



# UPDATE

## Agricultural and Resource Economics

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### Grocery Retailer Pricing and Its Effects on Producers: Evidence for California Fresh Produce

by

*Richard J. Sexton, James A. Chalfant, Humei Wang and Mingxia Zhang*

*Retailers are becoming the dominant players in the food marketing chain. This study examines retailers' pricing practices for some major California produce commodities, and concludes that, on balance, retailers' pricing strategies are not good news for grower-shippers.*

Most food sector analysts agree that retailers are becoming the dominant players in the food marketing chain. During the 1990s food retailing experienced unprecedented structural change due to a wave of mergers and acquisitions and new entry, most notably by discount retailer Wal Mart, which expanded into food retailing in the late 1980s and today is the nation's fourth largest food retailer. The national market share of the four leading retailers rose from 23% in 1993 to 28% in 1999. Because most grocery chains do not operate in all regions of the country, the market concentration is much higher within any local metropolitan area. The population-weighted average of the four-firm market share in the 100 largest U.S. metropolitan statistical areas (MSAs) rose from 65.7% in 1992 to 69.8% in 1998. The four-firm market shares for California MSAs in 1992 and 1998 are indicated in Table 1 on page 2.

Most of the discussion associated with the emerging domination of retailers in food marketing has focused on the impact upon consumers. The antitrust authorities have also emphasized the potential consumer impacts in evaluating proposed mergers in food retailing. Compelling divestiture of stores in areas where merger partners have

overlapping markets has been a common prerequisite to approving mergers. For example, the Federal Trade Commission required Albertsons and American Stores (Jewel, Osco) to jointly divest 144 stores in 57 cities where both operated, before granting approval for their merger.

Much less emphasis has been given to the impact of powerful grocery retailers on the welfare of growers and shippers. However, we have recently completed work that focused upon this question for various California fresh produce commodities. One dimension of structural change in the food chain has often been the streamlining of the marketing process. Many produce commodities are sold directly from grower-shippers to retailers, with little or no involvement from market intermediaries. Traditional wholesale or terminal markets still operate in many major cities, but they serve primarily small retailers, food service, and institutional buyers. Because of the direct link from the grower to the retailer for produce commodities, the impact of retailers' pricing practices is felt directly by the producer.

The California commodities we studied included iceberg lettuce, iceberg-based bagged salads, vine-ripe and mature-green

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*by Daniel A. Sumner*

**Table 1. Four-Firm Grocery Retailer Market Shares for California MSAs**

MSA	Four-Firm Market Share	
	1992	1998
Fresno	67.7%	65.8%
LA-Long Beach	78.6	67.1
Oakland	78.4	79.0
Orange County	65.5	74.7
Sacramento	61.7	65.6
San Diego	79.9	77.6
San Francisco	75.5	72.1
San Jose	71.7	72.4
Stockton-Lodi	55.3	64.5
Vallejo-Fairfield-Napa	61.2	NA
Ventura	63.0	82.1

tomatoes, and red and green table grapes. Lettuce and fresh tomatoes were studied as part of a cooperative agreement with the USDA Economic Research Service, while table grapes were examined in work conducted for the California Table Grapes Commission. In both studies, we had access to weekly store-level pricing information for a sample of MSAs across the U.S.--20 chains in total for iceberg lettuce and fresh tomatoes and 24 chains in total for table grapes. In some cases, concerns about the accuracy of the data caused us to work with less than the full sample of chains.

### Retailer Pricing Practices for Produce Items

We encountered remarkable variety among retailers in how they chose to set prices for produce commodities. Sellers in perfectly competitive markets are sometimes called “price takers” because they don’t have the power to influence prices and must take them as given. The marked differences in retailers’ pricing strategies for these basic commodities within given MSAs directly refute any notions that retailers act as competitive price takers.

Table 2 illustrates the wide variability among Los Angeles retailers in setting prices for iceberg head lettuce and iceberg-based bagged salads. We had information for four LA-area chains, denoted as Chain 1 through Chain 4 (based upon an agreement with the data vendor, we cannot reveal the chain names). The table contains the correlations in the weekly retail prices charged by the various chains for head lettuce and the various brands of bagged salads (Dole, Fresh Express, Ready Pac and private label). Correlation with the FOB (farm gate) price for iceberg lettuce is also provided. Correlation coefficients fall in the range of -1.0 (perfect negative correlation) to 1.0 (perfect positive correlation), with values near zero indicating very little correlation between the movements over time for the particular price pair. Each chain’s head lettuce price is positively correlated with the FOB price (column 1), but the correlations are much lower than if the retailers were merely adding a cost-based mark

