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Special Issue: What Is a Farm Bill, What Is in the 2013 Version, and What Does It Mean to California Agriculture?

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Although as of late summer 2013, the generally similar agricultural titles of the farm bill have been accepted by both the House and Senate, but there may not be a new farm bill at all. Nonetheless, understanding the proposals is useful to follow the next steps.

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Replacement for the 2008 farm bill has been on the horizon for more than a year. Although final passage remains uncertain, pending legislation has controversial provisions of particular importance to California agriculture.

Since the New Deal legislation of 1933, the United States has periodically renewed and revised its agricultural policies in what has come to be called the "farm bill." Many provisions of the current legislation, signed by President Bush in June 2008, were temporary amendments to the Agriculture Act of 1949. Because a new law was not approved, many of these provisions and others were set to expire in 2012, but Congress extended the 2008 law with a few adjustments through September 2013.

A one-year delay in the farm bill is not unusual. For example, Congress extended existing Farm Acts in both 1995 and 2001 to give themselves time to pass comprehensive legislation in the following years. But, the 2012/2013 delay has been longer than usual and in June 2013, the comprehensive farm bill was unexpectedly rejected by the full House of Representatives in a floor vote. Generally, such legislation is not brought to a floor vote until leaders strongly expect passage. The House of Representatives subsequently passed their version of the farm bill that contained the agricultural and rural titles, but without the "food" title.

Although known universally as the "farm bill" for the past forty years, this periodic omnibus legislation has included authorization for food stamps, now renamed the Supplemental Nutrition Assistance Program (SNAP). SNAP provides income supplements to the poor and, if not changed, would cost about $80 billion per year. Other programs run by USDA, such as school lunch subsidies and a program for women, infants and children (WIC), are authorized by other legislation and are not part of the farm bill.

Farm and Rural Provisions of the Farm Bill

The rural and agricultural side of the farm bill, which authorizes and regulates commodity subsidies, farm environmental programs, rural development subsidies, international food aid, agricultural research and more, is projected to cost about $20 billion per year. It is useful to acknowledge that substantial farm subsidy and price policies are also outside the farm bill. For example, authorization of the bulk of crop insurance subsidies and regulations that govern the programs are outside the farm bill. And, federal milk marketing orders that contain an elaborate array of regulations are authorized by legislation separate from the farm bill.

Table 1. Change in Projected Outlays for House Farm Bill (HR 2642) from Baseline Projections, Assuming Continuation of 2008 Farm Bill Provisions; Fiscal Years

Title	2014	5-year Sum 2014-2018	10-year Sum 2014-2023
	----------($ millions)----------		
Commodity	926	-7,944	-18,699
Conservation	106	-266	-4,827
Research and Extension	41	394	760
Horticulture	42	298	619
Crop Insurance (Risk Management)	199	3,396	8,914
Sum of These Five Titles	1335	-3,882	-12,821

Source: Congressional Budget Office July 11, 2013.

Table 1 shows the July "budget score" of five relevant titles of the House-passed farm bill. Following the tradition of the budget score process, these budget projections are reported as differences from what would be projected under the current farm bill programs if they were simply extended for the next decade.

Within the commodity title of the farm bill, both the House and Senate would change crop subsidy programs substantially. Direct payments, tied to historical production of grains, oilseeds and cotton, but largely not linked to current production or prices, would be replaced with payments triggered by shortfalls of annual revenue in the crop. Cotton, an exception, would have explicit revenue insurance subsidies instead. The historically important payment programs (marketing loans and counter-cyclical payments) that are tied to low prices have become mostly irrelevant with high projected market prices for grains and oilseeds.

The House version of the commodity title would raise these government price guarantees. These increases represent a reversal of recent trends and are worrisome for U.S. objectives under trade negotiations because they raise the prospects for market distortions. However, given the high prices expected over the next decade, they do not trigger significant increases in projected government outlays.

Projected outlays from the commodity title would have declined by about $5 billion per year if the direct payment program were simply eliminated. New programs and provisions of the House farm bill, primarily revenue-based "shallow-loss" subsidies, would add back about $3 billion per year of those potential savings to the commodity title. Some of the additional outlays are derived from the new dairy programs discussed in the article in this issue by Balagtas, Sumner, and Yu.

Conservation title outlays would decline by about $0.5 billion per year over the 10-year horizon, primarily because land idled under the Conservation Reserve Program would be smaller—given expectations of relatively high commodity prices and demand for feed and pasture. Other proposed conservation program changes have smaller budgetary impacts.

Research and extension outlays are scheduled to rise by about $76 million per year (a few percent of the research extension budget) over the next decade. In this issue, Alston argues that there are strong reasons for a much larger increase in public agricultural research investment. He points out that the rate of return to public agricultural R&D has been quite high and that outlays have not kept up with growth in the demand for new knowledge. Outlays for horticultural crops, including some R&D and promotion efforts, would also rise by about $60 million per year over the decade. California agriculture would be a significant recipient of these funds.

As noted above, most crop insurance programs are not authorized in the farm bill. Nonetheless, the House farm bill (and its Senate counterpart) does include some new programs and some expansion that would increase outlays for existing programs. Lee and Sumner consider crop insurance for specialty crops in California, but by far the largest of share crop insurance outlays are for the grains, oilseeds, and cotton grown largely in the Midwest and South.

The biggest new crop insurance provision, accounting for much of the $8.9 billion projected increase in outlays shown in Table 1, is a new revenue-based cotton program that would replace the traditional cotton program that had been in the commodity title. Both the House and Senate farm bills would shift the cotton program out of the commodity title and into the crop insurance title, while raising the projected outlays for cotton-specific support. Similar to the proposed shallow-loss programs for grains and oilseeds, which remain in the commodity title, the new "STAX" cotton program would entail government payments when county-wide cotton revenues decline. This proposed program is designed to stack on top of long-standing crop insurance benefits, which pay when individual farm cotton revenues fall below a chosen trigger.

New Provisions

A specific proposal in the House farm bill has raised significant concerns in California. The so called "King amendment" would stop states from

specifying allowed farm production methods for agricultural products shipped into a state. Under the King amendment, agricultural products could not be blocked at a state border because they were produced using a production or processing method different from those allowed in the receiving state. The commerce clause of the U.S. Constitution already limits what states can do to restrict free trade across state lines. Although its precise interpretation remains unclear, and it would likely stimulate court challenges, the King amendment would appear to go further in limiting what states can do to restrict shipments of agricultural products from other states.

The King amendment would apply directly to housing for egg-laying hens and this case has been at the center of the controversy. Recall that California law now requires that, starting in 2015, hens producing shell eggs sold in California must be housed in such a way to allow more freedom of movement than is available in conventional cages. Proposition 2, passed by California voters in 2008, set such standards for eggs produced in California.

AB 1437, passed by the legislature in 2010, extends those standards to shell eggs shipped into California. Under the King amendment, it appears that California standards would still apply to California farms, but out-of-state eggs could continue to be produced from hens in conventional cages. The result would be a severe cost disadvantage for California egg producers and an extreme contraction of California egg production.

As noted above, for about sixty years, many farm subsidy provisions have been written as temporary amendments to previous farm bills, especially the 1949 Act. One of the motivations to pass a new farm bill has been that the permanent law to which farm programs would revert is wildly out of date, and reversion to "permanent" provisions would wreak havoc on commodity and food markets. The House-passed farm bill would end that tradition and is written as new, permanent legislation. Some farm subsidy proponents oppose this feature of the House bill because a more up-to-date permanent law would reduce the "must pass" nature of farm legislation and weaken their political position for the next time. Observers and analysts who oppose farm subsidies agree that there would be less pressure to revise programs in a few years, and therefore oppose the permanent law provision because they relish the opportunity to severely reduce or eliminate subsidies in the next farm bill.

