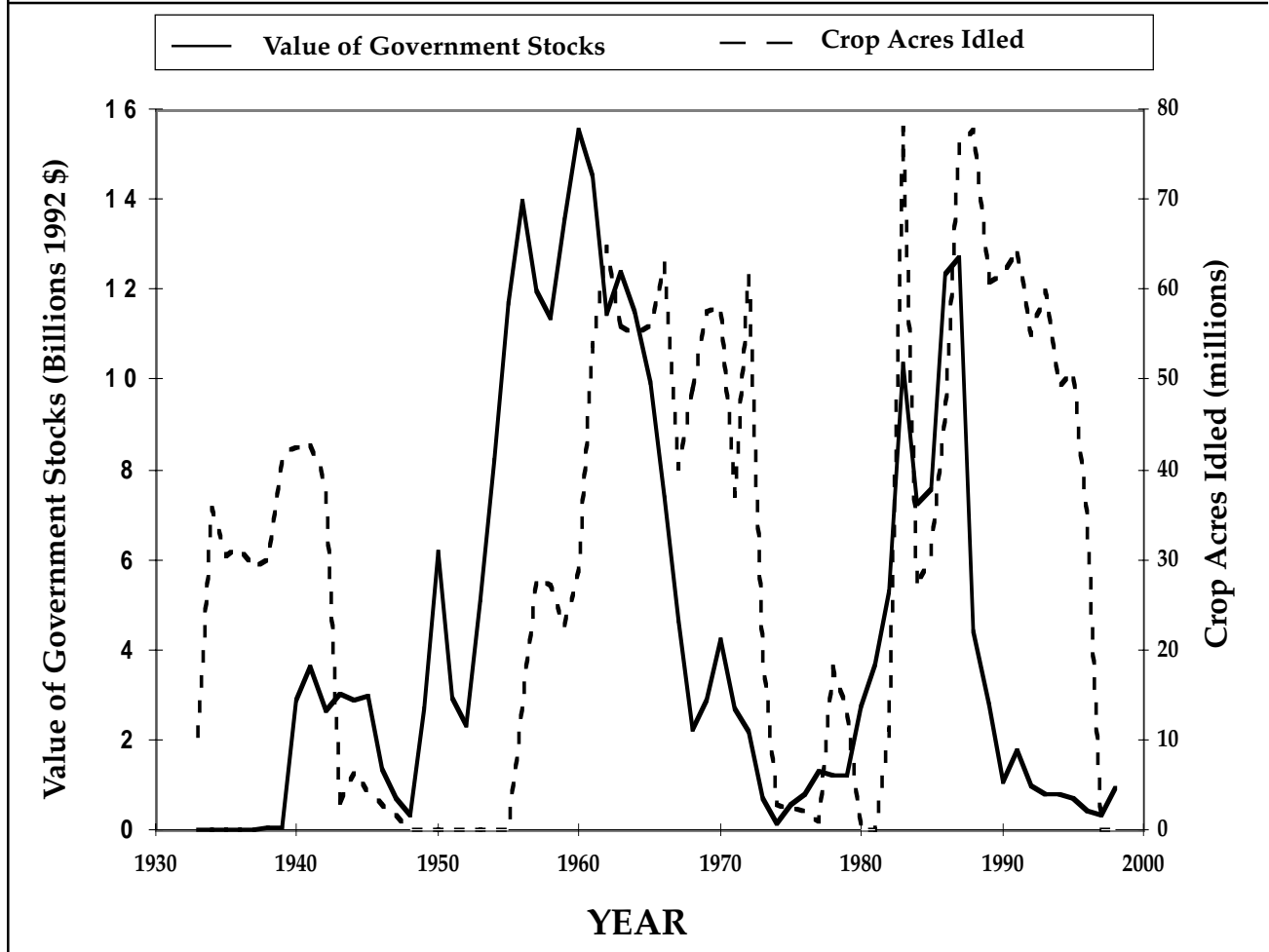
output quotas, limits on planted acres, mandated or subsidized land idling, and restrictions on which crops were permitted on farms receiving payments. The government also used domestic food subsidies, export subsidies, international food aid and storage programs to deal with excess supply created by minimum prices.

