CALIFORNIA AGRICULTURE
DIMENSIONS AND ISSUES

Edited by Jerry Siebert
2003

University of California Giannini Foundation of Agricultural Economics
Division of Agriculture and Natural Resources

CHAPTER 6

Commodity Policy and California Agriculture

Daniel A. Sumner and Henrich Brunke

Daniel A. Sumner is the Frank H. Buck, Jr. Professor in the Department of Agricultural and Resource Economics at University of California, Davis and Director of University of California Agricultural Issues Center; Henrich Brunke is a Post-Graduate Researcher at the University of California Agricultural Issues Center.

Government influences agriculture everywhere. This chapter reviews some of the most significant governmental programs that influence California agriculture and highlights similarities with and differences from agricultural policy elsewhere. The chapter describes government programs that support California commodities and attempts to quantify that description. We present new producer support estimates (PSEs) building on the work of Sumner and Hart.

Federal government programs and some California state programs support California agriculture. The central legislative basis for federal farm programs is now the Farm Security and Rural Investment Act (FSRI Act) of 2002 (PL 107-171). The law affects program crops and provides a framework for government support of some conservation programs that affect a wider array of commodities. We also discuss the implication of implementation of the Uruguay Round Agreement on Agriculture (URAA), which became effective in 1995. Federal budget outlays that support California agriculture are also covered. The most important of the California state policies that we cover is the milk marketing order. However, we also discuss other state marketing orders and state outlays for agricultural support.

Other chapters in this book have dealt with environmental and resource policies that are particularly important in California. Labor market policy is also important and the subject of a separate chapter. Here we focus the discussion mainly on farm commodity programs, but other governmental policies that provide support to agriculture are also included in the review.

As noted throughout this book, one of the most striking aspects of California agriculture is the breadth of commodities produced. This breadth makes it nearly impossible to deal with each of the policies or programs that may be important for government support for agriculture. We highlight major programs that affect the most important handful of the commodities grown commercially in the state.

Government's overall effect on agriculture includes the impacts of a variety of policies that affect business in general. These policies include taxes on sales, income, excise, and real estate property, as well as provisions of infrastructure, education, and other government services. In addition, regulation of certain other businesses may affect agriculture indirectly. While these general policies pertaining to business may be important, they will be dealt with here only to the extent that agriculture is treated differently from other industries.

A discussion of agricultural policy can be organized in a variety of ways. In this chapter we examine both major policy tools and major commodity-specific programs to summarize the influence of government. In order to provide a summary measure and a framework for the discussion, we have developed Producer Support Estimates by policy and by commodity for California agriculture.

USE AND LIMITATIONS OF THE PRODUCER SUPPORT ESTIMATE

The Producer Support Estimate can be used as an approximate indicator of the magnitude of the net subsidy from a policy. The PSE is a widely applied summary measure of agricultural policy that attempts to measure the money value of explicit or implicit income transfers to agriculture. When calculated as a ratio of total transfer to total industry revenue, the percentage PSE is a rough guide that may be compared across commodities, time, and national or other geographic boundaries. When these comparisons are interpreted with care, they provide useful summary indicators. The PSE may also be decomposed by policy type to indicate the relative importance of different policies (Organization of Economic Cooperation and Development (OECD), 2002).

The Producer Support Estimate is not a measure of production subsidy. It measures all transfers to an industry, including those that may do little to stimulate output. The PSE is not a substitute for a measure of import protection or export stimulant. Nor is the PSE a measure of producer benefit from government programs. Program outlays or other measures that enter the PSE may do little for net revenue or producer surplus. The PSE does not offer a substitute for a full analysis of the market and non-market effects of government programs. It is simply a convenient summary measure of a variety of agricultural programs that does not require a full analysis of each industry. Changes in the PSE do not necessarily reflect changes in government programs. In particular, for a PSE that contains aspects of trade barriers, price support, or deficiency payments, the movement of market prices may dominate

movements in the PSE over time. This means also that a PSE for a single year may not reflect accurately the degree of government support for a commodity in other years.

Even with these limitations, we believe that it is useful to summarize government policies affecting California agriculture by using a variety of decompositions of the PSE for recent years. The following sections discuss the PSE by program or policy category and by commodity, using recent data.

THE PATTERN OF SUPPORT FOR AGRICULTURE AS MEASURED BY PSES

Column 3 of Table 1 reports the dollar value of the Producer Support Estimate by commodity, using methods and data similar to that used by the OECD (2002). Column 2 reports the value of production by commodity to so that PSEs can be compared across commodities. The value of production for each commodity includes the value of direct payments and, of course also reflects trade barriers or other policies that raise the market price. Column 4 of Table 1 presents the percentage PSE. In Figure 1, we summarize the percentage PSE for major commodities and commodity aggregates. These PSE figures are based on detailed analysis of data that is reported in the appendix.

Figure 1. Producer Support Estimates by Commodity or Commodity Group
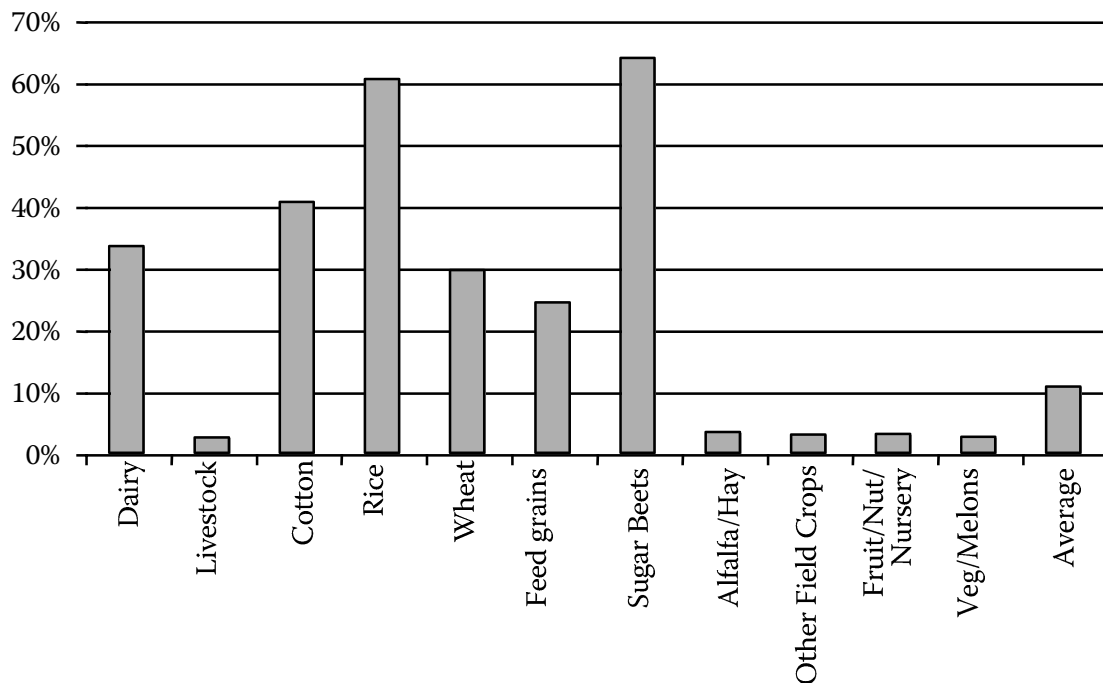
Source: Table 1

Table 1. Producer Support Estimate (PSE) by Commodity[a]