Replacement of the 2008 farm bill has been on the horizon for more than a year. Although final passage remains uncertain, pending legislation has controversial provisions of particular importance to California agriculture.

Final Remark

Overall, starting with removing $50 billion in direct payments, agricultural programs in both the House and Senate farm bills would entail lower projected outlays than the continuation of current farm bill programs. Of course, until the President actually signs a new farm bill into law, no one can be sure what will be included. As the 2012 farm bill was delayed into 2013, controversy continued to surround the farm bill proposals and the process. The extension through the fiscal year expires on September 30, 2013, and at the end of August, no one can tell when new farm legislation will finally become law.

As headlines have focused on budget costs and the separation of SNAP from the agricultural and rural provisions, other controversy involves several farm and agricultural provisions. This *ARE Update* focuses on perennial farm policy issues, such as dairy, crop insurance and agricultural research, and areas where the House and Senate provisions are generally in agreement. It therefore provides a useful description and economic analysis of farm policies likely to be on the horizon.

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Changes Are Coming to U.S. Dairy Policy

Joseph V. Balagtas, Daniel A. Sumner, and Jisang Yu

Dairy farms have faced bouts of very low margins of milk prices over feed costs, and new subsidies propose to remedy that with insurance and, perhaps, supply management.

Towards the end of 2012, at the same time as the overall U.S. budget was set to drop over the "fiscal cliff," the dairy provisions of the 2008 farm law were set to expire. A nine-month extension of the 2008 law helped to avert the consequences of an impending "dairy cliff," that had focused U.S. lawmakers on what reversion to the 1949 farm law would mean for U.S. dairy markets.

After much legislative effort in the spring and early summer of 2013, Congress continues to debate new farm policy provisions and, as this article is being prepared in mid-August 2013, no one can really tell what dairy programs may emerge or when. Nonetheless, there seem to be significant areas of agreement and this article lays out the main dairy components of the House and Senate farm bills, with a focus on what policy changes might mean for California.

Elimination of Price Supports and MILC Payments

Both House and Senate versions of the new farm bill would eliminate long-standing elements of the current policy: the Dairy Price Support Program and the Milk Income Lost Contract (MILC).

Since 1949, Congress has directed USDA to purchase and store cheese, butter, and milk powder at government-set minimum prices in order to keep the farm price of milk from falling below what Congress considers acceptable. At times, the policy kept U.S. dairy product prices well above those that would clear the markets and USDA acquired significant quantities. In response to these taxpayer costs, Congress reduced USDA purchase prices in the early 1980s and support prices have continued to decline in inflation-adjusted terms.

Government purchase prices have typically been below market prices for more than two decades, but USDA has acquired dairy products periodically when market prices dipped. For example, program costs spiked to $2.5 billion in Fiscal Year 2003 and to $1.3 billion in Fiscal Year 2009, with a large percentage of purchases coming from California plants that produced non-fat dry milk and butter. Elimination of dairy price supports would allow lower U.S. prices of butter, powder, and cheese during the periods of large supply or weak demand.

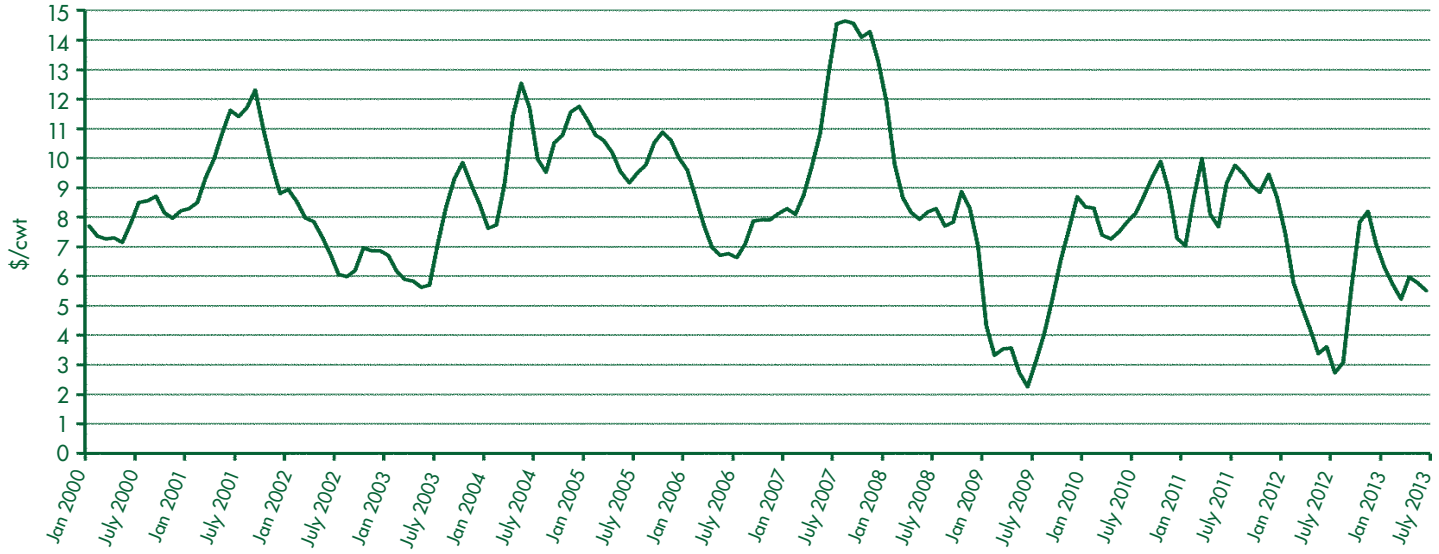
California's substantial manufacturing capacity in these commodities means that, if low prices were to recur, California producers and processors would be directly affected by the elimination of government purchases. Additionally, however, without government purchases, the California dairy industry would become a more reliable supplier in national and global markets. Most projections of dairy prices indicate that such low prices are likely to be extremely rare, so analysts expect only very small consequences from eliminating the dairy price support program.

The MILC subsidy was introduced in the 2000 farm bill, as a replacement for a milk price subsidy that had been active in the Northeast. MILC initially directed USDA payments to dairy farms whenever the price of milk fell below the government-set minimum price. Consistent with its roots in a region with small dairy farms, MILC limited the quantity of milk on which a farm could receive payments. The limit, of three million pounds per year (the annual output of approximately 140 average cows), tilted program benefits towards small farms that predominate in the East and Midwest.

In the early years, MILC outlays occasionally approached a billion dollars per year, but this program did not provide payments when the rise in feed costs squeezed dairy farmers. The 2008 farm bill adjusted the payment formula so that it was responsive to both low milk prices and high feed costs. MILC subsidy rates do not satisfy dairy farm lobbyists and the quantity limit means farms that produce most of milk in the United States receive limited benefit.

The consequences of permanently eliminating the MILC subsidy depend on the size of the farm. For small farms, eliminating MILC would reduce the effective price of milk (price plus per unit MILC payment), so milk production from these small farms would decline. A larger farm receives a MILC payment when margins dip, but unlike the small farm, the individual payment is not affected by adjustments in that farm's production because the farm already produces well above the limit, so the payment quantity is fixed. Removing MILC would eliminate payments but raise milk prices as aggregate supply declines. Many larger farms, including many farms in California, would be net winners from eliminating MILC, as the benefits of higher milk prices across a large quantity of milk outweighs the loss of the relatively small

Figure 1. Dairy Margin, January 2000–July 2013



*Sources: Calculated by the formula (Margin = National all-milk price – (1.0728*Price of corn per bushel+0.00735*Price of soybean meal per ton+0.0137*Price of alfalfa hay per ton)) from U.S. House of Representative, 2013, Federal Agriculture Reform and Risk Management Act of 2013 (H.R. 2642). National all-milk price, price of corn and price of alfalfa hay are from NASS, USDA and price of soybean meal is from AMS, USDA.*

MILC payment. Overall, California dairy would gain from permanent elimination of the MILC program.