PRODUCE PRICING- *Continued on page 10*

**Table 2. Farm and Retail Price Correlations for Iceberg Lettuce Los Angeles Retail Chains**

	FOB	LA 1 Private Label	LA 1 Head	LA 2 Fresh Express	LA 2 Dole	LA 2 Ready Pac	LA 2 Head	LA 3 Dole	LA 3 Ready Pac	LA 3 Head	LA 4 Fresh Express	LA 4 Ready Pac	LA 4 Head
FOB	1.000												
LA 1 Private Label	0.110	1.000											
LA 1 Iceberg	0.688	0.073	1.000										
LA 2 Fresh Express	-0.133	0.124	-0.035	1.000									
LA 2 Dole	-0.169	0.015	-0.279	0.389	1.000								
LA 2 Ready Pac	0.103	0.021	0.139	-0.083	-0.063	1.000							
LA 2 Head	0.446	0.174	0.613	0.005	-0.238	0.125	1.000						
LA 3 Dole	-0.237	0.015	-0.405	0.179	0.385	-0.330	-0.146	1.000					
LA 3 Ready Pac	0.011	0.133	-0.007	0.018	0.216	-0.349	0.072	0.137	1.000				
LA 3 Head	0.534	0.029	0.775	-0.047	-0.465	0.122	0.717	-0.332	-0.078	1.000			
LA 4 Fresh Express	0.033	0.009	0.027	-0.078	-0.002	0.065	-0.008	-0.155	-0.027	0.014	1.000		
LA 4 Ready Pac	-0.201	-0.032	-0.280	0.221	0.214	-0.014	-0.178	0.058	0.032	-0.272	0.028	1.000	
LA 4 Head	0.456	0.063	0.660	0.063	-0.268	-0.032	0.659	-0.192	0.046	0.733	0.019	-0.232	1.000

# Agriculture and the Environment in the Brazilian Amazon

by

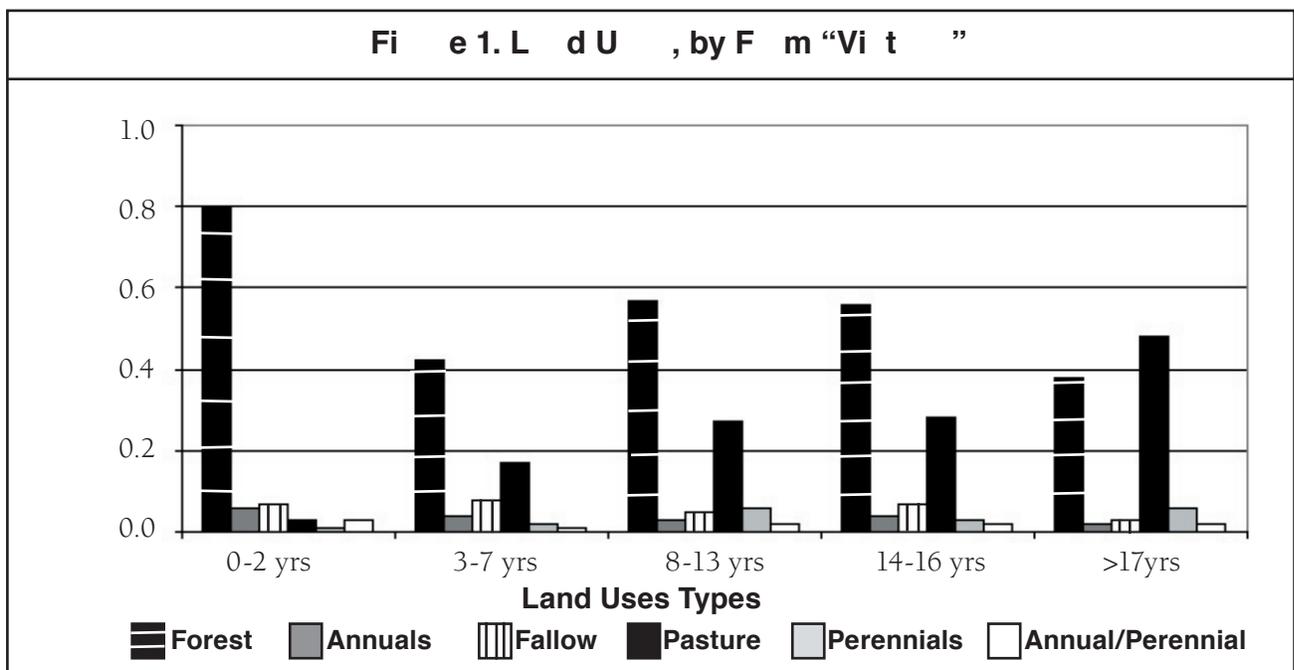
*Stephen A. Vosti, Julie Witcover, Chantal Line Carpentier, Samuel Oliveira and Jair Santos*

*The profitability of agriculture is driving much of the deforestation in the Amazon, and labor scarcity is chiefly responsible for the establishment of pastures on cleared land. Deforestation can be slowed and non-pasture alternatives can be promoted, but doing so will be an expensive and slow process, which the international community should support.*

