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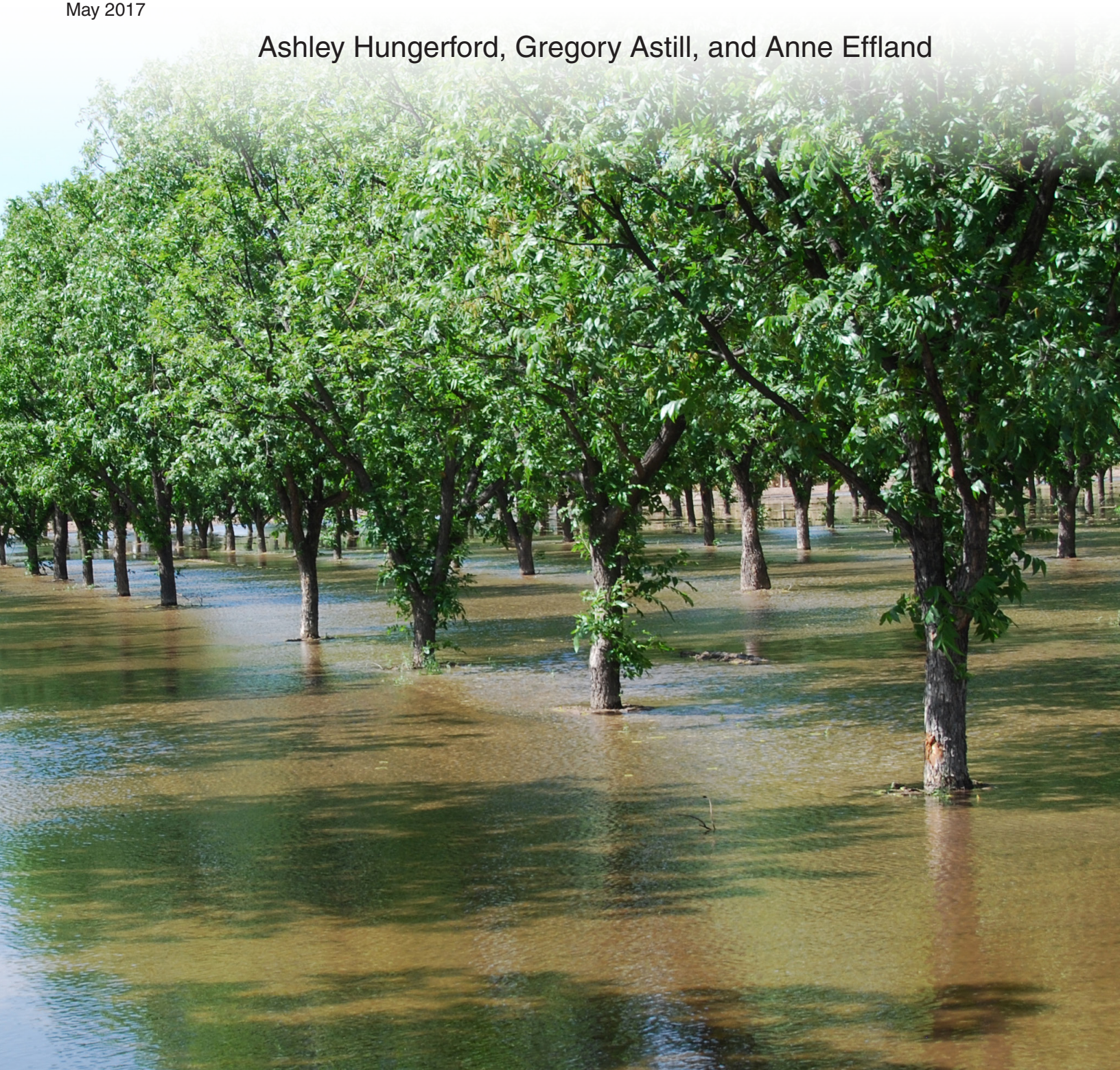
Changes to the Noninsured Crop Disaster Assistance Program Under the Agricultural Act of 2014: Their Potential Risk Reduction Impacts

Ashley Hungerford, Gregory Astill, and Anne Effland



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Ashley Hungerford, Gregory Astill, and Anne Effland

Abstract

The Agricultural Act of 2014 increased support for crops ineligible for Federal Crop Insurance (FCI) through the U.S. Department of Agriculture's (USDA) Noninsured Crop Disaster Assistance Program (NAP). Previously, producers ineligible for FCI could only purchase catastrophic coverage under NAP, which covered yield losses greater than 50 percent of the approved crop yield at 55 percent of the average market price. Under the Agricultural Act of 2014, crop producers can purchase NAP Buy-Up coverage that guarantees up to 65 percent of the expected yield at 100 percent of the average market price. This report examines the impact of NAP Buy-Up coverage on expected payments and producers' risk reduction, NAP enrollment by producer and crop types, and outlays. In our simulation analysis, the expected payments for NAP Buy-Up are 63 percent higher than the expected payments for NAP Basic, and the revenue risk reduction from NAP Buy-Up is more than twice that of NAP Basic. In 2015, almost 23,000 NAP applications for individual crops included Buy-Up coverage; that year, the number of limited resource, beginning, and socially disadvantaged farmers doubled, from 8,374 in 2014 to 16,467 in 2015. Overall, the changes in NAP provide revenue stabilization for specialty crops and other noninsured crops not previously offered by the Farm Service Agency.

Keywords: specialty crops, risk management, Noninsured Crop Disaster Assistance Program, NAP, Agricultural Act of 2014, Federal crop insurance (FCI)

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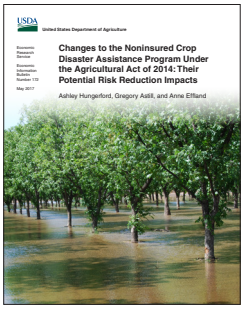

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Changes to the Noninsured Crop Disaster Assistance Program Under the Agricultural Act of 2014: Their Potential Risk Reduction Impacts

Ashley Hungerford, Gregory Astill, and Anne Effland

What Is the Issue?

Federal crop insurance (FCI) underwritten by USDA's Risk Management Agency is not available for all crops, and an FCI-covered product may not be available in all counties. Since 1994, if crop insurance is unavailable, a producer may enroll in the Noninsured Crop Disaster Assistance Program (NAP). Before 2014, producers could only purchase catastrophic coverage under NAP, which covered yield losses greater than 50 percent of the expected yield at 55 percent of the average market price (NAP Basic). Now producers can pay a premium to purchase coverage for up to 65 percent of the approved yield at 100 percent of average market price (NAP Buy-Up). This report examines the effects this change in policy has on producers' income and revenue risk, as well as the makeup of NAP enrollment. The information can help policymakers and producers better understand the cost and benefits of enrolling in NAP.

What Did the Study Find?

Since the Agricultural Act of 2014, both the revenue stabilization from NAP and the participation in NAP have changed:

- The new NAP Buy-Up policy can mitigate yield risk more than NAP Basic and slightly increase a producer's average revenue.
- NAP applications with Buy-Up coverage were first offered in 2015 and constituted 16 percent of NAP applications. In 2015, NAP applications increased to 138,000, up from 66,000 in 2014. (An application is defined here as a request from a producer to cover an individual crop.)
- The participation of limited resource, socially disadvantaged, and beginning farmers and ranchers more than doubled in 2015.