Commodities	Value of production[g]	Support	PSE
	--------- (Thousand dollars)----------		*Percent*
Dairy	4,705,171	1,571,330	33.4%
Cattle/calves	1,351,500	33,691	2.5%
Poultry[b]	980,110	23,081	2.4%
Other Livestock/poultry	384,478	10,141	2.6%
Sugar Beets	53,306	34,047	63.9%
Rice	456,194	275,851	60.5%
Cotton	987,875	400,399	40.5%
Wheat	142,475	42,071	29.5%
Feed Grains[c]	120,914	29,392	24.3%
Hay, all	1,020,510	34,252	3.4%
Other Field crops	1,018,197	30,279	3.0%
Almonds	753,720	27,997	3.7%
Other tree nuts[d]	482,016	15,609	3.2%
Grapes, rest[e]	2,249,650	68,582	3.0%
Raisins	401,256	11,090	2.8%
Citrus[f]	736,564	19,037	2.6%
Strawberries	832,515	19,444	2.3%
Other Fruit	1,401,503	68,526	4.9%
Tomatoes, proc.	654,156	24,011	3.7%
Tomatoes, fresh	290,081	7,049	2.4%
Lettuce, all	1,331,292	30,272	2.3%
Other Vegetables	4,149,622	101,858	2.5%
Nursery/Flowers	3,096,506	70,512	2.3%
Total	27,599,611	2,948,522	10.7%

a) The support estimates are generally an average of the period 1999-2001, except for government payments. For federal government payments we used the federal fiscal year 2001 through 2003 for production flexibility contract payments (replaced in 2002 Farm Bill by a direct payment program) and market loss assistance payments (replaced in 2002 Farm Bill by a counter cyclical payment program). We used data from crop years 2000 through 2002 for loan deficiency payment and marketing loan gains.

b) Poultry includes broilers, eggs, and turkeys

c) Feed grains includes corn, barley and oats

d) Other tree nuts include walnut and pistachios

e) Grapes, rest include table and wine grapes

f) Citrus includes oranges and lemons

g) Value of production includes government payments

The dollar value of the PSE is designed to reflect the government support provided to a commodity industry from a variety of policies and programs. We have used a large number of sources for information on budget outlays, internal and external prices, quantities, and other data that enter the calculation of the PSE. For many of the programs there is relatively little change from year to year. For these we have mainly use the most recent year available, often federal fiscal year 2000 (October 1 1999 to September 30 2000), fiscal year 2001 or 2002. In some cases we use calendar year 2001 or calendar year 2002 data.

In many cases we measure a portion of the government support as an average of recent years. For example, for commodity payments under the Farm Bill we use the average for crop years 2000 through 2002 for loan base program benefits (Loan Deficiency Payments and Marketing Loan Gains) and federal fiscal years 2001 through 2003 for payment programs under the Production Flexibility Contracts, Market Loss Assistance, Counter Cyclical Payments and Direct Payments. For discussion of the FSRI Act of 2002 see USDA publications by Westcott, Young and Price, and Sumner, 2003.

For broad-based input subsidies, we use national data and allocate a share of the national total to California based on California's share of national receipts. We then allocate the California total to commodities within California by their share of California agricultural receipts. In other categories of support, we use the California budget data for California fiscal year 2000 or 2001 as available. The California fiscal year runs from July 1 to June 30 so, that fiscal year 2001 runs from July 1 2000 to June 30 2001. Other specific measurements or data issues are dealt with below when we discuss individual programs and policies. The appendix contains a detailed description of our data and calculations.

The PSE calculations and the percentage PSE results would differ somewhat if we chose different years or calculation methods, but, under any reasonable procedure, the pattern across commodities and policy instruments would differ little from the results presented here. The state average PSE would also change slightly if we used different base years. However, we do not believe that the current estimate represents any systematic bias. The crop PSE has likely been declining gradually over time as the share of relatively less subsidized crops has expanded. However, dairy, which is a high subsidy commodity, has an expanding share of California farm value.

As noted in Table 1, the state PSE is about $3 billion or 10.7 percent of the total value of output and payments (See also Figure 1). The OECD calculates and reports PSEs for member countries for six major crop categories and seven livestock products. Fruits, vegetables, and other horticultural crops are not included in OECD figures. For 2001, the OECD reports an aggregate PSE range from about 1 percent for New Zealand (down from 3 percent in 1994) to over 69 percent for Switzerland (80 percent in 1994). Norway, Iceland, Japan and Korea all have PSEs over 59 percent. The average PSE for all OECD member countries in 2001 was 31 percent (38 percent in 1994). The OECD reports an aggregate PSE of 21 percent for the United States. For the thirteen commodities classified by the OECD, the average PSE in California is roughly equal to that of the United States as a whole. Support levels tend to be lower for fruits, vegetables and other horticultural commodities in the United States and some other countries. The crops that are less subsidized are particularly important in

California and therefore the average PSE we report is well below the PSE for the United States as a whole as reported by OECD.
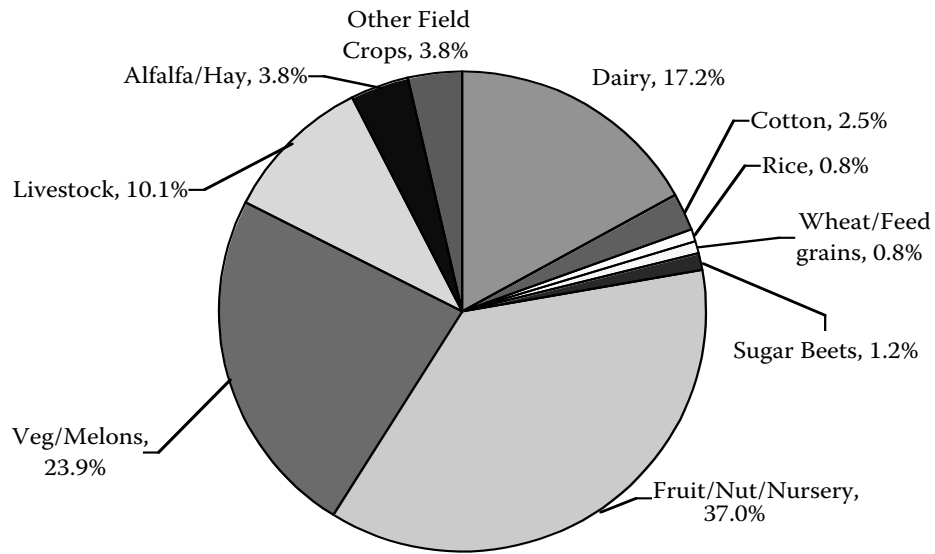
Figure 1 illustrates substantial variation across commodities in the percent PSE. At that high end, sugar has a PSE of 63.9 percent. Rice is next at about 60.5 percent followed by cotton at about 40.5 percent. Wheat has a PSE of about 29.5 percent. Dairy, the state's most important commodity in terms of value of production has a PSE of 33.4 percent. Feed grains, which include corn, oats and barley, have a PSE of about 24.3 percent. The PSEs for all other California commodities are in the single-figure percentage range, which is below the state average of 10.7 percent. Alfalfa and hay, for example, has a PSE of about 3.4 percent. Among the horticultural crops, PSEs range from 3 percent to 5 percent. Other livestock and poultry and the remaining crop categories have PSEs between 2 percent and 5 percent. These low PSE groups include such important California crops as nursery and flowers, grapes, lettuce, tomatoes, almonds, and strawberries.

As background to further discussion, Figure 2 shows the distribution of total agricultural receipts in California by commodity category. The two broad categories of horticultural crops (including all tree crops, vegetables, melons, fruits, and nursery crops) comprise well over half of all agricultural receipts in California. Dairy is the most important single commodity with about 17 percent of all receipts. Of the field crops, alfalfa hay is most important, followed by cotton and rice.

