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Federal Risk Management Tools for Agricultural Producers: An Overview

Mesbah Motamed, Ashley Hungerford, Stephanie Rosch, Erik O'Donoghue, Matthew MacLachlan, Gregory Astill, Jerry Cessna, and Joseph Cooper

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Abstract

This report describes the current landscape of Federal risk management policies, including the Agricultural Act of 2014, and analyzes the outcomes and interactions of these programs. Despite their common objective of risk reduction, Federal programs differ in their payment mechanisms and their impacts on producer revenue, and uptake has varied significantly across programs and crops. Area-loss insurance programs, such as the Stacked Income Protection Plan and Supplemental Coverage Option, received low enrollments, while applications to the Noninsured Crop Disaster Assistance Program witnessed sizable growth. Differences in program enrollment and program provisions across crops led the bulk of Agriculture Risk Coverage payments to go to producers with corn and soybean base acres, while most Price Loss Coverage payments went to rice, peanuts, and wheat base acres. Half of dairy producers enrolled in the Margin Protection Program for Dairy, but large national margins led to few payments in 2015 and 2016. In contrast, changes in program design led the Livestock Gross Margin for Dairy program to make significantly more indemnity payments per policy. Outside of dairy, the Livestock Forage Program remains the largest livestock support program, though outlays have fallen in recent years.

Keywords: Farm Act, risk management, crops, livestock, Agriculture Risk Coverage, Price Loss Coverage, Federal crop insurance, Stacked Income Protection Plan, Supplemental Coverage Option, disaster assistance, Margin Protection Program for Dairy, Livestock Gross Margin for Dairy, Livestock Forage Disaster Program

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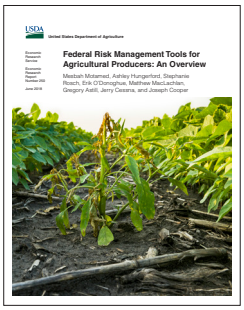

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What Is the Issue?

Agricultural producers employ a variety of strategies to manage risk in production and markets, including participation in Federal risk management support programs. These programs, often updated with every new Farm Act, can vary widely in their coverage and mechanics, with market and production conditions potentially affecting producers' decisions and outcomes. This report summarizes the current landscape of Federal risk management programs in agriculture, describes the various triggers and payment formulas, analyzes the interactions among the different programs, and calculates their effects on producers' revenues.

What Did the Study Find?

For decades, Federal risk management programs have offered crop producers the opportunity to reduce their revenue variability and income risk due to bad weather, disease outbreak, fluctuating prices, and other causes. These programs include crop insurance tools to manage revenue and yield risk for producers of covered commodities, as well as disaster assistance payments for noninsurable crops.

- Since the 1990s, agricultural area covered by crop insurance programs has steadily grown, reaching 300 million acres in 2017. The largest program by area and total liabilities is Revenue Protection (RP), which can reduce revenue variability for producers of corn, soybeans, and wheat by one-quarter to one-third, and also raise average per acre revenues. The Yield Exclusion option, introduced in the 2014 Farm Act, allows producers to omit very low yields from their yield history and potentially raise their guaranteed revenue or yield level. Enrollment of eligible acres in the new Yield Exclusion option varied across States, from 44 percent to under 10 percent, while corn garnered the most enrollment relative to other crops.

- The Noninsured Crop Disaster Assistance Program (NAP), which compensates producers for catastrophic losses to certain crops in certain counties (e.g., specialty crops), experienced a doubling of enrollment from 2014 to 2015 thanks to the recent introduction of NAP-Buy Up, which offers producers improved risk reduction and slightly higher average revenues.

- The Supplemental Coverage Option (SCO) and Stacked Income Protection (STAX), shallow-loss programs that were also implemented in the 2014 Farm Act, offer producers an additional layer of coverage on top of traditional crop insurance. But

simulations showing lower expected returns and risk reductions compared to other options may point to why uptake in these programs has been so low.

In addition to crop insurance options, the Federal Government has also long offered producers a variety of support programs that respond to downward swings in prices or revenues. Under the 2014 Farm Act, producers with historical base acres of designated commodities can participate in either the revenue-based Agriculture Risk Coverage (ARC) program or the price-based Price Loss Coverage (PLC) program. Producers' beliefs about future prices and yields can inform their specific program election and, in combination with their chosen crop insurance policy, can ultimately influence their expected revenues and risk exposure.

- Producers enrolled the majority of corn and soybean base acres in Agriculture Risk Coverage, while most rice and peanut base acres moved into Price Loss Coverage. Simulation analyses show that this outcome corresponds with the expected benefits each program paid to different crop base acres.
- In 2014, producers with base acres in corn, soybeans, and winter wheat received higher payments from ARC than PLC. As commodity prices fell in 2016, the gap between ARC and PLC payments to corn and soybean base acres narrowed, while producers with wheat base acres saw payments from PLC exceed ARC.
- Over 2014-16, the majority of ARC payments went to corn base acres, averaging around $3.5 billion annually. Wheat and soybeans payments followed distantly, with a yearly average of around $547 and $539 million, respectively.
- From 2014 to 2016, PLC payments rose from around $774 million to nearly $3.2 billion, mainly due to greater payments to wheat acres.

A variety of Federal programs also compensate dairy and livestock producers for disease, natural disaster, and forage-related herd losses, or dips in margins (output price less input price).

- The Livestock Forage Disaster Program (LFP) is the largest Federal livestock disaster program, with outlays totaling nearly $7 billion over 2008-16. Payments for 2012 alone topped $2.5 billion due to severe drought conditions and higher feed prices. Other Federal programs covering livestock-related losses are the Livestock Risk Protection and the Pasture, Rangeland and Forage programs, the Livestock Indemnity Program, and the Emergency Assistance for Livestock, Honey Bees, and Farm-Raised Fish program.
- The Margin Protection Program for Dairy (MPP-Dairy) is the largest Federal program supporting dairy producers. Approximately 55 percent of dairy producers enrolled in the MPP-Dairy in 2016, accounting for around 87 percent of all milk production in the United States. Due to high national dairy margins, the program distributed very few payments in 2015 and 2016. The Livestock Gross Margin-Dairy, based on futures prices, had a budgetary cap that was lifted under the 2018 Bipartisan Budget Act

How Was the Study Conducted?

The two main components of the report are (1) an examination of enrollment and outlays and (2) simulation analysis of expected payments. Data on enrollment and outlays were collected from USDA's Farm Service Agency and Risk Management Agency. Simulation analysis was conducted using the methodology in O'Donoghue et al. (2016), which used projected prices and volatilities from the Risk Management Agency as well as historic yields and prices from the USDA National Agricultural Statistics Service.

Federal Risk Management Tools for Agricultural Producers: An Overview

Introduction

In agricultural production, uncertainty threatens producers' revenue or income in many ways. Unpredictable weather as well as sudden infestations of pests and diseases can harm crop yields. The costs of inputs, such as fuel and animal feed, can suddenly spike, eroding profit margins. And commodity prices in international markets can swing wildly, often due to events halfway around the world, potentially causing upward or downward swings in producers' revenues.

Producers employ a number of strategies for reducing and coping with these risks to their revenue. They adjust what crops they choose to plant, how many acres to plant, and what quantity of inputs to use. They invest in technologies like irrigation and drought-resistant seeds that increase resilience to extreme weather outcomes. To manage price risk, producers of major crops can participate in futures and options markets to lock in prices at harvest time. Grain storage also helps manage price and production volatility from year to year.

While such efforts can go a long way toward reducing producers' exposure to different sources of risk, the Federal Government also plays an important role. A variety of risk management programs are available to help crop and livestock producers mitigate losses to their income due to yield and price risk.

Table 1 presents a summary of selected commodity support programs organized by commodity type, legislative statute, and payment triggers.[1]

The scope, rules, benefits, and interactions of these different programs can pose very complex choices for producers. The Farm Act's Title I and Title XI have so-called "deep loss" and "shallow loss" programs that present a variety of options to producers seeking protection from revenue losses, both large and small. Several recent ERS reports cover individual programs under Titles I and XI of the 2014 Farm Act as well as under separate Federal crop insurance legislation: O'Donoghue et al. (2016), Hungerford and O'Donoghue (2016), and the dairy Margin Protection Program (Mark et al., 2016). This report synthesizes the analyses and insights in these earlier studies and others to offer a comprehensive overview of the operation and interaction of major U.S. crop, livestock, and dairy risk management programs.[2] The report also presents details on program enrollment, payments, and their impacts on producer revenues under different scenarios.

[1]The U.S. sugar program is not covered in this report. The program provides a price guarantee to producers and processors of sugarcane and sugar beets through tools such as price support loans, marketing allotments, and import quotas.

[2]The Bipartisan Budget Act of 2018 that was signed into law in February 2018 makes changes to several commodity support programs. While it is too early to have data to analyze impacts of these changes, this report points out where changes have been made to program provisions.

Table 1
Summary of provisions of Federal crop and livestock programs for risk management and associated legislation

	Crops			Livestock and dairy	
Payment trigger	Title I 2014 Farm Act	Title XI 2014 Farm Act/Federal Crop Insurance Act	Title XII 2014 Farm Act	Title I 2014 Farm Act	Authorized under the Federal Crop Insurance Act
Price	• Price Loss Coverage • Loan Deficiency Payments/Marketing Assistance Loans • Sugar Price Support[a]				Livestock Risk Protection (LRP)
Yield or physical loss	Tree Assistance Program	• Yield protection insurance policies • Supplemental Coverage Option (SCO) • Livestock Forage	Noninsured Crop Disaster Assistance Program	• Livestock Indemnity Program (LIP) • Livestock Forage Disaster Program (LFP) • Emergency Assistance for Livestock, Honey Bees, and Farm-Raised Fish (ELAP)	Pasture, Rangeland, and Forage (PRF)
Revenue	Agriculture Risk Coverage	• Revenue protection insurance policies • Stacked Income Protection Plan (STAX) • Supplemental Coverage Option (SCO)			
Margin		Margin Protection insurance for Corn, Rice, Soybeans, and Wheat Pilot Program		Margin Protection Program for Dairy (MPP-Dairy)	Livestock Gross Margin Insurance

[a]Unlike traditional crop price supports, sugar price supports are achieved through a combination of price supports, loans, marketing allotments, and tariff rate quotas.
Source: USDA, Economic Research Service, based on risk management program legislation.

Figure 1 shows the Congressional Budget Office's (CBO) actual and projected spending on mandatory farm programs, including the items that appear in table 1, namely, crop insurance, crop commodity support programs under Title I of the Agricultural Act of 2014, and other payments to farmers.[3] The latter payments include disaster assistance payments to livestock producers, including dairy. Payments for the crop commodity program and certain other payments to farmers are funded by the Commodity Credit Corporation (CCC).[4] The Congressional Budget Office projects budget outlays for crop commodity programs (primarily Agriculture Risk Coverage and Price Loss Coverage) to grow in 2018, while outlays for conservation programs are estimated to remain constant (CBO, 2018). Crop insurance outlays fell to about $4.2 billion in 2017, below CBO's projected trends. If the projected trend holds true, however, outlays will rise to over $7.1 billion in 2018 (CBO, 2018).

The future role and size of commodity support and risk management programs, which currently account for the second-largest portion of USDA's budget, may depend on a variety of factors, including farm incomes that have fallen from their recent peaks, lower prices for several major crops, and Federal budget constraints. This report aims to shine light on the current set of programs and the environment in which producers operate to better inform the policymaking process. It describes the complex landscape of risk management programs, the rules governing eligibility, the formulas that determine payments, and the effects of programs on both producers' revenue levels and volatilities. Using historical data as well as simulations, the report also illustrates the range of outcomes possible under different conditions, policies, and coverage levels.

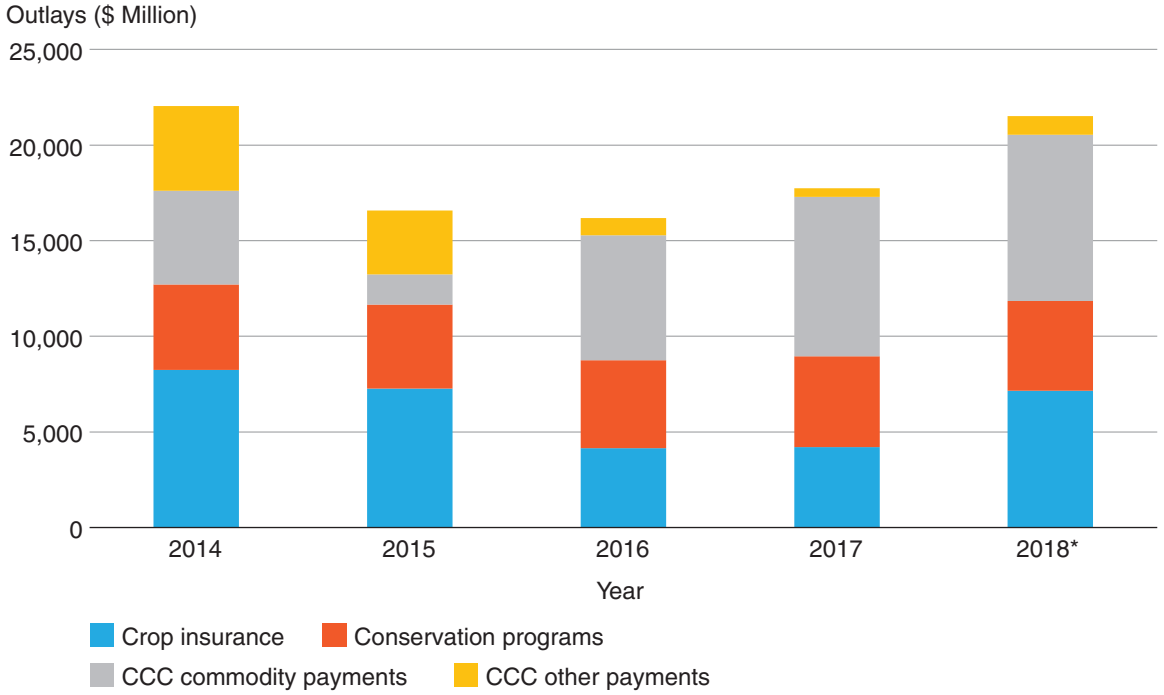
U.S. Federal crop support programs can reduce the risks faced by farmers due to unpredictable and often uncontrollable factors that affect yields, input costs, and farmgate prices. Title I of the Farm Act establishes programs that make payments when losses associated with price, yield, or revenue fall below some reference or benchmark value. Title XI of the Farm Act, in contrast, offers a variety of insurance programs that allow farmers to select coverage rates and pay premiums, and, in return, receive payments in the event of losses to yields or revenues. Title XII provides for certain disaster assistance payments for crops not covered by crop insurance. The following sections describe the different programs under each title in greater detail and then illustrate the range of benefits they can offer under different scenarios.