While over 150 crops have been enrolled in NAP, this report contrasts three cases: cherries, pecans, and squash, with differing climate requirements and farming practices. Analysis of the effects of NAP on producers of these three products can help stakeholders and policymakers understand the effects that NAP has on producers of different crops across the United States. The authors found that:

- For some cherry-producing States, Buy-Up comprises up to 80 percent of NAP applications.
- On average for these three crops, 30 percent of NAP applications have Buy-Up coverage.

Although NAP is typically purchased for forage, vegetables, and fruits, there are not enough available data on these crops to perform risk analysis. Using corn as a proxy, the authors instead modeled the effects of NAP Basic and NAP Buy-Up on the revenue of a corn producer in a county with high revenue risk in crop production. The simulation showed that while expected total revenue is only slightly higher when either NAP Basic or NAP Buy-Up is purchased, the lower bound for realized revenue is approximately 50 percent higher when NAP Basic is purchased and over twice as high when NAP Buy-Up is purchased than when no NAP policy is purchased. That is, the risk of low revenue falls substantially with either NAP policy, but drops twice as much under Buy-Up.

How Was the Study Conducted?

NAP enrollment is measured by the total number of active applications in the Farm Service Agency's National Summary Report, "Applications for Coverage." Coverage is reported by crop, not by operation, so an application is reported for each crop enrolled in NAP. The Farm Service Agency supplied NAP outlays for crop losses from 2013 to 2015 that were distributed after April 15, 2014.

Prices and yields were simulated using conditions present in 2015 to estimate expected revenue and revenue risk. County-level yields documented by USDA's National Agricultural Statistics Service (NASS) for each year between 1975 and 2014 were collected to generate a county-level yield distribution for feed corn. The distribution of corn prices was also calculated for planting prices and harvest prices from 1975 to 2014, using the futures contract prices from the Chicago Board of Trade. While maintaining the historical relationship among yields and prices, the model drew 10,000 yields from the county and 10,000 prices. To model the yields of a representative farmer for the county, additional variation was added to the county yields, derived from the crop insurance premium rates for the county. From these simulated yields and prices, we calculated revenue, payments from NAP, and the revenue risk reduction from NAP.

Changes to the Noninsured Crop Disaster Assistance Program Under the Agricultural Act of 2014: Their Potential Risk Reduction Impacts

Introduction

Farming is an inherently risky endeavor, with uncertain prices and yield and with revenue varying greatly from year to year. Price risk is related to changes in market supply and demand, while yield risk is influenced by factors such as weather events and the outcome of farming decisions. For certain crops, such as sweet corn or tomatoes, production and marketing contracts are used to protect the producer from downward price risk by establishing a selling price with a buyer before harvest. While farmers can protect themselves from price risk with contracts and mitigate yield losses with good farming practices, they are always exposed to some yield risk from the weather. Due to the persistent threat of downside yield risk, many producers purchase crop insurance to mitigate revenue losses.

Federal crop insurance (FCI) underwritten by USDA's Risk Management Agency is not available for all crops in all counties. Crops that cannot be enrolled in the FCI program are defined as noninsured crops. Catastrophic coverage for noninsurable crops, known as the Noninsured Crop Disaster Assistance Program (NAP), has been available since the Federal Crop Insurance Reform Act of 1994. Catastrophic coverage protects against yield losses greater than 50 percent of the approved yield[1] at 55 percent of the average market price.[2] The Agricultural Act of 2014 expanded NAP to allow producers of noninsurable crops to purchase higher coverage levels.

This report examines the effects of the 2014 NAP policy change. A series of examples show how NAP payments vary with realized yield, holding average market price constant. Enrollment and outlays for NAP are examined by crop and producer characteristics. Due to insufficient data on specialty crops (which are typically associated with NAP), prices and yields are simulated using 2015 conditions to estimate expected revenue and revenue risk, with feed corn as an illustrative example.

[1]The approved yield is the expected yield for the producer. Local FSA offices determine approved yield using an average of past yields realized by the producer, or, if less than 4 years of documented yields are available, a percentage of the county-level expected yield.

[2]The average market price is the average price from the previous 5 years, with the highest and lowest price removed from the average.

What Is NAP and How Does It Work?

NAP Coverage and Premium Calculation

The U.S. Department of Agriculture's Farm Service Agency (FSA) manages NAP, which covers yield loss of crops due to extreme weather and natural disasters, as well as related conditions such as plant disease, volcanic smog, and insect infestation, which must result from damaging weather or adverse natural occurrences. Table 1 provides a comparison between applications from the Federal Crop Insurance Program and the Noninsured Crop Disaster Assistance Program. For almost all covered crops, NAP delivers indemnity payments using a trigger based on the producer's approved yield.[3]

Catastrophic coverage, known as Basic or CAT, pays 55 percent of the average market price for yield losses greater than 50 percent of the approved yield.[4] NAP Basic requires a service fee, to equal "the lesser of $250 per crop or $750 per producer per administrative county, not to exceed a total of

Table 1
Comparison Between the Federal Crop Insurance Program and the Noninsured Crop Disaster Program

Program	Federal Crop Insurance Program (FCI)	Noninsured Crop Disaster Assistance Program
Who can purchase?	Producers with FCI available for their crop in their county of production.	Producers without FCI available in their county for their crop
Buy-Up premium calculation	The total premium is actuarially fair for an average producer in a given county. A portion of the total premium is subsidized by the Federal Government. Lower coverage levels typically have a higher portion of the premium subsidized compared to higher coverage levels.	All producers are subject to the 5.25% premium rate regardless of location, crop, or level of Buy-Up coverage.
Income limitations	None	Adjusted Gross Income: $900,000
Premium/payment caps	None	$6,562.50/$125,000.00
Types of Buy-Up coverage	The type depends on the crop. For large commodities, both yield-triggered applications and revenue-triggered applications are offered. Yield-triggered applications pay at 100% of the projected price.	Yield-triggered applications that pay at 100% of the average market price
Catastrophic coverage	Payments are made on losses exceeding 50% of expected yield at 55% of market price.	Same as for FCI
Coverage levels for Buy-Up	Coverage starts at 50% of expectation and (depending on the crop and county) can go up to 85%.	Range from 50% to 65% in increments of 5% of expected yield

[3]Value-loss products—such as aquaculture, sod, and Christmas trees—can also qualify for NAP but are subject to a different calculation of loss. These products, which account for a small percentage of NAP policies, are not covered in this report.

[4]Historical yields are collected from the producer on the application for NAP coverage or are assigned as a percentage of the county's expected yield, if production records are not available.

$1,875 for a producer with farming interests in multiple counties" (FSA, 2015). The service fee is waived for beginning, limited resource, and socially disadvantaged farmers and ranchers.

If the acreage is shared by multiple producers, then the total of the producers' shares must be equal to 100 percent. The "Producer's Share" is factored into the payment formula for NAP.