New Proposed Dairy Programs

The proposals for changing dairy policy came from the dairy industry that found price supports of little benefit because recently, milk prices have remained high while dairy farm profits fell. The MILC program simply has not provided the magnitude of payments that many farms and producer organizations consider adequate.

Figure 1 shows the data that has been most influential in the dairy policy debates. Feed is the most important cost item for dairy farms and the relationship between milk prices and feed prices is crucial to determining profitability. While the farms differ in efficiency, debt and other factors, all dairy farms are challenged when the margin falls too low. In most months from 2000 through 2008, the margin was above $8.00. Even then, in periods such as March 2002 through July 2003, or March 2006 through November 2006, the margin was relatively low. Dairy farmers received high margins from early 2004 to early 2006, and even higher margins from May 2007 through December 2007. However, since mid-2008, due to the increase in feed costs, there have been several periods with the margin below $8.00.

In 2009 and again in 2012, the margins between milk prices and feed prices (shown as the cost of a typical ratio that would produce 100 pounds of milk) dipped well below what was generally considered adequate to cover costs of labor, maintenance, investment in cows, management, and a return on investment. The result was many dairy farms were unable to pay their debts and many farms had negative cash flows. So far, in 2013, milk prices have been up and feed prices lower so margins have been higher.

Both House and Senate versions of the farm bill would create a new subsidy similar to MILC that pays farms when margins (milk prices less feed costs) are low. In addition, the Senate farm bill would require dairy farms that sign up for the margin payment to also agree to government-run "supply management" limits on production.

Both proposals would offer subsidized margin insurance for dairy farms. Dairy farms would receive government payments whenever an index of milk revenue minus feed costs falls below the farmer-chosen coverage level for two consecutive months. Given this common structure, the specifics about administrative fees, the premium rates, and coverage payments differ between the Senate version and the House version.

Table 1 (on page 6) shows the premiums by coverage level from the House-passed farm bill (H.R. 2642) and the Senate-passed farm bill (S. 954) for small and large farms. The pattern of premiums differ between the two programs and, of course, full costs to farmers also reflect the administrative fee that is included in the Senate version.

The Senate version of margin insurance would allow farmers to receive zero-premium insurance for coverage levels below $4.00 per hundredweight. Dairy farms enrolled in the program would receive a monthly payment per hundredweight equal to the difference between $4.00 and the government-calculated margin. Farms would receive the payment on the lesser of 80% of historical production base or actual production. The historical base is either the farm's production in

Table 1. Margin Insurance Premium per Hundredweight of Milk for Each Coverage Level

	H.R. 2642		S. 954	
Coverage Level	Premium for First 4 million lbs.	Premium More than 4 million lbs.	Premium for First 4 million lbs.	Premium for more than 4 million lbs.
$4.00	$0.00	$0.030	$0.00	$0.00
$4.50	$0.01	$0.045	$0.01	$0.02
$5.00	$0.02	$0.066	$0.02	$0.04
$5.50	$0.035	$0.11	$0.035	$0.10
$6.00	$0.045	$0.185	$0.045	$0.15
$6.50	$0.09	$0.29	$0.09	$0.29
$7.00	$0.18	$0.38	$0.40	$0.62
$7.50	$0.60	$0.83	$0.60	$0.83
$8.00	$0.95	$1.06	$0.95	$1.06

Source: US House of Representatives: Federal Agriculture Reform and Risk Management Act of 2013 and US Senate: Agriculture Reform, Food and Jobs Act of 2013.

the same month of the previous year or average production in the previous three months of the current year.

To enroll, farms would pay annual administrative fees, with larger farms paying fees as high as $2,500 per farm. Farms could buy additional margin insurance in 50-cent increments, up to an $8.00 margin, and could choose a coverage percentage from 25% up to 90% of the production history.

The producer cost of the buy-up insurance is increasing in the chosen margin, and is higher for any milk marketing in excess of 4 million pounds per year per farm. So again, larger farms pay more, with the small farm limit equivalent to the production of about 160 cows.

The House version of the margin insurance program has no administrative fee per farm, but includes a premium for base coverage for larger farms. In the House version, coverage is limited to 80% of production. The premium rates also differ from the Senate version.

In the House version of margin insurance, premiums would be zero for coverage of margins below $4 per hundredweight, except for quantities below 4 million pounds. For the low quantities, premium rates would remain below $0.10 per hundredweight for coverage up to $6.50 per hundredweight. But premiums would rise rapidly, even for coverage of margins that have been common in the last few years. Premiums would exceed $1 per hundredweight for margins that dip below $8, which has been a regular occurrence over the past eight years. The pattern of premiums suggests a higher subsidy rate for very low margins and premiums that jump rapidly for higher margins, especially for larger milk quantities per farm.

The substantially higher premiums for milk marketed above 4 million hundredweight per year reduce the benefit of the program for California farms, which typically milk 1,000 cows or more. This bias is especially pronounced in the case of insurance for higher coverage levels. Farms that anticipated margins to remain relatively strong and only occasionally dip below seven or eight dollars per hundredweight would expect to receive relatively little benefit from this program. The net payoff would be even lower for farms producing substantially more than 4 million pounds.

It is useful to consider how the program might operate for a typical California dairy farm. Consider a farm producing 24 million pounds of milk per year (the milk from about 1,000 cows). If the price of milk is $15 per hundredweight, this farm would have annual gross revenue from milk sales of $3.6 million. If the farm decided to cover 80% of their base production (assumed, for convenience to be equal to actual production), for a margin of $7.00, the premium (in the House version) would be 0.8 X ($0.18(40,000) + $0.38(200,000)) = $66,560. Now consider the benefit when the margin falls to $6 per hundredweight for four months and remains above $7 per hundredweight for the other months. Assume that this farm has a base of 80,000 hundredweight and coverage of 0.8(80,000). The indemnity payment would be $64,000—not quite enough to cover their premium.

This simple example was just to illustrate the program and, for simplicity, assumed production history was the same as current production and did not incorporate supply response to the margins or the insurance. However, the example does illustrate that the insurance subsidy involves substantial potential gains and losses for a typical California farm. It also shows that even with significant subsidy, the program is not a sure winner.

Overall, those farms with greatest exposure to tight milk price-feed cost margins, for example, because they are less able to manage margin risk or are more reliant on purchased feed, would benefit most from the security provided by the insurance subsidy. Farms that have market prices and feed costs that closely track the national averages built into the USDA calculations also benefit more.

For farms, such as those in California, that have a somewhat different pattern of milk prices and quite different feed rations than eastern dairy farms, margin insurance is less useful because indemnities will track periods of low margins less precisely. Moreover, the economic consequences of a margin insurance program extend

beyond just payments to farms. Subsidized insurance affects taxpayers as well as affecting the production of milk and, therefore, market prices.

Paying farms in the case of tight margins would reduce incentives to reduce production in response to low milk prices or high feed costs, and thus would encourage greater milk production as farms became less responsive to market incentives. By inducing increased milk production, margin insurance subsidies would put downward pressure on milk prices, thus making tight margins more likely.

At the same time, reduced responsiveness to tight margins would tend to prolong episodes of tight margins. So while the program would provide relief from margin risk, it also exacerbates the problem it is designed to address.