Tropical ecosystems are under attack from two sides: deforestation rates are high and post-deforestation land uses provide virtually none of the environmental services once supplied by forests. This is especially true in Brazil, home to the world's largest remaining tract of tropical moist forests. Why is this happening? What can be done to slow deforestation? In particular, can the intensification of agriculture on already-cleared lands at the forest margin help slow deforestation? In this article, we use the results of field research on smallholder agriculture in the western Brazilian Amazon to address these issues. More specifically, we examine the potential tradeoffs between one important environmental objective (increasing and retaining carbon stocks) and farmer objectives (profitability and efficient labor use) across various land use systems (LUS) available to smallholders in that region today.

## Trends in Land Use

Anyone who has visited the western Brazilian Amazon, or who has monitored the popular press regarding land use in that huge but remote area, will be aware of the large amount of deforestation taking place (it is estimated that an area about the size of Belgium is deforested, annually) and the marked trend toward converting deforested areas to pasture to support mixed cattle (beef and milk) production systems. Figure 1 confirms these trends by depicting land uses for several 'vintages' of farms, from those very recently established farms (0-2 years) to much older farms (more than 17 years) which comprised the first waves of migrant agriculturalists to this region beginning in the late-1970s. The decisions to decrease the amount of forest on farms and especially to increase the amount of pasture are clear.



But what motivates smallholders to clear forest? Surely they are aware of the environmental effects of forest clearing. And, of all the alternative LUS available to smallholders in that region, why is pasture so predominant?

The answers to these and related questions lie in the relative private financial returns to alternative LUS in this region and the acute shortage of labor available to establish and manage LUS. Research results based on systematic measurements of the profitability of LUS explain why smallholders routinely pick up their chainsaws, and the enormity of the challenge faced by policymakers seeking to dissuade them from doing so. Systematic measurements of selected environmental characteristics of LUS explain why policymakers should continue to try to meet this challenge.

### Evaluation of Land Use Systems

Table 1 presents summary results of field research undertaken in the western Brazilian Amazon. The rows of Table 1 represent LUS (with labels appearing in the first column of Table 1), paired so as to highlight the costs/benefits of LUS intensification. In order of presentation, the LUS rows represent:

- Forest–traditional Brazil nut extraction
- Managed Forestry–the sustainable, low-impact extraction of timber products from privately held forests on farms
- Coffee/*Bandarra*–a coffee-based system that includes a fast-growing native tree species
- Coffee/Rubber–coffee and rubber, intercropped
- Traditional Pasture–a low-technology, mixed cattle production system
- Improved Pasture–a more intensive and higher-producing cattle and pasture system
- Annual/Fallow–a slash-and-burn agriculture system involving annual crops
- Improved Fallow–a legume-based fallow system involving annual crops.

Beginning in column two, the columns of Table 1 represent selected LUS characteristics of interest to the international community (ability to sequester carbon) and those of interest to farmers (returns to land, returns to labor and labor requirements). Comparing the profitability of traditional forest extraction activities (forest) with that of alternative LUS can shed light on deforestation issues, examining LUS labor requirements can help explain the use of cleared land, and reviewing carbon

sequestration results highlights the environmental costs associated with LUS change.

### Land Use Systems Compared—Farmer Concerns

In the relatively labor-scarce setting of the western Brazilian Amazon (about three inhabitants per square kilometer), the returns to labor outweigh returns to land in farmers' LUS decisions. Table 1 presents both profitability measures for comparison. Clearly, the returns to labor dedicated to traditional forest extraction activities are by far the lowest among all alternative LUS, yielding about U.S.\$1 per person-day; this is the fundamental reason why forests continue to fall in the region.

Among the non-forest-based LUS alternatives, systems at or below the average rural daily wage for unskilled labor, approximately U.S.\$6.50 per day, are probably not attractive to farmers; hence, the annual/fallow system is not practiced. Traditional pasture/cattle production systems, the most prevalent in the study area, yield slightly better returns than wage labor. All of the remaining systems yield even higher returns to labor. For example, the improved pasture/cattle system brings in about three times more per person-day than the traditional cattle system.

Analysis of returns to land (column three of Table 1) shows that all intensified systems appear relatively attractive, and the two traditional systems (forest and annual/fallow) are below average. Farmers who are more interested in returns to labor than to land would likely select improved pasture/cattle systems, while those more concerned with per hectare (ha) asset values might prefer systems scoring high on both counts, such as improved fallow and coffee/*bandarra*.

