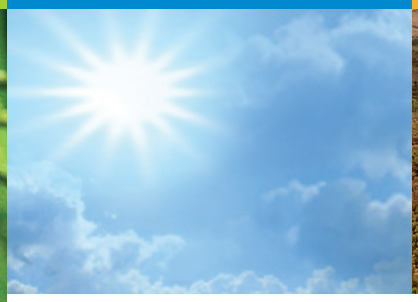
The Conservation Crossroads in Agriculture:

Insight from Leading Economists

Economic & Environmental Effects of **Agricultural Insurance Programs**



by

Daniel A. Sumner
University of California, Davis

and

Carl Zulauf
Ohio State University

July 2012

FARE The Council on Food, Agricultural & Resource Economics

Contents

Dan Sumner is Director of the University of California Agricultural Issues Center and the Frank Buck, Jr. Professor, Department of Agricultural and Resource Economics, UC Davis. Carl Zulauf is Professor, Department of Agricultural, Environmental, and Development Economics, Ohio State University. The authors thank Joe Glauber, Barry Goodwin, and Keith Coble for helpful guidance and Jessica Vergati for exemplary research assistance.

More information is available at
www.cfare.org

Executive Summary

Crop insurance has evolved over the past decade to become the most important crop subsidy program in the U.S. For fiscal year 2013, crop insurance programs are budgeted to account for about 63 percent of all crop subsidies. With the proposed elimination of the direct payment programs in all main Farm Bill proposals, crop insurance will serve as the primary subsidy for domestic agriculture.

This paper provides a review of the core economic rationale for subsidies for crop insurance and a review of the economic literature associated with crop insurance programs. In addition, the paper examines how certain design elements of the insurance programs may result in less diversification of crops, planting in marginal land and the potential to increase the use of inputs while reducing certain risk mitigation practices.

Included in the findings is that crop insurance seems to affect production in three primary ways:

- The subsidies raise the net revenue per acre and thereby raise incentives to plant eligible crops and plant more of crops with higher subsidy rates;
- The availability of crop insurance, which is made possible by the government program, encourages planting insured crops on fields that would not otherwise be considered for that crop because of the potential for significant losses; and
- By reducing chances of losses from low yields and prices, crop insurance creates incentives for growers to undertake fewer other risk mitigating practices and therefore focus more on increases in average productivity.

In a review of crop insurance and environmental quality, although research is not yet definitive, the paper points out, evidence-based analysis supports that subsidized crop insurance encourages the movement of crop production onto marginal lands and can result in environmental risks that would not occur in the absence of subsidized crop insurance.

For example, a large study conducted by the Economic Research Service (Lubowski, et al.) found that: “Increased crop insurance subsidies in the mid-1990s motivated farmers to expand cultivated cropland area in the contiguous 48 states by an estimated 2.5 million acres (0.8 percent) in 1997, with the bulk of this land coming from hay and pasture. This land-use change increased annual wind and water erosion by an estimated 1.4 and 0.9 percent, as of 1997.”

Evidence-based analysis supports that subsidized crop insurance encourages the movement of crop production onto marginal lands and can result in environmental risks that would not occur in the absence of subsidized crop insurance.

Regarding environmental consequences of subsidized crop insurance, the paper states that subsidies for crop insurance may affect environmental consequences through several channels including:

- Incentives to expand onto more environmentally sensitive lands;
- Incentives to use more inputs as average returns rise;
- Incentives to shift across crops toward those, such as cotton, that may have more negative environmental consequences;
- Incentives to use fewer risk-reducing practices and materials; and
- Impact from the lack of environmental or conservation compliance rules for crop insurance as have applied to land under the traditional crop subsidy programs.

Introduction

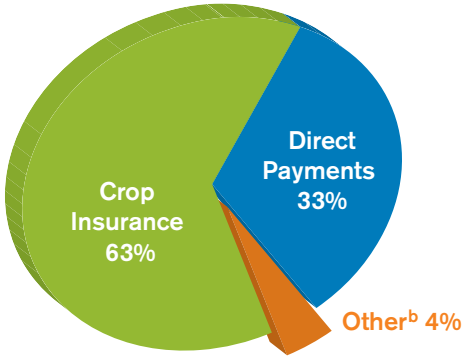
After a long history as a relatively small part of the U.S. farm program regime, crop insurance has evolved over the past decade into the most important crop subsidy. For fiscal year 2013, crop insurance programs are projected to account for about 63 percent of all U.S. Department of Agriculture's budgeted outlays for farm subsidies **(Figure 1)**. The dominant role of insurance reflects the impact of recent high prices, which have eliminated payments from traditional price-based programs, and Congressional efforts to broaden the availability and attractiveness of federal insurance.

Economists have devoted substantial attention to the underlying economic rationale for government crop insurance programs. Basic insurance issues are risk aversion, moral hazard and adverse selection; as well as heterogeneity of risk and correlation of negative shocks over time and across policyholders. For crop insurance, the lack of market-based insurance at commercially viable premiums has served as both a stated rationale for government-sponsored programs and a caution about whether demand by farmers for insurance against risks is as strong as often portrayed.

Policy issues associated with government insurance programs are (a) their public cost, (b) the supply response of farmers to insurance subsidies and impacts on the quantity produced and thus on commodity markets, (c) the geographic distribution of subsidies and resulting impacts on spatial distribution of production, (d) the distribution of subsidies across farms and the impact on the size distribution of farms, (e) environmental impacts, and (f) the potential effects on obligations under international trade agreements, including potential challenges in the World Trade Organization (WTO). Other issues include the impact on organic agriculture and production for local consumption.