[3]Throughout this report, references are made to crop years (marketing years) and fiscal years. According to the USDA, the crop year (or marketing year) refers to the 12-month period starting with the month when the harvest of a specific crop typically begins. The 2016 wheat crop year, for example, is June 1, 2016, through May 30, 2017. The amount harvested during this time is then considered the "2016 crop." The fiscal year for the Federal Government runs from October 1 to September 31.

[4]The Commodity Credit Corporation (CCC) has the authority to borrow up to $30 billion from the U.S. Treasury for implementing programs authorized under the CCC Charter Act and various other statutes, including the 2014 Farm Bill. CCC outlays are not exempt from sequestration.

Figure 1

Congressional Budget Office (CBO) baseline for mandatory farm programs



Note: * Indicates a projection. CBO values are reported on a fiscal year basis. As a result, fiscal year 2014 outlays include payments related to the earlier 2008 Farm Act. Also, fiscal year 2014 includes a large retroactive payment to producers who experienced losses due to drought or blizzard in fiscal years 2012-2013. The category "CCC other payments" includes outlays such as Cotton Transition Payments, WTO Settlement with Brazil, and Livestock Disaster Payments.
CCC = Commodity Credit Corporation; WTO = World Trade Organization
Source: CBO Baseline Projections of USDA Mandatory Farm Programs for March 2015, March 2016, June 2017, and April 2018.

Title I Support Programs for Crops: Price Loss Coverage and Agriculture Risk Coverage

Title I of the 2014 Farm Act repealed the Direct Payments (DP), Countercyclical Payments (CCP), and Average Crop Revenue Election (ACRE) programs.[5] The Act also removed upland cotton from the list of covered crops. In their place, Title I established two new programs: Price Loss Coverage (PLC) and Agriculture Risk Coverage (ARC).

Table 2 summarizes their major provisions. Certain provisions of Title I programs are typically authorized to last for a set duration specified in a Farm Act, usually around 5 years. Title I's statutory parameters governing prices used in programs, unlike those found in crop insurance programs, follow historical averages or remain fixed for the duration of the Farm Act.

Table 2
Major provisions of the Agriculture Risk Coverage and Price Loss Coverage programs

	Agriculture Risk Coverage - County (ARC-CO)	**Agriculture Risk Coverage - Individual (ARC-IC)**	**Price Loss Coverage (PLC)**
Premium/subsidy	No	No	No
Availability	Covered commodities	Covered commodities	Covered commodities
Restrictions	For the covered commodity on a farm, PLC and SCO are not available	PLC and SCO are not available	For the covered commodity on a farm, ARC is not available
Payment trigger	County revenue falls below 86% of benchmark county revenue	Farm covered commodity revenue falls below 86% of benchmark farm revenue	Market price falls below reference price
Payment calculation	(86% of benchmark county revenue - county average revenue) x 0.85 x base acres	(86% of benchmark farm revenue - whole farm revenue of covered commodities) x 0.65 x base acres	(Reference price-market price) x base yield x 0.85 x base acres
Maximum payment	10% of county benchmark revenue	10% of individual benchmark revenue	Market price at or below the National Average Loan Rate

Note: A list of the individual covered commodities appears in table 3. Restrictions also exist on planting certain fruits and vegetables on base acres.
Source: Compiled by USDA, Economic Research Service from 2014 Farm Act legislation.

[5]Direct payments (DP) were crop-specific flat-rate payments made to producers with base acres in a given crop, regardless of what crop, if any, was cultivated on the area. Countercyclical payments (CCP) refer to payments designed to compensate producers for price-related losses. The Average Crop Revenue Election (ACRE) program paid producers for certain losses to revenues. Details of these programs are available online.

The general design of PLC is similar to the former CCP program. PLC provides payments when a covered commodity's average national price for the marketing year falls below the reference price specified in the 2014 Farm Act (table 3). Producers with historical base acres of that commodity enrolled in PLC receive the difference between the reference price and the average national price multiplied by 85 percent of the farm's base acres and program yield. If the average national market price falls below the national average loan rate, the PLC payment formula uses the loan rate instead of the market price.[6]

ARC pays farmers with historical base acres of a covered commodity when average revenue for that commodity falls below an average revenue guarantee. For the ARC-County program (ARC-CO), benchmark revenue is the 5-year Olympic average of a county's yields multiplied by the 5-year Olympic average of the annual benchmark price.[7] For the ARC-Individual program (ARC-IC), benchmark revenue is the participating farm's weighted 5-year Olympic average of revenue from all covered commodities produced on the farm. ARC-CO (ARC-IC) provides payments when realized county (farm) revenue falls below 86 percent of the benchmark revenue. ARC payments are capped at 10 percent of the benchmark revenue. Thus, given the 86-percent coverage rate and the payment cap, revenue losses in the range of 76 percent to 86 percent of benchmark revenue are covered by ARC. ARC-CO and ARC-IC payments are made on 85 percent and 65 percent of the base acres, respectively.

[6]Under a Non-Recourse Marketing Assistance Loan (MAL), the national average loan rate is the price per unit that a producer can borrow from the Commodity Credit Corporation to hold the commodity for a later sale date. If the market price is below the national loan rate, the producer can repay the loan at the lower market price. Alternatively, a producer can receive the equivalent benefit as a loan deficiency payment (LDP). For most commodities—the only recent exceptions are cotton, peanuts, and wheat—market prices have not fallen low enough to trigger MALs or LDPs for some time.

[7]An Olympic average is the mean calculated with the highest and lowest values omitted. These averages use the previous 5 years of yields and prices. The annual benchmark price is the higher of the national average market price or the reference price.

Table 3
Reference prices for covered commodities

Covered commodities	Reference prices
Wheat	$5.50/bushel
Corn	$3.70/bushel
Grain sorghum	$3.95/bushel
Barley	$4.95/bushel
Oats	$2.40/bushel
Long-grain rice	$14.00/cwt
Medium-grain rice	$14.00/cwt
California medium-grain rice (temperate japonica)	$16.10/cwt
Soybeans	$8.40/bushel
Other oilseeds	$20.15/cwt
Dry peas	$11.00/cwt
Lentils	$19.97/cwt
Small chickpeas	$19.04/cwt
Large chickpeas	$21.54/cwt
Peanuts	$535.00/ton
Seed Cotton	$0.367/pound[1]

[1]Under the Bipartisan Budget Act of 2018 signed into law on February 9, 2018, seed cotton (unginned upland cotton that includes both lint and seed) is a covered commodity under Title I. Starting with the 2018 crop, producers will be eligible for ARC/PLC support for seed cotton by reallocating their generic base (the farm's acreage of specified crops, including rice, eligible for Farm Service Agency programs), and by not enrolling in the Stacked Income Protection Plan (STAX). The marketing loan rate for seed cotton is $0.25/pound.
Note: Japonica rice varieties trade at a higher price than long- and medium-grain varieties, the reason its reference price is 115% of the long-grain/medium-grain rice reference price. cwt = hundredweight.
Source: Agricultural Act of 2014, Title I.

ARC and PLC do not charge premiums for participation, although eligible producers must enroll annually in order to receive coverage.[8] Farmers chose to receive either ARC-CO or PLC for each covered commodity or ARC-IC for all covered commodities during the election period held in 2014/2015, a decision lasting the duration of the 2014 Farm Act. Importantly, PLC payments and ARC-CO payments are not dependent on the crops planted or considered planted at the farm level for the current crop year.[9] ARC-IC requires current crop production at the farm level to determine revenue for the current year.

[8]In general, farmers are eligible to participate in PLC or ARC if they: (1) are actively engaged in farming; (2) have base acres for a covered commodity; (3) are in compliance with applicable conservation and wetland protection requirements; (4) maintain the land with sound agricultural practices; (5) maintain the land in an agricultural use; and (6) annually submit acreage reports on the farm. These programs require a two-step process for producer eligibility: election, and enrollment.

[9]An exception is the case of a covered crop planted on former cotton base acres that were converted to generic base acres under the 2014 Farm Act. ARC or PLC payments on generic acres are made on the planted covered commodity.

Box 1

Program Requirements, Limitations, and Interactions

Many programs administered by the Farm Service Agency are subject to payment and income limits. Producers may receive up to $125,000 in combined annual payments from Title I programs and livestock disaster assistance programs.[10] Producers with adjusted gross income exceeding $900,000 are ineligible for direct payments from the Farm Service Agency, except for the Margin Protection Program for Dairy Insurance policies administered by the Risk Management Agency, which are not subject to payment or income restrictions.

Tables 2 and 7 list the restrictions that govern participation across different Title I and XI programs. Title I programs and shallow loss insurance policies can be used with a deep loss policy, though total payouts are limited. Table 11 shows that payments across certain combinations of livestock programs are limited, but no programs are prohibited from being used together.

[10]The FSA program payments for peanuts have a separate $125,000 limit. Under the Bipartisan Budget Act of 2018, the $125,000 payment cap per producer is eliminated for the Livestock Disaster Indemnity program.

Title XI and XII Support Programs for Crops: Crop Insurance, Shallow Loss Insurance Programs, and Disaster Protection

In addition to price and revenue support programs, the Federal Government offers a variety of insurance and disaster assistance programs to agricultural producers. A summary of these programs appears in table 4. Producers and policymakers have moved increasingly toward risk management programs, such as insurance with subsidized premiums and insurance-like buy-up provisions for the Noninsured Crop Disaster Assistance Program (NAP), created for noninsurable commodities. In 2016, the Risk Management Agency (RMA) of the USDA covered nearly 300 million acres and over $100 billion in liabilities (USDA, RMA, 2017b). These costs account for around $7.9 billion out of the USDA's $164 billion budget for fiscal year (FY) 2017 (USDA, Office of Budget and Program Analysis, 2017).

Traditional Federal Crop Insurance Programs

Most policies offered by the RMA pay indemnities when realized revenue or yield (depending on the policy) falls below a percentage of the expected value. This percentage, chosen by the producer, typically ranges from 50 to 85 percent. A "deep loss" policy pays when production losses are large or even total, due to a catastrophic event after planting. Coverage for these policies is typically determined by the amount of expected revenue or yield guaranteed. For example, a revenue policy with 75 percent coverage will pay an indemnity if the producer's actual revenue is 75 percent or less of the expected revenue. Most producers of major commodities choose coverage levels between 70 and 85 percent.

Table 4 gives brief descriptions of the primary Federal crop insurance policies for which the Government subsidizes premiums. The subsidy depends on the coverage levels and the type of insured unit, as seen in table 5 (USDA, RMA, 2017b).[11] O'Donoghue (2014) explored the relationship between premium subsidies and crop insurance purchases and found that increasing the premium subsidies has a significant effect on the coverage level of the insurance purchased but not the number of acres insured.

[11]The crop insurance program is a private-public partnership, and the Federal Government reimburses the private companies selling and servicing the insurance products for administrative and operating costs involved in delivery. These reimbursements are referred to as administrative and operating (A&O) subsidies and roughly total $1.4 billion each year (USDA, RMA, 2016b). For more information on the partnership between the Federal Government and private crop insurance companies, refer to the Standard Reinsurance Agreement (USDA, RMA, 2017a).

Table 4
Availability, indemnity payment information, and costs of commonly used crop insurance and disaster policies

Policy/program	Availability	Coverage trigger[a]	Indemnity payment[b]	Costs to farmer
Catastrophic Risk Protection Endorsement (CAT Coverage)	100+ crops (not all crops covered in all locations)	50% of expected yield	(0.50 x expected yield – actual yield) x (0.55 x market price)[g]	Administrative fee[f]
Yield Protection (YP)	13 crops (not all crops covered in all locations)	50% - 85% of expected yield[d]	Assuming 85% coverage: (0.85 x expected yield – actual yield) x market price	Portion of actuarially fair premium for producers in a given county[c]
Revenue Protection (RP)	13 crops (not all crops covered in all locations)	50% - 85% of expected revenue[d] (uses higher of projected price or harvest price in expected revenue)	Assuming 85% coverage: (0.85 x expected yield x price[e]) – actual revenue	Portion of the actuarially fair premium for producers in a given county[c]
Revenue Protection – Harvest Price Exclusion (RP-HPE)	13 crops (not all crops covered in all locations)	50% - 85% of expected revenue[d] (uses projected price in expected revenue)	Assuming 85% coverage: 0.85 x expected yield x projected price – actual revenue	Portion of the actuarially fair premium for producers in a given county[c]
Noninsured Crop Disaster Assistance Program – Basic (NAP-Basic)	Available for crops where FCI is not available	50% of expected yield	(0.50 x expected yield – actual yield) x (0.55 x market price)	Service fee[f]
Noninsured Crop Disaster Assistance Program – Buy-Up (NAP-Buy-Up)	• Available for crops where FCI is not available • Not open to grazing crops	50% - 65% of expected yield[d]	Assuming 65% coverage: (0.65 x expected yield – actual yield) x market price	Assuming 65% coverage: Service fee[f] + 0.65 x acres x market price x expected yield x 0.0525
Tree Assistance Program (TAP)	Commercial trees, bushes, and vines with annual production	Exceeds normal mortality rate specified by Farm Service Agency	Payment dependent on tree, bush, or vine type	None

[a]The trigger is the amount of loss that results in an indemnity payment to the producer.
[b]The indemnity payment is the dollar amount received by the farmer if an insurance loss is triggered. The most common coverage trigger and indemnity payment calculation are presented in the table. Other coverage triggers and indemnity payment calculations are available for county-based policies and other crop-specific policies.
[c] According to economic theory, an actuarially fair insurance premium is one in which the premium equals the average of the possible indemnity payments. Under Federal crop insurance (FCI), the farmer pays less than 100 percent of the actuarially fair premium, given that the Government pays a share of the premium.
[d] Coverage is available in 5-percent increments.
[e] Price refers to the greater of the harvest price or the projected price.
[f] Fee waivers exist for beginning, limited resource, and socially disadvantaged farmers.
[g] This payment formula is the most common option of several available to producers.
Source: Constructed by USDA, Economic Research Service from risk management legislative details.