### Adoptability of Intensive Agricultural Systems

But a LUS with high returns to labor may simply be out of reach of many small farmers in the area, given the current labor scarcity and poorly performing labor markets. Labor required to manage LUS are reported in column 5 of Table 1. The coffee/rubber system demands the most labor by far, nearly 60 person-days per hectare per year. At the other end of the spectrum lies traditional forest extraction, which requires only about one person-day per ha per year to manage. Traditional pasture requires the least labor of any system other than the forest-based

**Table 1. Carbon Sequestration and Profitability of Selected Land Use Systems**

	Global Environmental Concerns		Farmer Concerns	
	Carbon Sequestration	Profitability		Labor Requirements
	Above-ground Carbon t/ha (time-averaged)	Returns to land R\$/ha (1 ha=2.471 ac)	Returns to Labor R\$/person-day	Labor person-day/ha/yr
Forest	148	-2	1	1
Managed Forestry	148	416	20	1
Coffee/Bandarra	56	1955	13	27
Coffee/Rubber	56	872	9	59
Traditional Pasture	3	2	7	11
Improved Pasture	3	710	22	13
Annual/Fallow	7	-17	6	23
Improved Fallow	3-6	2056	17	21

*Notes to Table: Prices are based on 1996 averages, and expressed in December, 1996 reais, R\$ (U.S.\$=R\$1.04).*

systems, approximately 11 person-days per ha annually; its intensified version, improved pasture, needs just slightly more than this. Clustered at 1.5-2.0 times the labor requirements of these systems are coffee/*bandarra* and improved fallow, as well as the vanished shifting cultivation (annual/fallow) system.

### Tradeoffs Between Farmer Concerns and Environmental Concerns

Will the search for higher profitability in general, and higher returns to labor in particular, come at a high environmental cost? One environmental service of critical concern is the ability of LUS to retain and sequester carbon. CO<sub>2</sub> emissions from forested areas make up about 25% of total global emissions, and therefore can substantially impact atmospheric quality and global warming. Available evidence shows that the trade-off between returns to labor (column four) and carbon stocks (column two) is stark. Forests are by far the best way to store carbon, but extracting Brazil nuts from them yields far less per person-day than manual labor. Managed forestry looks promising as an intensive system that retains a large amount of carbon. However, the most attractive system along the returns-to-labor spectrum, improved pasture/cattle, is one of the *worst* ways of storing above-ground carbon. The coffee-based systems occupy intermediate

positions. Moving from coffee/rubber to the coffee/*bandarra* system (the more attractive in terms of labor requirements as well) improves returns to labor without sacrificing carbon stocks.

### Summary, Conclusions and Policy Messages

This article has examined the financial and environmental consequences of changes in selected LUS in the western Brazilian Amazon, concentrating on smallholder concerns and carbon sequestration. With one exception, we uncovered no 'win-win' systems that boosted farm profits and sequestered large amounts of carbon.

Since labor returns from traditional extractive forest activities remain *far below* those from any alternative non-forest-based LUS examined, the prospect of continued deforestation looms large; unless the financial returns to forest-based activities can be increased, forests will continue to fall.

Labor scarcity, rather than LUS profitability, seems to be driving the use of cleared land. Small patches of very profitable non-pasture LUS do appear on farms, but the labor-saving pasture/live-stock systems dominate the agricultural landscape.

More intensive, non-forest-based LUS can affect deforestation in conflicting ways. On the one hand, these LUS use much more labor, and hence can



*Small-scale farmers removing forest to earn a living and ensure food security.*

*Photo: Steve Vosti*

deflect labor from deforestation activities. However, these systems are more profitable and hence can generate cash to cover the costs of hired labor for deforestation. The second effect is likely to overwhelm the first, leaving severe regional labor shortages as the only 'brake' on deforestation.

But what of managed forestry that seems to be a 'win-win' system? Managed forestry holds great promise for retaining carbon stocks and increasing farm income. But, this LUS remains experimental and may not be suitable for smallholders who face depleted forest reserves or who are too poor to make needed up-front investments. Moreover, third party monitoring will be required to ensure sustainable timber off-take, and institutions for doing so are not currently in place.

What can and should national policymakers do to reduce deforestation and improve farmer welfare at the forest margins? To be most effective, strategies should work both sides of the forest margin, increasing the intensity of use of cleared land while either pushing up the costs of deforesting or increasing the value of standing forest. For example, policy changes can improve incentives for the formation of farmers' groups capable of managing small-scale managed forestry systems that do not now exist. Almost all intensive systems require rural credit; this credit will not flow from commercial sources, so policy action is needed. Reducing transportation costs will also be key to intensifying agriculture, so again, policy action is

required. Finally, direct subsidies may be needed to promote some systems; chemical fertilizers for establishing some systems are an example. To reiterate, policies that boost incentives to maintain forests must complement these efforts.

Investing in the most promising land use systems is possible and worthwhile if done with the awareness that intensification *per se* of a given land use may have unintended consequences; that is, in the absence of other measures, policies can establish a profit motive for accelerated deforestation. When this occurs, policymakers must redouble their

regulatory and other direct interventions to manage deforestation.