This brief review cannot delve into all of these complex insurance and policy issues in depth. It will also leave aside technical elements that have been the focus of much of the academic literature. After a brief description of current crop insurance programs and some recent data about the evolution of the programs, we will consider briefly the core economics of the rationale for subsidies for crop insurance. Then we will consider what the economics literature suggests about the implications of current agricultural insurance programs.

Figure 1 **Budgeted USDA Outlays by Commodity Program[a], Fiscal Year 2013**



[a] *Tobacco buyout transactions, milk program outlays and conservation programs are not included.*

[b] *Other includes Marketing Assistance Loans; Countercyclical Payments; Loan Deficiency Payments; Cotton Payments; Noninsured Crop Disaster Assistance Program; Biomass Crop Assistance Program; Farm Storage Facility Loans; Purchases and Sales; Processing, Storage and Transportation; Bio-based Fuel Production; Operating Expenses; Interest Expenses and other smaller outlays.*

Source: U.S. Department of Agriculture, Office of Budget and Program Analysis (2012). FY 2013 Budget Summary and Annual Performance Plan, U.S. Department of Agriculture. Accessed: http://www.obpa.usda.gov/.

Recent Evolution of Crop Insurance in the United States

Congress authorized formation of the Federal Crop Insurance Corporation (FCIC) in 1938. Crop insurance remained a small program until the *Federal Crop Insurance Act of 1980* expanded both the crops and regions it covered. However, the modern crop insurance program can be dated to the *Crop Insurance Reform Act of 1994* and the formation of the Risk Management Agency (RMA) in 1995 to administer the FCIC. RMA oversees the delivery of programs by private insurance companies, sets premium rates, pays for operation and management of the program including farm premium subsidies, and reinsures private insurance companies against losses.

By any measure the federal crop insurance program has grown immensely since the early 1990s. The number of separately insured crops has increased from about 50 to more than 300 depending on how crops are categorized. Insured acres have increased by 50 percent while liabilities and indemnities have increased about seven times to liabilities of $113 billion and indemnities of $7 billion in 2011. Premium subsidies have also risen to about $7 billion in 2011 **(Table 1)**.

Since 2005, covered acreage has stayed relatively constant as insured acres of the large-acreage crops of wheat, corn and soybeans have stabilized. However, liabilities have continued to grow. The reasons are higher crop prices, extending insurance to crops with a higher value per acre, and farmer decisions to buy higher

Table 1 **Profile of the U.S. Crop Insurance Program, Selected Years, 1990-2011**

Year	Total policies sold[a] (million)	Buy-up policies sold (million)	Net acres insured (million)	Total liability ($ billion)	Total premium ($ billion)	Total indemnity ($ billion)	Loss ratio
1990	0.89	0.89	101.4	12.83	0.84	0.97	0.86
1995	2.03	0.86	220.5	23.73	1.54	1.57	1.02
2000	1.32	1.01	206.5	34.44	2.54	2.59	1.02
2005	1.19	1.05	245.9	44.26	3.95	2.37	0.60
2006	1.15	1.03	242.2	49.92	4.58	3.50	0.77
2007	1.14	1.02	271.6	67.34	6.56	3.55	0.54
2008	1.15	1.03	272.3	89.90	9.85	8.68	0.88
2009	1.17	1.08	264.8	79.57	8.95	5.23	0.58
2010	1.14	1.06	256.2	78.10	7.59	4.25	0.56
2011	1.15	1.07	265.3	114.07	11.95	10.71	0.90

[a] *Catastrophic (CAT) policies, introduced in 1995, make up the difference between buy-up and total policies.*

Source: U.S. Department of Agriculture, Risk Management Agency (2012). Summary of Business Reports and Data. Accessed: http://www.rma.usda.gov/data/sob.html.

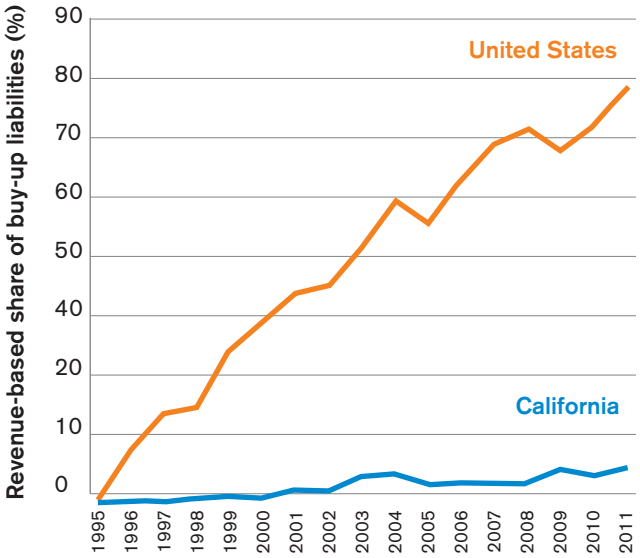
coverage levels and revenue instead of yield insurance **(see Figure 2)**. In 1995, nearly all insured acres were at 65 percent or lower coverage, but by 2011 about 75 percent of insured acres were at 75 percent or higher coverage. While revenue insurance has grown dramatically in popularity, adoption of revenue insurance has lagged in specialty crops. The inclusion of California in **Figure 2** illustrates this point. To summarize the growth in crop insurance, the ratio of insured liability relative to U.S. crop cash receipts has increased from 0.1 to 0.2 in the early 1990s to almost 0.6 in 2011 **(see Figure 3)**.

Crop Insurance Principles

A few concepts and principles are noted before discussing current crop insurance issues in the context of recent economic literature. As with all insurance, crop insurance makes an insurance indemnity payment when a loss exceeds the insurance deductible. Payment equals the difference between the loss amount and deductible. For example, if the deductible loss is 10 percent and the actual loss is 20 percent, the insurance indemnity payment equals 10 percent.