The gross payment formula for NAP Basic is:

$$NAP\ Basic/acre = max((0.5 \times Approved\ Yield - Realized\ Yield),0) \times (0.55 \times Average\ Market\ Price) \times Producer's\ Share.$$

Alternatively, the producer can enroll in NAP Buy-Up coverage, where yield losses are paid at 100 percent of the market price and the producer selects a yield coverage level between 50 percent and 65 percent in 5-percent increments. The gross payment for NAP Buy-Up is expressed as:

$$NAP\ Buy\text{-}up\ /acre = max((Coverage\ Level \times Approved\ Yield - Realized\ Yield),0) \times (Average\ Market\ Price) \times Producer's\ Share.$$

Payments for NAP Basic and NAP Buy-Up cannot exceed $125,000 per crop year, per producer. All NAP applications incur a service fee, while only applications with Buy-Up coverage pay a premium based on the coverage level elected by the NAP participant, which is calculated as follows:

$$NAP\ premium/acre = 5.25\% \times Coverage\ Level \times Approved\ Yield \times Average\ Market\ Price \times Producer's\ Share$$

Premiums (not including the service fee) may not exceed $6,562.50 per payment limitation, and beginning, limited resource, and socially disadvantaged farmers and ranchers are eligible for a 50-percent premium waiver (FSA, 2015). The NAP premium rate does not account for the downside yield risk of the producer or county; instead, NAP employs a flat premium rate across all producers, counties, coverage levels, and crops. This differs from applications under the Federal Crop Insurance program, which, on average, are actuarially fair for producers of a given county. Figure 1 compares NAP's flat premium rate to actuarially fair premium rates for yield insurance that vary across yield risk (measured by the coefficient of variation).[5] If a premium rate is actuarially fair, the rate increases with the coverage rate as well as the yield risk.

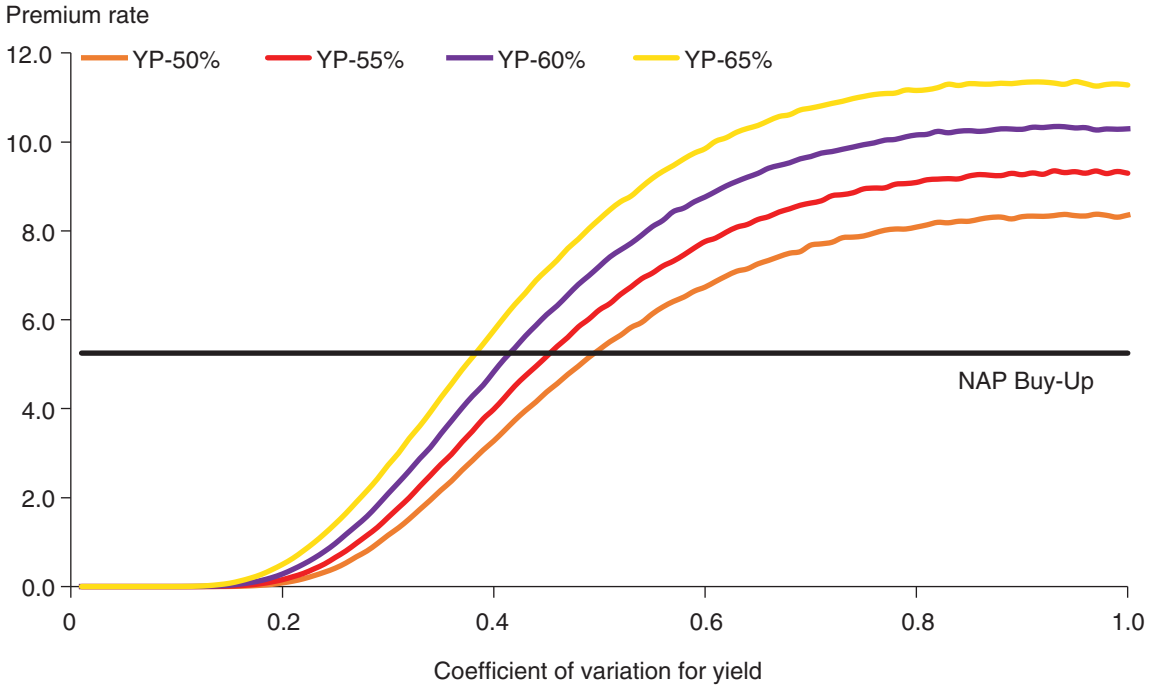
Example of NAP Premiums and Payments for Crop Loss

The example of a squash producer illustrates how the NAP premium and payments are calculated. Suppose a squash producer is eligible for NAP. The producer planted 20 acres of squash, his approved yield is 12,000 pounds of squash per acre, and the FSA-reported average price in 2014 is $0.32 per pound of squash. His options for NAP applications are listed in table 2, with the associated yield guarantee and support prices (i.e., the prices for calculating an indemnity payment). Assuming squash is the producer's only crop enrolled in NAP and the planted acres are all located in one county, the producer will pay a $250 service fee for any policy. If the producer enrolls in NAP Buy-Up, the premium will range from $101 to $131 per acre for 50-percent and 65-percent coverage levels, respectively, as presented in table 3.

[5]The coefficient of variation is the standard deviation divided by the mean.

Figure 1

Producer's yield risk (coefficient of variation) versus premium rates for actuarially fair yield insurance and Noninsured Crop Disaster Assistance Program (NAP)



YP = Yield Protection.
Note: The coefficient of variation is a measure of risk equal to the standard deviation of yield divided by the average yield. Also, an actuarially fair premium rate is equal to the expected monetary loss of a policy divided by the policy's liability.
Source: U.S. Dept. of Agriculture, Economic Research Service estimates based on authors' calculation.

Table 2

Yield guarantees for support prices for coverage levels

Coverage	Basic	50% Buy-Up	55% Buy-Up	60% Buy-Up	65% Buy-Up
Yield guarantee (pounds per acre)	6,000	6,000	6,600	7,200	7,800
Support price ($ per pound)	0.18	0.32	0.32	0.32	0.32

Source: U.S. Dept. of Agriculture, Economic Research Service calculations and Farm Service Agency data.

Table 3

Noninsured Crop Disaster Assistance Program fees and premiums for coverage levels

	Basic	50% Buy-Up	55% Buy-Up	60% Buy-Up	65% Buy-Up
Service fee	$250	$250	$250	$250	$250
Premium per acre	$0	$101	$111	$121	$131
Service fee plus premium for 20 acres	$250	$2,266	$2,468	$2,669	$2,870

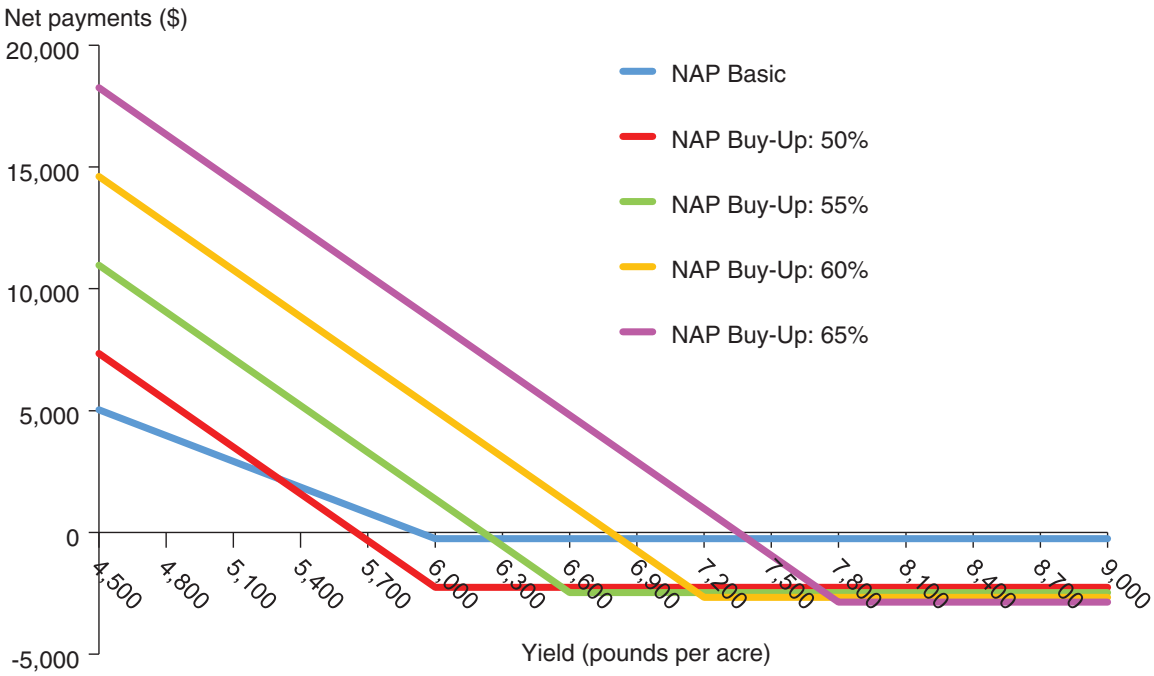
Source: U.S. Dept. of Agriculture, Economic Research Service calculations and Farm Service Agency data.