Table 5
Premium subsidy rates for Yield Protection (YP) and Revenue Protection (RP) for different coverage levels and insured units

	Percent							
Coverage level	50	55	60	65	70	75	80	85
Basic/Optional unit subsidy	67	64	64	59	59	55	48	38
Enterprise unit subsidy	80	80	80	80	80	77	68	53
Whole farm units	80	80	80	80	80	80	71	56

Source: USDA, Risk Management Agency.

Between 1989 and 2016, the U.S. crop insurance program increased its coverage and saw demand for different policy types evolve (fig. 2). Yield-based policies dominated in the early 1990s, but in 1996, newly available revenue-based policies began absorbing a larger share of insured acres, accounting for more than two-thirds of all insured area by 2016. Group policies, which are triggered by losses at the level of the county instead of the producer, accounted for over 37 million acres in 2005. Group policy enrollment dwindled substantially, however, after 2008, in the same time period when the subsidy rates for enterprise units increased.[12,13] Meanwhile, forage producers who graze livestock and are ineligible for yield or revenue protection have enrolled over 50 million acres (or just under one-fifth of total insured area) in index policies based on rainfall or vegetation.[14]

Despite these changes in policy types, the proportion of total insured acres attributable to each commodity crop has not changed significantly. Figure 3 illustrates the year-to-year changes of each crop's portion of total insured acres since 1989. The proportion of insured acres for corn, soybeans, cotton, and rice changed very little. Wheat's area, however, fell from 35 percent in 1990 to around 15 percent of total insured acres in 2016, as wheat plantings in the United States declined. In contrast, the category "other," representing all other crops, has absorbed an increasingly larger share of acres, reflecting the addition of new crops to the overall mix.

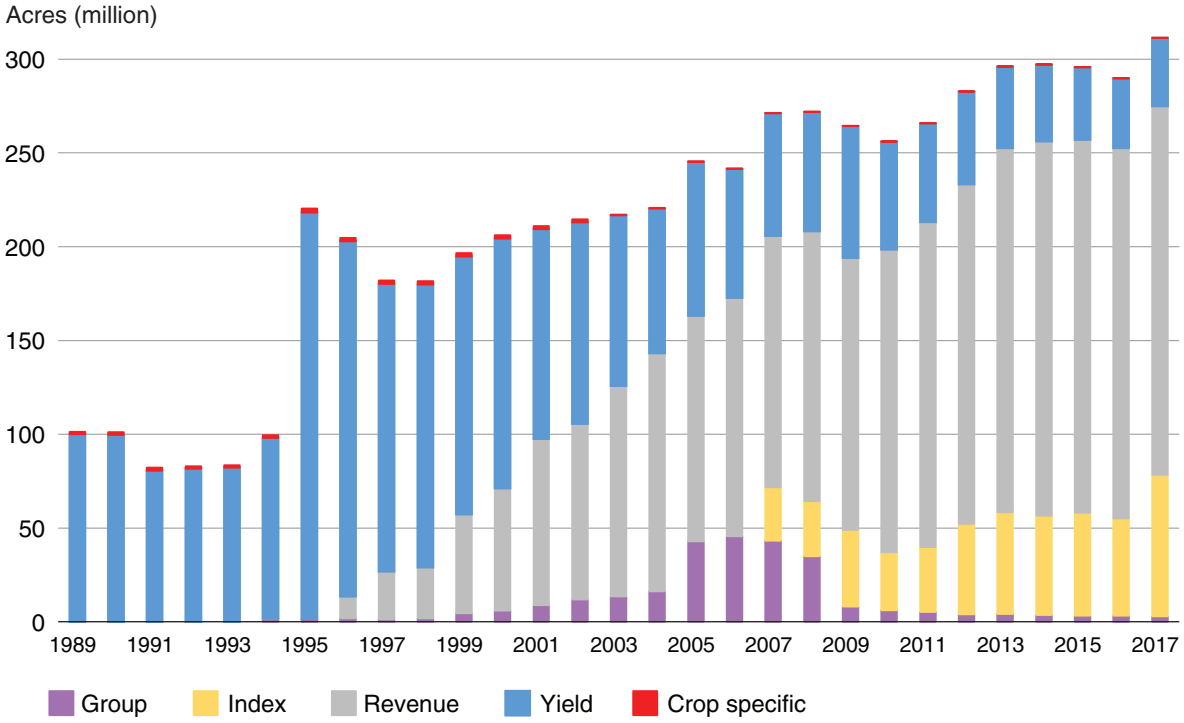
[12]Yield Protection and Revenue Protection policies distinguish insurable units by location, crop type, production practices, and rental agreements. There are three levels of spatial coverage: basic unit, optional unit, and enterprise unit. A basic unit is all insurable acreage of the insured crop in the county in which the operator has either a 100-percent crop share or which is owned by one person and operated by another person on a share basis. An optional unit is a subdivision of a basic unit. Optional units may be used to distinguish irrigated and nonirrigated acreage; certified organic, transitional, and buffer zone acreages; or in areas where other methods of determining legal land sections are not available. An enterprise unit is all insurable acreage of the same insured crop in which the farmer has some share within one county. Enterprise units can be used to aggregate basic units into a single enterprise policy for a given crop and county.

[13]Group policies generally have higher premium subsidies than Yield Protection or Revenue Protection policies.

[14]Index policies rely on observable natural phenomena, such as rainfall, to estimate losses and ultimately pay indemnities (e.g., see Pasture, Rangeland, and Forage program in table 11).

Figure 2

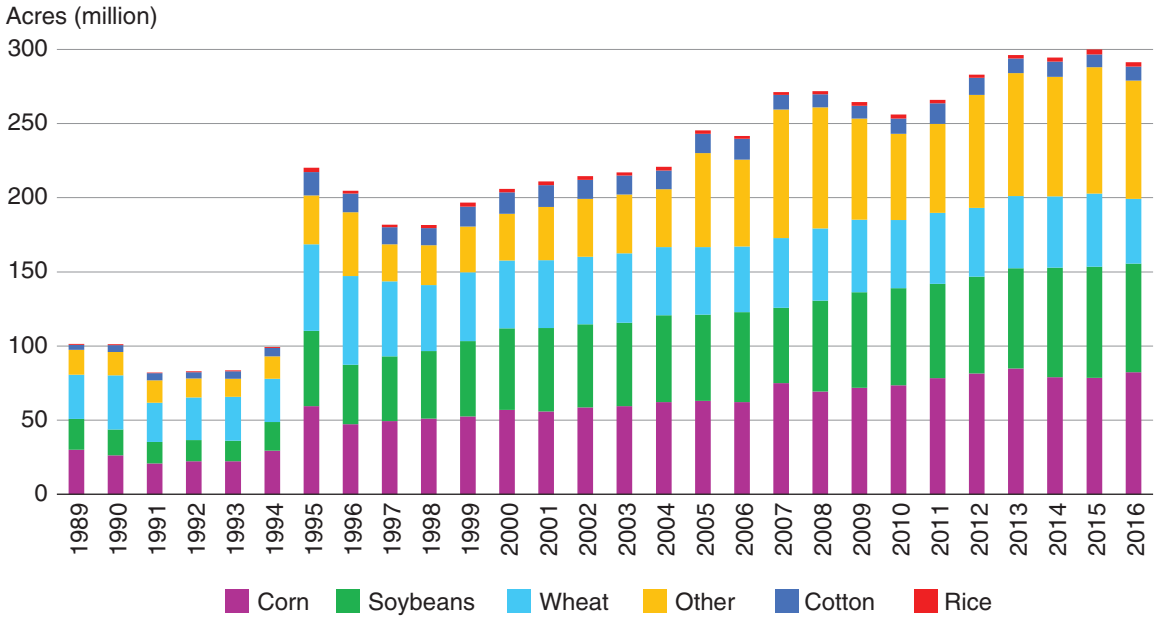
Insured acres by policy type, 1989-2017



Note: The "Index and Other" categories include insurance programs such as Pasture, Rangeland, and Forage (PRF), as well as Margin Protection Insurance for Corn, Rice, Soybeans, and Wheat Pilot Program. PRF accounts for most of the acres in this category. This graph does not include small crop-specific programs, such as pecan revenue insurance or avocado insurance—which make up a very small percentage of the total acres insured—or insurance programs that are not based on acreage.
Source: USDA, Risk Management Agency, Summary of Business (2017b).

Figure 3

Insured acres by crop, 1989-2016



Note: The category "Other" includes fruits, vegetables, nuts, seeds, other grains, tobacco, and other crops.
Source: USDA, Risk Management Agency, Summary of Business (2017b).

Table 6 illustrates the effects of adding Revenue Protection (RP) insurance with 75 percent coverage for producers of three crop types: corn, soybeans, and winter wheat. The numbers come from the authors' repeated computer simulations of yields and prices, which produce a range of revenue outcomes with known probabilities, with and without the policy. In the simulations, gross net revenue is defined as expected gross revenue plus any indemnity minus the producer's insurance premium. The largest effect of RP is the reduction in the downside risk to a producer's gross net revenue. For example, a representative policyholding corn farmer sees the lower bound of gross net revenue rise from $257 to $583 per acre. Average gross net revenue also climbs slightly, from $739 to $768, nearly 4 percent. For a policyholder, the premium payment slightly reduces the upper bound of gross net revenue, which in the case of the corn farmer is reflected in the drop from $1,286 to $1,257. Purchasing insurance also lowers the variability of gross net revenues, as measured by the coefficient of variation.[15] For the representative corn producer, buying the RP policy lowers the coefficient of variation from 0.36 to 0.26. Overall, crop insurance raises the floor for gross net revenues and simultaneously reduces its variability (i.e., risk).

Table 6
Simulation results of Revenue Protection (RP) insurance impacts on farm revenue per acre averaged across all counties in the sample

	Premium subsidy ($/acre)	Avg total revenue ($/acre)	95% Confidence Interval of revenue/acre ($/acre)	Coefficient of variation of revenue/acre
Corn				
No insurance	–	739	[257; 1,286]	0.36
RP insurance	28.68	768	[583; 1,257]	0.26
Soybeans				
No insurance	–	480	[150; 871]	0.39
RP insurance	18.48	498	[358; 854]	0.29
Winter Wheat				
No insurance	–	265	[31; 564]	0.54
RP insurance	15.63	280	[180; 552]	0.40

Notes: Revenue Protection (RP) insurance based on 75% coverage. Analysis assumes the 2016 Risk Management Agency (RMA) base price. Simulated farm level yields are calibrated to 2016 by multiplying them by the ratio of the expected 2016 national yield from the 2016 USDA Baseline (USDA, Office of the Chief Economist, World Agricultural Outlook Board (2016)) and mean of the detrended National Agricultural Statistics Service national yield data. RP insurance is the standard RP insurance calculated over farm-level yields. The representative farmer in each county is assumed to choose the actual average 2014 coverage rate for the county (rounded to the closest actual available rate). The analysis includes simulated yield distributions for representative farmers in 1,001 corn counties, 889 soybean counties, and 525 winter wheat counties. For each representative farm, the premium subsidy is calculated using the official RMA subsidy rate (basic units) associated with the county's average chosen coverage rate (rounded to the closest actual available rate). The revenue (gross net revenue) figures are net of the farmer-paid portion of the premium. The values in brackets are the lower and upper bound, respectively, of a 95-percent confidence interval around average revenue. A rising lower bound with the addition of a support program indicates decreased revenue risk. Note that the upper bound will fall, reflecting the premium paid by the producer, regardless of whether an indemnity is received.
Source: Simulations performed by USDA, Economic Research Service with data collected from the USDA, National Agricultural Statistics Service and Risk Management Agency.

[15]The coefficient of variation of revenue is obtained by dividing its standard deviation by its average. Lower coefficients of variation imply lower variability (i.e., less risk).

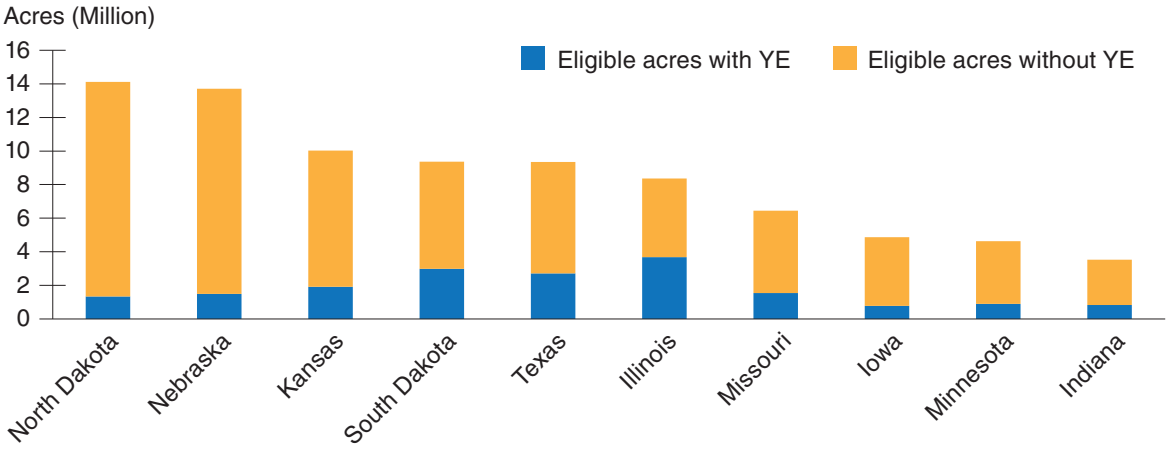
The Yield Exclusion Option

Although the 2014 Farm Act did not change premium subsidy rates, it did offer farmers the chance to omit very low yields from their production history, a feature called Yield Exclusion (YE).[16] By omitting low yields, farmers can potentially achieve higher insurance revenue or yield guarantees (USDA, RMA, 2016a). YE slightly alters the rates of the premiums and subsidies at different levels of coverage in table 5. A producer's historical yield (Actual Production History, or APH) is eligible for Yield Exclusion if the county yield (or the yield of a contiguous county) in a given year is below 50 percent of the previous 10 consecutive-year average.