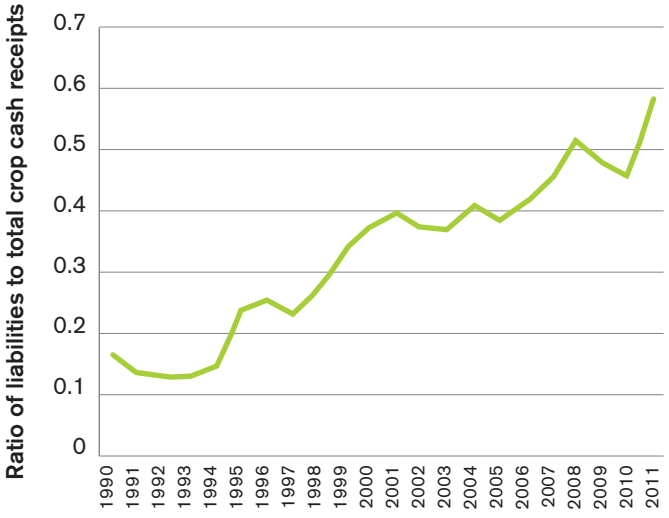
Crop insurance is multi-peril insurance because it covers a range of events that may trigger low yields or low revenue, such as drought, frost, too much rain, etc. Multi-peril insurance is more costly than insurance for a specific cause of a loss because the potential for a covered loss is higher.

Figure 2 **Share of Buy-Up Liabilities Under Revenue-Based Policies, U.S., 1995-2011**



Source: U.S. Department of Agriculture, Risk Management Agency (2012). Summary of Business Reports and Data. Accessed: http://www.rma.usda.gov/data/sob.html.

Figure 3 **Ratio of Total Liabilities to Total U.S. Cash Receipts From Crops, 1990-2011**



Sources: U.S. Department of Agriculture, Risk Management Agency (2012). Summary of Business Reports and Data. Accessed: http://www.rma.usda.gov/data/sob.html.

U.S. Department of Agriculture, Economic Research Service (2012). Farm Income Data Files, Cash Receipts. Accessed: http://www.ers.usda.gov/Data/FarmIncome/finfidmu.htm.

Because adverse selection and moral hazard increase expected insurance claims, they must be built into premium rates and contribute to why some farmers, notably those with less moral hazard and adverse selection, think premiums are too high.

Two key issues associated with insurance are moral hazard and adverse selection. Moral hazard exists when insurance alters decisions of the insured in a way that increases the probability of a loss. Moral hazard is considered especially problematic in a complex process such as crop production. Farmers make a series of managerial decisions from planting through harvest that influence yield and include considerations of risk. Many of these decisions can be influenced by whether or not the farmer has insurance.

Adverse selection exists when a potential insurance customer knows more than the insurance company about the probability and magnitude of loss relative to the premium. For example, a farmer may know that his crop yields have a higher potential for large shortfalls and that the premium does not fully reflect his/her higher downside risk.

Neither moral hazard nor adverse selection implies fraud or other illegal or immoral behavior. They simply reflect the impact that insurance can have on decision-making and differences in information known by the insured and the insurance company.

Because adverse selection and moral hazard increase expected insurance claims, they must be built into premium rates and contribute to why some farmers, notably those with less moral hazard and adverse selection, think premiums are too high (Babcock, 2012 and Glauber, 2004). These farmers are less likely to purchase crop insurance and this means that premiums are higher yet.

A standard tool used by insurance companies to manage moral hazard and adverse selection is a deductible. A deductible precludes payments on small losses, which are considered the losses most susceptible to either change in the management decisions because the farm has insurance (moral hazard) or are losses that the farmer knows more about than the insurance company (adverse selection).

Area-wide insurance is also used to address moral hazard and adverse selection. Halcrow (1949) pointed out that, when the cause of indemnities is outside the control of the individual farm, such as for insurance triggered by a countywide yield shortfall, the choice to buy insurance is less influenced by adverse selection and the behavior after purchase is less influenced by moral hazard. Miranda's update (1991) of Halcrow's ideas stimulated research on setting premium rates and other operational issues for area insurance (see for example, Skees, Black and Barnett, 1997; Miranda and Glauber, 1997; and Mahul, 1999.) However, area-based crop insurance has not had notable market success in the face of substantial competition from individual coverage at high-premium subsidies. According to

data from USDA, RMA, county insurance products accounted for only 2 percent of the total net acres insured in crop insurance during the 2011 crop year.

Crop Insurance and the Evolution of Farm Commodity Programs

Since the New Deal, farm commodity programs have provided benefits when prices or revenues were low. At the same time, various programs have provided payments when farms faced widespread losses on crop or livestock production. *The Food, Conservation, and Energy Act of 2008* (2008 Farm Bill) authorized two revenue-based programs for the program crops: the Supplemental Revenue Assistance (SURE) Program and the Average Crop Revenue Election (ACRE) program. ACRE enrollments were small and neither program is likely to survive in the 2012 Farm Bill. Programs similar to ACRE, which offer government payments to producers of program crops when area-wide revenue fall relative to some recent benchmark, have been favored by commodity groups. Such programs would replace payments based on planting history and those based on a national price trigger (Zulauf and Orden (forthcoming.) One set of simulations find that such programs could have high government budget costs under some circumstances (Smith, Goodwin and Babcock, 2012).

The geographical aggregation used to measure shortfalls has received the same economic analysis. As the breadth of geographical aggregation decreases, say from states to counties, program cost increases because yields become more variable.