Figure 2 shows cropland left idle and the accumulation of surplus commodities caused by farm programs from the 1930s through the 1990s. For sixty years, farm policy evolved in a series of increasingly complex arrangements to deal with contradictions in the attempt to set prices above market clearing levels. By the 1980s and early 1990s, programs included an incredibly complex mix of all previous instruments. These policies did not solve financial problems for farmers, continued to disrupt markets, and became intolerably expensive for the taxpayers.

During the 1980s and 1990s, a broad consensus emerged that many of the policy tools used for five decades or more had not worked or were outmoded. From the Food Security Act of 1985 through the Federal Agricultural Improvement and Reform (FAIR) Act of 1996, a series of reforms were enacted. Government-set price floors were lowered and then eliminated, government stockpiles were gradually eliminated, mandatory land idling was limited and then terminated, planting flexibility was increased and deficiency payments were converted to contract payments, which were supposed to be disconnected from market prices.

A rapid rise in grain prices in 1995 and 1996 facilitated the enactment of the FAIR Act. Continued high prices in 1997 meant that in the first two years under the new legislation, farmers received far higher government payments than they would have received under the old program. But in 1998 many farm prices collapsed at the same time poor weather cut some crop yields. Under “marketing loan” provisions of existing legislation, the low prices generated substantial payments to grain and oilseed producers, but economic distress was a reality in some regions. As in the past, the drop in prices and the prospect of low farm incomes triggered a policy response.

Figure 2. Crop Acres Idled and the Value of Government Stocks



In October 1998, contract payments, which had been set in advance for seven years by the FAIR Act, were raised by 50 percent. Further, in direct conflict with reforms of 1994, disaster payments were made available to growers who had low yields but who had chosen not to buy subsidized crop insurance, or for whom insurance was deemed inadequate. In all, the new one-year subsidy package cost more than six billion dollars.

The question now facing farmers, taxpayers and farm policy makers is which path to follow: move back to regular ad hoc disaster programs and production subsidies for selected crops, or move forward to an open-market approach of phased down subsidies with emphasis on technology, investments and domestic and export market growth. Central on the policy agenda is the government's role in agricultural risk management. The policy question is the extent to which the government can help growers manage risks

inherent in agricultural production and markets. There is no question that farming is a tough and risky business. The challenge is to devise a role for government that does not create side-effects that are worse than the problems the policy is designed to cure. Policy analysis requires careful consideration of the full set of consequences. This important issue is also a current topic of research and outreach at the University of California.

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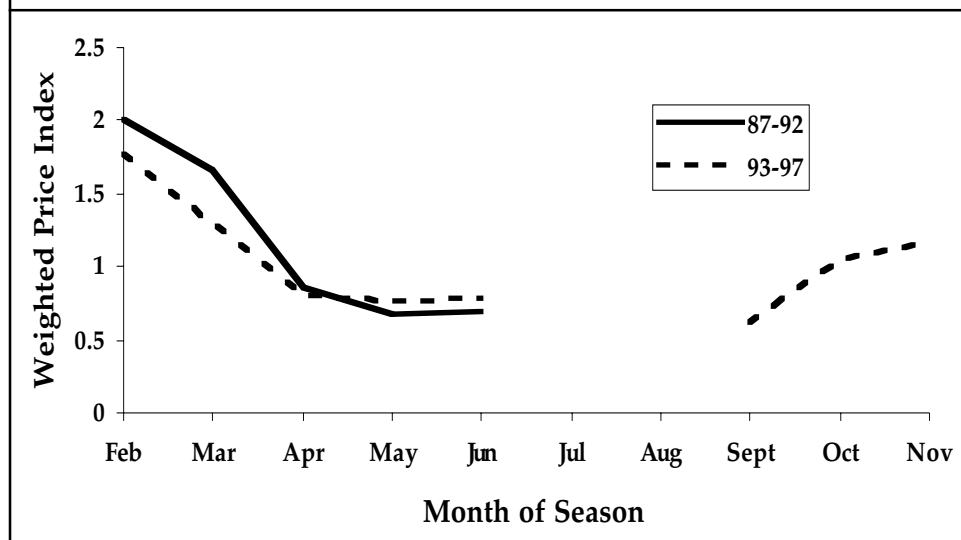
Strawberries—