Finally, what role should the international community play in reducing deforestation? First, sponsoring research on issues of global interest is essential. Second, paying some of the costs of establishing and monitoring LUS that generate large amounts of environmental (and other) services of importance to the global community is appropriate.

This Update article is based on Vosti, Stephen A., et al., 2000. Intensifying Small-Scale Agriculture in the Western Brazilian Amazon: Issues, Implications and Implementation. In *Tradeoffs or Synergies? Agricultural Intensification, Economic Development and the Environment*. David Lee and Chris Barrett (eds.). Wallingford, UK: CAB International.

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## Giannini Conference Brings Water Stakeholders Together to Discuss the Future of the West Side

by  
**David Sunding**

*State-wide interests grapple with hard choices of land retirement, water supply expansion and better management of existing water supplies as possible solutions needed to keep the West Side farming community economically and environmentally sound. Ê*

About 125 farmers, policy makers, environmentalists and UC researchers met to discuss the future of the San Joaquin Valley's "West Side" in a conference at the University of California's Kearney Agricultural Center on March 22, 2002. Sponsored by the Giannini Foundation and UC Berkeley's Center for Sustainable Resource Development, the conference brought stakeholders together to share opinions on policy decisions that must be made to keep the area economically viable and environmentally sound.

### Issues Facing the West Side Today

The West Side is a geographic region bounded by Tracy in the north to Kettleman City in the south, and running up to several dozen miles east of I-5. The region is primarily agricultural, and receives a large part of its water supply from the Central Valley Project. While large portions of the West Side are exceptionally productive, the twin problems of unreliable water supply and the buildup of saline drain water plague the area's farmers.

Because much of the West Side has been put into production relatively recently, many farms there have "junior" water rights that are highly likely to be cut back in the event of a shortfall. Exacerbating this problem is the fact that in the past ten years, increasing amounts of California's water have been dedicated to the environment. For example, the Central Valley Project Improvement Act of

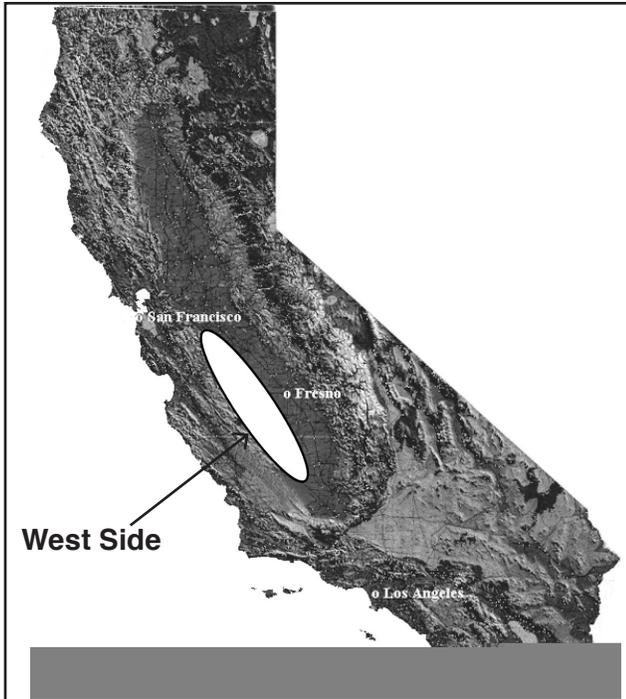
1992 reallocated 800,000-acre feet of water from agriculture to the environment for the purpose of rehabilitating the San Francisco Bay-Delta estuary. Because West Side farmers are at the end of the water queue, most of the burden of restoring the aquatic environment has fallen upon them.

Salinity is another long-term problem facing farmers in the region. Water imported from the Delta to West Side farms contains salt, and without an outlet for drain water, salt will accumulate in the region. The logical conclusion of this process is for farmland to go out of production as it becomes unproductive. West Side farmers have been pursuing a lawsuit against the Department of the Interior alleging that the Bureau of Reclamation is obligated to provide drainage service that was promised at the time the water delivery contract was signed. The U.S. District Court in Fresno recently handed these farmers a victory when it agreed that the federal government was indeed obligated to provide some form of drainage service.

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*Professionals from several fields of expertise were represented on the first conference panel. Members include, in order from left to right, Michael Hanemann of UC Berkeley, Tom Birmingham, general manager of Westlands Water District, Sarge Green, president of I-5 Development Corridor, Tom Graff, senior attorney of Environmental Defense, and Wes Wallender of UC Davis.*



### The Pros and Cons of Land Retirement

One impetus for the conference was a recent proposal floated by Westlands Water District (the single largest water district in California and the dominant West Side water interest) to settle the lawsuit. Tom Birmingham, manager of Westlands Water District, explained at the conference that Westlands has proposed that the government buy up to 200,000 acres of its farmland, thereby removing much of the need for drainage service. In exchange, Westlands would drop its drainage suit against the government (and other legal actions as well) and would keep all of its current water supply for use on the 400,000 acres of its farmland remaining in production.