For example, suppose a corn producer's approved APH yield is 150 bushels per acre; the yield guarantee would then be 98 bushels per acre for a Yield Protection (YP) policy with 65 percent coverage. Now suppose the same producer is eligible for Yield Exclusion and opts to exclude a year from the APH history, which increases the approved APH yield to 162 bushels per acre. With Yield Exclusion, the producer's YP policy with 65 percent coverage has a yield guarantee of 105, which is equivalent to a YP policy—without YE—with approximately 70 percent coverage.

Figure 4 shows the total number of acres eligible for YE in 2015, the number of insured acres enrolled in YE, and the number of eligible acres that did not use YE for the 10 States with the most acres eligible for YE. In Illinois, producers applied YE to over 3.5 million acres (44 percent of the eligible insured acres). Texas and South Dakota applied YE to approximately 30 percent of their eligible insured acres. Despite North Dakota's having the most acres eligible for YE, there were fewer insured acres with YE in North Dakota than in Kansas, Texas, Illinois, or Missouri. When disaggregated by crop (fig. 5), corn had the highest percentage (25 percent) of insured acres with YE (USDA, RMA, 2016d).

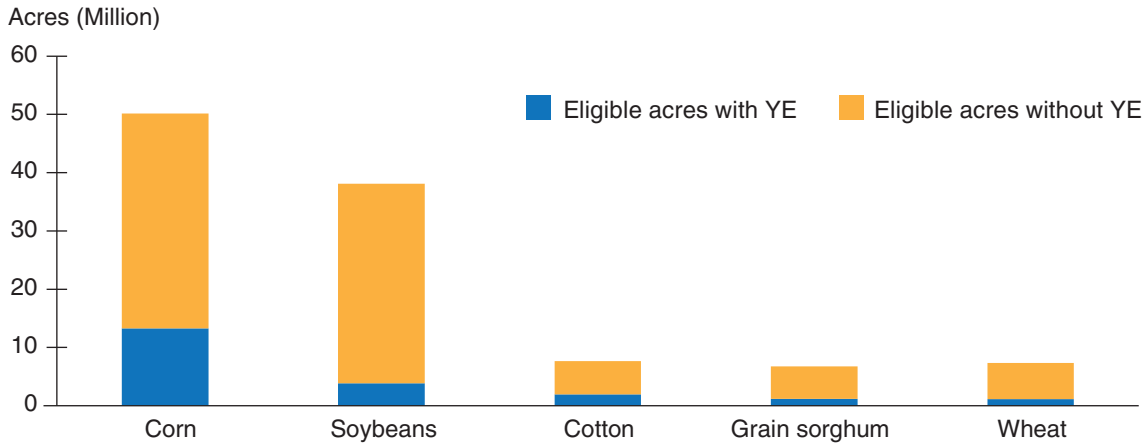
Figure 4
Insured acres eligible for yield exclusion (YE) by State, 2015



Source: USDA, Risk Management Agency (2016d), "Federal Crop Insurance Summary of Business for Yield Exclusion."

[16]While YE changes the APH used in the yield guarantee, RMA uses the "rate yield" to ensure the premiums are actuarially fair. The rate yield is the average yield of the producer used to determine how risky the producer is relative to the county yield.

Figure 5
Insured acres eligible for yield exclusion (YE) by crop, 2015



Source: USDA, Risk Management Agency (2016d), "Federal Crop Insurance Summary of Business for Yield Exclusion."

Shallow Loss Programs in the 2014 Farm Act: SCO and STAX

Title XI of the 2014 Farm Act introduced two area-level "shallow loss" crop insurance policies managed by the Risk Management Agency. "Shallow loss" refers to coverage that only compensates farmers for the initial layer of loss and does not provide any additional payment for deeper losses. Specifically, the liability covers a range that is capped at or above 50 percent of an expected yield or revenue, depending on the program. Table 7 summarizes the key features of these policies, the Supplemental Coverage Option (SCO) and the Stacked Income Protection Plan (STAX), both administered by the Risk Management Agency.

The Supplemental Coverage Option is available for 40 commodities, including most covered commodities, cotton, and select fruits and vegetables. Covered commodities are eligible for SCO if base acres for those commodities are enrolled in PLC but not ARC-CO or ARC-IC. SCO requires producers to purchase an underlying insurance policy from among the following choices: Revenue Protection, Yield Protection, or Revenue Protection with Harvest Price Exclusion. The payment mechanism (i.e., yield versus revenue) for SCO parallels that of the underlying insurance policy, but—unlike the underlying policies—the trigger is tied to county production rather than the producer's production. For example, if a producer's underlying policy is Yield Protection, SCO payments will trigger when a county's yield falls below 86 percent of its expected level. The SCO payment equals the difference between 86 percent of the expected level and the coverage level of the underlying policy. If a producer has a Revenue Protection policy with 70 percent coverage, the producer's maximum payment is 16 percent (86 percent minus 70 percent) of the expected farm revenue. Since SCO is a crop insurance policy, producers must pay a premium to enroll. Sixty-five percent of the premium is subsidized by the Federal Government (USDA, RMA, 2014).

Upland cotton producers may purchase the Stacked Income Protection Plan instead of SCO. Unlike SCO, STAX can operate as a stand-alone insurance policy or as a companion to a "deep loss" crop insurance policy such as Revenue Protection. As a shallow loss program, STAX indemnifies producers according to a "STAX coverage range" consisting of an upper and lower bound.

The upper bound, known as the "area loss trigger," can vary in 5-percent increments from 75 to 90 percent of expected county revenues, depending on the producer's choice. For producers with companion policies, the STAX lower bound they select (1) must be at least 70 percent, (2) cannot be lower than the companion policy's coverage level, (3) and must be a multiple of 5 (e.g., 70, 75, 80 percent).[17] The coverage range equals the difference between the area loss trigger and the lower bound, and, by construction, does not exceed 20 percent. Finally, producers must select a "protection factor" ranging from 0.8 to 1.2 in 0.01 increments, which is multiplied by the coverage range in the payment calculation. Since STAX is a crop insurance policy like SCO, enrollees must pay a premium, which is 80 percent subsidized by the Federal Government (USDA, RMA, 2016f).

Table 7
Major provisions of Title XI "shallow loss" crop insurance programs

Provision	Supplemental Coverage Option (SCO)	Stacked Income Protection Plan (STAX)
Premium/ subsidy	Yes/65%	Yes/80%
Availability	50+ crops	Upland Cotton only
Restrictions	Not used with ARC or STAX. Requires YP, RP, or RP-HPE (called the companion policy)	Not used with SCO
Payment trigger	County revenue (or yield if producer enrolled in YP) falls below 86% of expected county revenue	County revenue falls below 75% - 90% (depending on producers' choice)
Payment calculation	(0.86 – coverage level of the underlying policy) x expected farm revenue	Assuming 90% coverage: County revenue – (0.90 x expected county revenue) x protection factor
Maximum payment	County revenue falls to or below coverage level of companion policy.	County revenue falls to or below a percentage of expected revenue chosen by the producer (must be equal to or greater than 70% of the coverage level of any companion policy)

ARC=Agriculture Risk Coverage; YP=Yield Protection; RP=Revenue Protection;
RP-HPE=Revenue Protection – Harvest Price Exclusion.
Source: USDA, Economic Research Service calculations based on 2014 Farm Act legislation.

[17]For producers without a companion policy, condition (2) is not applicable.

Noninsured Crop Disaster Assistance Program

In certain counties and for certain crops (e.g., specialty crops), federally subsidized crop insurance may be unavailable. The Noninsured Crop Disaster Assistance Program (NAP) administered by the Farm Service Agency attempts to fill this gap. NAP-Basic offers producers catastrophic coverage for yield losses greater than 50 percent of the approved yield at 55 percent of the average market price.[18] The 2014 Farm Act introduced an additional option, NAP Buy-Up, in which producers can pay premiums to purchase coverage up to 65 percent of the approved yield at 100 percent of average market price.

In contrast to Federal crop insurance, the maximum NAP Buy-Up premium rate for a person—or a legal entity that is a NAP-covered producer—is set by statute as the lesser of liability or maximum payment limitation times a 5.25-percent premium fee.[19] The payment limitation is $125,000 per crop year per individual, member of a joint operation (such as a general partnership), or entity (such as a corporation or trust); beginning, limited resource, and socially disadvantaged farmers are eligible for a 50-percent premium waiver (USDA, FSA, 2016b). Like most Farm Service Agency programs discussed in this report, NAP is subject to payment and income limits, as explained in Box 1, "Program Requirements, Limitations, and Interactions" (p. 8).

Figure 6 illustrates how premium rates relate to risk levels for NAP compared to Yield Protection, a similar yield-based insurance program. NAP's constant 5.25-percent premium rate does not vary with yield risk, as measured by the coefficient of variation. But YP's premium rates vary both with yield risk and coverage level (e.g., 50 percent, 55 percent). Under all scenarios of risk and coverage level, the YP producer-paid premium rate is less than NAP's, implying that producers pay less for coverage. Much of this difference, however, is due to a YP premium subsidy paid by the Government.[20]

NAP applications doubled to 138,000 policies from 2014 to 2015, with the share of policies with service fee waivers remaining constant at 12 percent. From 2013 to 2015, the top three States to receive NAP outlays by count and dollar value (Texas, California, and Oklahoma) comprised approximately 50 percent of total outlays by dollar value. Overall, due to higher participation levels, the Western United States received more outlays by count and dollar value than the Eastern United States. The crops with the most applications for NAP in 2015 included grass, greens, sorghum, squash, peppers, and watermelon. NAP policies for certain crops tend to be concentrated in a few States, as they are for pecans and cherries, or widely dispersed, as for squash. NAP-Buy-Up coverage was first offered in 2015 and accounted for 16 percent of all NAP applications. Buy-Up coverage has been especially popular for certain crops, such as for cherries in Michigan and Oregon or pecans in Texas (Hungerford et al., 2017).

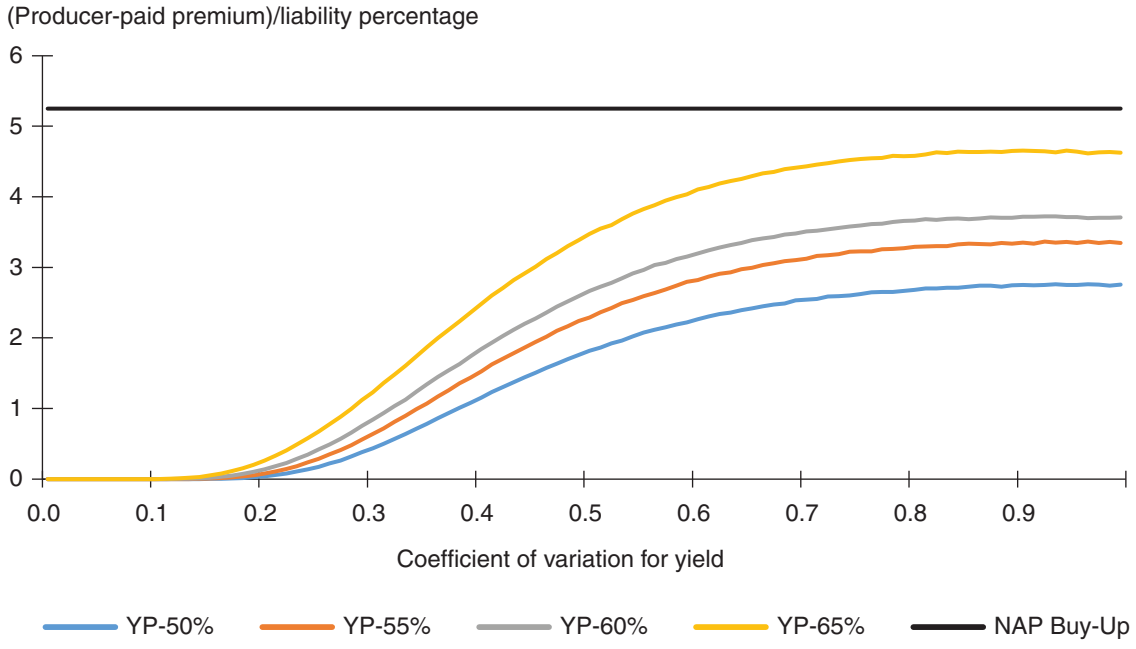
[18]The approved yield is calculated using the producer's actual production history and transition yields.

[19]A premium rate is defined as the premium divided by the liability.

[20]Absent such a subsidy, the premium rates for YP begin to surpass the NAP rate when yield risk, i.e., the coefficient of variation, exceeds 0.4.

Figure 6

Relating premium rates to yield risk: Noninsured Crop Disaster Assistance (NAP) and Yield Protection (YP) Comparison



Source: USDA, Economic Research Service calculations based on 2014 Farm Act legislation.