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Industry price patterns are affected by physical quality characteristics, such as flavor, firmness, size and shelf life associated with specific varieties. For example, some proprietary varieties attract a price premium of up to \$2.00 per 12-1 pint tray over the price of the more commonly produced "University varieties" such as the Selva, Chandler, Seascape and Camarosa strawberries. Characteristics for which retail buyers will typically pay a premium are:

1) better appearance (e.g., larger size and fewer blemishes); 2) longer shelf life; 3) marketing services; 4) brand identification; and 5) better flavor. Proprietary variety strawberries, such as those grown and marketed by the companies Driscoll and Well-Pict, generally command premiums from retail buyers for having the desired physical characteristics, the brand reputation, and the marketing services. However, premiums are based on physical and non-physical characteristics that are not necessarily restricted to proprietary varieties or the companies which market them.

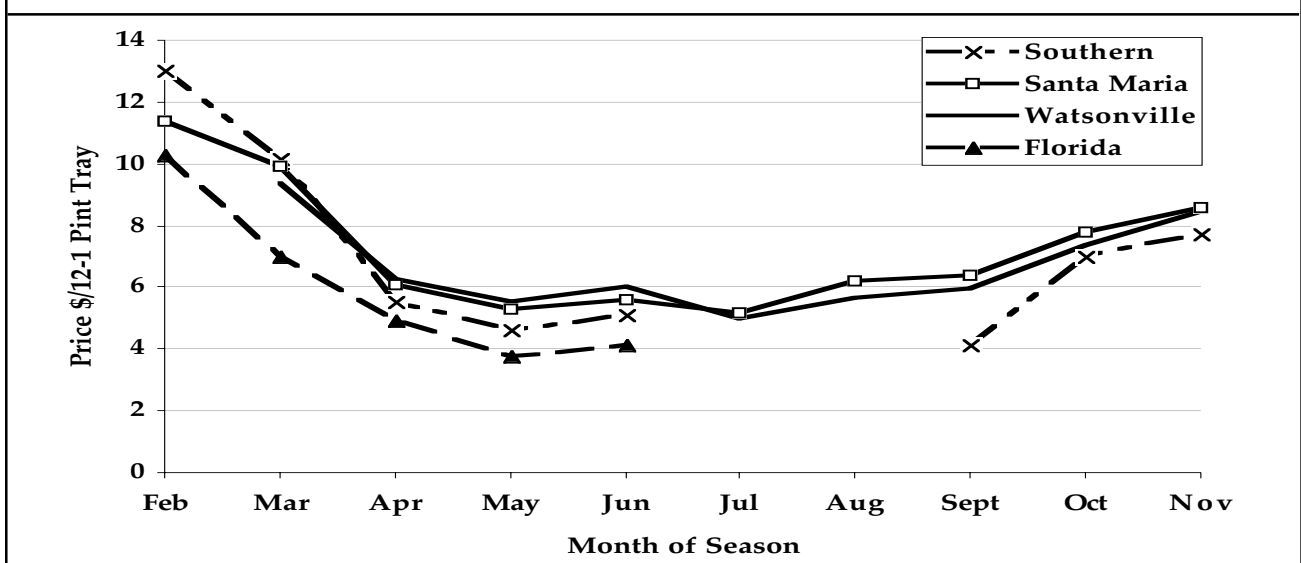
Figure 2. Season Volume Weighted Price Index: Southern California



For example, other non-proprietary varieties command premiums for their berries based on a combination of good physical characteristics, marketing services and brand reputation. The existence of quality-based price differentials provides growers with an alternative to traditional marketing.

Entrepreneurial growers use quality differences to target high price periods at the end of the season. In 1994, growers of a proprietary variety in Oxnard, California (a southern growing district) first instituted a second planting that yielded a second harvest season

Figure 3. Average Monthly FOB Price 1987-1997



to take advantage of a “market window” in late September, October and early November. This second season harvest introduces an additional supply source into a market period traditionally occupied only by northern California growers. Just as the Southern California growers rely on high prices during a few weeks at the start of the season, northern California growers rely on those few weeks of higher prices late in the season. Growers in Northern California enjoy a longer

harvest season than southern growers; however, they do not command very high prices on average. Fresh market prices in July and August are among the lowest received by northern California growers all year. Late September and October typically yield higher fresh market prices than the peak northern season months of March, April and May (Figure 3).