Figure 2 is presented to provide a basis for comparison with Figure 3, which shows the distribution of total support by commodity. Now the dairy industry is dominant in terms of its share of total support. Dairy is an important industry in California and also has a relatively high degree of government support. About 54 percent of all support in California agriculture is provided to the dairy industry. Notice that, because of their importance in total receipts, even the less subsidized categories of horticultural crops receive a combined total of over 19 percent of all the PSE for the state. Also, the heavily subsidized but relatively minor crops, cotton and rice, show up significantly in Figure 3.
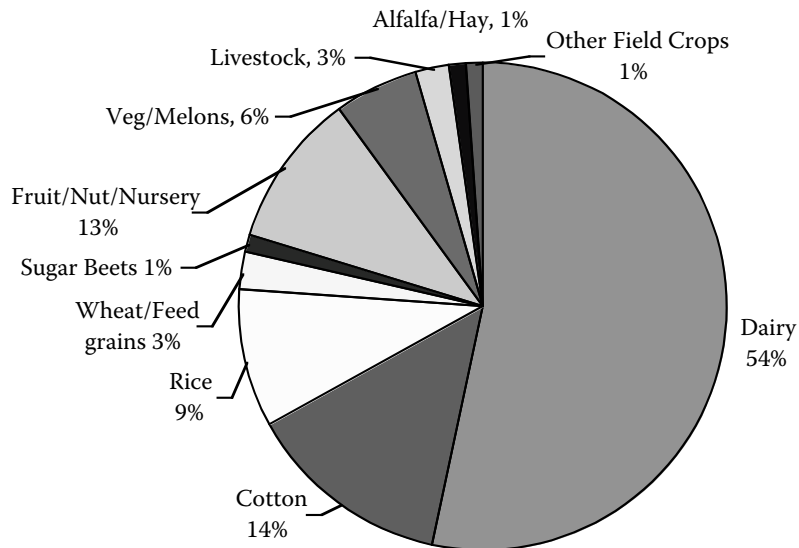
Table 2 provides an alternative categorization of the aggregate PSE. Rather than providing a distribution across commodities, Table 2 distributes the PSE by policy area and more specific policy tools. Import barriers account for the largest share of support, followed by government payments. Input assistance is ranked third. By far the most important policy tool in terms of the aggregate PSE is the dairy import barrier, valued at more than $1.15 billion per year. Government payments are an important policy, accounting for an annual average of $210 million in Market Loss Assistance payments (replaced by the Counter-Cyclical Payments under the FSRI Act) and $194 million in Production Flexibility Contract payments (replaced by the Direct Payment Program under the FSRI Act). Support from marketing loan benefits and Loan Deficiency Payments is valued at nearly $277 million. Direct payments account for about 25 percent of the total support in California agriculture.

Figure 2. Commodity Share of Total Value of Production

Other Field Crops, 3.8%

Alfalfa/Hay, 3.8%

Dairy, 17.2%

Cotton, 2.5%

Rice, 0.8%

Livestock, 10.1%

Wheat/Feed grains, 0.8%

Sugar Beets, 1.2%

Veg/Melons, 23.9%

Fruit/Nut/Nursery, 37.0%

Source: Table 1

Figure 3. Share of Total Support by Commodity

Alfalfa/Hay, 1%

Livestock, 3%

Other Field Crops 1%

Veg/Melons, 6%

Fruit/Nut/Nursery 13%

Sugar Beets 1%

Wheat/Feed grains 3%

Dairy 54%

Rice 9%

Cotton 14%

Source: Table 1

Table 2. California PSE Contributed by Each Policy Tool[a]

Policy Tool	Value	Share
	(thousand dollars)	*%*
Import Barriers	*1,180,643*	*40.0%*
Dairy	1,150,360	39.0%
Sugar Beets	30,284	1.0%
Export Assistance	*43,382*	*1.5%*
Dairy Export Incentive Program/Export Enhancement Program	20,002	0.7%
Foreign Market Development/Market Access Program	23,380	0.8%
Government Payments	*756,235*	*25.6%*
Production Flexibility Contract Payments	194,231	6.6%
Market Loss Assistance Payments	209,808	7.1%
Loan Deficiency Payments and Marketing Loan Gains	277,196	9.4%
Milk Income Loss Contract Payments	75,000	2.5%
Input Assistance	*303,998*	*10.3%*
Water	81,810	2.8%
Crop Insurance/Disaster Payments	219,229	7.4%
Grazing Fees	2,959	0.1%
Other Marketing	*242,630*	*8.2%*
Inspection	147,149	5.0%
Processing and Marketing	58,300	2.0%
Upland Cotton User Marketing Certificate.	37,181	1.3%
Dairy Marketing Order	*154,368*	*5.2%*
Research/Extension	*148,842*	*5.0%*
Economy-wide Policies	*118,424*	*4.0%*
Total	2,948,522	100.0%

a) The support estimates are generally an average of the period 1999-2001, except for government payments. For federal government payments we used the federal fiscal years 2001 through 2003 for production flexibility contract payments (replaced in 2002 Farm Bill by a direct payment program) and market loss assistance payments (replaced in 2002 Farm Bill by a counter cyclical payment program). We used data from crop years 2000 through 2002 for loan deficiency payment and marketing loan gains.

Figure 4 provides an illustration of some of the data in Table 2. This figure emphasizes visually how widely the aggregated PSE is spread across instruments. It also reveals that, despite their national prominence in the policy debate, direct government payments play a relatively minor role in California.

Figure 4. Share of Support by Policy

Source: Table 2
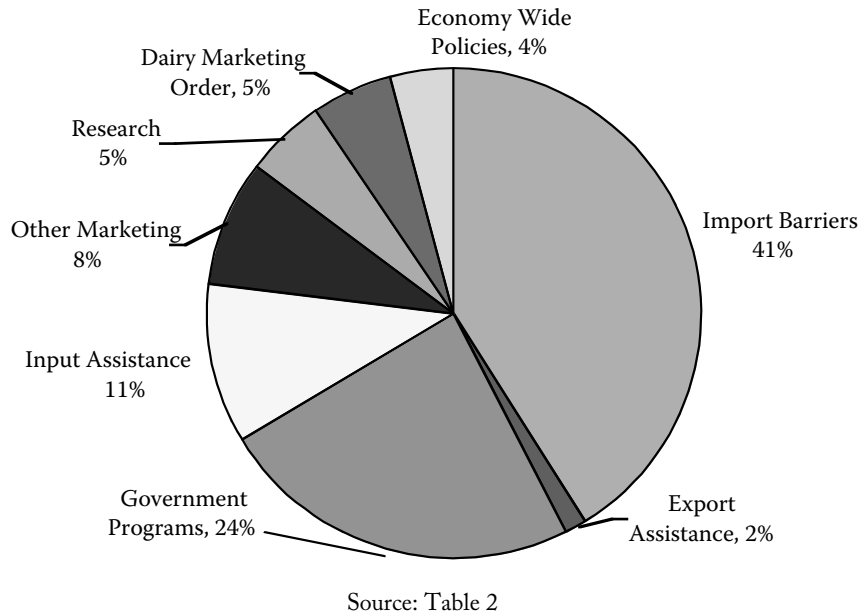
The rest of the chapter is devoted to discussing individual policies in more detail. While the discussion is limited to a very broad overview, it provides both additional background on the policies underlying the PSE and more analysis of their effects. Because of its complexity and importance in California, we begin with a discussion of dairy policy. We then turn to a brief review of various policy instruments, beginning with trade policy.