Adding Supply Management to the Margin Insurance Policy

The Senate version of the farm bill ties the margin insurance to a new program that mandates reduced production when the margin insurance payments are significant. This supply-management program has been a contentious element in the dairy policy debate. Under supply management, the USDA would impose farm-level marketing quotas whenever margins fall below certain thresholds.

By requiring farms that participate in the insurance subsidy to cut production in times of tight margins, the policy is designed make such episodes shorter, shallower and less frequent, thereby reducing budget costs of the subsidized margin insurance. For the margin index below $6.00, the participating farms would be required to reduce their production by 2–4% below their base production history or their actual marketings.

A binding quota would limit farmers' positive supply response to the margin payment. The extent to which the policy has the intended effects depends on the extent to which the quota actually reduces output below what it would have been otherwise. Base updating—the fact that production history adjusts as farmers produce more or less—creates an incentive for farmers to raise production in non-quota periods so they have a larger base the next time the quota binds. This means the quota may create more production variability and undermine the ability of quotas to reduce production and limit the outlays from the subsidized insurance.

Both House and Senate versions of the farm bill would create a new subsidy that pays farms when margins (milk prices less feed costs) are low.

So far the Congressional Budget Office (CBO) has not released outlay estimates for the dairy margin insurance without supply management. The cost estimation for the recently passed House version (H.R. 2642), cited in the lead article in this issue, does not have the cost estimation for the dairy program separately. CBO reported that the Senate version of the dairy provisions (S. 954), which includes supply management, would add costs of $302 million over the ten-year period (2014–2023). We expect the projected budget outlay of the House version, without supply management, would be higher. However, there are other differences as well, including no administrative fee and higher premiums for several coverage levels.

Opponents and proponents of supply management both expect the program to reduce milk production and increase milk prices over what would occur with subsidized insurance alone. The National Milk Producers Federation leads a group of farmers that has favored supply management, in part because they have been concerned that budget costs of the margin insurance subsidy would not be sustainable otherwise. The International Dairy Foods Association leads a group of processors that has objected to supply management on the grounds that it will raise their costs and reduce dairy sales.

Some farmers object to the farm quotas because they want the freedom to determine their own production plans. These producers may also have relatively low production costs and expect to expand their operations. Thus, the quota policy does not just pit producers against consumers.

The extent to which the quota is binding—and thus the costs of the quota born by farms—will be negligible for farms expecting to reduce output anyway, and will be large for farms expecting to expand. That means the quota policy entails a transfer of income from dynamic, growing farms to those that have limited growth potential. Dairy farmers can be found on both sides of the debate over supply management.

Is Margin Insurance with Supply Management Better than Nothing?

Because both the House and Senate bills include the margin insurance policy, the current debate seems to be focused on whether or not the new farm bill should include supply management. But the combination of margin insurance and supply management policies could have perverse effects. These policies have offsetting effects on production and prices: the margin insurance encourages more production and supply management discourages production. In order to increase milk prices and thus shorten an episode of tight margins, the net effect of the combined policy would have to be to reduce production, at least in low margin periods.

Moreover, the payment and quota triggers would have to be timed in such a way as to counteract whatever market events trigger tight margins. If the net effect of the policies is to increase production (for example, if

Table 2. Effects of Margin Insurance With and Without Supply Management

	HOUSE Margin Insurance and No Supply Management (Compared to No Policy)	SENATE Add Supply Management to Margin Insurance (Compared to Without Supply Management)
Participating Producer Effective Price per Unit	+	Offsetting effects
Consumer Price (Also Non-Participating Producer Price)	-	+
Production	+	-
Participating Producer Benefit	+	-
Non-Participating Producer Benefit	-	+
Consumer Benefit	+	-
Taxpayer Costs	+	-

the margin payment is generous and base updating waters down the effects of the quota), or if the policy is not timed just right, the policy can easily exacerbate low or volatile margins. Table 2 summarizes overall likely effects of margin insurance and then the effects of adding supply management to margin insurance on groups of producers, consumers, and taxpayers.

Finally, notice that farms that face the most binding restrictions from supply management are those farms that would otherwise be growing. These farms would tend to have lower costs, be located near plants producing high-demand products (such as greek yogurt), have environmental advantages, have younger operators, or are otherwise at a more dynamic stage in their life cycle. Penalizing such farms raises concerns about the long-term competitiveness of the U.S. industry.

Additional and Longer-Term Considerations

The introduction of subsidized margin insurance could improve profitability of dairy farming and reduce the frequency, depth, and duration of periods with low margins. If insurance is important as a risk management tool, a basic question is why no such insurance is now offered either by private firms or the large national dairy cooperatives. The answer may be that the insurance aspects of the program are less important than the subsidy aspects. So far, there has been no clear assessment of how large the subsidy is likely to be.

The related question is why it is in the interest of taxpayers to provide this insurance subsidy. As with other farms and businesses, dairy farms manage risk by diversification, using forward contracts, vertical integration (especially through cooperatives), establishing variable lines of credit, maintaining substantial equity, and other means. Subsidized margin insurance rewards those who have been less effective at risk management relative to dairy farms who have accepted lower returns to manage risk. Finally, by limiting U.S. milk supply and causing it to be more variable, supply management causes the U.S. dairy industry to be less reliable in world markets to the benefit of competitors such as New Zealand.

Bottom line questions for the dairy industry and policy makers are: do these new policies aid U.S. dairy producers, and what is the cost of such aid for milk consumers and taxpayers? In the longer term, do subsidized insurance and supply management help create a more effective U.S. dairy sector as it supplies consumers with healthful and enjoyable dairy products?

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For additional information, the authors recommend:

H.R. 2642, Federal Agriculture Reform and Risk Management Act. www.govtrack.us/congress/bills/113/hr2642/text

Agriculture Reform, Food and Jobs Act of 2013. www.ag.senate.gov/issues/farm-bill

Balagtas, Joseph V., and Daniel A. Sumner. "Evaluation of U.S. Policies and the Supply Management Proposals for Managing Milk Margin Variability." *American Journal of Agricultural Economics* 94(2)(2012): 522-527.

What Can Be Done to Reinvigorate U.S. Agricultural Research?

Philip G. Pardey, Julian M. Alston, and Connie Chan-Kang

Agricultural R&D yields very high returns, but total public and private spending has stalled. Innovative funding approaches combining private and public funds to finance publicly performed research could revitalize U.S. agricultural R&D.

Over the past century and more, R&D has contributed to a transformation of the U.S. agricultural and food sectors. R&D has fueled productivity growth, enabling U.S. farmers to do more with less. It has helped U.S. farmers to remain competitive in increasingly integrated global commodity markets and better achieve an environmentally sustainable supply of biofuels, fiber, and feed, as well as safe, nutritious, and affordable food. But support for U.S. public agricultural R&D has waned at a time when U.S. farm productivity growth is slowing. In what follows, we describe the evolving patterns of support for public agricultural and food R&D, the shifting emphasis of spending within the broad portfolio, and some potential policy approaches to revitalize U.S. agricultural research.

The Value of Agricultural R&D and Productivity

In 2007, U.S. agriculture produced more than five times the quantity of agricultural output (as measured by an index aggregating the quantities of all crop and livestock products) produced in 1910. The 1.74% per year increase in output over 1910–2007 was achieved with only a 0.15% per year increase in inputs (as measured by an index aggregating quantities of labor, capital, land, and purchased inputs such as agricultural chemicals and seeds).

This productivity growth is valuable. The upper line in Figure 1 plots the total value of U.S. agricultural output from 1949 to 2007. If U.S. agriculture had employed the same inputs but agricultural productivity had remained constant from 1949 forward, then the value of agricultural production would have followed the lower line instead. Thus the (lower) light-shaded area represents the output attributable to inputs given constant 1949 technology and productivity, and the (upper) dark-shaded area represents the output attributable to productivity growth since 1949.