Sufficient yield data are not available to estimate the impact of NAP on the revenue risk reduction of eligible crops. However, Hungerford et al. (2017) simulated prices and yields from historical data for a Texas corn producer and found revenue risk falls by over 20 percent when the producer purchases NAP Buy-Up coverage compared to 8 percent for NAP Basic.[21] NAP Basic and NAP Buy-Up also raise the lower bound for gross revenue by approximately 50 and 100 percent, respectively, compared to no support. In most cases, NAP Buy-Up allows producers to reduce yield risk and slightly raise average revenue compared to NAP Basic, suggesting that the policies produce outcomes that are actuarially super-fair (that is, the expected value of the insurance is greater than zero) to producers.

[21]Simulation method is the same as that described in O'Donoghue (2016). The yield data used to calibrate the simulation model is from NASS, and the projected price was collected from RMA (USDA, RMA 2016d). The county of the representative corn farm (Bell County, Texas) is eligible for crop insurance but is adjacent to counties that are not able to insure corn through Federal crop insurance policies.

Simulating the Effects and Interactions of Support Programs on Farm Revenue and Risk

Computer simulations can offer useful insights into the effects of crop insurance programs on a variety of farm outcomes, including revenue levels and volatilities. By applying different weather and yield assumptions to an economic model of producer behavior, simulations generate a range of real-world outcomes that reflect the conditions producers might face and capture how the different insurance programs operate and potentially interact. We use the simulation methodology described in O'Donoghue et al. (2016) and detailed in Cooper and Delbecq (2014) to generate estimates of revenue levels and risk for corn, soybeans, and winter wheat when producers enroll in a shallow loss program, PLC, RP, or a combination of programs. A more detailed discussion is presented in Box 2 below, "Overview of Data and Analysis Methods."

Box 2

Overview of Data and Analysis Methods

In this analysis, county and representative farm yields and prices are simulated to determine revenue for corn, soybeans, and wheat, along with payments from Revenue Protection (RP), Agriculture Risk Coverage (ARC), Price Loss Coverage (PLC), and the Supplemental Coverage Option (SCO). Simulations are used to show what a producer could expect for a certain year, such as 2014.

National, State, and county yields for corn, soybeans, and wheat are collected from USDA's National Agricultural Statistics Service for the period 1975-2015 (USDA, NASS, 2016). Only time series with all 41 years of data were used to calibrate the simulations; hence, incomplete time series are eliminated from the analysis. For each yield time series, a time trend is estimated through regression modeling. This time trend represents changes in production technology, so removal of the yield time trend leaves only exogenous yield shocks unrelated to technological change. From the detrended yields, nonparametric univariate distributions are estimated.

For the price of each crop, historical price deviates (the difference between the futures contract price at planting and harvest time) are collected from the Chicago Board of Trade for 1975 to 2015. The projected prices and volatility factors of the Risk Management Agency (RMA) are also gathered. The historical price deviates are used to calculate the covariance between price and historical yields, while the RMA's projected price and volatility factor provide the lognormal price distributions.

For each crop, the covariance matrix among the detrended yields and historical price deviates is calculated. Together, the univariate distributions of yields and price, along with the covariance matrix, form a multivariate distribution. The function that connects the covariance matrix and univariate distributions is called a Gaussian copula. Next, 10,000 random observations of yields and price are drawn from the multivariate distribution. Each random observation contains one simulated yield for each county and State in the dataset, a national yield, and a harvest price.

continued—

From the county base premium rates, we can derive the farm-level variation in yields for each county, following Coble and Dismukes (2008). Using this farm-level variation, the idiosyncratic risk for a representative farm for each county can be deduced. To create a simulated yield for a representative farm, random draws of idiosyncratic variation are added to simulated county yields until the variation equals the RMA county base premium rate. The variation in yields is either systemic or idiosyncratic. The correlated draws from the copula model provide systemic variation, while the variation derived from the county base premium rates provides idiosyncratic variation. All yield draws are truncated at zero to prevent negative yields.

For each of the three crops, two counties are selected based on their coefficients of variation (CV), a standardized measure of volatility,[22] for crop revenue. One county has relatively high revenue risk (CV greater than 0.80), while the other has relatively low revenue risk (CV less than 0.40). Using the simulated representative farm yields, county yields, and prices, the crop revenue and payments for RP, ARC, PLC, and SCO are calculated on a per acre basis.

References

Coble, K., and R. Dismukes. 2008. "Distributional and Risk Reduction Effects of Commodity Revenue Program Design," *Review of Agricultural Economics* 30:543-53.

USDA, National Agricultural Statistics Service. 2016, "Quick Stats."

For Revenue Protection, the "deep loss" insurance program with the largest enrollment, we assume a 75-percent coverage level. Table 8 reports the simulated results of revenue impacts associated with the Revenue Protection and the Supplemental Coverage Option. The top value in each cell is the average estimated net revenue per acre, and the values in the brackets are the lower and upper bounds of the 95-percent confidence intervals for revenue per acre. The predicted revenue is reported for both 2014 crops—the year when producers elected either ARC or PLC, which affects eligibility for SCO—and 2016 crops, for which payments will be distributed after October 1, 2017. Because ARC payment triggers depend on past-year prices and yields, and because PLC pays against a fixed reference price, reporting both years shows why producers might have chosen ARC-CO, PLC, or SCO and how those choices would affect them for the most recent year with available data. To show the range of estimates under different risk scenarios, the table reports revenues for a high-risk and low-risk county.

Overall, commodity prices have decreased since producers made their ARC/PLC election decision, causing crop revenues to fall from 2014 to 2016. Differences in program design between ARC and PLC led to differences across program payouts. For corn, the payment difference for enrollees in ARC-CO or PLC shrank between 2014 and 2016, while the difference in payments for soybeans grew. In 2014, the difference between the payments to winter wheat base acres enrolled in PLC or

[22]The coefficient of variation is equal to the standard deviation divided by the mean.

ARC-CO was minimal, with ARC having slightly higher expected payments compared to PLC. In 2016, however, winter wheat base acres with PLC could expect higher payments than winter wheat base acres enrolled in ARC. Between the higher simulated PLC payments in 2016 and continuing low prices projected by the USDA baseline, many producers may reconsider their election decision in the future.

The combination of the Supplemental Coverage Option and Revenue Protection leads to higher average revenue compared to ARC-CO and RP for wheat. However, SCO's premium leads to the lower bound and upper bound of gross revenue, being lower compared to gross revenue with RP or gross revenue with RP and ARC-CO. This may have discouraged producers from purchasing SCO policies, even if the average payment is higher than ARC-CO. SCO enrollment for the past few years has been relatively low compared to the eligible acres (USDA, RMA, 2017b).

Table 8
Simulation results of expected gross net revenue and revenue risk across support programs and major crops, for low- and high-risk counties

	Corn			
	Low-risk county		High-risk county	
	2014 crop	2016 crop	2014 crop	2016 crop
Revenue only	767 [432, 1136]	692 [417, 912]	255 [0, 719]	235 [0,670]
Revenue + ARC-CO	804 [503, 1137]	712 [489, 913]	266 [0, 725]	251 [0, 677]
Revenue + PLC	771 [433, 1136]	702 [305, 1113]	257 [0, 719]	246 [0, 671]
Revenue + RP	778 [581, 1127]	702 [519, 906]	284 [156, 696]	267 [158, 644]
Revenue + RP+ ARC-CO	805 [610, 1128]	722 [568, 909]	283 [156, 701]	282 [158, 651]
Revenue + RP+ SCO	788 [575, 1124]	711 [582, 908]	289 [153, 699]	275 [154, 646]

	Soybeans			
	Low-risk county		High-risk county	
	2014 crop	2016 crop	2014 crop	2016 crop
Revenue only	606 [334, 933]	495 [284, 710]	270 [0, 774]	236 [0, 671]
Revenue + ARC-CO	619 [367, 933]	542 [343, 739]	275 [0, 774]	256 [8, 687]
Revenue + PLC	607 [334, 933]	503 [289, 711]	270 [0, 774]	239 [0, 671]
Revenue + RP	615 [451, 926]	503 [384, 704]	297 [148, 752]	268 [154, 645]
Revenue + RP+ ARC-CO	627 [454, 926]	550 [446, 733]	302 [148,751]	287 [156, 662]
Revenue + RP+ SCO	624 [447, 925]	512 [381, 702]	301 [146, 750]	274 [150, 650]

continued—

Table 8
Simulation results of expected gross net revenue and revenue risk across support programs and major crops, for low-and high-risk counties—continued

	Winter wheat			
	Low-risk county		High-risk county	
	2014 crop	2016 crop	2014 crop	2016 crop
Revenue only	509 [211, 922]	367 [147, 651]	103 [0, 324]	88 [0, 278]
Revenue + ARC-CO	513 [236, 914]	374 [175, 651]	109 [6, 324]	97 [12, 283]
Revenue + PLC	511 [223, 914]	399 [200, 651]	104 [0, 323]	103 [0, 284]
Revenue + RP	518 [355, 906]	373 [241, 646]	126 [84, 303]	109 [73, 262]
Revenue + RP+ ARC-CO	523 [355, 913]	380 [241, 646]	132 [84, 306]	118 [73, 266]
Revenue + RP+ SCO	527 [350, 901]	378 [242, 643]	133 [80, 302]	115 [70, 263]

Notes: The first value in each cell is the average gross net revenue ($) per acre. The values in brackets are the lower and upper bounds, respectively, of a 95-percent confidence interval around average revenue. A rising lower bound with the addition of a support program indicates decreased revenue risk. Note that the upper bound will fall, reflecting the premium paid by the producer (the producer-paid insurance is included in the revenue figures, where applicable), regardless of whether an indemnity is received.
Source: Simulations performed by USDA, Economic Research Service with data collected from USDA, National Agricultural Statistics Service and Risk Management Agency (2016c).

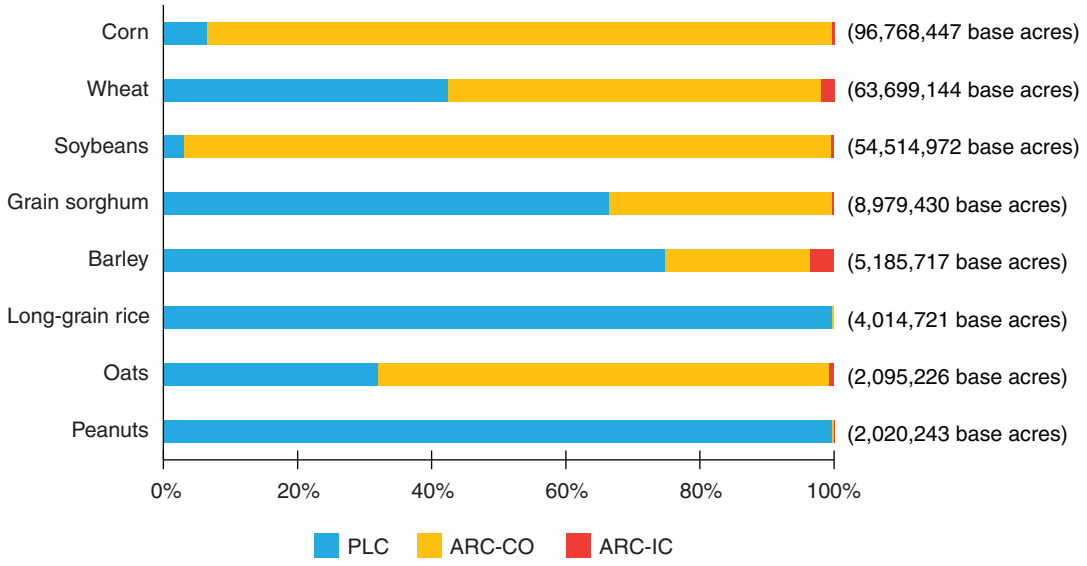
Enrollment and Total Payments in Crop Support Programs

Basic economic principles suggest that producers generally select programs based on their expected benefits. The simulation results for 2014 crops in table 8 reflect the decisions made by producers when choosing between PLC and ARC. Crops planted on generic acres (i.e., acres that were formerly cotton base acres) vary greatly by geographic location, and the choice of crops planted appears to be driven by each location's natural advantage. Moreover, PLC reference prices were set closer to market prices for certain crops, like peanuts and rice, which also likely affected program participation. SCO and STAX, like previously developed area-based insurance programs, have seen low adoption rates relative to RP or YP (USDA, RMA, 2017b).

Enrollment in Title I Programs: ARC and PLC

Figure 7 shows the percentage shares of ARC-CO, ARC-IC, and PLC election for the eight crops with the most base acres. Corn and soybean producers heavily favored ARC-CO, while rice and peanut farmers almost exclusively elected PLC. Many wheat producers chose ARC-CO, but a sizable minority chose PLC. For all commodities, ARC-IC was the least chosen program; overall, less than 1 percent of all base acres elected it.[23] The likely reason is that ARC-IC only pays on 65 percent of base acres, compared to the 85 percent paid by ARC-CO and PLC (USDA, FSA, 2016d). Unless a producer has average historical yields that are extraordinarily high compared to the rest of the county, ARC-CO will have higher payments than ARC-IC.