Crop Risks and the Role of Government

Businesses face risk that has both little correlation across firms (idiosyncratic risk) and risk that firms in the same line of business tend to share (systemic risk). Insurance is often easier and cheaper for idiosyncratic risks, although adverse selection and moral hazard remain issues. Systemic risk, which may generate large indemnities at the same time, creates incentives for larger and more diversified insurance companies or reinsurance with firms that cover potential losses across several different lines of risk.

Systemic risk is important in most industries. For example, many industries face common variations in energy fuel prices, or recessions and fluctuations in exchange rates. Farming is also subject to considerable systemic risk. This risk arises in part from natural events such as frost, drought and excess moisture, both in the U.S. and internationally, and in part from variation in commodity prices and the prices of major production inputs.

Since the New Deal, farm commodity programs have provided benefits when prices or revenues were low. At the same time, various programs have provided payments when farms faced widespread losses on crop or livestock production.

Farm returns are less correlated with the rest of business than are most other industries, as the farm revenue boom of the past five years has shown. That increases the opportunity for insurance companies to diversify across agriculture and other businesses. Of course, in most industries, insurance for routine production and revenue variability is not common. Likewise, except for fire and hail insurance, insurance against farm yield and revenue losses has not been available without heavy government subsidy (Wright and Hewitt, 1994; Tweeten and Zulauf, 1997).

Effects of Crop Insurance Subsidies

The crop insurance literature began with Valgren in 1922, but this brief discussion draws on Goodwin and Smith (1995), Knight and Coble (1997), and the more recent expositions in Glauber (2004 and 2007), and Sumner, Alston and Glauber (2010). For application to the current policy debate, Shields (2010) and Smith (2011) summarize useful facts and perspectives.

Budgetary Cost of Crop Insurance

Government outlays for crop insurance have grown substantially over the past decade **(see Table 2 and Figure 4)**. For the 2011 crop year, total government

Table 2 **Income and Expenses of U.S. Federal Crop Insurance Program, Crop Years[a] 2002-2011**

Crop Year	Farmer Paid Premium	Premium Subsidy[b]	Underwriting (Gain) / Loss	Total Income[c]	Loss Claims Paid	Claims in Excess of Total Income	Administrative Expense Reimbursement	Total Government Costs[d]
	$ Millions							
2002	1,177	1,744	10	2,989	4,067	1,078	628	3,565
2003	1,393	2,061	-381	3,124	3,262	138	736	3,084
2004	1,720	2,481	-696	3,556	3,238	-318	894	3,200
2005	1,617	2,346	-915	3,097	2,370	-727	833	2,591
2006	1,906	2,687	-825	3,815	3,506	-309	962	3,465
2007	2,745	3,828	-1,574	5,045	3,551	-1,494	1,335	3,792
2008	4,171	5,696	-1,098	8,818	8,689	-129	2,013	7,717
2009	3,530	5,430	-2,277	6,750	5,234	-1,516	1,619	5,664
2010	2,891	4,714	-1,929	5,740	4,236	-1,504	1,371	4,724
2011 est.	4,348	7,164	-1,007	10,585	13,103	2,518	1,383	11,209
Total	**25,498**	**38,151**	**-10,692**	**53,519**	**51,256**	**-2,263**	**11,774**	**49,011**

[a] *Interest and other income, and other administrative and program costs are on a fiscal year basis. Remainder of the data is on a crop-year basis.*
[b] *May include additional subsidy from other sources.*
[c] *Includes interest and other income.*
[d] *Sum of premium subsidy, claims paid above income, administrative reimbursement, and other administration and program costs.*

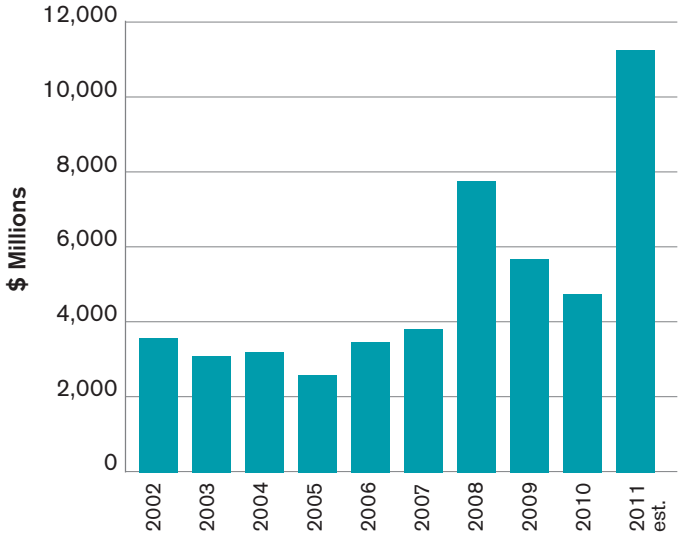
Source: U.S. Department of Agriculture, Risk Management Agency. "About RMA: Costs and Outlays." Accessed on June 22, 2012 at http://www.rma.usda.gov/aboutrma/budget/costsoutlays.html.

cost for crop insurance is currently estimated to exceed $11 billion. Since the 2002 crop year, premium subsides for farmers have accounted for approximately three-quarters while reimbursements to crop insurance companies account for about one-quarter of the government's cost. In recent years, farmers have paid about 38 percent of the total premium. This share has raised a question about whether the demand for crop insurance is being driven by the premium subsidy rather than by risk management (Glauber, 2004; Goodwin, 2001).

Most USDA reimbursement of insurance company costs is calculated simply as a percentage of premiums. But this makes sense only if premiums reflect costs of servicing a policy, and if premiums rise only because of higher farm prices, insurance company operational costs will not rise proportionately (Glauber 2007). Babcock (2012) has suggested it would be more cost effective, in terms of benefits for growers, to simply provide crop insurance for free, rather than subsidize the complex system of administration and operation of insurance companies. Free insurance

Analysis has suggested it would be more cost effective, in terms of benefits for growers, to simply provide crop insurance for free, rather than subsidize the complex system of administration and operation of insurance companies.