DAIRY POLICY

Dairy policy in California is important and unique. Policy governing the industry is highly developed and associated with a substantial share of industry revenue. It is unique in the sense that some policy instruments are unlike those used in other agricultural industries and, whereas much of California dairy policy is the same as in other parts of the United States, some is the instruments are unlike those used elsewhere. The California dairy industry participates in the U.S. federal price support program, the direct payment program (MILC) and the industry benefits from U.S. import barriers and export subsidies. But California operates its own regulated milk marketing system, which has some features that differ from the federally regulated

system governing most milk markets outside California and some federal programs have different effects in California (Balagtas and Sumner).

The federal price support program for milk in the United States is implemented with a government purchase program for manufactured dairy products. The USDA purchases butter, non-fat dry milk (NFDM), and American cheese from processors at prices calculated to ensure that the farm price of milk used for the manufacture of those programs will generally remain above the legislated support price. From 1990 to 1995, the price support program included a small assessment on milk production to help offset the budget cost of the price support. The assessment varied from year to year and was implemented in a complex way, but was essentially a tax on milk output of approximately $0.11 per hundredweight (approximately one percent of milk revenue). The FAIR Act of 1996 was to have eliminated price support program, but that was first delayed and then reversed. The dairy price support program was phased down 15 cents per hundredweight per year, from $10.35 per hundredweight, and was supposed to be completely eliminated by the year 2000 (at which time it is to be replaced by a recourse loan program). The assessment on dairy production was eliminated immediately and this affected producers immediately (Cox and Sumner, 1997). The FSRI Act continued the price support until 2007 at a rate of $9.90 per hundredweight of milk.

Trade barriers are the most significant feature of U.S. dairy policy, and no serious trade policy reform was even contemplated in the discussions leading to the 1996 FAIR Act or the FSRI Act of 2002. In general, imports of dairy products in the United States have been limited to about 2 to 3 percent of U.S. consumption. The United States maintains binding tariff-rate quotas with high in-quota tariffs for imports of most major dairy products. These trade barriers have insulated U.S. dairy product markets from world market forces, with domestic prices for major agricultural products typically significantly higher than world prices. California's dairy industry, which produces nearly half of the nation's non-fat dry milk and approximately 20 percent of its cheese, benefits from these border measures. As part of the Uruguay Round Agreement on Agriculture that took effect in 1995, the system of absolute quotas gave way to a system of tariff-rate quotas (TRQs). However, the second-tier tariffs that limit over-quota imports are prohibitively high; therefore, the effects of the TRQs remain the same as the absolute quotas that were replaced. The Uruguay Round GATT agreement also provided for a gradual increase in the quantity of dairy product imports into the United States under the TRQs. This provision allowed for a gradual increase in import access into the U.S. dairy market until 2000. The North American Free Trade Agreement (NAFTA), which became effective in 1994, eliminated dairy trade barriers with Mexico, but Mexico is a high-cost milk producer and so no new imports have arrived. Canada insisted that dairy be largely outside that bilateral free trade regime. Imports of some products, notably casein and milk protein concentrates are outside the TRQ regime. The U.S. dairy industry has proposed imposing new trade barriers to limit imports of these products, but such proposed legislation is still pending and would require some accommodation with WTO trading partners.

Current trade negotiations, initiated with the Doha Round, might increase that import access further. Even under the proposal urged by the United States substantial

increases in imports would be likely. However, a multilateral deal would also allow more imports into Europe and protected Asian markets and reduce export subsidies from Europe, so world prices would be likely to rise substantially. Dairy trade is a significant issue in the proposed free trade agreement with Australia. Australia is a major non-subsidized dairy product exporter and opening the border with Australia would likely place downward pressure on U.S. and California milk prices, especially through the impact on the price of products that contain milk fat.

California shares in the impacts of the import barriers. As noted in Table 2, by raising the domestic price of milk above the world price, the import barriers alone contribute more than 1.15 billion to the dairy PSE in California (we are using USDA data on world prices). Subsidized exports, along with donations to domestic food programs and international food aid, have long been used to dispose of stocks of dairy products acquired under the federal price support program. Subsidized exports have been considered a market for U.S. dairy products that does not disrupt domestic commercial sales. In addition to the disposal of government stocks, the Dairy Export Incentive Program (DEIP) has provided explicit price subsidies for commercial dairy product exports since 1989. The DEIP has been scaled back over the 1995-2000 period as part of the Uruguay Round Agreement. The average 1999-2001 dairy export subsidy had a relatively small impact on the dairy industry with a value of $20 million. The 2002 Farm Act also extended DEIP through FY 2007. DEIP payments in 2002 were higher at about $28 million, of which, under the Uruguay Round WTO agreement most went to exports of NFDM.

Federal milk marketing orders in the United States are regional in their implementation. California is the only significant dairy state that is not a part of the federal system of milk marketing orders. Both the California and federal milk marketing orders establish specific minimum prices that must be paid for raw milk according to the class of its end use (classified pricing). Marketing orders also establish pool pricing for farms such that individual farmers receive weighted average prices of milk sold in the marketing order. Federal milk marketing orders calculate a single, separate pool price for all milk under each of the regional orders (Neff and Plato, 1995). The FAIR Act of 1996 required the USDA to consolidate current federal orders from about 33 to between 10 and 14 within three years. Today, there are 11 federal marketing orders for milk.

The California milk marketing order operates with five classes of milk designated by end use. These classes provide separate prices for milk sold for fluid use and for manufactured products such as yogurt, ice cream, cheese, butter or NFDM. The California milk marketing order provides for price discrimination, with different minimum prices set by the state for fluid products with relatively inelastic demands.

The California marketing order provides for two producer "pool" prices. Individual farmers in California receive a weighted average of the two prices, with these weights determined by individual ownership of milk quota (Sumner and Wolf, 1996). The California milk quota program provided that owners of milk quota received benefits from this program by receiving a bonus for quota milk equal to the differences between the average of the high price uses and the average of the low price uses. This difference averaged approximately $1.70 per hundredweight. The total annual flow return to quota ownership has been about $154 million per year. This figure is taken as

an estimate of the value of the marketing order in the PSE calculation. The underlying assumption is that the flow benefits to quota owners has represented the approximate flow to the dairy industry from price discrimination that nets out the transfer from those who own less quota to those who own more than the average quota amount.

The FSRI Act of 2002 introduced a new direct payment for dairy, the Milk Income Loss Contract (MILC). This payment was designed to limit the total payment to individual producers, thus favoring smaller producers. Research has shown that supply responses to the payments resulted in lower milk prices and that for most California producers, as well as large producers throughout the country, reduced milk revenues due to lower milk prices have outweighed the MILC payment (Balagtas and Sumner, 2002). The direct payments from the MILC payment to California dairy producers totaled approximately $75 million in 2002.

OTHER TRADE BARRIERS

Aside from dairy, import barriers also apply for the sugar sector in California. The trade restrictions for sugar have resulted in a U.S. domestic sugar price twice that of sugar traded on world markets. The proliferation of high fructose corn syrup as a sweetener is a by-product of the relatively high prices of sugar in the United States. The sugar import barrier provides California sugar beet producers with over 80 percent of total support.

Other trade barriers for California commodities have relatively small effects. A potential exception relates to selected phytosanitary or food safety and sanitary regulations (Sumner, editor 2003). Most countries restrict imports of commodities that may transmit diseases, pests, or parasites, in order to keep the infection from developing domestically. For example, beef products from countries that have herds with endemic Foot and Mouth Disease infections are generally banned from import into countries free of the disease. These kinds of regulations can be considered protectionist trade barriers when they are not based upon sound scientific principles. The United States has challenged a number of barriers of other countries, and a few U.S. barriers have likewise been challenged on these grounds. For example, the phytosanitary regulations blocking avocado imports from Mexico to the United States were challenged, and the barrier was slightly relaxed in 1993 and again in 1997 and 2002 (APHIS, 2003). Following the practice of OECD and USDA, we have not attempted to judge which technical restrictions are protectionist. Therefore, trade restrictions based on technical considerations have not been included in calculating the Producer Support Estimates.