Figure 7
Price Loss Coverage (PLC), Agriculture Risk Coverage-County (ARC-CO), Agriculture Risk Coverage-Individual (ARC-IC) election by crop



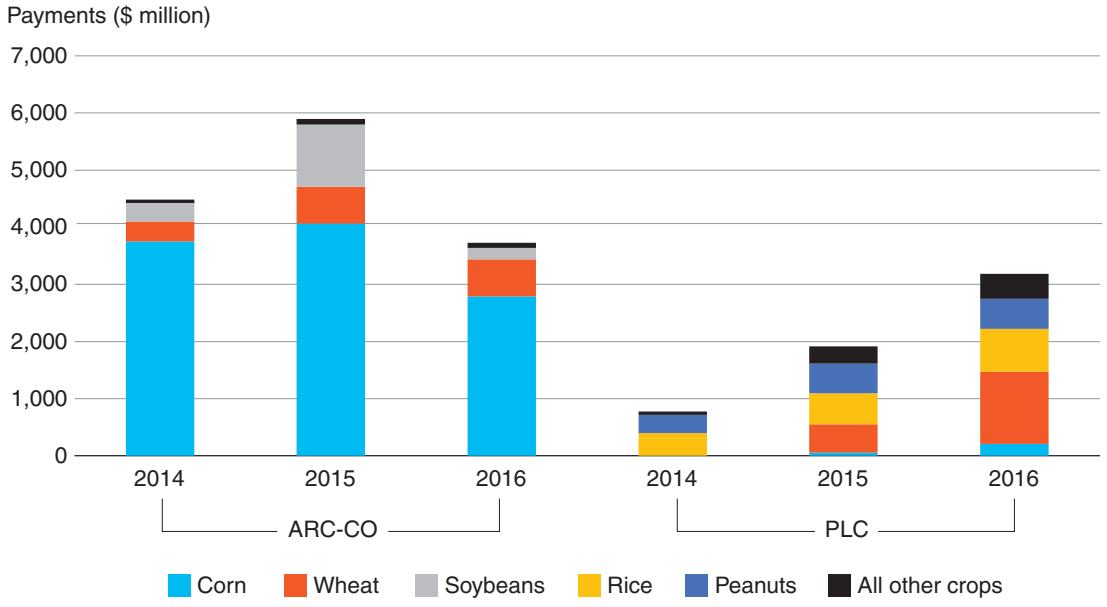
Source: USDA, Farm Service Agency, "ARC/PLC Election Data," 2016.

[23]One exception to this is pulse crops, which enrolled in ARC-IC at a much higher rate than ARC-CO.

The ARC-CO and PLC election results for corn, soybeans, and wheat align with the simulation results provided in table 8. In particular, based on year 2014 crop price projections, the predicted average ARC-CO payments were much higher for corn and soybeans compared to PLC payments in 2014. Since the difference between the predicted ARC-CO and PLC payments was smaller for winter wheat in 2014, this may explain the lack of a strong preference for ARC-CO over PLC for wheat. In contrast, by 2016 wheat prices had declined enough for PLC payments to be approximately twice ARC payments.

Before passage of the Agricultural Act of 2014, the Congressional Budget Office (CBO) projected that the annual total cost for the ARC and PLC programs would be on average $2.5 billion each fiscal year between 2016 and 2023 (Congressional Budget Office, 2014). ARC and PLC program payments for 2014 totaled $5.26 billion—similar to the level of payments paid out by the repealed Direct Payment program.[24, 25] For the 2015 and 2016 crop years, ARC and PLC payments summed to just over $7.8 billion and $6.9 billion, respectively (fig. 8). The majority of these payments were made to the commodity base enrolled in the ARC program, to corn in particular. Over the crop year period 2014-2016, payments to corn producers averaged over $3.5 billion. Wheat and soybean payments followed distantly with a yearly average of around $547 and $539 million, respectively. Soybean producers saw their ARC payments triple from 2014 to 2015 due to a drop in soybean prices over the same period and a simultaneous loss in yields in many soybean-growing counties. (USDA, FSA, 2016d). From 2014 to 2016, PLC payments rose from around $774 million to nearly $3.2 billion, mainly due to greater payments to wheat acres.

Figure 8
Agriculture Risk Coverage-County (ARC-CO) and Price Loss Coverage (PLC) payments for the 2014-2016 crop year



Source: USDA, Farm Service Agency, "2014 ARC/PLC Payments as of Sep. 30, 2016"; "2015 ARC/PLC Payments as of Feb. 2, 2017"; "2016 ARC/PLC Payments as of Dec. 5, 2017."

[24]Payments for a crop year are issued at the end of the marketing year for each commodity, but not before October 1. For example, payments for the 2016 crop year were announced by the Secretary of Agriculture on October 1, 2017.

[25]Actual ARC/PLC payments are subject to Federal budget sequestration. The simulated results presented in this report do not account for sequestration or other reductions (payment limitations, gross income limits, etc.).

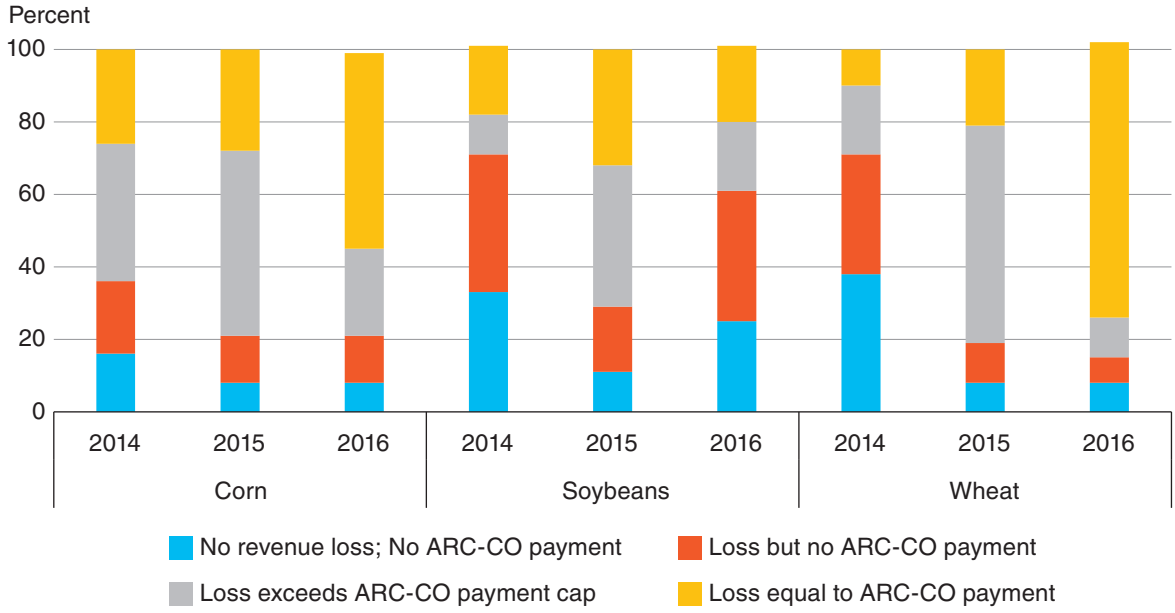
Reflecting the impact of price and yield volatility on support payments, CBO's January 2017 baseline reports actual and projected average annual combined ARC and PLC costs of $5.7 billion for 2016 to 2023 crops to increase by two-thirds over the level projected in 2014 (Congressional Budget Office, 2014 and 2017). The CBO analysis assumes that the next Farm Act will offer producers the opportunity to change their ARC/PLC election. Based on recent relatively low crop prices and the expectation that they will stabilize in the future, CBO projects that, by 2023, PLC outlays will account for over 80 percent of all farm program costs.

Across counties and over time, ARC-CO payments can vary substantially. One county may incur average revenue losses too small to trigger ARC-CO payments, while neighboring counties may have losses that exceed the maximum possible ARC-CO payment.

Figure 9 shows the distribution of ARC-CO payments to all U.S. counties for different revenue outcomes for corn, soybeans, and wheat during the 2014 and 2015 crop years. For the 2014 crop, more than 71 percent of counties with enrolled wheat and soybean base acres were not eligible to receive ARC-CO payments because their average revenues were above the guarantee level. In 15 percent of the counties, revenues for wheat and soybean base acres fell so far below the guarantee that the resulting payment was capped by the 10-percent limit (see "Maximum Payment" row in table 2). In contrast, 64 percent of counties with enrolled corn base acres were eligible for payments, and 38 percent of counties had payments capped at 10 percent of benchmark revenue.

Figure 9

Agriculture Risk Coverage-County (ARC-CO) and Price Loss Coverage (PLC) payments for the 2014-2016 crop year



Notes: Loss is defined as actual county revenue compared to benchmark county revenue. The category "No revenue loss" indicates that the actual county revenue was greater than or equal to benchmark county revenue. The category "Loss but no ARC-CO payment" indicates counties where actual county revenue is greater than 86 percent and less than 100 percent of the benchmark revenue. The category "Loss equal to ARC-CO payment" indicates counties where actual county revenue is between 76 percent and 86 percent of the benchmark county revenue. The category "Loss exceeds ARC-CO payment cap" indicates counties where actual county revenue is less than 76 percent of benchmark revenue (i.e., the payments are capped at 10 percent of benchmark revenue for these counties).
Source: USDA, Economic Research Service calculations based on Farm Service Agency data.

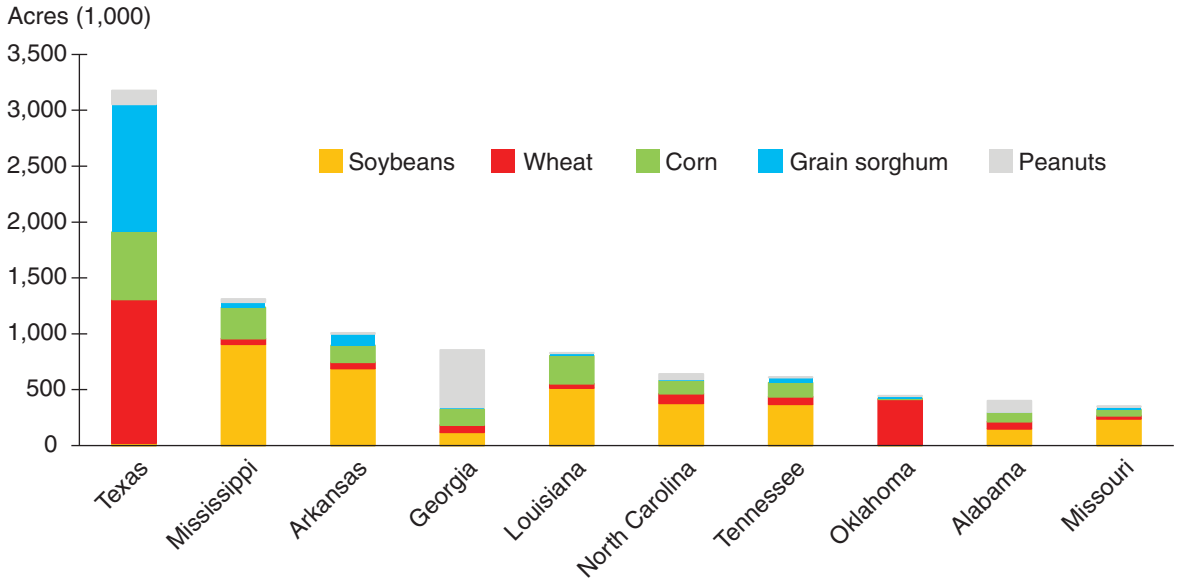
For 2015, approximately 89 percent of soybean-producing counties, along with 92 percent of corn-producing and wheat-producing counties, realized county revenues that fell below their historical benchmark revenue, higher proportions than in 2014. And more than half of corn- and wheat-producing counties saw county average revenue fall far enough below the guarantee that the ARC-CO payment could not fully compensate due to the 10-percent maximum payment limit.

Plantings on Generic Base Acres

The 2014 Farm Act designated previously categorized cotton base acres as "generic" base acres. Producers with generic base acres are eligible to receive ARC and PLC payments based on the covered commodities they plant. Generic base acres are attributed to a covered commodity based on each year's individual covered commodity's proportion of total covered commodity plantings on the farm. For example, suppose a producer has a 500-acre farm, of which 150 acres are generic base. The producer plants 200 acres of peanuts and 300 acres of wheat. Assuming the producer elected PLC for all of the covered commodities, 40 percent (200 out of 500) of his 150 generic base acres will receive PLC payments for peanuts and 60 percent (300 out of 500) of his generic base acres will receive PLC payments for wheat.

Figure 10 shows which covered commodities were associated with generic acres in the 10 States with the most generic acres.[26] In six States, soybeans account for the majority of generic acres. For Oklahoma, the majority of generic acres are wheat, and Texas generic acres are primarily split among wheat, corn, and grain sorghum. Georgia is unique among these States since its generic acres are primarily planted to peanuts. Not appearing on the graph are commodities in the remaining 2 percent planted on generic acres (USDA, FSA, 2016d).

Figure 10
Crops planted on generic acres by State



Source: USDA, Farm Service Agency, 2016e.

[26]Over 90 percent of generic acres are located in these 10 States, which historically grow upland cotton.

Enrollment in the Title XI "Shallow Loss" Programs

Enrollment in the "shallow loss" crop insurance programs managed by the Risk Management Agency (RMA) has been low compared to "deep loss" crop insurance programs (table 9). RMA reported that SCO-covered acres fell from around 4 million acres in 2015 to 2.5 million in 2016.

Table 9
Supplemental Coverage Option (SCO) participation for major commodities in 2016

Commodity	Area (Acres)	Premiums ($ Million)	Subsidies ($ Million)
Wheat	1,462,281	$14.8	$9.6
Soybeans	240,365	$2.6	$1.7
Rice	257,244	$1.3	$0.86
Corn	275,915	$4.9	$3.2
All Crops	2,533,025	$29.0	$18.9

Source: USDA, Risk Management Agency, 2017b.

As mentioned earlier, SCO and STAX are the two "shallow loss" programs available to upland cotton. In 2016, only 122 cotton producers purchased SCO, with total premiums amounting to about half a million dollars. In 2016, nearly 2.5 million acres of cotton were covered by STAX policies, representing $18.2 million in farmer-paid premiums. Given that 80 percent of the premium for STAX and 65 percent of the premium for SCO is subsidized, the higher enrollment in STAX is not surprising. Also, in Hungerford and O'Donoghue's analysis (2016), simulated revenue distributions of cotton growers under STAX and SCO showed that STAX reduced revenue risk by roughly 2 to 10 percent while SCO lowered risk by 7 percent, assuming the producers' underlying policy was RP with 70 percent coverage. The variation in STAX risk reduction capabilities is due to STAX having several coverage level options, while SCO is always triggered when realized county revenue falls below 86 percent of its expected level.

However, as shown in table 10, STAX-insured acres were low relative to the total number of acres insured under RP and YP. RMA reports that over 7.6 million acres of cotton were insured with RP, while an additional 1.8 million acres were insured with yield protection policies. Producers enrolled roughly 27 percent of insured cotton acres in a STAX companion policy and less than 1 percent in SCO. (USDA, RMA, 2017b).