Figure 4 **Total Federal Budget Costs of U.S. Crop Insurance Program, Crop Years 2002-2011 ($ in millions)**



Source: U.S. Department of Agriculture, Risk Management Agency. "About RMA: Costs and Outlays." Accessed on June 22, 2012 at http://www.rma.usda.gov/aboutrma/budget/costsoutlays.html.

would avoid adverse selection problems and reduce operational costs. More than anything, the free insurance idea highlights just how expensive the administration and operation of the crop insurance system has become.

The budgetary cost of crop insurance naturally depends on the level of aggregation at which indemnities are paid and premium rates are set. For example, Dismukes, et al. (2011) found that, compared with the state level, a county-level revenue program would cost 28 to 32 percent more for wheat, cotton and grain sorghum and 16 to 19 percent more for corn and soybeans.[1]

Year-to-year budget costs vary with crop prices and yields. In some years, such as 2009 and 2010, with very low loss ratios, government costs are low. In years such as 2011 with indemnities, budget costs rise **(Table 1 and Table 2)**.

Effects of Subsidized Crop Insurance on Production and the Environment

If subsidized insurance changes decisions about what mix of crops to grow, where to plant them, and/or the process to produce them, it can affect land use and environmental quality.

A relatively early paper by Nelson and Loehman (1987) raised the issue that subsidized crop insurance may encourage increased production. Subsidies for crop insurance may affect production in three ways:

First, by compensating growers for losses and providing a subsidy in the process, subsidized public insurance will increase expected income per acre since farmers are not paying the full actuarial cost of the insurance. The higher expected (or average) net revenue should encourage farmers to plant insured crops and plant more of the crops with higher subsidy rates. In effect, it is reasonable to hypothesize that subsidized insurance premiums will have effects similar to that of a price subsidy.

Second, the availability of crop insurance, which is made possible by the government program, encourages planting insured crops on fields that would not otherwise be considered for that crop because of the potential for significant losses. More generally, by removing the potential for large losses from low prices or low yields, crop insurance, and especially revenue insurance, causes additional production of covered crops, especially in risky areas. Such effects may follow from risk aversion on the part of growers or the costs of operating loan defaults for lenders and others who finance crop production.

Third, by reducing chances of losses from low yields and prices, insurance creates incentives for growers to undertake fewer other risk-mitigating practices and therefore focus more on increases in average productivity. When the grower (or his banker) bears the full costs of losses, he has an incentive to devote more resources to reduce large potential losses even at the cost of lower average output. For example, subsidized crop insurance may encourage a grower to diversify less, and invest less in risk-reducing inputs such as prophylactic chemical treatments for potential pest outbreaks.

Relatively few studies have addressed these topics, and their findings tend to be specific to the region and crop examined. Wu (1999) found that Nebraska corn farms that purchased insurance were more likely to also produce soybeans but less likely to produce forage crops. Young, Vandeveer and Schnepf (2001) found small positive production effects of crop insurance. Goodwin, Vandeveer and Deal (2004) found that a 30 percent decrease in premium costs caused less than a 1 percent increase in Midwest corn acreage and about a 1 percent increase in Northern Plains barley acreage. The production

[1] The differences among the crops are to be expected and reflect the variability of the agro-climate where the crops are grown and the degree to which production of a given crop is concentrated geographically. It is also worth noting that program cost varied little by level of aggregation for rice because its yield variability is low since almost all acres of rice are irrigated.

impacts measured by these studies are likely to be small for three reasons. First, acreage choices in the Midwest are limited by rotational considerations and by the lack of land available for expanding on the extensive margin. Second, impact of crop insurance on acreage choices in the Midwest and Plains states are further reduced because crop insurance is generally available for all relevant alternative crops. The impact may well be larger for other crops in regions with more diverse cropping alternatives. Third, the research preceded the recent expansion of the crop insurance program.

No studies have directly analyzed the effects of crop insurance on yield. However, a few papers have considered the impact of crop insurance on input use (see review in Glauber 2004). Horowitz and Lichtenberg (1993) suggested that crop insurance may be a substitute for risk-reducing chemicals—a moral hazard response. Babcock and Hennessey (1996) and Smith and Goodwin (1996) report small positive effects of yield insurance on input use, during a period of time when subsidies were low and revenue insurance was uncommon—so these can be considered conservative compared with today's higher subsidization rate. Babcock and Hennessy find that crop insurance is a substitute for farm chemical use so that on a per-acre basis, chemical use declines on insured cropland. However, Wu's (1999) study that showed that crop insurance changed crop mix, finds increased chemical use overall as a result of the crop mix change.

LaFrance, Shimshack and Wu (2002) simulated the effects of a variety of different insurance options. They conclude that "Land use is unchanged only when an actuarially sound and (unsubsidized) insurance contract is offered." They go on to show that the increase in acreage devoted to crop production is on more economically marginal land, especially when the cost of insurance is subsidized.

Lubowski, et al. (2006) used historical data on crop insurance program participation and land uses to test the relationship between insurance subsidization and land use. They conclude that "Increased crop insurance subsidies in the mid-1990s motivated farmers to expand cultivated cropland area in the contiguous 48 states by an estimated 2.5 million acres (0.8 percent) in 1997, with the bulk of this land coming from hay and pasture. This land-use change increased annual wind and water erosion by an estimated 1.4 and 0.9 percent, as of 1997. Their empirical findings also substantiate LaFrance, Shimshack and Wu's assessment that "… lands brought into or retained in cultivation due to these crop insurance subsidy increases are, on average, less productive, more vulnerable to erosion and more likely to include wetlands and imperiled species habitats than cultivated cropland overall."