Figure 2 shows the total net payments for the squash producer when the realized yield ranges between 4,500 pounds per acre (38 percent of approved yield) and 8,500 pounds per acre (75 percent of approved yield). Net payments are defined as the payment from NAP minus the service fee and premium.

At 4,500 pounds per acre, the producer receives a positive net payment from NAP under every coverage level. NAP Basic provides the lowest net payments of all the coverage levels at 4,500 pounds per acre. Because NAP Basic only has a service fee and NAP Buy-Up has a service fee and premium, NAP Basic has the highest net payments (least negative) at yields above 7,500 pounds per acre (63 percent of the approved yield).

At 5,250 pounds per acre and a net payment of $2,500, the net payment for NAP Basic equals that of NAP Buy-Up with 50-percent coverage. At yields higher than 5,250 pounds per acre, the net payment for NAP Basic exceeds the net payments for NAP Buy-Up with 50-percent coverage because the cost of NAP Buy-UP outweighs the benefit of NAP Buy-Up paying indemnities at 100 percent of market price. For the other NAP Buy-Up coverage levels, the net payments for NAP Buy-Up exceed the net payments for NAP Basic until NAP Buy-Up net payments fall below negative $250.

Figure 2
Total net payments (indemnity payment minus premium), given realized yield for a squash producer



Note: The producer is assumed to have 20 acres planted in squash, an approved yield of 12,000 pounds per acre, and an approved price of $0.32 per pound. Portions of lines below $0 indicate a loss in net Noninsured Crop Disaster Assistance Program (NAP) payments for the producer. Also, if the producer qualifies for the 50-percent premium waiver, then the producer will experience higher net payments.
Source: U.S. Dept. of Agriculture, Economic Research Service and Farm Service Agency.

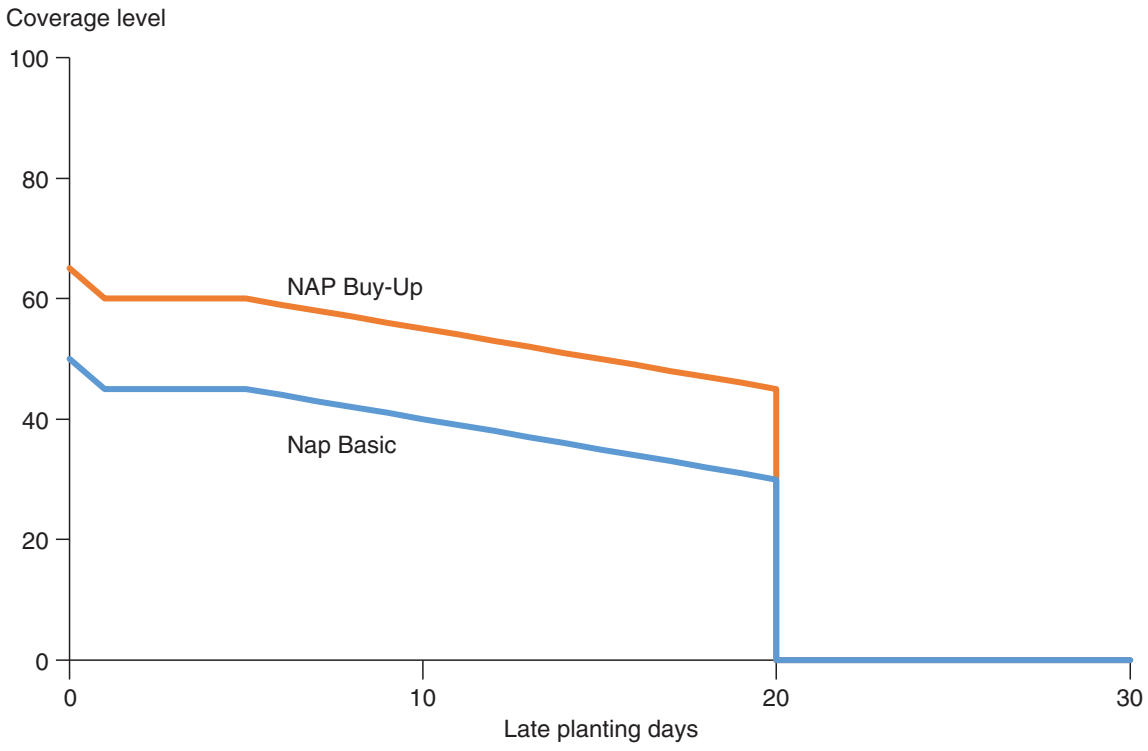
NAP Payments for Planting Disruption

In cases where producers have applied for NAP coverage but are forced to delay planting until after the stated final planting date due to weather events, NAP payments will be reduced. For a crop with a short maturity, coverage is reduced by 5 percent if planting is delayed by 1 to 5 days (fig. 3). If planting is delayed by 6 to 20 days, the coverage provided by NAP decreases by 1 percent per day. Last, if the planting is delayed by 21 days or more, payments will not be made based on a percent of yield loss (Federal Register, 2014). When planting is prevented, payments are provided for any prevented acreage that exceeds 35 percent of the total crop acreage (planted acreage plus prevented acreage).[6]

NAP Enrollment by Producer Type and Crop

Due to changes in program logistics, enrollment data are only available for 2014 and 2015. The year 2015 had the higher enrollment for NAP and approximately twice as many overall applications for covered crops and participation of underserved producers, which include limited resource, beginning, and socially disadvantaged farmers and ranchers (table 4.).

Figure 3
Coverage level for late planting for short-maturity crops



Note: the Noninsured Crop Disaster Assistance Program (NAP) Buy-up in the figure is assumed to be 65 percent.
Source: U.S. Dept. of Agriculture, Economic Research Service and Farm Service Agency.

[6]Payments for prevented planting are equal to (acres of prevented planting) – 0.35 × (total crop acreage × producer's share × base yield × price).

Tables 5-7 show that a wide variety of crops were enrolled in NAP. As table 5 shows, 41 percent of NAP applications were for grass. Between 2014 and 2015, the enrollment of beans and peas increased threefold, and the enrollment for greens increased from 1,027 applications to 6,360 applications. The top five vegetables for NAP enrollment in 2015, presented in table 6, were greens, squash, peppers, peas, and beans. Interestingly, the most consumed vegetable in the United States, the potato (Bentley, 2015), is not included in table 6, but crop insurance for potatoes is available in several parts of the country. Watermelon was the only fruit in the top 15 crops for NAP, as seen in table 5, which is unsurprising since watermelon is an annual crop that is grown throughout the United States. Several other fruits commonly enrolled in NAP, like grapes and cherries, have more localized production (table 7) (NASS, 2016).