One difficult problem with such a land retirement program, as was noted at the conference, is determining exactly which land to retire. The main goal of land retirement is to combat drainage. Another goal is to create upland habitat for the area's numerous endangered species. Wes Wallender of UC Davis described the choice between retiring "upland" and "bottom" land. Most retirement proposals call for the purchase of bottom land. Wallender noted that if bottom land is retired and upslope land remains in production, subsurface flows of saline drain water will impair the productivity of bottom lands and degrade their suitability as habitat for plants and animals, particularly endangered species.

Socioeconomic dimensions of land retirement are complex as well. Sarge Green, manager of the Tranquillity Irrigation District and president of the I-5 Development Corridor, noted that many towns in western Fresno County are among California's poorest. While these towns are in poor shape even with abundant water supplies to West Side farms, retiring several hundred thousand acres of farmland will certainly not help matters as there would be many lost jobs as a consequence of retirement. Green argued that if retirement is to occur, a share of the money paid by the government should go directly to these communities to compensate for adverse impacts.

### Unreliability of Water Supplies

The other major issue discussed at the conference was water supply reliability, or the lack of it. Most West Side farmers have never enjoyed abundant water supplies, and in recent years this situation has only grown worse. In fact, the Bureau of Reclamation now forecasts that West Side interests can only expect around half of their maximum deliveries in an average rainfall year, reported Dan Nelson, manager of the San Luis & Delta-Mendota Water Authority.

Given the unreliability of their water supplies, West Side farmers have expressed interest recently in expanding the state's water supplies, to include the construction of surface storage facilities. Environmental interests strongly oppose construction of more dams in California, arguing that diversion from streams and rivers has already decimated important resources, most notably the Bay/Delta estuary and once-abundant salmon runs in the Sacramento and San Joaquin Valleys.

### Expand Supply or Improve Management of Water Sources?

Giannini Foundation economists including David Zilberman and myself from UC Berkeley, Richard Howitt of UC Davis and Henry Vaux of UC Riverside have a long history of studying the policy and efficiency aspects of water supply in California, and have contributed to the debate about the need for expanding water supply in California. We have examined the relative efficiency of expanding supply versus reducing demand through water conservation. Our collective work has identified several conclusions that bear directly on the West

Side debate and which were presented at the conference by myself and David Zilberman.

California farmers can cope with reduced deliveries by reallocating water within agriculture. Water markets are an especially important way to accomplish this reallocation. In fact, Westlands farmers have already demonstrated the usefulness of water markets by actively adopting a trading program within the district. The four aforementioned UC economists have written that this water trading concept should be expanded well beyond the West Side. Expanding the scope of the active water market to, say, the East Side, or to the Sacramento Valley would help relieve pressure on West Side farms who bear a disproportionate share of the burden of protecting the environment. Farmers reducing water use in other areas would do so voluntarily, and would receive monetary compensation for their conservation.

Farmers can achieve even higher rates of water use efficiency by improving irrigation systems. In particular, they can invest in more modern irrigation systems and reduce their water application (and reduce drainage outflow in the process). West Side farmers have achieved much in this regard, but there is still some room for improvement.

Even if the state's water supply is expanded, Giannini Foundation economists have argued that the least expensive water supply projects should be selected first. It is unlikely that surface storage is among this set of projects. In fact, it is highly likely that the cost of water from new dams exceeds the willingness of farmers to pay for it. The state and federal governments have concluded, for example, that the average cost of water from a new dam in the Sacramento Valley would be over \$400 per acre foot at the source. West Side farmers would be hesitant to pay much more than \$200 per acre foot, meaning that the water would have to be massively subsidized to be affordable. More promising alternatives for supply enhancement include groundwater banking (also around \$200 per acre foot for many projects), which also poses less of a threat to the environment. But it is important to note that water transfers are a much cheaper means of replenishing West Side water supplies than either of these alternatives. This past year, for example, Sacramento Valley rice farmers sold water to a government transfer program for \$75 per acre foot.