Quality differences between northern and southern berries are also a likely factor affecting prices in late September and October. Oxnard’s second season berries are the larger, firmer “new fruit” produced by plants at the beginning of their production cycle. This quality difference further enhances the desirability of Oxnard’s proprietary varieties over late season berries from the north. Thus, northern California growers will likely face reduced prices that are attributable to both increased overall volume and relatively lower quality fruit. The plot of the season index (Figure 4) for northern California growers, confirms that the overall price level has indeed declined since Oxnard instituted its second harvest season. For the period 1993-1997, the months of September, October and November have average index values markedly below the average index values for the same months during the years 1987-1992.

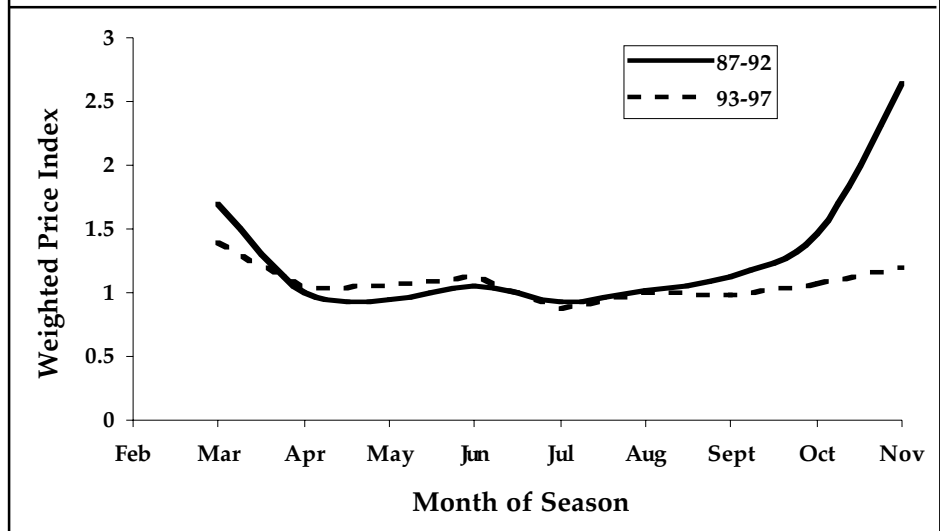
Similar effects occur at the end of the Southern California season – i.e., at the end of May and into June. Price differences between the processed market and the higher-valued fresh market keep lower quality berries from the south in the fresh market longer, thereby depressing the fresh market price for higher quality berries from the north. While berries from Southern California in May and June are smaller, less

firm, and less suited for the fresh market, retail buyers will buy them if the price is right.

Processing prices are traditionally thought to influence the volume available on the fresh market, particularly in June, when warm temperatures make southern strawberry quality marginal for sale on the fresh market. Recently, Southern California growers have adjusted to delay their exit from the high value fresh market. The planted acreage of proprietary varieties has nearly doubled from approximately 600 acres, accounting for 8% of the acreage in Southern California in 1993, to over 1200 acres, or 16%, in 1997. The premiums often paid for non-physical characteristics associated with these proprietary varieties may mitigate the differentials in physical quality between northern and southern berries and permit these growers to stay in the fresh market. Additionally, improvement of late season quality of non-proprietary berries in Southern California has been an additional benefit of the widespread adoption of the Camarosa strawberry. This variety produces a firmer berry over a longer period than other university varieties, allowing growers the flexibility to move between fresh and processed markets when market conditions permit.

As the California strawberry industry demonstrates, where boom-bust price swings occur because of seasonality of supply, incentives exist for growers to implement supply-side adjustments (when they are possible). Examples we have seen are:

Figure 4. Season Weighted Volume Price Index: Watsonville



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(1) the adoption of new varieties to capture niche markets; (2) adjustments in production practices to take advantage of market windows, and (3) utilization of quality differentials to remain in lucrative markets. It is possible that these supply-side adjustments may lower the seasonal boom-bust cycle of fresh strawberry prices. Smoothing, however, is achieved through the reduction of high prices. The possibility exists, then, that the strawberry industry's adjustments may lower industry profits. Consequently, there may be a trade-off between greater market stability and greater expected or average profits.