Lands brought into or retained in cultivation due to these crop insurance subsidy increases are, on average, less productive, more vulnerable to erosion and more likely to include wetlands and imperiled species habitats than cultivated cropland overall.

Although the results are not definitive, economics studies suggest that insurance subsidies shift land into crops that have subsidized insurance and expand acreage generally and, specifically, on marginal lands that pose greater environmental threats.

Distribution of Crop Insurance Subsidies

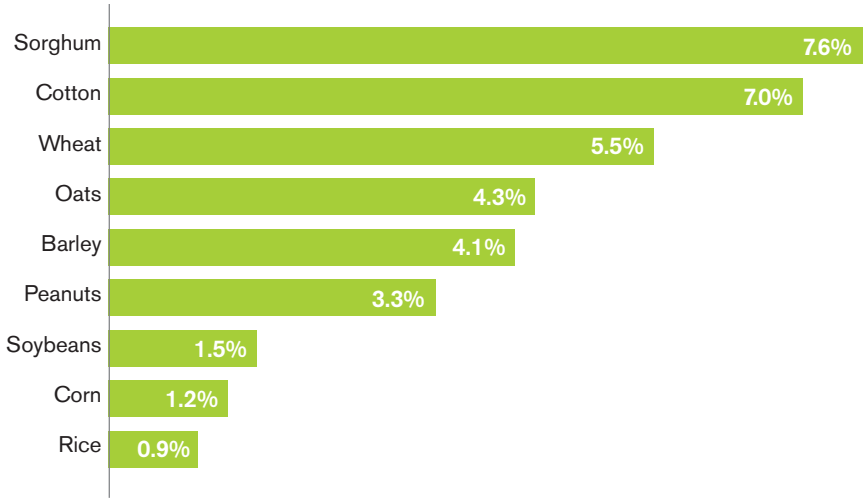
Crop insurance benefits differ across farms by which crops are produced, how the crop is marketed and other characteristics. To consider the distribution across crops, **(Figure 5)** expresses net insurance payment per insured acre as a ratio to the national average of gross revenue per acre.

Net insurance payment is the difference between insurance payments made to farmers of a crop and the insurance premiums paid by the farmers. The ratio was calculated for each crop year from 2001 through 2011 and averaged. These ratios differ substantially across crops. For 2001 to 2011, the ratio was less than 1.5 percent for rice, corn and soybeans; between 3.3 percent and 4.3 percent for peanuts, barley and oats; and greater than 5.5 percent for wheat, cotton and sorghum **(see Figure 5)**. First note that all these ratios are well above 1.0. The range across crops underscores just how much crop insurance has benefited some major field crops relative to others.

Less information is available about the distribution of benefits across farm size categories. Unlike the standard farm commodity subsidy programs, payment and revenue limits do not apply to crop insurance subsidies. That means large operations are eligible for subsidized insurance on all their acreage. Some policy advocates express concern that large farms get large benefits from crop insurance subsidies. Nevertheless, no empirical evidence exists that crop insurance subsidies affect the farm size distribution.

Advocates note that crop insurance subsidies are more available for standard crops grown in conventional ways in core production regions than for specialty and small acreage crops grown in outlying regions, for organic crops, and for crops with emerging or rapidly changing markets. Recent farm bills and other legislation have contained provisions that direct RMA to analyze the creation of crop insurance contracts for these types of commodities. The actuarial insurance concern and associated federal budget concern is that it is more difficult and costly to set appropriate premium rates for commodities for which there is less production history and for which there are few growers. Thus, costs of offering policies are likely to be higher and confidence is lower that premiums are correct. These considerations are highlighted by Singerman, Hart and Lence (2011) in their assessment of developing insurance products for organic crops.

Figure 5 **Average Net Insurance Payment as a Share of Gross Receipts Per Acre by Crop for Major Field Crops, U.S., 2001-2011**



Source: Calculated using data from U.S. Department of Agriculture, Risk Management Agency, Summary of Business Reports and Data, available at http://www.rma.usda.gov/data/sob.html.

Crop Insurance Subsidy and World Trade Organization Obligations

The 1994 WTO Agreement on Agriculture (in Annex 2 paragraph 7) lists the characteristics of crop insurance programs that would be "at most minimally trade distorting." The basic criteria require that subsidies are very small and percentage losses must be large (at least 30 percent) before compensation is made. U.S. crop insurance programs do not meet these requirements. However, the cap on overall WTO commitment for U.S. farm subsidies is unlikely to be binding in the near future, so the failure of U.S. crop insurance to meet "green box" criteria is unlikely to be of significant concern under the 1994 agreement.

Of perhaps more concern is that WTO agreements specify that government subsidy programs (for agriculture or other products) may not significantly suppress prices or similarly distort market conditions from what would otherwise be available. If the set of U.S. farm subsidies for a commodity, including crop insurance, increases U.S. production and thereby reduces imports, increases exports or suppresses market prices, then other WTO members may have grounds to win a formal complaint. The market effects of U.S. subsidies constituted one core complaint in the WTO dispute over U.S. cotton subsidies that the United States lost in several rounds of legal decisions and appellate body rulings from 2003 through 2010. Under current conditions and those that are likely to prevail after the 2012 Farm Bill, crop insurance will have an especially prominent role. This prominence makes crop insurance subsidies more vulnerable to potential challenge, especially as crop insurance subsidies have increased in recent years.