Table 4
Total enrollment for Noninsured Crop Disaster Assistance Program from 2014 to 2015

Year	LR/SDA/BFR particpation[1]	Total active applications for covered crops
2014	8,081	66,030
2015	16,432	137,821

[1]"LR/SDA/BFR" denotes limited-resource farmers, socially disadvantaged famers, and beginning farmers.
Source: U.S. Dept. of Agriculture, Farm Service Agency and Economic Research Service.

Table 5
15 crops[1] with the highest count of Noninsured Crop Disaster Assistance Program applications from 2014 to 2015

	Year 2014		Year 2015	
Position	Crop	Active applications	Crop	Active applications
1	GRASS	38,812	GRASS	56,575
2	SORGHUM FORAGE	2,870	GREENS	6,360
3	SQUASH	1,940	SORGHUM FORAGE	6,169
4	PEPPERS	1,519	SQUASH	5,421
5	WATERMELON	1,369	PEPPERS	5,097
6	MILLET	1,354	WATERMELON	3,668
7	SWEET POTATOES	1,294	PEAS	3,335
8	OATS	1,170	BEANS	3,011
9	PUMPKINS	1,135	MILLET	2,898
10	WHEAT	1,122	OATS	2,828
11	GREENS	1,027	PUMPKINS	2,813
12	TOMATOES	953	TOMATOES	2,798
13	BEANS	921	CUCUMBERS	2,638
14	CUCUMBERS	899	HERBS	2,437
15	PEAS	750	WHEAT	2,210

[1]The Risk Management Agency does not have insurance products for squash, fresh market cucumbers, watermelon, greens, herbs, and fresh market pumpkin. Crop insurance products are offered for all other crops in table 5 but not in all counties (RMA, 2016).

Source: U.S. Dept. of Agriculture, Farm Service Agency and Economic Research Service.

Table 6

Vegetables[1] with the highest count of Noninsured Crop Disaster Assistance Program applications for 2015

Position	Crop	Total active	Buy-Up	Buy-Up (%)
1	GREENS	6,360	2,439	38
2	SQUASH	5,421	1,668	31
3	PEPPERS	5,097	1,714	34
4	PEAS	3,335	801	24
5	BEANS	3,011	858	28
6	PUMPKINS	2,813	893	32
7	TOMATOES	2,798	824	29
8	CUCUMBERS	2,638	776	29
9	POTATOES, SWEET	2,032	429	21
10	CABBAGE	1,658	506	31

[1]The Risk Management Agency does not have insurance products for squash, fresh market cucumbers, greens, fresh market pumpkin, lettuce, and eggplant. Crop insurance products are offered for all other crops in table 6 but not in all counties (RMA, 2016).

Source: U.S. Dept. of Agriculture, Farm Service Agency and Economic Research Service.

Table 7

Fruits[1] with the highest count of Noninsured Crop Disaster Assistance Program applications for 2015

Position	Crop	Total active	Buy-Up	Buy-Up (%)
1	WATERMELON	3,668	1,355	37
2	GRAPES	1,000	531	53
3	CANTALOUPES	902	258	29
4	CHERRIES	631	390	62
5	CANEBERRIES	469	129	28
6	STRAWBERRIES	378	115	30
7	PEARS	300	118	39
8	PEACHES	267	109	41
9	HONEYDEW	241	90	37
10	APPLES	229	107	47

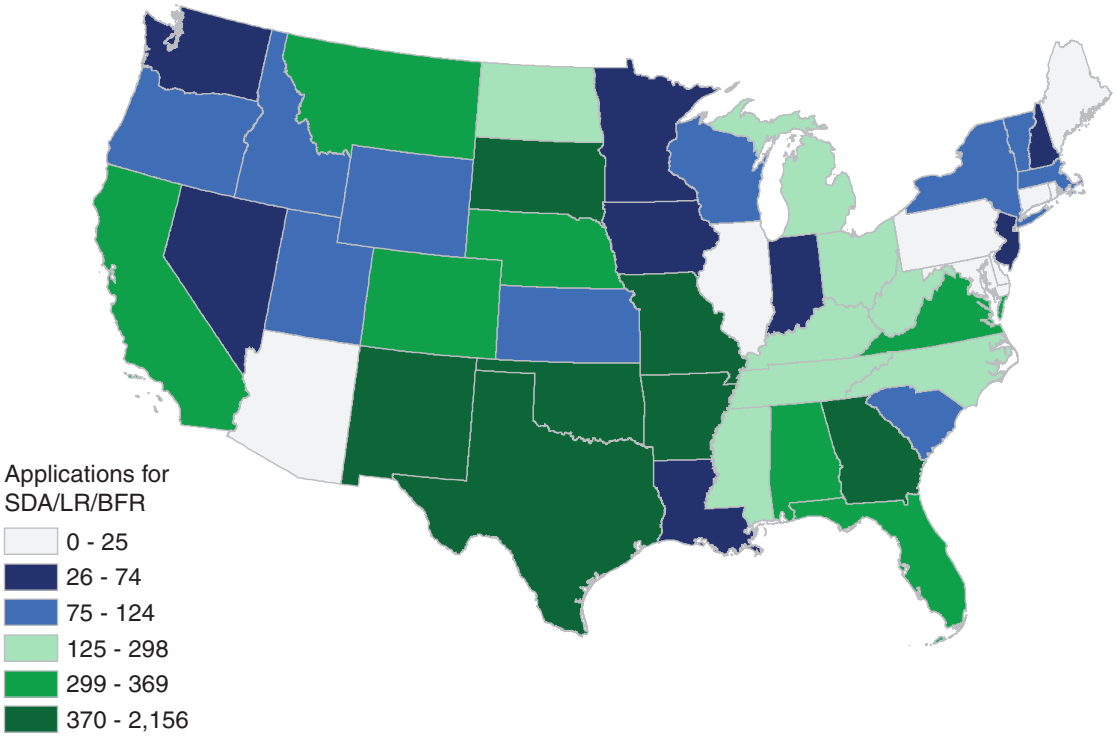
[1]The Risk Management Agency does not have insurance products for watermelon, cantaloupes, caneberries, and honeydew. Crop insurance products are offered for all other crops in table 7 but not in all counties (RMA, 2016).

Source: U.S. Dept. of Agriculture, Farm Service Agency and Economic Research Service.

Figure 4 shows the total participation for underserved populations for 2015. The number of applications loosely corresponds to the number of farming operations, with the exception of the majority of States in the Corn Belt, including Iowa, Illinois, and Indiana. The limited number of applications of LR/SDA/BFR in the Corn Belt is likely a reflection of fewer producers purchasing NAP applications since this region primarily grows major field crops and crop insurance is widely available. Texas has the largest number of farming operations and the largest number of applications for these underserved farmers.

Figure 4

Noninsured Crop Disaster Assistance Program participation of Socially Disadvantaged, Limited-Resource, and Beginning Farmers/Ranchers, 2015



Note: LR/SDA/BFR denotes limited-resource farmers, socially disadvantaged famers, and beginning farmers.
Source: U.S. Dept. of Agriculture, Farm Service Agency.