Table 10
Federal Crop Insurance enrollment for upland cotton

Program	Area (acres)	Percent of area insured
Revenue Protection (RP)	7,610,382	80.8
Yield Protection (YP), Buy-Up	1,023,668	10.9
Yield Protection (YP), Catastrophic	763,808	8.1
Supplemental Coverage Option (SCO)	9,311	0.1
Stacked Income Protection Plan (STAX), Independent	16,152	0.2
Stacked Income Protection Plan (STAX), Companion	2,534,990	26.9

Source: USDA, Risk Management Agency, 2017b.

Livestock and Dairy

Livestock and dairy producers who experience certain types of losses can receive assistance from a number of Federal programs. This section describes the group of livestock and dairy support programs that cover losses owing to livestock deaths, protect producers who lose access to critical inputs (e.g., forage), and dampen the effect of shocks to prices of livestock or inputs (USDA, RMA, 2016e). Table 11 summarizes the Federal programs designed to assist livestock and dairy producers.[27] Unlike the crop programs described above, several of the programs in Table 11 have funding ceilings.

[27]The Livestock Risk Protection (LRP), Livestock Gross Margin (LGM), and Pasture, Rangeland, and Forage (PRF) insurance programs did not undergo major changes under the 2014 Farm Act, and therefore detailed discussions of these programs are not provided here.

Table 11
Description of programs for livestock producers

	Livestock Gross Margin (LGM)	Livestock Risk Protection (LRP)	Pasture, Rangeland, and Forage (PRF)	Margin Protection Program for Dairy Producers (MPP-Dairy)	Livestock Indemnity Program (LIP)	Livestock Forage Disaster Program (LFP)	Emergency Assistance for Livestock, Honey Bees and Farm-Raised Fish (ELAP)
Covered commodities	Cattle, swine, dairy	Fed cattle, feeder cattle, lamb, swine	Pasture, rangeland, and forage for grazing livestock	Milk production	All major and many minor livestock species	Forage for grazing livestock	Honey bees and farm-raised fish, water conveyance losses, cattle tick fever losses
Enrollment and/or premium requirements	Yes. Premium is dependent on the deductible selected by the producer and the type of livestock. A lower deductible equals a higher premium	Yes. Premium dependent on percent of expected price insured	Yes. Premium dependent on acreage and rainfall index	Yes. Service fee for guarantee of a $4 cwt margin. For a guaranteed margin greater than $4 cwt (up to $8 cwt), a producer pays a premium set in the 2014 Farm Act.	None	None	None
Participation restrictions	Dairy producers enrolled in MPP are not eligible for LGM-Dairy		Can accompany LFP and ELAP	Dairy producers enrolled in MPP are not eligible for LGM-Dairy	Can accompany LFP, ELAP, and TAP (with payment limitations)	Can accompany PRF (with payment limitations)	Can accompany PRF, as well as LFP, LIP, and TAP (with payment limitations).
Payment trigger	Realized margin (livestock price - feed cost) less than the covered margin less the producer-selected deductible	Expected price below a percentage specified by the producer (70% - 100%)	Actual rainfall below percentage of expected rainfall insured (70% - 90% chosen by producer)	Realized margin (milk price - feed cost) less than amount of coverage selected by producer ($4 cwt - $8 cwt)	Livestock deaths caused by adverse weather or reintroduction of wolves or avian predators	Reduced grazing capacity of land due to either wildfire on federally managed land or drought, as rated by the U.S. Drought Monitor	• Honeybee feed, colony, and hive losses. • Cost of moving cattle for vaccinating for cattle tick fever • Wildfire and drought on non-federally managed land • Cost of water transportation due to drought.
Special notes	Unlimited funding[1]	Unlimited funding[1]	Program is available in 48 States, no funding limitation	Unlimited funding	• Unlimited funding • Payments are 75% of market value of livestock.	Unlimited funding	Unlimited funding[1]

[1]Until the passage of the Bipartisan Budget Act of 2018, which was signed into law on February 9, 2018, the funding for these programs was capped at $20 million each.
Source: Compiled by USDA, Economic Research Service based on livestock and dairy support legislation.

Dairy Programs

The 2014 Farm Act repealed the Milk Income Loss Contract (MILC) program, as well as the Dairy Product Price Support Program and the Dairy Export Incentive Program. In their place, the Act introduced a completely new program for dairy producers called the Margin Protection Program for Dairy Producers (MPP-Dairy).

MPP-Dairy

MPP-Dairy is a voluntary program that pays producers when the difference between the all-milk price and feed cost,[28] called the margin, is below covered levels. Feed costs include corn, soybean meal, and alfalfa. According to FSA data, 24,748 dairies were enrolled in MPP-Dairy in 2015 (USDA, FSA, 2017b). The National Agricultural Statistics Service of the USDA estimates there were 43,534 licensed dairy producers in 2015. MPP-Dairy has a catastrophic level, which pays when the margin is smaller than $4.00 per hundredweight (cwt) of milk over a period of 2 consecutive months and can be purchased for a $100 annual service fee. The election decision can be made in any year, but once made, it lasts the life of the 2014 Farm Act. Once producers opt into the program, they make an annual decision whether to purchase buy-up coverage for an additional premium.[29] Purchasing buy-up coverage increases the triggering margin in $0.50 increments up to $8.00 per cwt. Premiums are calculated based on the triggering margin and the operation's registered historical dairy production. Dairies pay a higher premium on annual covered production greater than 4 million pounds (USDA, FSA, 2016a). To be eligible for support from MPP-Dairy, producers need to provide an established production history. When enrolling annually, the farmer chooses how much of the established history to cover, ranging from 25 to 90 percent in 5-percent increments, along with the margin coverage level.[30]

California has the highest level of historical production covered under MPP-Dairy, with almost 30 billion pounds in 2015, constituting over 20 percent of all milk production covered in the program. California, along with the next four largest producing States, Wisconsin, Idaho, Texas, and New York, accounted for more than half of all historical production enrolled in MPP-Dairy. In 2015, producers in the top 20 States accounted for just under 91 percent of all historical production enrolled.

While California was the clear frontrunner in terms of historical production, it ranks fifth in terms of enrollment, with slightly more than 1,100 farms (fig. 11). Wisconsin, the second-highest State in terms of historical production, had the most farms enrolled in MPP, with 6,580 in 2016. This divergence in the number of farms likely results from California's enrolled dairy farms being much larger than Wisconsin's. The top five States, including Minnesota, New York, Pennsylvania, and

[28]The price for milk is the national average. The feed cost in the MPP-Dairy payment calculation is a weighted average of the national price of several commodities and may not reflect what producers actually feed their dairy cattle.

[29]On September 1, 2017, the Secretary of Agriculture gave dairy producers the ability to opt out of the program for 2018.

[30]The Bipartisan Budget Act of 2018, which was signed into law on February 9, 2018, makes several changes to MPP. Among these, the enrollment period for 2018 will be extended for at least 90 days. Potential payments will be calculated on a monthly rather than a bimonthly basis. A dairy's production threshold at which premiums (other than the administration fee) are paid is moved up to 5 million pounds. Buy-up coverage premiums are reduced, and administrative fees are waived for some farmers.

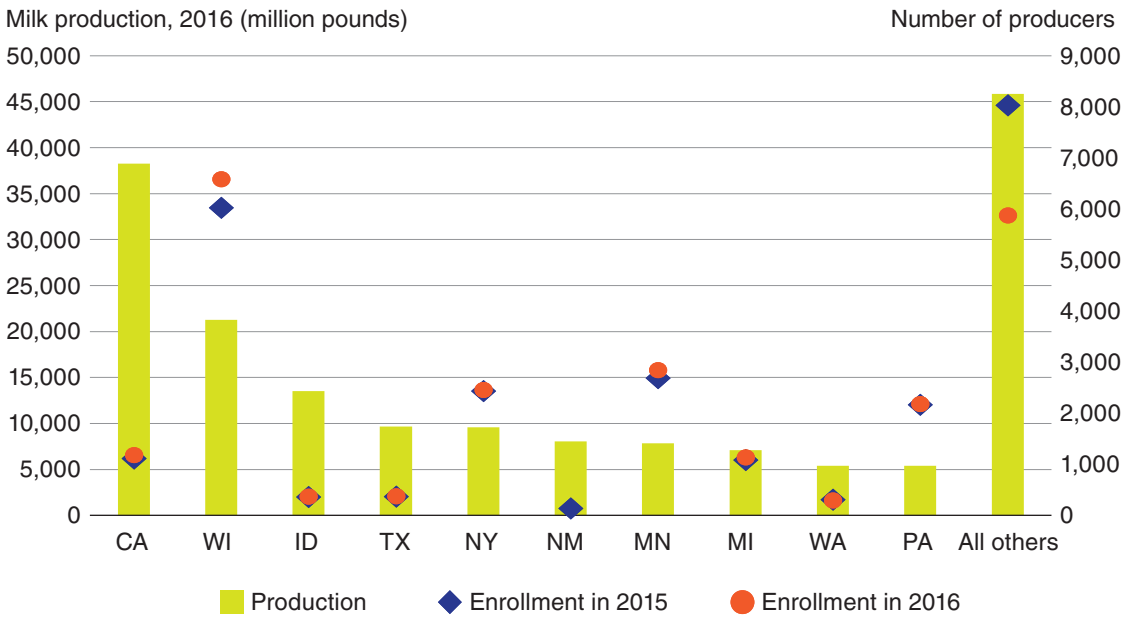
California, made up roughly 58 percent of all farms enrolled in 2015. Increased enrollment across the Nation in 2016 led to a slight decrease in geographic concentration, with just over 55 percent of all farms enrolled in MPP in 2016 in the top five States. In a similar trend, while the top 20 States had just under 90 percent of all farms enrolled in MPP in 2015, these States had just over 84 percent of all farms in 2016 (USDA, FSA, 2016e).

Between 2015 and 2016, the percentage of producers who chose to enroll in MPP-Dairy remained fairly constant at approximately 55 percent, while the elected margins changed substantially (fig. 12). Producers selecting catastrophic coverage increased from 24 percent in 2015 to 44 percent in 2016. Also, fewer producers chose coverage at the highest margins. From 2015 to 2016, producers who elected coverage of $7.00 or higher fell from 4.9 percent to 1.2 percent. In 2014 and 2015, dairy margins were relatively high, and in calendar year 2015 MPP-Dairy payments were made only for a single 2-month period, to those who elected the highest coverage level ($8.00 per cwt) (USDA, FSA, 2016e). In calendar year 2016, payouts were made at the $7.50 and $6.00 coverage level in two different 2-month periods, totaling about $10.5 million.

In one prospective analysis of MPP-Dairy's impacts, Mark et al. (2016) studied how the program would have operated on a historical sample of producers from 2002 to 2013. Based on the conditions facing producers over this period, small producers (4-million-pound production history or less) would have realized higher net payments per cwt from MPP-Dairy at all coverage levels compared to larger producers, with the highest net payments occurring at the $8-per-cwt coverage. Producers with a production history of 20 million or 40 million pounds would receive higher net payments at the coverage levels between $4.00 per cwt (catastrophic) and $6.50 per cwt. MPP-Dairy impacts varied not only by the size of the operation, but the location of the dairy as well, since the scale of production and feed costs vary by region. For example, purchasing MPP-Dairy at the $8-per-cwt coverage level with 90 percent of production history covered would have resulted in risk reduction of 68 percent for a producer in California, but only 46 percent for a producer in New England.

Figure 11

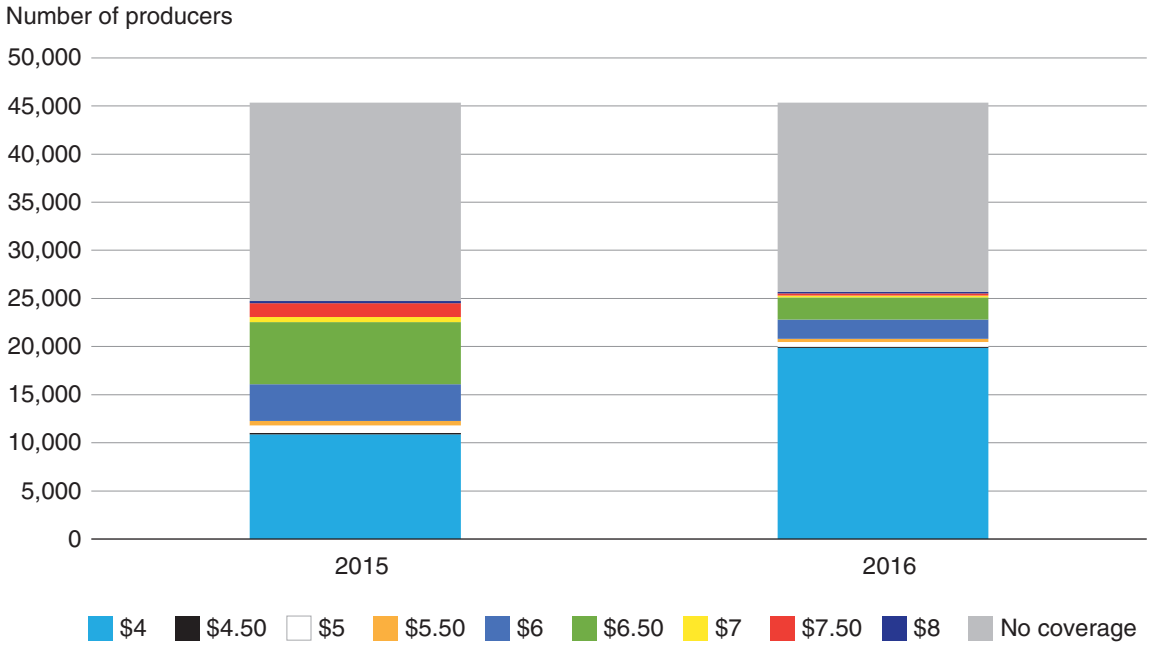
Milk production history and Dairy Margin Protection Program (MPP-Dairy) enrollment by State



Source: USDA, Farm Service Agency, Dairy Margin Protection Program.