Summary and Conclusions

Economic reasoning and empirical analyses strongly suggest that crop insurance subsidies encourage production changes that increase aggregate negative environmental effects of farming. The production changes themselves may be relatively small for some crops but because insurance encourages planting on marginal lands the environmental impacts are disproportionately high. The relatively few empirical studies on this relationship generally date to an earlier time when crop insurance was a smaller program with a lower degree of subsidization. Thus, they may understate the effects that the subsidization of programs has in 2012, with a larger, more diversified set of insurance programs at higher subsidy rates. More academic research of this issue at regional or national levels and with more current data is needed.

More research is also needed to measure the extent to which farmers respond to crop insurance subsidies by taking on more risk elsewhere in their operation, such as by shifting to cash rents or practicing less diversification.

Economic reasoning and empirical analyses strongly suggest that crop insurance subsidies encourage production changes that increase aggregate negative environmental effects of farming. The production changes themselves may be relatively small for some crops but because insurance encourages planting on marginal lands the environmental impacts are disproportionately high.

Crop insurance subsidies are now thoroughly embedded within much of crop agriculture, especially the program crops, and farmers would confront adjustment costs if Congress reduced or eliminated the programs now. However, while the long history and recent growth of crop insurance programs may provide a *political* reason for maintaining the programs, they do not provide an economic rationale.

The academic literature contains many studies that examine insurance ratings issues, in particular the appropriate yield distribution, and other program operation issues, as well as the choice of insurance between individual and county insurance and the impact of premiums on the demand for insurance. However, the academic literature remains limited on issues such as the role of systemic risk, explanation of different payment rates across crops, and the potential consequences of payment limits.

In the debate over the 2012 Farm Bill, commodity groups have favored replacing payments tied to planting history and market price with payments triggered by area-wide revenue shortfalls for program crops. Researchers have yet to consider many issues about such programs, but it has been established that the cost of such programs is inversely related to the extent of geographical area used to determine shortfalls.

Given rising budget costs, effects on production and environmental consequences, the threshold question remains what convincing public policy rationale exists for the use of taxpayer funds to cover crop insurance premiums, administration and operation costs for delivery of insurance by private companies or the reinsurance for potential losses by insurance companies? Risk management is inherent in all sound business plans, whether in farming or other industries, and most farms use forward contracts, futures markets, diversification and/or myriad other risk mitigation or risk management practices and tools. Of course, crop insurance subsidies are now thoroughly embedded within much of crop agriculture, especially the program crops, and farmers would confront adjustment costs if Congress reduced or eliminated the programs now. However, while the long history and recent growth of crop insurance programs may provide a *political* reason for maintaining the programs, they do not provide an economic rationale.

References and Data Sources

Babcock, B.A., and D.A. Hennessy. 1996. "Input Demand Under Yield and Revenue Insurance." *American Journal of Agricultural Economics* 78(3):416–27.

Dismukes, Robert, Keith H. Coble, David Ubilava, Joseph C. Cooper, and Christine Arriola. "Alternatives to a State-Based ACRE Program: Expected Payments Under a National, Crop District, or County Base." U.S. Department of Agriculture, Economic Research Report No. (ERR-126) 42 pp, September 2001. Accessed June 28, 2012 at http://www.ers.usda.gov/publications/err-economic-research-report/err126.aspx.

Glauber, Joseph W. "Crop Insurance Reconsidered." 2004. *Am. J. Agr. Econ*. 86(5): 1179-1195.

Glauber, Joseph W. 2007. "Double Indemnity: Crop Insurance and the Failure of U.S. Agricultural Disaster Relief Policy." Agricultural Policy for the U.S. Farm Bill and Beyond. Bruce Gardner and Daniel A. Sumner Editors. American Enterprise Institute. Washington, D.C. (2007).

Goodwin. Barry K. 2001. "Problems with Market Insurance in Agriculture." *Am. J. Agr. Econ*. 83(3): 643-649.

Goodwin, Barry K. and Vincent H. Smith. 1995. *The Economics of Crop Insurance and Disaster Relief*. American Enterprise Institute, Washington, D.C.

Goodwin, B.K., M. L. Vandeveer, and J. Deal. 2004. "An Empirical Analysis of Acreage Effects of Participation in the Federal Crop Insurance Program." *American Journal of Agricultural Economics* 86:1058–1077.

Halcrow, Harold G. 1949. "Actuarial Structures for Crop Insurance." *Journal of Farm Economics* 31: 418–43.

Horowitz, John K. and Erik Lichtenberg. 1993. "Insurance, Moral Hazard, and Chemical Use in Agriculture." *Am. J. Agr. Econ*. 75(4): 926-935.

Knight Thomas O. and Keith H. Coble. 1997. "Survey of U.S. Multiple Peril Crop Insurance Literature Since 1980." *Review of Agricultural Economics*. 19(1): 128-156.

LaFrance, J.T., J.P. Shimshack, and S.Y. Wu. 2002. "Crop Insurance and the Extensive Margin." *World Congress of Environmental and Resource Economists*, AERE/EAERE, 2002.

Lubowski, Ruben N. Shawn Bucholtz , Roger Claassen, Michael Roberts, Joseph Cooper, Anna Gueorguieva and Robert Johansson. Environmental Effects of Agricultural Land-Use Change: The Role of Economics and Policy. USDA Economic Research Service. Economic Research Report No. (ERR-25) 82 pp, August 2006. http://www.ers.usda.gov/publications/err-economic-research-report/err25.aspx.

Mahul, O. 1999. "Optimum Area Yield Crop Insurance." *American Journal of Agricultural Economics* 81(1):75–2.

Miranda, M.J. 1991. "Area–Yield Crop Insurance Reconsidered." *American Journal of Agricultural Economics* 73:233–42.

Miranda, M.J., and J.W. Glauber. 1997. "Systemic Risk, Reinsurance, and the Failure of Crop Insurance Markets." *American Journal of Agricultural Economics* 79:206–15.