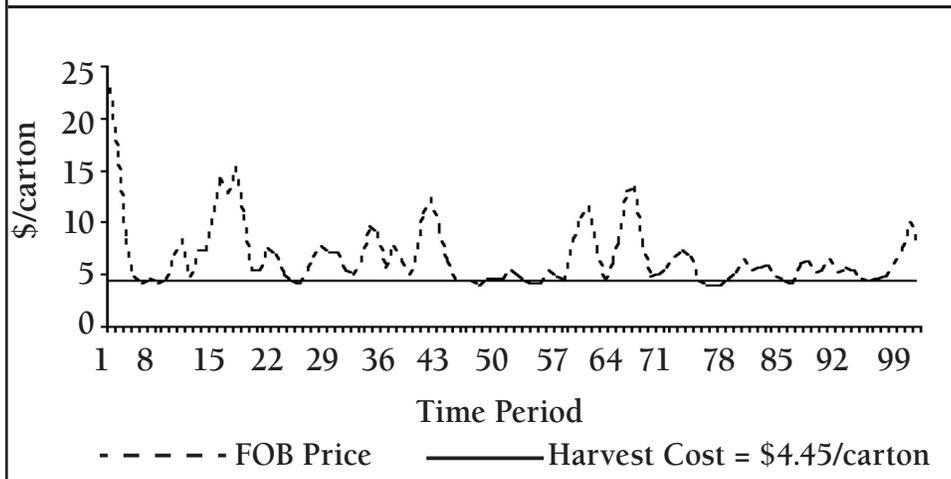
## Envisioning the Future

At this point, the conference made clear that there is little agreement among California's water stakeholders on how to deal with the problem of water supply reliability for West Side agriculture. Surface storage is the most polarizing issue. Many in the agricultural community argue that the West Side is entitled by its contract with the federal government to a more reliable water supply, and that new dams are the only realistic means of assuring reliability. Environmentalists point out that new dams are not affordable at current water rates, and that they would require a massive new subsidy to agriculture from the federal and state governments. Further, they note that dams are environmentally damaging.

Giannini Foundation economists have found some merit in both positions, and have pressed for a middle path. By reallocating agricultural water use through trading, the West Side can be empowered to increase its water supply reliability while avoiding unnecessary burdens on state and federal taxpayers. That is, Foundation economists have emphasized improving the management of existing agricultural water supplies rather than expanding them through new storage projects.

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**Figure 1. California-Arizona Iceberg Lettuce  
FOB Price and Harvest Cost: 1998-1999**



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up to the FOB price. Note, however, that any correlation between retail and farm pricing essentially disappears for the bagged salads. In all cases, the correlations are nearly zero, and in some cases are negative, meaning the retail price moved on average in the opposite direction of the farm price. Note further that there is little correlation among stores in the prices they charge for the various iceberg products (the bold numbers in Table 2 on page 2). This result is evidence that the retailers are not pursuing any type of coordinated pricing strategy for these products, as some have alleged.

FOB prices for iceberg lettuce are notoriously volatile, as Figure 1 illustrates for 1998-99. Note that the FOB price is near the estimated \$4.45 per-carton combined cost for harvesting, packing and marketing for over one-third of the weekly observations. Despite the volatility in the farm price, six of the 20 retail chains in our sample maintained the same price per head throughout the two-year period of our study. When one segment of the market does not allow price to vary, it means that the price must vary even more widely in the segments of the market with flexible prices, in order for the market to clear. We showed for a very general set of market conditions that producer average income is reduced when some retailers hold price constant despite fluctuating supplies and farm prices.

We also examined the farm-retail price spread for the various commodities. We specified the price spread (the difference between the retail and farm prices for an equivalent amount of the commodity) as

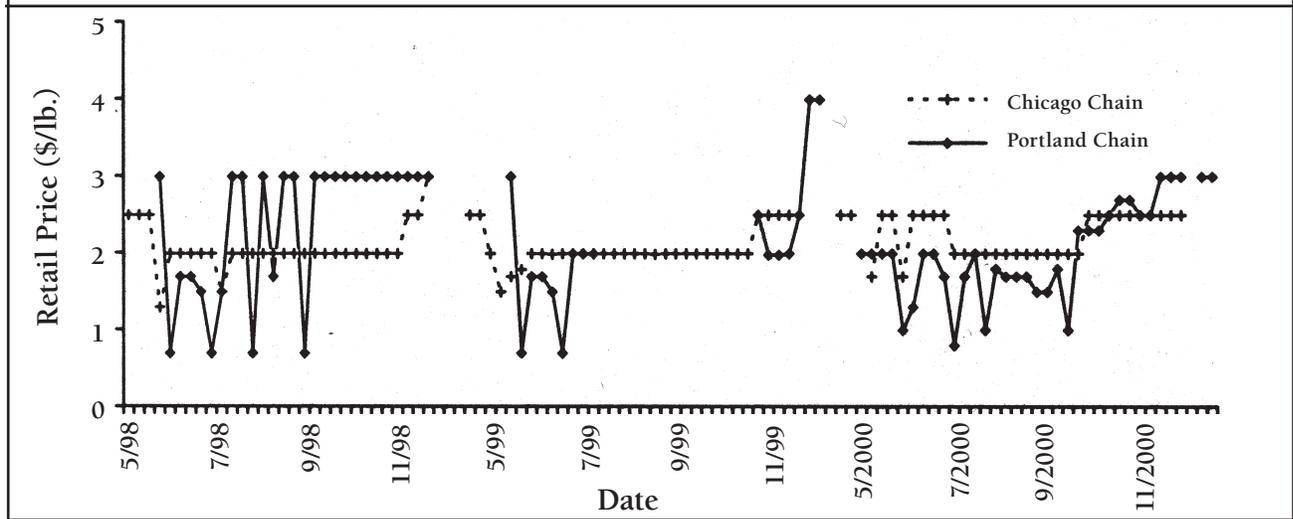
a function of per-unit shipping costs, a time trend, and the total volume of the harvest. Inclusion of the harvest variable in the price-spread equations was based on prior research that suggested buyers were able to use relatively large harvests of a perishable produce commodity to reduce producers' relative bargaining power and increase the price spread. This effect was confirmed in the case of iceberg lettuce for 11 of