NAP Enrollment by State for Three Crops

In 2015, over 150 crops were enrolled in NAP. This section examines NAP enrollment for three specialty crops: cherries, pecans, and squash. From this examination of three crops that require different climates and farming practices, stakeholders and policymakers can better understand the unique effects NAP has on producers of different crops across the United States.

Cherries

The United States produces two main types of cherries: sweet cherries that are consumed fresh and tart cherries that are processed prior to consumption. Sweet cherries constitute over three-fourths of total cherries produced. Ninety percent of commercially grown sweet cherries are produced in Washington, California, and Oregon. Michigan produces nearly 75 percent of commercially grown tart cherries (Perez and Plattner, 2012).

Federally backed crop insurance for cherry producers is only available in select counties in eight States (fig. 5.); hence, growers in most counties with reported commercial cherry production have to enroll in NAP for multi-peril protection for their crop. Of all the major fruits and vegetables covered by NAP, cherries had the highest percentage of NAP Buy-Up applications at 62 percent of applications purchased (table 7).

NAP enrollment for cherries increased from 169 to 631 applications from 2014 to 2015 (table 8.). The State with the most NAP applications for cherries was Michigan, with 259 applications. During this same period, the number of Federal crop insurance applications for cherries remained at around 2,300 applications for the entire United States (RMA, 2015a).

Table 8
Total Noninsured Crop Disaster Assistance Program applications for squash, cherries, and pecans for States with the most applications

	Cherries			Pecans			Squash		
Position	State	Total applications	Buy-up applications (%)	State	Total applications	Buy-up applications (%)	State	Total applications	Buy-up applications (%)
1	Michigan	259	59	Oklahoma	167	31	New York	650	32
2	Oregon	180	84	Texas	84	56	North Carolina	614	40
3	New York	62	49	Arkansas	48	29	Georgia	575	37
	Grand total[1]	631	62	Grand total[1]	443	32	Grand total[1]	5,421	31

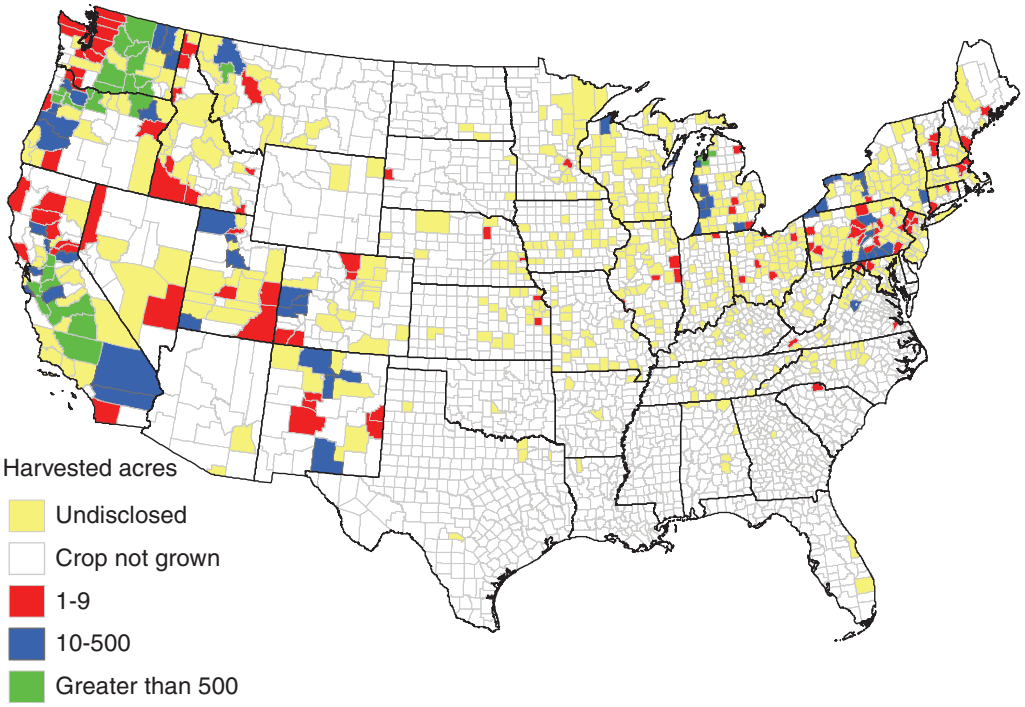
[1]Grand Total includes all States—not only the top three States shown in the table.

Source: U.S. Dept. of Agriculture, Farm Service Agency and Economic Research Service.

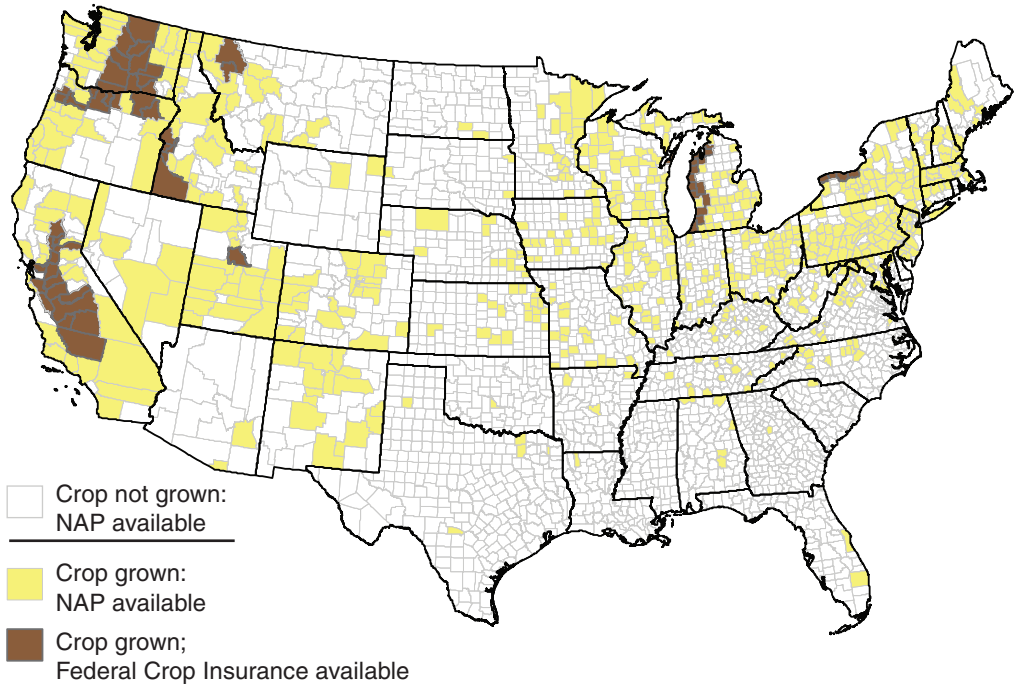
Figure 5

Acreage in cherry trees and RMA insurance availability for cherries

(a) 2012 acres bearing cherries



(b) RMA insurance availability for cherries



NAP = Noninsured Crop Disaster Assistance Program.
Source: U.S. Dept. of Agriculture, Economic Research Service, Risk Management Agency (RMA), and National Agricultural Statistics Service.

Pecans

Pecans, the only native tree nuts commercially grown in the United States, are produced across the Southern States. More U.S. farms produce pecans than all other tree nuts combined, and while pecans have the second-highest total of bearing acres for any nut in the United States, the average bearing acres per pecan operation are less than those of almonds, pistachios, walnuts, and hazelnuts (NASS, 2016). The two main varieties of pecans are native and improved. The proportion of native and improved varieties cultivated varies widely by State and operation. Native varieties require more space, and the nuts are smaller, with harder shells than the improved varieties (Perez and Pollack, 2003). Both varietals alternate naturally between bearing large and small crops, with native trees exhibiting larger fluctuations between years than the improved variety trees.