By 2007, when the value of U.S. agricultural output was $281.5 billion, 78% of the output in that year (i.e., $219.6 billion) was attributable to productivity growth since 1949. Equivalently, absent that productivity growth, it would have taken 78% more inputs to achieve the same output as actually produced; so productivity growth since 1949 saved $219.6 billion worth of inputs in 2007 alone. In more concrete terms, it would take an additional 729.5 million acres combined with an additional farm labor force of 1.76 million full-time equivalents, as well as much more other inputs, to produce the 2007 output using 1949 technology.

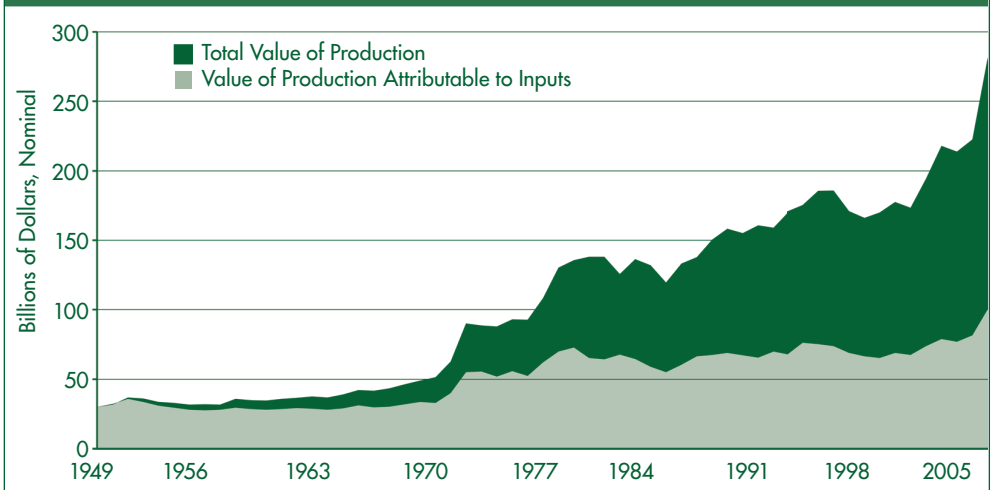
Much of this growth in U.S. agricultural productivity and production is attributable to innovations enabled by investments in agricultural R&D. The public part of these investments yield benefit-cost ratios in the range of 20:1 to 30:1—proof not only of a remarkably profitable undertaking for the nation, but also of persistent underinvestment.

The Policy Challenge

U.S. farm productivity growth has slowed appreciably since 1990. Even though rates of return for productivity-enhancing research are demonstrably very high, we have seen a slowdown in both public and private spending on agricultural R&D in the United States, and a diversion of public research funds away from farm productivity enhancement. Together, these trends spell a further slowdown in U.S. farm productivity growth at a time when the market has begun to signal the beginning of the end of a half-century and more of global agricultural abundance.

U.S. agriculture is closely connected to international markets, so

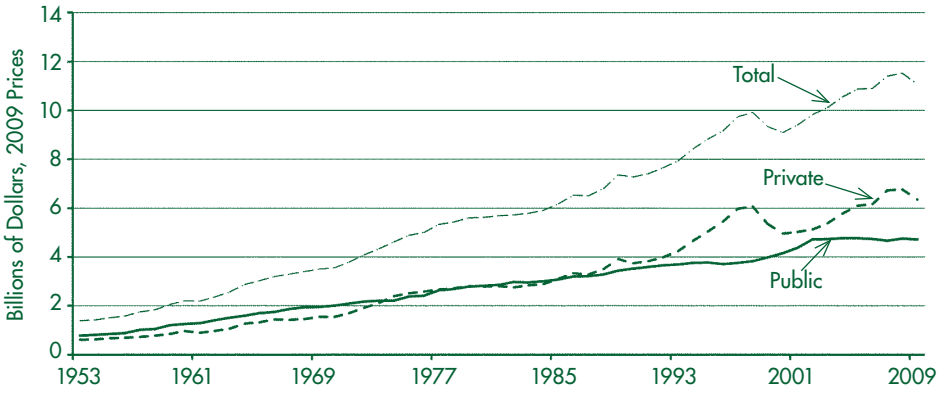
Figure 1. U.S. Agricultural Output Value Attributed to Productivity Growth, 1949–2007



Sources: Pardey, Alston and Chan-Kang (2013b).

Notes: Total value of production is equal to value of production attributable to growth in productivity since 1949 plus value of production attributable to inputs.

Figure 2. Public, Private, and Total U.S. Agricultural R&D, 1950–2009



Sources: Pardey, Alston and Chan-Kang (2013b).

domestic agricultural R&D policies must take into account developments elsewhere in the world. Middle-income countries, such as Brazil and China, have been gaining ground generally relative to the United States and the high-income countries, in both their shares of global investments in agricultural R&D and in their shares of global agricultural production. And in those large agricultural countries, agricultural productivity growth rates have not slowed as they have in the United States. One implication, if this pattern continues, is that the United States can expect to continue to become less competitive in international markets, and will continue to lose market share to today's middle-income countries.

Agricultural R&D policy in the United States is at a critical juncture. In early May 2013, both the Senate Committee on Agriculture, Nutrition, and Forestry and the House Committee on Agriculture finalized proposals for a new U.S. Farm Bill. Both Committees proposed to eliminate "direct payments" and thereby reduce commodity supports by more than $4 billion per year. But neither of the Committees proposed to redirect any substantial amount of these budget savings to growth-promoting investments in public agricultural R&D. Instead, both proposed only very modest increases in funding for agricultural R&D that will imply a further decline in the real quantity of R&D once inflation is taken into account.

An economic approach to U.S. agricultural R&D policy suggests the federal government need not necessarily foot the entire bill; coupling increased federal investments with policy innovations to incentivize additional investments from state governments and industry participants should be part of the policy package. The Senate Committee proposed a new "Foundation for Food and Agricultural Research" that would combine public and private research funds, but the amount of proposed federal funding is modest and the implementation details are not altogether clear. Pardey, Alston, and Chan-Kang (2013b) present arguments for approaches in this genre, for reinvigorating U.S. agricultural R&D, involving public-private partnerships funded in part by coupling commodity "check-off" arrangements with matching public funding.

Shifting Investment Patterns

Agricultural R&D is funded and conducted more in the public sector, compared with general R&D. In 2009 the United States invested a total of $400.5 billion in R&D of all types. The business sector accounted for $289 billion of this total, with the federal government picking up $31 billion (8%) of the tab. An estimated $11.1 billion (just 2.8%) of the total spent on science in the United States in 2009 was related directly to food and agriculture. The business sector conducted a larger share of total R&D (72% of the total in 2009) than agricultural and food R&D (57%), though the private share of agricultural R&D has been growing (Figure 2). Food processing research accounted for around 38% of the $6.3 billion of total private agricultural and food R&D in the United States in 2009.

Public agricultural and food R&D spending (net of forestry) grew from 1889 at an average annual rate of 7.7% in nominal terms and 3.9% in real (i.e., inflation-adjusted, 2009 base-year prices) terms, to a total of $4.7 billion in 2009. Inflation-adjusted growth in spending averaged only 3.4% per year for the period 1950–1980, and slowed to 0.71% per year for the period 1980–2009. In more recent years, aggregate real spending on public agricultural R&D has been on the decline. Real spending in 2009 was 7% below the corresponding amount in 2004 (Figure 3).