the 12 chains studied. The volume of shipments was associated with a higher price spread in seven of nine chains for vine-ripe tomatoes and all eleven chains analyzed for mature-green tomatoes. Conversely, the volume of harvests had little impact on the price spread for table grapes. The likely reason for the difference is that table grapes can be stored, meaning that large harvests do not have to be committed to the market at one time, whereas highly perishable lettuce and fresh tomatoes must be marketed in the harvest period, giving producers little bargaining power when supplies are plentiful.

Shipping costs were not an important determinant of the farm-retail price spread for any of the commodities we studied. Under a competitive theory of retailer pricing, the price spread should rise and fall with increases and decreases in shipping costs. Although shipping costs vary considerably over time, most retailers paid no attention to them in setting prices to consumers. The trend variable also had little effect on the price spread, meaning that, in general, the spreads neither widened nor narrowed significantly over the two-year period of the sample.

To understand retailer pricing for fresh produce commodities, one needs to appreciate that the modern retailer sets prices for 30,000 or more product codes. Pricing decisions are not made with an eye towards profitability of any single product, but, rather, are oriented toward the profitability of the entire store. The produce section is traditionally a source of high profits for retailers, and, because of the importance consumers attach to produce, retailers can use their produce aisle as a way to differentiate themselves and attract

Figure 2. Retail Table Grape Prices: Chicago Chain and Portland Chain



consumers to the store. Accordingly, stores' pricing policies for produce vary widely. As we have already noted, some stores prefer to offer consumers stable prices week in and week out (referred to as everyday-low pricing). Other stores regularly feature produce as a sale item, so prices vary dramatically from week to week (often referred to as hi-lo pricing).

Figure 2 provides an illustration for green table grapes. It illustrates weekly price from May 1998 – December 2000 for a Chicago chain. This chain maintained a base price of \$1.99/lb. throughout the period, with only brief and minor deviations upward and downward from this base. Figure 2 also depicts pricing for a chain in Portland, Oregon over the same period. No base price is evident in the series, and price fluctuates over a wide range, with several weeks of sale prices below \$1.00/lb. Our statistical analysis indicated that this chain reduced price by \$1.15/lb. during weeks when grapes were on ad. Other chains, however, reduced prices much less, generally in the range of \$0.35 - \$0.60/lb. during advertised specials. Although it is often believed that retail prices are more stable than farm prices, our research indicates that the retail prices may be more variable, especially for products, such as produce, used frequently as sale items.

### Conclusions

The produce aisle is a very important component of today's supermarket, and retailers employ a wide range of pricing strategies for produce. Our studies show that retail prices for produce bear little relation to the underlying farm price or to the marketing costs incurred in moving the product from the producer to

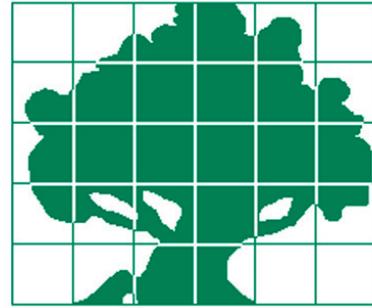
the consumer. Thus, the concept of a farm-retail price spread is today largely irrelevant for produce commodities. In general, the attenuation of the link between farm and retail prices is not good news for producers. Maintaining stable retail prices despite fluctuations in farm production means both lower revenue and wider price fluctuations at the farm level. Advertised sales of produce items represent a way to stimulate sales of the product and may benefit producers, but our work revealed no pattern between the timing of sales and the price at the farm level. In other words, there is no tendency for retailers to use advertised sales to move product during periods of high supply and low farm prices. Further, the downside to advertised specials often appears to be a high and stable price (e.g., \$1.99/lb. for table grapes) during non-sale periods. Further exacerbating the problems of produce grower-shippers is the asymmetry of bargaining power between buyers and sellers, due to the perishable nature of most produce commodities and the increasing consolidation of the retail sector. One manifestation of retailer power is the tendency of farm-retail price spreads to increase for perishable commodities during periods of abundant harvest.

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