Most pecan operations in Oklahoma and Texas do not have access to insurance even though many counties in these States contain more than 500 bearing acres (fig. 6). The number of crop insurance applications sold for pecans stayed at approximately 1,500 between 2014 and 2015 (RMA, 2015a). Given the many counties without FCI, NAP is a possible risk management tool for pecan producers. Oklahoma NAP applications for pecans increased from 26 in 2014 to 167 in 2015 (table 8). NAP applications in Texas increased from 56 in 2014 to 84 in 2015. NAP Buy-Up applications comprise 31 percent and 56 percent of pecan NAP applications for Oklahoma and Texas, respectively. Although Oklahoma had a relatively larger increase in pecan NAP applications than Texas, Texas has a larger portion of NAP Buy-Up applications.

Squash

Native to the United States, squash is a warm weather crop that comes in summer and winter varieties, named for their difference in storage lifetimes. The vast majority of squash is sold fresh. Summer squash is harvested when immature and has thin, soft rinds and tender flesh, while winter squash is harvested when mature and has thick, hard rinds and dense flesh. Summer squash varieties include zucchini, yellow, scallop types, and chayote, while winter squash varieties include butternut, acorn, spaghetti, buttercup, hubbard, and pumpkin (Lucier and Jerardo, 2004).

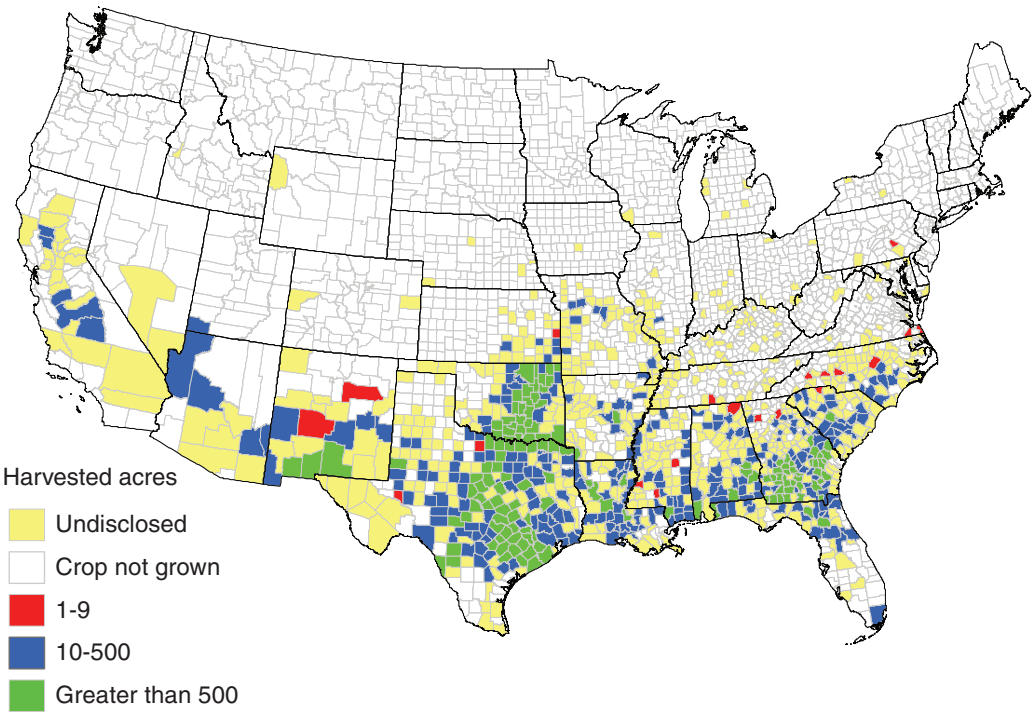
As seen in figure 7, squash production is widespread, with nearly all States reporting squash acres harvested in 2012. The top four States—California, Michigan, Florida, and New York—each produced between 9 and 14 percent of the total U.S. squash. The remaining States contribute less than 5 percent of total production each (NASS, 2016).

In 2015, 31 percent of the NAP applications purchased for squash included Buy-Up coverage (table 8). Unlike pecans and cherries, which have the majority of NAP applications in a few States, NAP applications for squash are widely dispersed. New York, North Carolina, Georgia, and Florida (not shown in table 8) all have over 500 NAP applications for squash, and another 12 States each have over 100 NAP applications.