Research conducted by the United States Department of Agriculture (USDA) and the state agricultural experiment stations (SAESs) accounted for roughly equal shares of public agricultural and food research spending until the early 1940s, after which the SAES share grew to 73% by 2009. Spending on Cooperative Extension grew from 1915 at an average rate of 6.7% per year, but during the period 1950–1980 inflation-adjusted growth in Extension spending slowed to 2.39% per year. During the period 1980–2006, real Extension spending shrank by 0.25% per year, to reach $1.76 billion in 2006.

The real rate of growth of U.S. science spending has also progressively slowed in recent decades. However, the slowdown in U.S. public and private agricultural R&D spending has been much more pronounced, such that total spending on agricultural

R&D, as a share of total U.S. science spending, gradually slipped from 4% in 1953 to under 3% in 2009. But unlike most other industrial sectors, agriculture requires significant investments in "maintenance" research.

By available estimates, it takes between 35–70% of all agricultural and food R&D just to maintain farm productivity and prevent it from falling, given changing environmental circumstances—most notably the inevitable co-evolution of pests and diseases to overcome technologies presently in use. As other agendas such as research on health, nutrition, the environment, and biofuels have gained ground, the share of SAES research directed to enhancing the productivity of U.S. farmers has declined from an estimated 65% of the total in 1976 to only 56% in 2009.

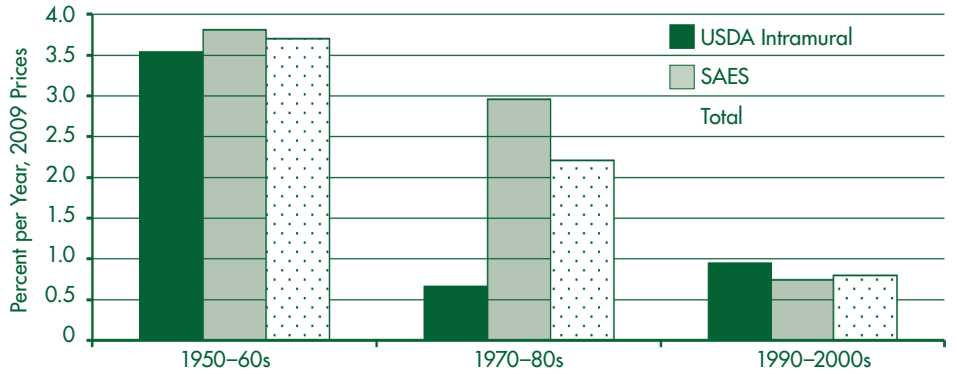
Sources and Forms of Public Funding

Of the $3.6 billion spent on agricultural and food R&D by the SAESs and related institutions in 2009, 38% came from federal sources, 38.3% from state government, 8.2% from industry grants and contracts, and 15.5% from income earned from sales, royalties, and various other sources. Research conducted by USDA labs was almost entirely reliant on federal government funding; 96% of the total of $1.53 billion of that research in 2009 was so funded.

The state-government share of total SAES funding has fallen dramatically—from 69.3% in 1970 to just 38.3% in 2009. Since 1975 funding from industry, self-generated and miscellaneous funds, has risen and accounted for 23.7% of total SAES funding in 2009. In the 1920s, on average, states provided $2.68 for every dollar of federal support to the SAESs. By 2009 only $1.01 of state funding flowed to the SAESs for every dollar of federal funding support.

Historically, the USDA was the dominant federal government agency channeling funds to the SAESs, but that has changed. In 1975 the USDA disbursed about 74% of the federal funds flowing to the SAESs through a combination of formula funds, grants, and contracts; by 2009 that share had declined to around 50% and the USDA's National Institute for Food and Agriculture (NIFA) now provides just 16% of total SAES funding. The other half of federal funds is disbursed by a wide range of federal agencies.

Figure 3. Rates of Growth in Agricultural Research Spending



Sources: Pardey, Alston and Chan-Kang (2013b).

Policy Innovations

It is a crucial time to rethink national agricultural and food R&D and innovation policies, and reposition the U.S. agricultural and food research and innovation system to address the changing scientific and market realities in the century ahead. A chronic lack of funding lies at the heart of the problems, and a doubling of total funding for public agricultural R&D could easily be justified. This could not be done usefully overnight, even if the funds were immediately available. But the total annual spending could be doubled over 5–10 years, with appropriate attention to the balance between investments in bricks and mortar and equipment, and to rebuilding the human capital capability.

Without question, it is hard to make a case for increasing public spending on anything—including agricultural R&D—in these tight fiscal times. However, given the long lags between investing in R&D and realizing the social payoffs to these investments, deferring decisions now could be "penny wise and pound foolish." Today's problems have been decades in the making and will take time to fix. Likewise, changes in investments in agricultural R&D, beginning from today, will have long-run consequences for the productivity and competitiveness of U.S. agriculture and the security of the nation's food supply.

An economic assessment of this problem suggests four practical policy changes that would address the funding shortfalls over the decades ahead and make more efficient use of ever-scarcer research resources.

- **Revitalize Federal R&D Support via the Farm Bill.** At least some of the savings envisaged in the Farm Bill from scaling back direct payments could be redirected toward additional federal support for R&D. As Pardey, Alston and Chan-Kang (2013b) observed, "If even half of these funds could be diverted to agricultural R&D, rather than countercyclical payments or crop insurance, they could yield very large dividends for the nation and a greater benefit for farmers."
- **Re-engage State Government Support for SAES Research.** Over the past 40 years, state government funding as a share of total government (federal plus state) SAES support has declined precipitously. Expanding the scope of the state matching requirements to secure federal funding for

SAES research is one practical way of rebalancing federal versus state support for SAES research. It could also serve to improve the spatial alignment of the performance of research with the location of agricultural production. Efficiencies might be achieved in the productiveness of R&D, given the strong site-specific attributes that affect agriculture, while expanding the overall amount of support for publicly performed R&D.

A recent move in this direction is the proposed Charitable Agricultural Research Act, which authorizes the creation of new tax-exempt Agricultural Research Organizations (AROs) that would use private funds to support agricultural research conducted in conjunction with agricultural and land grant colleges and universities.

- **Introduce Policies to Increase Private Support for Publicly Performed Research**. Substantially enhanced support for public agricultural and food R&D could be engendered from primary producer and agri-business sources if the United States adopted a funding model in which a combination of government and industry funds is used to finance industry-oriented agricultural R&D, as done in some countries. The role for the federal government in this context is to take the lead in devising the institutional arrangements, and providing incentives for industry to participate through the use of matching government grants.
- **Increase Flexibility and Contestability**. Increases in total funding could come with changes in the way these funds are allocated. For example, incremental funds could be used to revive investments in farm-productivity-enhancing agricultural research and other high-payoff areas where markets fail to fund the economically justifiable amount of research. They could also be used to bid SAES researchers' effort away from existing sources of funds and applied in a contestable fashion; making the funds also available to non-SAES scientists on a competitive basis and thereby expanding the total research capacity available for agricultural research. They could also be used flexibly, shifting in application as priorities change among research areas and among researchers, unlike the existing core SAES funds that are tied up predominantly in salaries of tenured faculty. Contestability and flexibility could extend beyond individual scientists within the SAESs to the entire SAES system.

The issues are urgent. U.S. agricultural productivity growth is slow and slowing. The Experiment Station capacity is dwindling as the SAES human capability is shrinking and aging. Agricultural R&D is slow magic: the social payoffs are high, but even if we act immediately to remake and revive the Experiment Station and restore spending, the effects will not be felt for a long time. And this all presupposes the availability of funds, but institutional change to enable enhanced agricultural R&D spending takes time, too, even when we have support within the industry and in government. The situation is not yet desperate, and not hopeless, but a meaningful change will require a seismic shift in attitudes, expectations, and aspirations, and soon.