EXPORT SUBSIDIES

In the 1980s and early 1990s, explicit export subsidy programs were important for selected grains and oilseed products. For wheat and a few other commodities, the United States has operated the Export Enhancement Program (EEP) since 1985. The Uruguay Round Agreement on Agriculture (URAA) implied no significant commitments for domestic subsidies in the United States, but it did impose limits on direct export price subsidies (Sumner, 1995b). Limits were placed on subsidy outlays

and quantities subsidized by commodity. The EEP was continued in the FAIR Act. The FSRI Act of 2002 extended the annual funding through 2007 at the current funding level of $478 million per year. Budget projections suggest that these authorizations will not be used.

Export credit guarantees, food aid and export promotion programs were not explicitly included among the export subsidy programs facing restrictions in the WTO. However, some of these programs are being challenged in WTO disputes. In this chapter, we have included foreign market development and credit programs as part of export assistance. The Market Promotion Program (MPP), renamed to Market Access Program (MAP) in the FAIR Act, and the Foreign Market Development (FMD) programs are market development programs that provide funds for advertising and product promotion in overseas markets. Under these programs, non-profit trade organizations, state and regional trade groups, private companies and agricultural cooperatives use government money to develop markets mostly for high-value and processed products.

The FSRI Act of 2002 increased MAP funding from $90 million to $100 million in 2002 and then to $200 million in 2007. The FSRI Act of 2002 authorized the use of CCC funds to support the FMD program and increased funding to $34 million per year.

GOVERNMENT COMMODITY PAYMENTS, CONSERVATION AND CROP INSURANCE

Commodity Payments

Until the FAIR Act of 1996, the deficiency payment program was the key government price and income support program for cotton, rice, wheat and feed grains (Sumner, 1995a). The FAIR Act eliminated deficiency payment programs and authority for acreage reduction programs. The price support and marketing loan programs were retained and under the direct payments base land may be used for almost any agricultural activity, including fallow, except fruit and vegetable production (Young and Shields, 1996; Nelson and Schertz, 1996). Under the FAIR Act, participants were to receive a predetermined payment each year for seven years, based on a declining percentage of past deficiency payments. These payments were to be independent of market prices and allow a large range of "agricultural" uses for program base land (Young and Shields, 1996; Smith and Glauber, 1996). However, agricultural prices fell considerably and remained depressed in the late 1990s through 2001. At the same time federal budget deficits became surpluses and Congress responded with annual ad hoc legislation (Market Loss Assistance (MLA) payments) that raised direct payments by 50 percent in 1998 and doubled payments for 1999 through 2001. In addition, the continuing marketing loan programs triggered billions of additional payments. According to the USDA (2003), subsidies jumped from about $4.6 billion in fiscal year 1996 to $19.2 billion in fiscal year 1999 and $32.3 billion in fiscal year 2000. By 2002, subsidies had fallen to $15.6 billion, because market prices had risen.

The 2002 FSRI Act reauthorized the marketing loan program at slightly adjusted loan rates. Marketing loan programs are also made available for peanuts, wool, mohair,

honey, small chickpeas, lentils, and dry peas. The 2002 Act further replaced the production flexibility contract payments of the FAIR Act with direct payments that are roughly equal to the payments that applied in 2001. These payments are not tied directly to current production of any crop, but are based on historical payments of a specific program crop and continue to forbid planting of wild rice, fruits, tree nuts or vegetables on base land. In addition, farmers were allowed to update the base areas used to determine payments. The third main payment program in the FSRI Act, the counter-cyclical program (CCP) was designed to replace the ad hoc MLA payments that were made from 1998 to 2001. In 2003 payments under the new CCP program were lower than the magnitude of MLA payments in 2001.

Conservation Reserve

The Conservation Reserve Program (CRP), and related long-term land idling schemes that focus on water quality and wetlands, cost the U.S. taxpayers about $2 billion per year and idle about 37 million acres in total. Land idled by the CRP has significant effects on grain supply and price. In the spring of 1997, the U.S. Secretary of Agriculture accepted bids for land to enter a smaller reformed CRP for the next 10 years. Of the national total, fewer than 200,000 acres were in California. Due to the relatively small use of CRP in California, and the requirement of the land idling offset the value of the payments received, CRP contracts were not included in our PSE calculations. Under the 2002 FSRI Act, the CRP along with other major conservation programs was reauthorized and extended. The CRP ceiling increased from 36.4 million acres to 39.2 million acres, so that additional land will be removed from crop production for 10-year periods. The 2002 Act also created a new Conservation Security Program (CSP). This program provides annual payments to farms that use environmentally approved practices in their production operations. Because many farms here in California already apply a number of environmentally approved practices in their operations, this program would provide an additional direct subsidy to farmers on a per acre basis up to relatively small payment limits. But this program has not yet been fully implemented and is very small in total funding.

Crop Insurance

Based on recent data, the Federal Crop Insurance Program provided about $37 billion in protection on about 78 percent of the nation's insurable acres in 2001 (USDA, 2002). The crop insurance program has experienced rising participation during the past decade as subsidies have increased and coverage has been extended to more crops. The 2001 level was nearly three times as high as the level in 1990, when crop insurance guarantees amounted to about $13 billion. This protection cost taxpayers about 2.8 billion in 2001. Producers paid about $1.2 billion in premiums and received about $3.1 billion in indemnities.

The Agricultural Risk Protection Act of 2000 resulted in increased premium subsidies and adjustments to the formulas used to calculate coverage. Under the new law premium levels at higher levels of coverage have increased. For example, the old subsidy level for a coverage level of 50/100 was 55 percent. It now amounts to 67 percent. For a higher coverage level of 75/100, the subsidy level increased from 24

percent to 55 percent. This change produced significant cost savings for producers purchasing revenue insurance compared to previous years and also led to a higher number of producers choosing a higher level of coverage.

This policy reform has the effect that the crop insurance plays a more important role in the present PSE calculations than it has done under past calculations, because more producers are likely to participate in the program due to the lower cost (higher subsidy). On a nationwide basis, the 2000 Act invests an additional $8.2 billion over 5 years to improve federal crop insurance.

With regard to California crops, the subsidy resulting from crop insurance in 2001 was substantial for cotton, all grapes, almonds, prunes, apples and wheat. Most other fruits, vegetables and field crops received only little subsidy as a consequence of participating in the crop insurance program.

IRRIGATION WATER SUBSIDY

Irrigation is a key element of the current pattern of agriculture in California. Water subsidy to California agriculture derives from access to surface irrigation water at prices below cost and below likely market prices for irrigation water if a market were allowed.

Much of the reservoir and distribution system that serves agriculture was developed by the federal and state governments. The federal Central Valley Project (CVP) and the California State Water Project (SWP) systems of dams and canals are important providers of water storage and delivery to growers. In these projects, water is accumulated and stored in large reservoirs in the northern part of the state and then released into the Sacramento River canals for delivery. Almost half of the water available for use in the San Joaquin Valley comes from CVP and SWP sources. In addition, the All-American Canal diverts water from the Colorado River for use in the Imperial Valley in the far south of California. Imperial Valley dependence on canal water is acute; over 90 percent of valley water comes from federal or state projects.

For the PSE calculations we assembled data on irrigation water usage by crop and then developed estimates of the subsidy implicit in the CVP. Based on data from the California Department of Water Resources, we were able to obtain figures on irrigated acreage per crop and irrigation region. This enabled us to calculate the total amount of acre-foot of water applied per crop and region. These calculations are based on average irrigated crop acreage during the 1988-1998 period. For commodities without individual number in DWR data, the share is determined by value of production (commodity share of total value).