Nelson, C.H., and E.T. Loehman. 1987. "Further Toward a Theory of Agricultural Insurance." *American Journal of Agricultural Economics* 69:523–31.

Shields, Dennis A. Congressional Research Service. 2010. "Federal Crop Insurance: Background and Issues." Dec. 13, 2010. http://www.nationalaglawcenter.org/assets/crs/R40532.pdf.

Singerman, Ariel, Chad E. Hart and Sergio Lence. 2011. "Price Analysis, Risk Assessment, and Insurance for Organic Crops." (August) CARD Policy Brief 11-PB 6. http://www.card.iastate.edu/publications/dbs/pdffiles/11pb6.pdf.

Skees, J.R., J.R. Black, and B.J. Barnett. 1997. "Designing and Rating an Area Yield Crop Insurance Contract." *American Journal of Agricultural Economics* 79, 430-438.

Smith, V.H. and V.K. Goodwin. 1996. "Crop Insurance, Moral Hazard and Agricultural Chemical Use." *American Journal of Agricultural Economics*. 78: 428-438.

Smith, Vincent H. 2011. "Premium Payments Why Crop Insurance Costs Too Much." American Enterprise Institute. http://www.aei.org/files/2011/11/04/-premium-payments-why-crop-insurance-costs-too-much_152221377467.pdf.

Smith, Vincent H., Barry Goodwin and Bruce Babcock. 2012. "Field of schemes: The taxpayer and economic welfare costs of shallow-loss farming programs." American Enterprise Institute. http://www.aei.org/article/economics/fiscal-policy/field-of-schemes-the-taxpayer-and-economic-welfare-costs-of-shallow-loss-farming-programs.

Sumner, Daniel A. Julian M. Alston and Joseph W. Glauber. 2010. "Evolution of the Economics of Agricultural Policy." *American Journal of Agricultural Economics* 92(2): 403-423.

Tweeten, Luther and Carl Zulauf. (Fall/Winter 1997). "Public Policy for Agriculture after Commodity Programs." *Review of Agricultural Economics*. Volume 19, number 2, pages 263-280.

U.S. Department of Agriculture, Economic Research Service 2012. Farm Income Data Files: Cash Receipts. Accessed: http://www.ers.usda.gov/Data/FarmIncome/finfidmu.htm.

U.S. Department of Agriculture, Office of Budget and Program Analysis 2012. FY 2013 Budget Summary and Annual Performance Plan, U.S. Department of Agriculture. Accessed: http://www.obpa.usda.gov/.

U.S. Department of Agriculture, Risk Management Agency. 2011. Costs and Outlays, FY Government Cost for Federal Crop Insurance, 2002-11. Accessed: http://www.rma.usda.gov/aboutrma/budget/costsoutlays.html.

U.S. Department of Agriculture, Risk Management Agency 2012. Summary of Business Reports and Data. Accessed: http://www.rma.usda.gov/data/sob.html.

U.S. Department of Agriculture, Risk Management Agency 2012, "About RMA: Costs and Outlays." Accessed http://www.rma.usda.gov/aboutrma/budget/costsoutlays.html.

Valgren, V.N. 1922. "Crop Insurance: Risks, Losses and Principles of Protection." *Bulletin No. 1043*. Washington, D.C.: U.S. Department of Agriculture.

Wright, B.D. and J.A. Hewitt. (1994) "All-Risk Crop Insurance: Lessons from Theory and Experience." in *Economics of Agricultural Crop Insurance: Theory and Evidence*. Edited by Darrell L. Hueth and William H. Furtan. Kluwer Academic Publishers: Boston. Pages 73–112.

Wu, J. "Crop Insurance, Acreage Decisions, and Nonpoint-Source Pollution." 1999. *American Journal of Agricultural Economics* 81 (2) 305-20.

Young, C. E., M.L. Vandeveer, and R.D. Schnepf. 2001. "Production and Price Impacts of U.S. Crop Insurance Programs." *American Journal of Agricultural Economics* 83 (5) 1194-1201.

Zulauf, C. and D. Orden. Forthcoming. "Managing Risk in Agriculture: An Assessment of Farm Safety net Proposals for the Next U.S. Farm Bill." International Centre for Trade and Sustainable Development.

Acknowledgements

Membership

C-FARE aims to represent the interests of all professional agricultural economists in the United States. The Council consists of at least 15 members representing major groups within the profession. Three members are appointed by the Agricultural and Applied Economics Association, and by the National Association of Agricultural Economics Administrators. One member is appointed by the Southern Agricultural Economics Association. These seven directors elect at least six at-large representatives. C-FARE is a tax exempt organization under Section 501(c)(3) of the IRS code.

Leadership

2012 C-FARE Officers

Damona Doye
Chair
Oklahoma State University

Roger Coupal
Vice-Chair
University of Wyoming

Steven Kraft
Secretary-Treasurer
Southern Illinois University

2012 Board Members

Soji Adelaja
Michigan State University

John Anderson
American Farm Bureau Federation

Walter Armbruster
Farm Foundation

Jon Brandt
North Carolina State University

Duncan Chembezi
Alabama A&M University

Gail Cramer
Louisiana State University

Damona Doye
Oklahoma State University

Jerry Fletcher
West Virginia University

Paul Gottlieb
Rutgers University

Steven Kraft
Southern Illinois University

David Lambert
Kansas State University

Lori Lynch
University of Maryland

Gene Nelson
Texas A&M

J.B. Penn
Deere and Co.

Steve Turner
Mississippi State University

Parke Wilde
Tufts University

Bob Yonkers
IDFA

Hector Zapata
Louisiana State University

www.cfare.org