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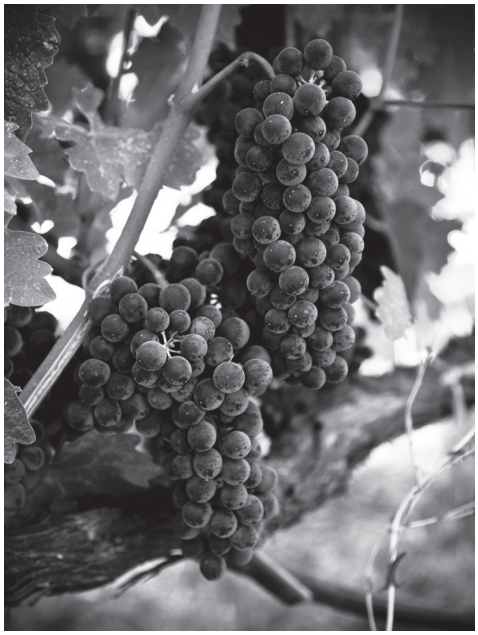
Risk Management and the Farm Bill: The Role of Crop Insurance

Hyunok Lee and Daniel A. Sumner

Risk management subsidies, of which federal crop insurance is a large component, have an expanding role in federal farm programs and are of growing importance for California specialty crops.



The participation rate for buy-up insurance for wine grapes, which is the highest revenue crop in California, is about 40%, whereas buy-up insurance covers less than 20% of table grape acreage.

Despite all the dispute and delay over the farm bill, both the Senate and House have agreed that the focus of renewed and revised farm commodity policy would be on "risk management." Indeed, the House-passed farm bill is officially the "Federal Agriculture Reform and Risk Management Act."

Both the House and Senate versions of the farm bill include payments to grain and oilseed producers when area-wide crop revenue falls below specified triggers. These "shallow-loss" programs have been designed to supplement individual farm policies for revenue insurance available at highly subsidized premiums for these program crops. For cotton, a new, heavily subsidized area-wide revenue insurance program (STAX) is designed to stack on top of individual revenue insurance policies. And, as an accompanying article explains, a new margin insurance program replaces traditional price support programs for dairy.

Although offered by private companies, federal crop insurance is highly regulated and subsidized. Farmers pay less than 40% of the premiums on average, and the federal government covers the administration and operation costs of the insurance companies and offers "reinsurance," which covers company losses. All these features would remain in place under all the farm bill options currently being discussed.

Fruit, tree nut, and vegetable crops have never been eligible for the traditional commodity programs that have provided billions of dollars in payments and price supports for grains, oilseeds, and cotton since the New Deal. In addition, for many years subsidized crop insurance was not available or not attractive for most California specialty crops. However, over the past decade, farmers have taken advantage of an increase in crop insurance availability and attractiveness for these crops that are so important in California agriculture. By 2011 subsidized crop insurance was available for more than 80 specialty crops. Although many vegetable crops as well as many small-revenue crops or locations are not covered, total liabilities for specialty crops reached nearly $12 billion in 2011—nearly 10% of total crop insurance liabilities in the nation.

The current farm bill debate accepts and reinforces the expanding role of federally subsidized crop insurance, while broadening the risk management rationale for farm subsidies. This article documents the increasing importance of crop insurance for California crops in the context of the farm bill debate.

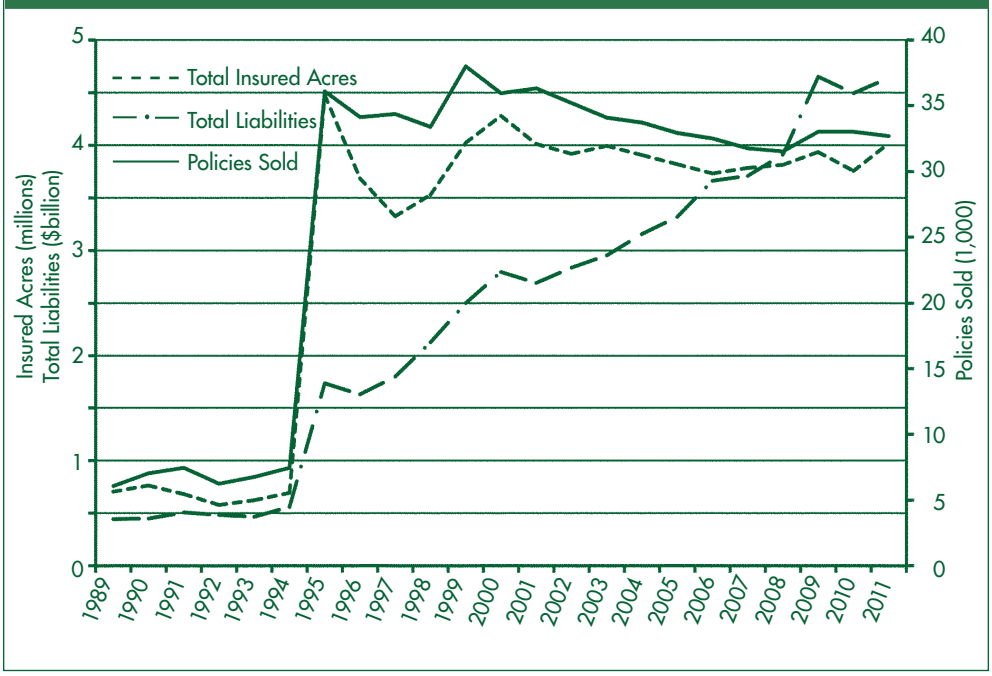
Crop Insurance for Specialty Crops

Based on the definition in the Specialty Crops Competitiveness Act of 2004 (SCCA), "specialty crops" include fruits and vegetables, tree nuts, dried fruits, horticulture and nursery crops (including floriculture). Federal crop insurance for these crops remained limited until passage of the Federal Crop Insurance Act of 1980. Expansion continued over the subsequent decades. By 2011, insurance was available for most perennial fruit and nut crops, dry and fresh beans and peas, fresh market and processing tomatoes, mustard, peppers, potatoes, pumpkins, sweet potatoes, and some nursery crops. Given that specialty crops account for about one-third of crop revenue nationally, the 10% of total crop insurance liability accounted for by specialty crops remains a significant under-representation.

In general, a host of insurance products are offered, including insurance covering shortfalls in yield, revenue, or some other index. With the exception of nursery crops, yield insurance based on actual production history (APH) is most widely available and used for specialty crops, while revenue insurance is more important for field crops.

Federal crop insurance provides two broad types of insurance plans: catastrophic and buy-up. The catastrophic plan (CAT) insures eligible farms for a 50% of yield loss at 55% of the USDA-announced price and charges only a small processing fee. This catastrophic insurance thus returns a maximum of about 27.5% of "expected" revenue, but costs growers little. Growers can also "buy-up" additional coverage up to 85%

Figure 1. Total Insured Acres, Liabilities, and Policies Sold in California, 1989–2011