The subsidy rates for irrigated water from the Central Valley Project are based on data from the Bureau of Reclamation. We calculated the subsidy rate as the difference of the contract rate that a water district pays per acre-foot and the actual cost per acre-foot. Generally, the contract rate ranges from $10 to $30 per acre-foot for most regions, but it is very low at $2 dollars per acre-foot for most contractors in the Sacramento River region. Subsidy rates varied from $10 to $40 per acre-foot depending on region. The water subsidy for California is estimated to total almost $88 million.

We do not consider SWP water in the PSE calculations because it is not subsidized on interest rate or operating cost, which is apparent in the substantially higher cost for SWP water as compared to CVP water. Also, Imperial Valley water is not included here, because the Imperial Valley successfully argued that they are not subject to the National Reclamation Act (Howitt, 2003).

OTHER INPUT ASSISTANCE

In addition to crop insurance and water subsidies, input assistance programs include farm credit, the fuel excise tax and pest and disease control. The farm credit system provides loans to farmers at favorable (and slightly subsidized) interest rates. Agricultural uses of fuel are exempt from federal gasoline taxes, and these exemptions are reflected in the PSE. Pest and disease control refers to outlays for Animal Plant Health and Inspection Service. The grazing fees paid to the federal Bureau of Land Management do not reflect the full cost of the grazing and thus provide a small amount of input assistance to cattle farmers in California.

MARKETING ASSISTANCE

Marketing assistance encompasses many programs and departments that provide resident assistance to the agriculture industry. Cooperative Extension and the Agricultural Cooperative Service provide advisory assistance. Inspection services are provided by the Federal Grain Inspection Service, the Food Safety Inspection Service, and the Packers and Stockyards Administration. The state government also provided approximately $147 million for agricultural plant and animal health, pest prevention and food safety services. Outlays for the Foreign Agriculture Service, Agricultural Marketing Service, and Office of Transportation comprise the federal portion of processing and marketing assistance. For the 1999-2001 period, the average state outlays for California Department of Food and Agriculture marketing, commodities and agricultural services totaled around $60 million. For those commodities with relatively small amounts of total support, marketing assistance (along with input assistance) provides the bulk of the support. Assessments are subtracted from outlays to determine the contribution to the PSE. Finally, there are state and federal marketing order, board and commissions for many California commodities. These are generally financed by check-off systems that apply a kind of excise tax on the marketed commodity to support promotion or research (Lee et al, 1996).

INFRASTRUCTURE AND ECONOMY-WIDE POLICIES

Infrastructure support includes federal soil conservation programs, which provide assistance in reducing soil erosion and degradation of resources. While the contribution of these programs to overall support of California agriculture is small, they are included as a separate category for consistency with the PSE calculation.

Economy-wide policies include taxes and federal transportation spending. There are various tax benefits for agriculture and foreign sales corporations that indirectly support the agricultural industry. Nelson, Simone and Valdes (1995) have compiled

the total value of federal tax benefits to agribusiness and have also calculated the value of inland waterway construction and railroad interest rate subsidies. In general, the value of transportation subsidies is relatively small, usually around 2 percent of total support for each commodity. This is likely an over-estimate, however, because the California share in these benefits is likely smaller than the California share of agricultural output (which is the basis for our estimates). Tax breaks were a larger share of the support, but were not substantial by themselves.

We did not include in our PSE calculations the value of state and local real estate tax benefits to agriculture. California, like many other states in the United States, provides for a special taxation rate on agricultural real estate. The state's Williamson Act, introduced in 1965, provides a preferential assessment program for agricultural land. Williamson Act acreage currently represents almost half of California agricultural land. Under the Williamson Act, landowners sign a contract with the appropriate local government agency (usually city or county government) restricting urban use of that land for ten years. In return, property under Williamson Act protection is assessed for tax purposes according to its capitalized agricultural income. Capitalized income assessments are usually about half of the market value-based assessments for Williamson Act land; thus landowners receive approximately $120 million in tax benefits. Contracts may be terminated through nonrenewal or cancellation. Nonrenewal gradually phases in the market value-based assessment over nine years; at the end of the ten-year contract, the land is appraised (and taxed) at full market value. Cancellation of Williamson Act contracts must be approved by the local governing board after conducting public hearings. If the contract cancellation is approved, the landowner pays a penalty of 12.5 percent of the current market value of the land (see Carter et al., Sokolow, 1990).

A REVIEW OF PSES FOR SELECTED COMMODITIES

Dairy

Dairy policy is discussed in detail above. Here we note only that, in addition to trade protection and internal price policies, the dairy industry receives support from several smaller programs as well. In addition, the dairy industry receives indirect support in the form of subsidies to the grain industry and, especially, the alfalfa hay industry. Hay is important in dairy production, accounting for about 20 percent of total costs. The major subsidy for alfalfa is irrigation water; some have argued that the water subsidy to alfalfa is a major contributor to lower dairy production costs in California. Let's examine this proposition.

Total alfalfa support is about $34 million. Most of this, about $15 million is attributable to the irrigation water subsidy. Some of the alfalfa and other hay grown in the state is consumed by other livestock. Approximately $12 million of the water subsidy to hay is ultimately of benefit to the dairy industry. If the $12 million were added to a subsidy of about one billion dollars, it would raise the overall dairy subsidy from 33.4 percent to 33.6 percent. In other words the effect of irrigation subsidy on dairy is very small, especially compared to the subsidy from other sources.

Fruits, Nuts, Vegetables, Melons, Nursery and Flowers

Commodities in this category have little government intervention in their markets. The PSEs range from about 3 to 5 percent of the revenue. There are no significant trade barriers or direct payments for these commodities. The main portion of support comes from input assistance, marketing assistance, broad government infrastructure and economy-wide policies. While these commodities have no explicit export subsidies, they do benefit from foreign market development (MAP and FMD) funding to some degree, especially almonds (16 percent of support) and strawberries (14 percent of support). Crop insurance benefits and disaster payments are also a source of a small amount of support for this group (only strawberries did not receive some income support from crop insurance or disaster programs). In the citrus industry, crop insurance and disaster payments comprise almost 30 percent of the support; large payments were made following the 1990 freeze that took a heavy toll on the California citrus industry (Lee, Harwood and Somwaru, 1995).

Most commodities in this group have some sort of marketing order, either federal, state, or both. The marketing order share of total support ranges from 3 percent (tomatoes) to around 25 percent (avocadoes, broccoli, walnuts). The share of support from research is relatively high for these commodities, around 25 percent. Nevertheless, since these percentages equal very small PSEs for the horticultural commodities, the overall subsidy is quite small.

Cotton and Grains.

The federal programs for these commodities were discussed in detail above. Direct government payments provide the lion's share of support: 90 percent for rice, 74 percent for cotton, 86 percent for feed grains, and over 76 percent for wheat. Cotton, wheat, and rice have active marketing orders but compared to the value of the direct income supports, the marketing order budgets are relatively small. The magnitude of the direct payments and the export subsidies also make the value of the input assistance, marketing assistance, infrastructure, and economy-wide policies a small percentage of total support.

Alfalfa

As noted above, the most important feature of support for alfalfa and other hay is the water input subsidy. Alfalfa production in California uses approximately 2.3 million acre-feet of CVP or SWP water per year. Like fruits, nuts, and vegetables, alfalfa production does not benefit from trade barriers or direct payments. Research accounts for about 15 percent of alfalfa support, while the input assistance (excluding water), marketing assistance, infrastructure, and economy-wide policies provide about 35 percent. Excluding water, the alfalfa industry would have a PSE of 2.2 percent.