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their exceptionally high economic value provides strong incentives for conservation of stocks to assure a supply of trophy animals.

Culling Strategies. Culling elephants to reduce and control elephant densities is highly controversial. While some wildlife managers feel this is a necessary management strategy, prominent international organizations object to the killing of elephants for any purpose, and can bring substantial political weight to this position. To the extent that culling yields valuable products such as ivory, countries have incentives to cull, which could affect region-wide elephant densities and impose costs on their neighbors. Cooperative strategies for culling thus seem potentially beneficial.

Developed Country Assistance. Developed countries outside of Africa can also play important roles. First, they can police their own imports to enforce bans in listed animal products. Second, they have financial and human resources useful in design and implementation of wildlife management systems, an "in-kind" form of foreign aid. Third, to the extent that their citizens are willing to pay for the preservation of elephants in situ, they should contribute to management costs.

Conservancy Development. The willingness to pay for elephant populations in situ by the developed world places great burdens on local African communities located in elephant habitat. Greater elephant populations cause more problems with damage to crops, infrastructure, and people. Historically, relatively little ecotourism and hunting revenues have flowed to these people, who bear the greatest cost of maintaining large elephant populations. The revenues are captured by tour and concessions operators who typically live in

urban areas or outside Africa entirely. This increases incentives for locals to poach or otherwise defend against wildlife incursions.

Namibia has recently begun some exciting experiments aimed at reversing this problem, by allowing local villages to form "conservancies", that have broad powers over the management and utilization of local wildlife. This transfer of property rights to local residents provides needed incentives to maintain elephant and other wildlife stocks at the local level, because better conservation yields something for them. This helps "internalize" costs of elephants because it entitles the bearers of wildlife damage costs to a share in the benefits from those stocks.

Elephant-human interactions are many and various, with many positive and some negative dimensions. The conservancy concept seems to have great promise for helping resolve some of the conflicts while maintaining the prospect of healthy and viable elephant stocks.

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ARE Faculty Profile

Philip Martin grew up in Hershey, PA and studied labor economics and agricultural economics at the University of Wisconsin-Madison, where he earned a Ph.D. in 1975. He is a professor of agricultural and resource economics at the University of California, Davis and chair of the University of California's sixty-member Comparative Immigration and Integration Program. Martin received UC Davis' Distinguished Public Service award in 1994.

Martin has published extensively on labor migration, economic development, and immigration policy issues, and has often testified before Congress and state and local agencies on these issues. Martin co-chairs Migration Dialogue, a not-for-profit organization dedicated to providing timely and nonpartisan migration analysis through seminars, the newsletters *Migration News* and *Rural Migration News*, and monographs and research articles on migration issues. He is on the editorial boards of the *International Migration Review* and *International Migration*. Phil and his wife, Cicily, are in their fifth year of publishing *Migration News*, whose Web site got over one million hits in 1998.

Martin has earned a reputation as an effective analyst who can develop practical solutions to complex and controversial migration and labor issues. In the U.S., Martin was the only academic appointed to the Commission on Agricultural Workers to assess the effects of the Immigration Reform and Control Act of 1986; his book on collective bargaining in California agriculture won the Richard Lester award as the outstanding book in labor economics and industrial relations published in 1996.

Abroad, Martin was the impartial analyst selected to assess the prospects for Turkish emigration to the European Union for the Development Program between 1987 and 1990. In 1994, he evaluated the effects of immigration on Malaysia's economy and its labor markets for the World Bank, and in 1996, evaluated the effects of remittances on development for the International Monetary Fund. Between 1995 and 97, he assessed the factors that initiate and sustain Mexico-U.S. migration for the Binational Study of Migration.



Philip Martin
Agricultural and Resource Economics
Professor

Dr. Martin travels extensively for his work, but he truly enjoys his time at home in Davis with his family. The highlights of Phil's family time include cheering his two children on from the sidelines of soccer fields, baseball diamonds, tracks, and pools as they each compete in multiple sports. On free weekends or vacations, the Martin family spends time together at the beaches at Jenner and Lake Tahoe.

Dr. Martin will teach his popular course in agricultural labor in the fall of 1999, and then be a Fulbright Senior Scholar on sabbatical in Germany in 2000.

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