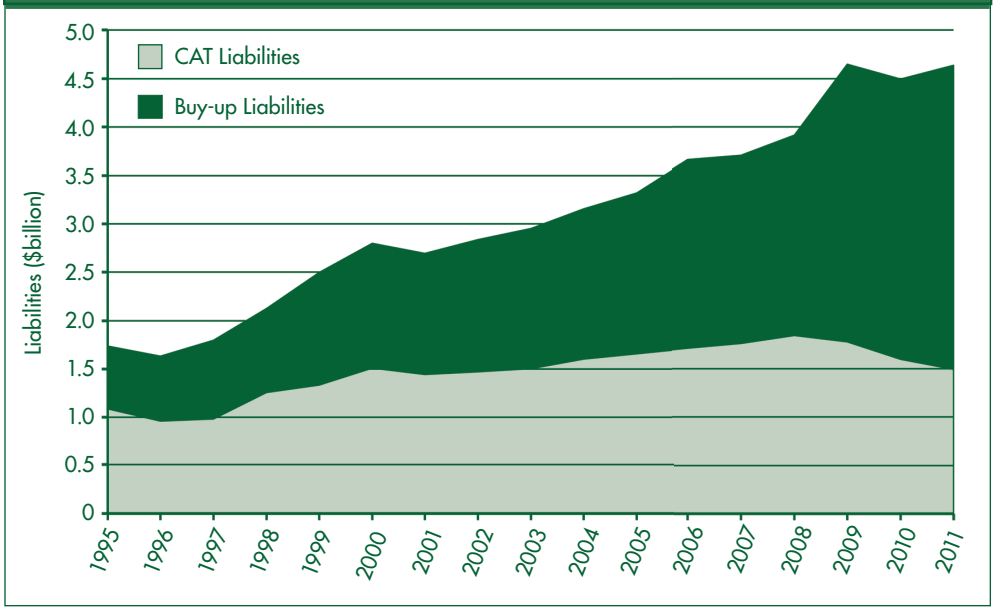


of production per acre with value up to 100% of a USDA-announced price that is based on a specified market price established for each crop and region.

Status of Crop Insurance in California

The purchase of federal crop insurance by California farmers has increased rapidly since 1989 (Figure 1). The big jump in acreage, policies sold and, to a lesser extent, liabilities occurred in 1995 when the CAT insurance option became available. Total policies sold have gradually declined from about 35,000 to about 33,000 since 1995, while total acres have declined from a high of about 4.5 million acres in 1995 to about 4 million acres in 2011. Liabilities have grown steadily from about $1.7 billion in 1995 to more than $4.5 billion in 2011—an almost tripling of crop insurance liabilities.

Figure 2. Liability Shares of CAT and Buy-up Insurance in California, 1995–2011



When it was introduced in 1995, the CAT option accounted for about $1 billion of liabilities, while the buy-up insurance option accounted for about $0.7 billion (Figure 2). CAT liabilities grew until 2008, but buy-up grew faster. Since 2008, CAT liabilities have declined while buy-up liabilities have jumped. In 2011 the share of buy-up liabilities exceeded two-thirds of total liabilities. Overall, the share of acreage covered under buy-up increased for all crops even as total acreage continued to expand for many specialty crops.

Moreover, given the importance of specialty crops in California, APH accounts for the majority of crop insurance in California. In 2011 APH accounted for over 70% of total liability in California. Where grains and oilseeds are dominant, revenue insurance is much more important to the liability profile.

Crop insurance participation in California differs widely across specialty crops (Figure 3). Based on buy-up data (since CAT sign-ups are almost free for participants), crop insurance participation measured as the share of acreage was highest for processed tomatoes, cherries, and prunes–with about 80% shares.

In 2012 coverage of buy-up insurance was lowest for onions, which had less than 10% of acreage covered. Avocados and walnuts both had less than 15% of acreage covered with buy-up insurance. Onion plantings have no CAT coverage listed, while more than half of the acreage of avocados and walnuts is covered if the minimal CAT coverage is included.

The participation rate for buy-up insurance for wine grapes, which is the highest revenue crop in California, is about 40%, whereas buy-up insurance covers less than 20% of table grape acreage. There is wide divergence among the tree nuts. Only about 14% of walnut acreage was covered

by buy-up insurance and another 40% with CAT. In contrast, about 40% of almond acreage is covered by buy-up insurance and another 50% by CAT.

Crop Insurance and Risk Management in the Farm Bills Under Discussion

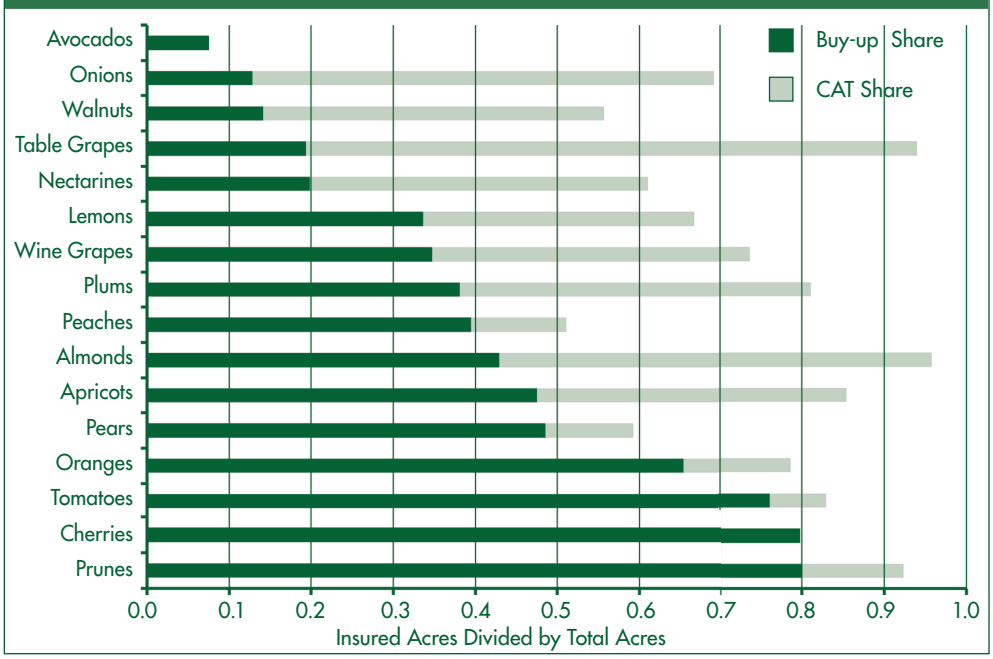
Both the House and Senate versions of the farm bill include several crop insurance revisions that could be important for specialty crops.

The bills mandate expanded coverage for "underserved" crops and regions, and this effort is extended to more specialty crops and regions:

- A premium discount of 10% will be offered for beginning farmers and ranchers;
- Index-based weather insurance is expanded (but this is less likely to be useful for California producers);
- Additional studies are mandated for insuring specialty crop producers for food safety and contamination-related losses; and,
- Proposals for insurance against losses from disruptions due to invasive species are under consideration.

In general, the proposed farm bills (in both the House and Senate versions) attempt to convert income support programs into risk management policies, including crop insurance. Several drivers account for this transition. First, as payments under other support programs recede to near zero, primarily because prices for program crops have been high by historical standards, crop insurance has become a major source of farm subsidies and transfers from taxpayers to farm operations. Second, whereas other payments face limits on the size of payments and on the eligibility for payments based on farmer income, such restrictions do not apply generally to crop insurance benefits. Third, insurance companies and local crop insurance agents are major beneficiaries of subsidized crop insurance. They have emerged as strong advocates of maintaining and expanding the federal crop insurance programs.

Figure 3. Shares of Acres Under Crop Insurance for Major Crops in California, 2012



Concluding Considerations

The new farm bill, whichever version is accepted and whenever it actually passes, will almost surely place more emphasis on risk management as a rationale for farm subsidy. Crop insurance has become a central piece of government policy for commodities and has the largest share of the commodity support budget. Federal costs for crop insurance outlays exceeded $12 billion in 2012, compared to about half that for other crop subsidies.

While California specialty crops remain under-represented in this budget, they receive a much larger share of federal attention under crop insurance than the negligible part they played in the traditional price and income programs. As the programs grow in importance, evaluating the implications of crop insurance for the long-term health and prosperity of California agriculture is worthy of much more research.

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