Meat and Poultry

Cattle and calves and poultry have similar policies and a similar overall level of support; both have a PSE of around 2.5 percent. Research accounts for about 25 percent of the support in both industries. Both commodities benefit from the various

government programs and agencies that are included in market assistance, infrastructure, and economy-wide policies. Also, both commodities have federal and states marketing orders to facilitate market promotion and research. A small share of the poultry PSE originates in support under the Export Enhancement Program.

CONCLUSION

California agriculture is diverse. The policies that support and regulate the industry are equally diverse. This chapter has not attempted a full economic analysis of these policies, but has taken on the more modest task of describing key policies and providing a set of summary measures of producer support. It is useful to reemphasize here that the PSE does not measure welfare gains to producers or welfare losses to consumers or taxpayers. Some of the policies described above may have little net benefit to agriculture. Some policies primarily benefit rural landowners, who may or may not be active agricultural producers. Other policies may provide substantial benefits to consumers, and some may even provide net benefits to California as a whole. A small subset of policies may even contribute to net world welfare gains as conventionally measured. This chapter does not provide the analysis necessary to substantiate any claims about welfare effects. Some of the literature we cite does provide such analysis, and the reader is encouraged to consult those sources.

Given its commodity mix, California agriculture has an aggregate PSE below the comparable figures for the United States as a whole. The major crop industries in the state compete effectively with relatively little direct subsidy and almost no commodity-specific support. These commodities tend to welcome policy reform of the sort, for example, that is being pursued in the World Trade Organization. Other California commodities, such as dairy and sugar, continue to maintain relatively high import barriers and have traditionally resisted market opening and other policy reforms. Nevertheless, many of these segments of California agriculture expect to prosper as markets are opened and subsidies reduced.

REFERENCES

Balagtas, J.V. and D.A. Sumner. "The Effect of the Northeast Dairy Compact on Producers and Consumers, with Implications of Compact Contagion." *Review of Agricultural Economics,* 25 123-144. 2003

California Department of Food and Agriculture. 2001 California Agricultural Resource Directory. 2002.

California Department of Food and Agriculture, Milk Marketing Branch, California Dairy Information Bulletin. Various issues. 2002.

California Department of Water Resources, Bulletin 160-98. 1998.

Carter, Harold O., Alvin D. Sokolow, George Goldman, Rob Maus, Terri Sexton, Julie Spezia and David Strong. *Land in the Balance: Williamson Act Costs, Benefits and Options.* University of California Agricultural Issues Center, 1989.

Goodwin, B.K. and V.H. Smith. "Crop Insurance and Disaster Policy," *Agricultural Policy Reform in the United States,* Daniel A. Sumner, (Ed.). American Enterprise Institute Press, Washington D.C., 1995.

Howitt, Richard E. Personal Conversation. June 2003.

Lee, Hyunok, Joy Harwood and Agapi Somwaru. "How New Crop Disaster Policy Could Affect California," *California Agriculture*, May-June, 1995.

Lee, Hyunok, Julian M. Alston, Hoy F. Carman and William Sutton. *Mandated Marketing Programs for California Commodities*, University of California Giannini Foundation Information Series No. 96-1. 1996.

Neff, Steven A. and Gerald E. Plato. "Federal Marketing Orders and Federal Research and Promotion Programs: Background for 1995 Farm Legislation." USDA, ERS, 1995.

Nelson, Frederick J. and Lyle P. Schertz, (Eds.) *Provisions of the Federal Agriculture Improvement and Reform Act of 1996*. USDA, ERS, Agriculture Information Bulletin Number 729. 1996.

Nelson, Frederick J., Mark V. Simone and Constanza M. Valdes. "Comparison of Agricultural Support in Canada, Mexico and the United States," USDA Agriculture Information Bulletin Number 719. 1995.

Organization for Economic Cooperation and Development. "Agricultural Policies, Markets and Trade in OECD Countries: Monitoring and Outlook." Paris, 2002.

Organization for Economic Co-Operation and Development. "Agricultural Policies in OECD Countries: Monitoring and Evaluation." Paris, 2002.

Smith, Vincent H. and Joseph W. Glauber. "The Effects of the 1996 Farm Bill on Wheat and Feed Grains," Presented at Western Economic Association Annual Meeting. San Francisco, July 1, 1996.

Sokolow, Alvin D. 1990. "The Williamson Act: 25 Years of Land Conservation." University of California Agricultural Issues Center.

State of California. Governor's Budget 2001-2002. 2002.

Sumner, Daniel A. "Farm Programs and Related Policy in the United States.". *Understanding Canada United States Grain Disputes*, R.M.A. Loyns et al. (Eds.), 62-87. University of Manitoba, 1995a.

Sumner, Daniel A. *Agricultural Trade Policy: Letting Markets Work. AEI Studies in Agricultural Policy*. Washington D.C., AEI Press, 1995b.

----------. " Implications of the USA Farm Bill of 2002 for Agricultural Trade and Trade Negotiations," *Australian Journal of Agricultural and Resource Economics,* 46, (3), 117-140. March 2003

Sumner, Daniel A. and Joseph V. Balagtas. "Agricultural Subsidy Schemes: United States' Agricultural System," *Encyclopedia of Dairy Science*, Hubert Roginski, (Ed.), 20-25. San Diego Academic Press 2002.

Sumner, Daniel A. and Tom Cox. "FAIR Dairy Policy," *Contemporary Economic Policy*, XVI, 58-68. January, 1998.

Sumner, Daniel A. and David S. Hart. "Government Policy and California Agriculture," *California Agriculture: Issues and Challenges*, Jerome B. Siebert, (Ed.) 247-274. Berkeley: University of California, Giannini Foundation, 1997.

Sumner, Daniel A. and Christopher A. Wolf. "Quotas Without Supply Control: Effects of Dairy Quota Policy in California," *American Journal of Agricultural Economics*, 78(May): 354-366. 1996.

United States Census Bureau. 1997 Census of Agriculture. Available at: http://www.nass.usda.gov/census/, 1997.

United States Department of Agriculture. Economic Research Service, The 2002 Farm Bill: Provisions and Economic Implications. Available at: http://www.ers.usda.gov/features/farmbill/, 2002.

United States Department of Agriculture. "Animal and Plant Health Inspection Service. Regulations Governing Mexican Hass Avocado Imports." Available at: http://cofcs66.aphis.usda.gov/ppq/avocados/ia_avacado.pdf, used May 2003.

----------. Foreign Agricultural Service (FAS). *Dairy World Markets and Trade*. Various issues. Available at: http://www.fas.usda.gov/dlp/dairy/dairypag.htm, 2003.

----------. Foreign Agricultural Service (FAS). *Reports on Export Assistance, Food Aid and Market Development Programs*. Various Issues, Available at: http://www.fas.usda.gov/excredits/quarterly/archive.html used May 2003.

----------. Farm Service Agency. Budget Division Home Page and Outlays. Available at: http://www.fsa.usda.gov/dam/bud/bud1.htm, used June 2003.

----------. Farm Service Agency. Price Support Division Reports. Available at: 2003. http://www.fsa.usda.gov/dafp/psd/reports.htm, used September 2003.

----------. Economic Research Service, Agricultural Outlook: Statistical Indicators. Available at: http://www.ers.usda.gov/publications/Agoutlook/AOTables/, used June 2003

----------. Economic Research Service, Briefing Room: Sugar and Sweetener: Data Tables. Available at: http://www.ers.usda.gov/Briefing/Sugar/Data/data.htm, 2003.

----------. National Agricultural Statistical Service. Agricultural Prices, 2001 Summary. Available at: http://jan.mannlib.cornell.edu/reports/nassr/price/zap-bb/agpran02.pdf, used May 2003.