Figure 12

Enrollment by producers in the Dairy Margin Protection Program (MPP-Dairy) by coverage level ($/cwt) chosen, 2016



cwt = hundredweight.
Source: USDA, Farm Service Agency (2017b).

Livestock Gross Margin Insurance for Dairy (LGM-Dairy)

An alternative to the Dairy Margin Protection Program is the Livestock Gross Margin-Dairy (LGM-Dairy).[31] LGM is an insurance program that does not charge a basic fee and requires producers to pay a premium to obtain coverage. As with the Margin Protection Plan for Dairy Producers, the margin is defined as the difference between the milk price and feed prices. However, the Livestock Gross Margin Insurance-Dairy Cattle (LGM-Dairy) program uses futures contracts, not cash prices, to calculate the margins and a different weighted average of feed components (soybean meal and corn). For the coverage level, deductibles range from $0 to $2 (in $0.10 increments) per cwt of milk. When the difference between the projected margin and the realized margin exceeds the deductible, the producer receives an indemnity payment. The premium subsidy ranges from 18 percent for the $0 deductible to 50 percent for the $2 deductible. Insurance contracts last for 11 months. The producers choose which months are included in the insurance contract, and then the indemnity is paid out at the end of the contract. The realized margin is based on the Wednesday through Friday closing averages for the milk, corn, and soybean meal futures contracts on the last week of the month.

Relative to MPP-Dairy, participation in LGM-Dairy is small. Unlike MPP-Dairy, which has no restrictions on the number of producers enrolled, all previous livestock insurance plans administered by RMA were capped together at $20 million of administrative and overhead (A&O) reimbursements and premium subsidies. Once the $20 million was exhausted, RMA would discontinue new livestock insurance enrollment for the rest of year. However, with the lifting of the budgetary cap on livestock products per the Bipartisan Budget Act of 2018, which passed into law on February 2018, more producers might enroll in LGM-dairy.

Dairy Outlays

Table 12 shows the outlays for MPP-Dairy and LGM-Dairy. As of February 2017, the outlay total for MPP-Dairy was $11.1 million for 2015 and 2016, of which most was paid in calendar year 2016 ($10.5 million). The payments for LGM Dairy were almost twice as high in 2015 compared to 2016, perhaps partly a result of the 27-percent reduction in policies sold in the later year. The difference in indemnities between MPP and LGM highlights how LGM Dairy's payment mechanism differs from MPP.

Table 12
Dairy Margin Protection Program (MPP-Dairy) and Livestock Gross Margin-Dairy (LGM-Dairy) enrollment and indemnities

	Number of operations enrolled			Quantity			Indemnities (millions)		
	2015	2016	2017	2015	2016	2017	2015	2016	2017
MPP-Dairy	24,758	25,663	24,262	169,581.3	171,921.7	176,079.7	$0.65	$10.46	-
LGM-Dairy	2,089	1,643	2,089	48.7	20.1	18.7	$16.72	$8.72	-

Note: Quantity for MPP and LGM Dairy are in millions of hundredweights of milk.
Source: USDA, Farm Service Agency and Risk Management Agency.

[31] The 2014 Farm Act prohibits producers from participating in both MPP-Dairy and LGM-Dairy.

Livestock Programs Under Title I

The Federal Government provides relief payments to eligible producers who experience feed or animal losses or increased production costs in the event of a qualifying natural disaster. The 2008 Farm Act established new programs, some based on previous ad hoc programs (described below), and offered payments to eligible producers experiencing qualifying natural disasters through September 30, 2011. The 2014 Farm Act covers disaster-related losses after September 30, 2011.

Livestock Forage Disaster Program (LFP)

LFP partially compensates producers for feed purchased in response to lost forage on a per animal basis. Forage must be lost to either drought or wildfire on native or improved grazing land. FSA determines eligibility and payments based on drought designations assigned by the U.S. Drought Monitor. Depending on drought duration and severity, producers are eligible for between one and five monthly payments equaling up to 60 percent of a producer's monthly feed costs (USDA, FSA, 2015a).[32, 33] In the 2014 Farm Act, eligibility requirements were relaxed for LFP, including abolishing required participation in crop insurance or NAP.

Livestock Indemnity Program (LIP)

LIP provides relief payments for elevated herd losses. LIP compensates producers for 75 percent of an animal's fair market value for above-average mortality due to natural disasters, certain diseases exacerbated by weather, and attacks by animals reintroduced into the wild or protected by the Federal Government. Animals that die within 60 days of a natural disaster—presumably due to compromised health—are also covered. LIP, in its various authorizations, is the oldest livestock disaster assistance program, with its roots in the 1997 Supplemental Appropriations Act, and has undergone few changes between Farm Acts (USDA, FSA, 2015b).

Emergency Assistance for Livestock, Honey Bees, and Farm-Raised Fish Program (ELAP)

ELAP covers production types and losses not covered by LFP or LIP, such as costs associated with hauling water to livestock during drought, some costs associated with treating cattle tick fever, and honey bee colony loss (USDA, FSA, 2015c). Under ELAP, the most significant change in the 2014 Farm Act was the inclusion of Colony Collapse Disorder (USDA, FSA, 2015c). Additional changes to ELAP included an increase in the maximum payment rate for livestock, added qualifying conditions (e.g., hail), and an increased payment rate for socially disadvantaged producers (USDA, FSA, 2014).

[32]In the 2008 Farm Act, producers could receive up to three payments.

[33]LFP payments are also available for grazing losses caused by fires on federally leased land.

Title I Livestock Outlays

Changes in payments over time simultaneously reflect interactions between livestock and natural disasters, program parameters, and markets for livestock and feed. Figure 13 shows program outlays since 2008. The vertical line distinguishes payments associated with the 2014 Farm Act and before.[34]

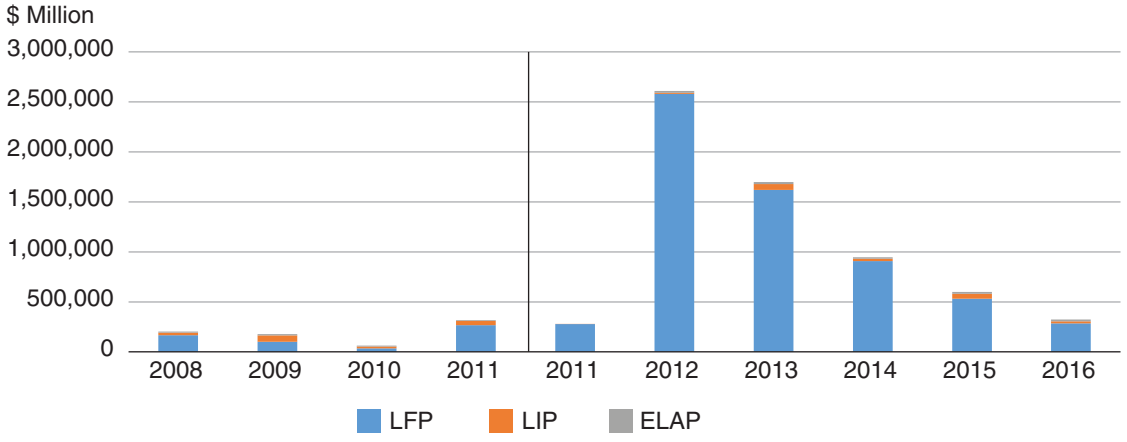
Aggregate expenditures across the three programs spiked for losses occurring in 2012, primarily due to increased LFP payments. Payments made by LFP consistently represent the largest expenditure for livestock disaster assistance programs (between 56 and 99 percent of annual costs), totaling approximately $6.77 billion for losses from 2008 through 2016. These outlays represented an average of 0.46 percent of total cash receipts for all livestock during this same period. Annual expenditures increased dramatically between the 2008 and 2014 Farm Acts, primarily due to multiple severe drought years and the use of corn to determine feed prices.[35] Relaxed eligibility requirements and increased maximum total payments also increased expenditures. Oklahoma and Texas alone accounted for about 41 percent of all LFP payments over the period of the 2014 Farm Bill.

LIP is the second-largest livestock disaster assistance program, with outlays summing to $313 million from 2008 through December 2016. Payments varied significantly between years, particularly because of blizzards, such as those in 2009 and 2013. The largest share of LIP payments went to South Dakota (26 percent), followed by Kentucky (11 percent), North Dakota (10 percent), and Texas (7 percent).

From late 2011 through calendar year 2016, ELAP provided approximately $90 million in payments, making it the smallest program. The cap was reduced from $50 million in the 2008 Farm Act to $20 million in the 2014 Farm Act, so payments have been prorated. Under the 2014 Farm Act, losses due to Colony Collapse Disorder are a major payment category, but the geography of outlays was more diffuse—no individual States stood out as large recipients—owing to the diversity of disasters and production types covered.

Figure 13

Livestock Forage Disaster Program (LFP), Livestock Indemnity Program (LIP), and Emergency Assistance for Livestock, Honey Bees, and Farm-Raised Fish Program (ELAP) annual payments ($ million)



Note: 2015 and 2016 payments are estimates. Losses reported by calendar year for LFP and LIP and fiscal year for ELAP.
Source: USDA, National Payment System, 2016.

[34]Payments in 2011 to the left of the vertical line correspond to losses covered under the 2008 Farm Act (before October 1, 2011); those to the right correspond to losses covered under the 2014 Farm Act after October 1, 2011).

[35]Feed costs are determined using the maximum of a 12- or 24-month average of corn prices. The price of corn reached historic highs between 2011 and 2014.

Conclusion

Revenue from agricultural production is variable due to price and production swings, and producers can use a variety of private and public tools to reduce their revenue risk and smooth their incomes. The Federal risk management policies and programs examined in this report work in differing ways, and, as a result, provide different types and levels of revenue support.

While the Revenue Protection policy offered under the Federal Crop Insurance program provides the most risk reduction among the tools discussed for major crop commodities in this report, the Title I programs also offer producers the prospect of revenue stabilization and income support. Using 2014 expected prices and yields, statistical simulation analysis showed that for corn and soybean producers, a combination of Revenue Protection and ARC (Agriculture Risk Coverage) maximized the expected return (measured in dollars per acre) and minimized downside risk in the likely revenue streams. Corn and soybean producers may have opted for ARC over PLC (Price Loss Coverage), based on their expectations of prices and yields in 2014 and beyond.

For winter wheat producers, a combination of Revenue Protection and PLC, along with SCO (Supplemental Coverage Option) maximized the expected revenue and minimized revenue risk. Comparing PLC to ARC, expected yield and prices for wheat over the duration of the 2014 Farm Act suggested PLC to be the optimal choice for winter wheat, but the differences in net payments were small. These results are consistent with the observed behavior of wheat producers, who split their selections roughly evenly between the two Title I programs.

Under the 2014 Farm Act, cotton was not a covered commodity for Title I programs. Instead, the Act introduced the STAX insurance product (Stacked Income Protection Plan) for cotton producers. Following the approach in O'Donoghue et al. (2016), simulated revenue distributions of cotton growers under STAX and SCO showed that STAX reduced revenue risk by roughly 2 to 10 percent while SCO lowered risk by 7 percent. STAX was also often cheaper than SCO due to its larger associated subsidy, partially accounting for its greater use by cotton producers.

Examining the revenue distributions for representative producers in low-, medium-, and high-risk counties across a range of expected prices, expected returns under STAX were higher than SCO, the difference between their expected revenues grew as risk increased, and overall STAX revenues were less variable, largely due to the additional cost of SCO. This likely explains STAX adoption rates exceeding SCO rates among cotton producers. Overall, however, STAX enrollment remained modest. In 2015, only 12,000 shallow-loss policies were purchased by cotton producers, compared with 83,000 deep-loss policies, and the same pattern emerged in the 2016 crop year. Areas with more concentrated cotton production saw greater STAX adoption than SCO for cotton.

The risk that producers face is not constant across the United States. Overall, O'Donoghue et al. (2016) and Hungerford and O'Donoghue (2016) found that the shallow-loss programs are more important for producers farming in low-risk areas than for those in high-risk areas. Compared to lower risk counties, higher risk counties over time tend to receive lower average payments from shallow-loss programs due to the lower expected revenues, leading to a lower guarantee and a smaller maximum payment.

Programs and policies for crops command a much higher share of budgetary resources than those covering livestock. As a result, the bulk of research to date has focused on programs for crop risk management. The 2014 Farm Act did not create any new insurance pilots for livestock. Congress established an insurance-like product for dairy producers, MPP-Dairy. In the same way that crop support programs make payments when prices or revenues fall below reference or benchmark levels, MPP-Dairy pays producers when the margin (i.e., the difference between the all-milk price and feed costs) falls below defined levels. Analysis of the MPP-Dairy program shows higher realized returns (that is, actual margins plus the indemnity payment) for dairy producers with a history of low production under all coverage levels and higher realized returns for larger producers who purchase coverage levels ranging from $4 to $6.50 per cwt margins. However, since dairy margins have been relatively high since 2015, only the handful of producers who enrolled in the highest buy-up level in 2015 received payments. In fact, less than 1 percent of producers chose a coverage level of $8.00.

While MPP-Dairy addresses margin risk, the FSA disaster assistance programs for livestock deal with losses. The Livestock Forage Disaster Program (LFP) addresses the physical loss of feed, while the Livestock Indemnity Program (LIP) and Emergency Assistance for Livestock, Honey Bees, and Farm-Raised Fish Program (ELAP) cover losses associated with both feed and animal deaths. The 2014 Farm Act lessens the requirements to apply for these disaster payments. Total outlays for LFP are greater than the outlays of LIP and ELAP combined.

In combination with their own on-farm strategies, agriculture, livestock, and dairy producers participate in a variety of Federal risk management programs to address production and market uncertainties. These programs offer producers the opportunity to reduce downside risk to their revenues. Differences across commodities, locations, and time periods can account for these programs' varying risk and revenue effects, which, along with participation costs and coverage rates, ultimately explain observed levels of program enrollments and outlays.

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