----------. Risk Management Agency. *Risk Management Agency Program Compliance and Integrity Report to Congress*, June 2000-December 2001. Available at: http://www.rma.usda.gov/pubs/2002/ComplianceReport.pdf, used March 2003.

United States Department of the Interior. Bureau of Land Management, *Annual Report*, Various Issues. Available at: http://www.ca.blm.gov/blmfacts.html, Used May 2003.

----------. Bureau of Reclamation. Central Valley Project: Schedule of Irrigation Contract, O&M, Cost of Service, and Full Cost Water Rates per Acre-Foot by Contractor. Available at: http://www.usbr.gov/mp/cvpwaterrates, used May 2003.

Young, Edwin and Dennis A. Shields. "Provisions of the 1996 Farm Bill," *Agricultural Outlook, Special Supplement*. USDA. ERS. AGO-961, April, 1996.

Young, Edwin and Paul Westcott. "The 1996 U.S. Farm Act Increases Market Orientation." USDA, ERS, Agriculture Information Bulletin No. 726. August, 1996.

Westcott, Paul C., C. E. Young and J. Michael Price. "The 2002 Farm Act: Provisions and Implications for Commodity Markets," USDA, ERS, Agricultural Information Bulletin, Number 778. 2002.

APPENDIX

Producer Subsidy Calculations

CCC Payments: For federal government payments we used average federal fiscal year figures for 2001 through 2003 for Production Flexibility Contract Payments (replaced in the 2002 Farm Bill by a Direct Payment Program) and Market Loss Assistance Payments (replaced in the 2002 Farm Bill by a Counter-Cyclical Payment Program). The data is available at the USDA Farm Service Agency (FAS) website at (http://www.fsa.usda.gov/dam/bud/bud1.htm). We used national payments and apply the California commodity share of value of production. We used three-year average data from crop years 2000 through 2002 for Loan Deficiency Payment and Marketing Loan gains. The California data is available at the FAS website at http://www.fsa.usda.gov/dafp/psd/reports.htm. The PSE for cotton also includes the Step 2 user marketing payments X California share of cotton value. Here we applied the average for the federal fiscal years 2001 and 2002.

Crop Insurance: The PSE measure from crop insurance is not the expected value but the actual net cash flow to producers in a given year. This is equal to the total indemnities minus the sum of the total premium, the subsidy, the farmer's cost share and the premium discount, which are essentially the total indemnities minus the producer premium. Recent crop insurance data for crop and states is available from the USDA Risk Management Agency at http://www.rma.usda.gov/data/

Trade Barrier, Dairy: (California price-world price) X California production. Monthly 2002 California production is used for cheddar cheese, butter and non-fat dry milk and monthly 2002 prices are used (*California Dairy Information Bulletin,* 2002). The world price is a simple average of the EU export price and the Oceania export price (*Dairy World Markets and Trade,* USDA FAS, 2002).

Trade Barrier, Sugar: 2001 California value of production X the ratio of 2001 world price to 2001 domestic price. We calculated the price ratio to be 0.43 (the world price is 43 percent of the U.S. price). The benefit to sugar producers is 57 percent of their revenue. U.S. and world sugar prices come from the USDA ERS Sugar and Sweetener Yearbook, 2003, available at http://www.ers.usda.gov/Briefing/Sugar/Data/data.htm. California sugar beet value of production comes from the *2002 California Agricultural Resource Directory* (2002).

Grazing Fees: Difference between private and public price for grazing AUM X the total number of California AUMs on public lands. (The AUM is the amount of forage needed by an "animal unit" (AU) grazing for one month. The animal unit in turn is defined as one mature 1 000 pound cow and her suckling calf). The private price per AUM was obtained from the USDA, NASS Agricultural Prices, available at: http://jan.mannlib.cornell.edu/reports/nassr/price/zap-bb/agpran02.pdf. The public price per AUM was obtained from the Bureau of Land Management (http://www.ca.blm.gov).

California Dairy Marketing Order: $1.70/cwt price differential X 790 million lbs SNF (amount of quota) divided by 8.7 lbs SNF/cwt. Amount of quota is determined in Sumner and Wolf (1996).

Export Subsidy: EEP (and DEIP) 2000-2002 average expenditures X California commodity share of national receipts. EEP (DEIP) expenditures are from USDA Foreign Agricultural Service Export Program Statistic Summary (2003), available at http://www.fas.usda.gov/export.html. For dairy and poultry, California market share is calculated from data available at the USDA National Agricultural Statistical Service. DEIP benefit determined from Uruguay Round Agreement maximum DEIP levels.

FMD/MAP: 1999-2001 average allocation by commodity X California share of U.S. value of production. Allocations are often made to specific trade organization, for instance the California Prune Board. In such cases 100 percent of the payment was counted toward the PSE. In more general payments, California share of U.S. value of production was taken into consideration. Vegetable, fruit and nut expenditures divided by share of commodity value in those categories. Expenditures are found at the USDA Foreign Agricultural Service Export Program Statistic Summary (2003). The California share of U.S. value is calculated from data of the USDA, NASS (2002).

Water: Subsidies apply for water from the Central Valley Project (CVP). The California Department of Water Resource (DWR) supplied data on averages of irrigated acreage per crop and irrigation region, and on average amount of acre-foot per acre of irrigated crop. The product (total irrigated acreage X acre foot per acre) yields the total amount (in acre foot) of water applied per crop per irrigation region. Subsidy rates were obtained from Bureau of Reclamation data, which lists figures for the contract rates and actual costs per acre-foot in the CVP regions. The difference between the actual cost and the contract rate is assumed to be approximately equal to the subsidy rate. DWR crops were almost identical with the crop selection in the PSE calculations. When that was not the case, crops were grouped into existing groupings according to their value of production.

Inspection: Average state expenditures (1999-2001) X commodity share of California value. Inspection includes payments for Animal and Plant Health Inspection Service, Grain Inspection, Packers and Stockyard Administration and Food Safety Inspection Services. State expenditures on agricultural plant and animal health, pest prevention and food safety services are available in the Governors' budget (2002).

Processing and Marketing: This includes 2001 CDFA expenditure for marketing, commodities and agricultural services. CDFA expenditures are 2001 expenditures from the *Governor's Budget* 2001-2002 (2002).

Research: (California share of average U.S. expenditures (1998-1999)) X (commodity share of California value) X (0.3). The California share of U.S. expenditures is calculated by multiplying the market share derived from USDA National Agricultural Statistical Service data (13 percent of U.S.) with the research expenditures in the U.S. notification to the WTO (1999). The total expenditure listed here also includes California expenditure for the Cooperative State Research, Extension and Education Service (CSREES). Commodity shares are found in the *2001 California Agricultural Resource Directory* (2002) data. The 30 percent factor represents the authors' estimate of the benefit from expenditure to producers.

Disaster Payments: Average national disaster payments (1996-2001) X (California share of U.S. agricultural value) X (commodity share of California value). National disaster payment totals are available at the USDA's Economic Research Service (Statistical Indicators). The California share of U.S. agriculture value is based on USDA National Agricultural Statistical Value data. Commodity shares are found in the *2001 California Agricultural Resource Directory* (2002) data.

Farmer's Credit; Fuel Excise Tax; Pest and Disease Control; Land Improvements; Taxation; Transport: These are calculated as the product of (average U.S. expenditures (1982-1992)) X (California share of U.S. agriculture value) X (commodity share of California value). Expenditures are from Nelson, Simone and Valdes (1995). The California share of U.S. value is obtained from the USDA's National Agricultural Statistical Service (2003) and the commodity shares are from the *2002 California Agricultural Resource Directory* (2003).