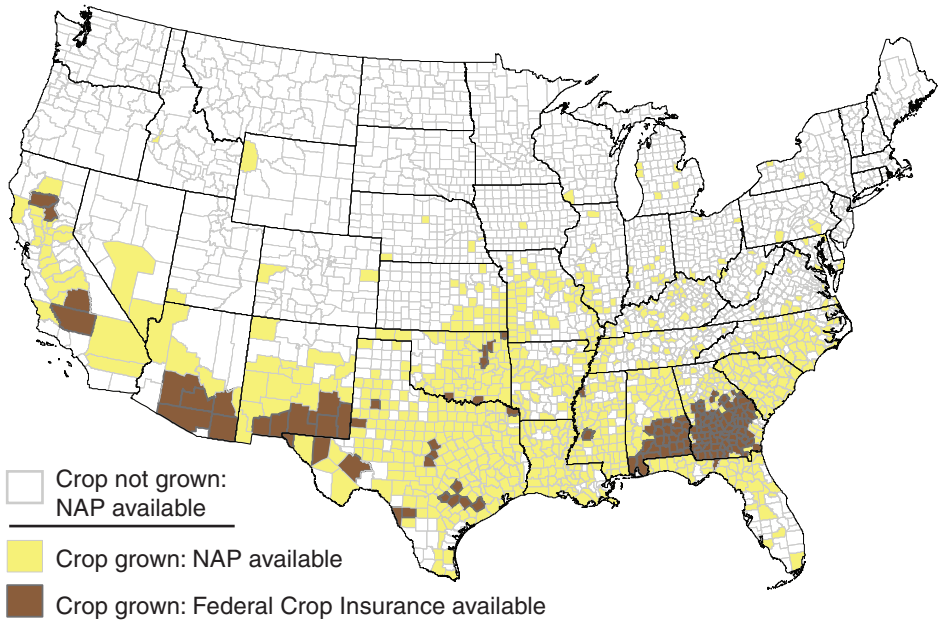
Figure 6

Acreage in pecan trees and RMA insurance availability for pecans

(a) 2012 acres bearing for pecans



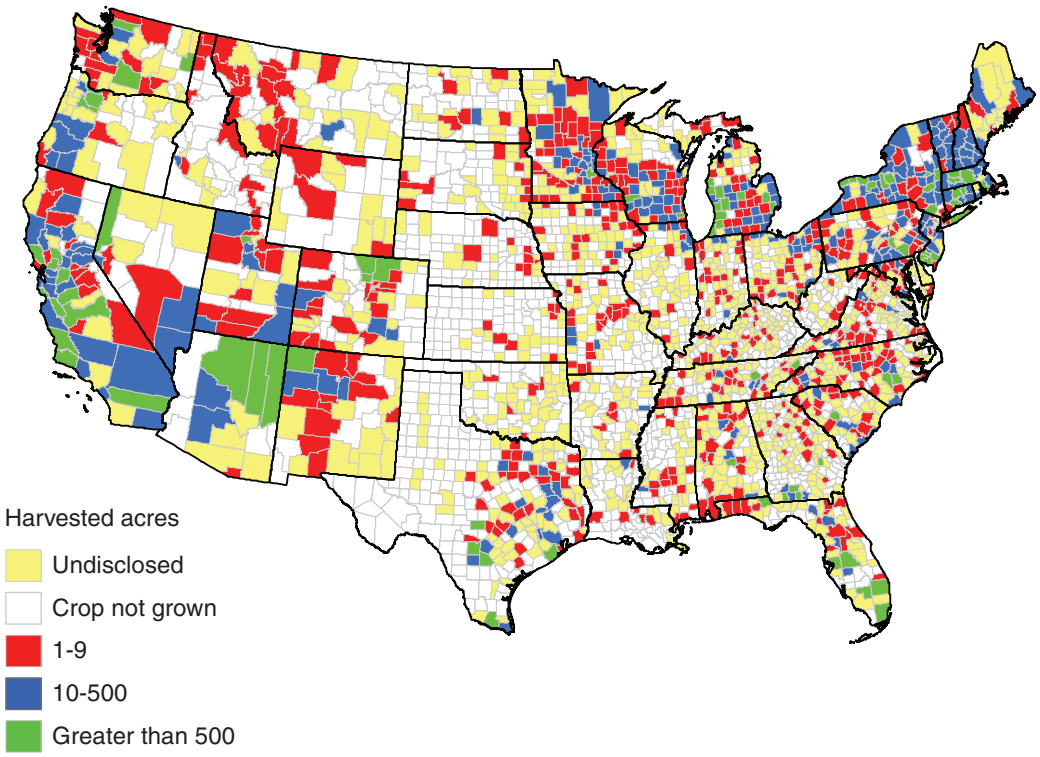
(b) RMA insurance availability for pecans



NAP = Noninsured Crop Disaster Assistance Program.
Source: U.S. Dept. of Agriculture, Economic Research Service, Risk Management Agency (RMA), and National Agricultural Statistics Service.

Figure 7

Acres harvested in 2012 for squash (all types)[1]



[1]Noninsured Crop Disaster Assistance Program is available for all counties since Federal Crop Insurance is not available for squash.

Source: U.S. Dept. of Agriculture, Economic Research Service and National Agricultural Statistics Service.

Outlays for NAP Claims

We examine Government outlays for the yield losses in 2013 through 2015.[7] In figure 8, the total outlays for 2015 do not indicate any marked changes due to the 2014 Farm Act. However, the average outlays are much higher for 2015 than for 2013 and 2014. Despite the increase in the average outlays, the short time span of this data does not allow us to make conclusive remarks about why average outlays have increased.

For yield losses from 2013 to 2015, $404 million was distributed through the NAP program. Texas and Oklahoma were first and third in outlays in terms of dollars and first and second in the count of indemnity payments (figs. 9a and 9b). These States both have a high proportion of NAP applications for grass. Despite the high total dollar value of payments for these States, the average payment is relatively low compared to other States like California. The average outlay in California was $16,000, while the average outlays in Oklahoma and Texas were $4,000 and $4,800, respectively. California has a greater diversity of crops covered under NAP compared to Oklahoma and Texas, and many of California's crops are high-value specialty crops.

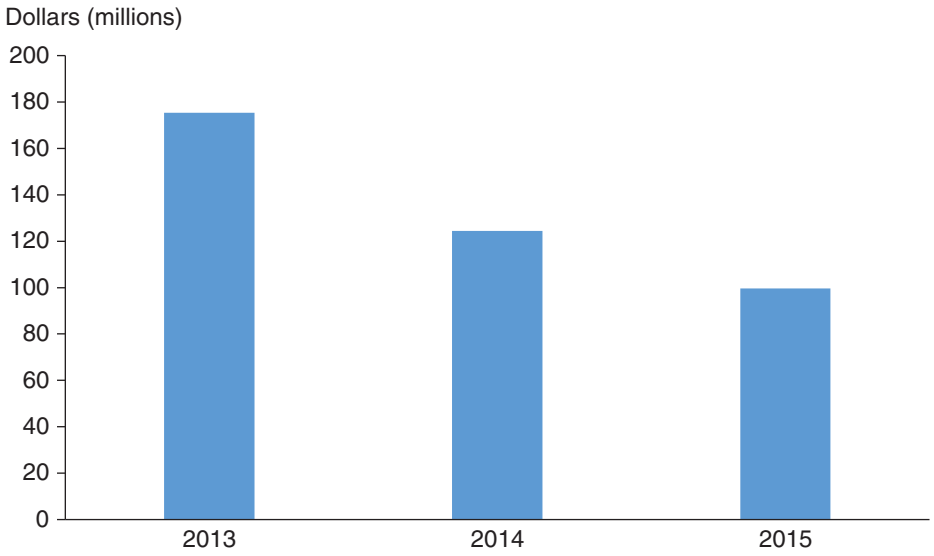
The Western United States had more outlays and higher valued outlays than the Eastern United States, as shown in figures 10a and 10b. The majority of NAP outlays were in a wide band of counties stretching from New Mexico and western Texas to eastern Montana and North Dakota. Clusters of outlays were also found in California and the Southern United States in Alabama, Georgia, and South Carolina. As expected given the low enrollment in NAP, the Corn Belt had a small number of outlays.

The number of producers receiving payments and the outlay count are not the same. A producer can receive multiple outlays if he (or she) experiences losses for multiple crops. Many producers received multiple outlays, especially in California and New York (fig. 10c).

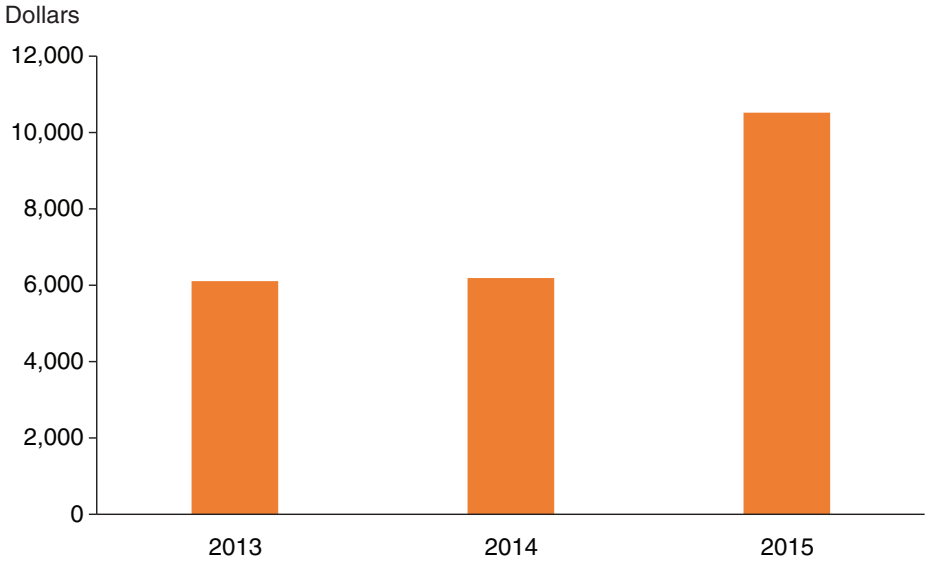
[7] While the yield losses were in the years 2013 through 2015, the payments included the totals that were distributed between April 15, 2014, and January 12, 2017.

Figure 8
Outlays for Noninsured Crop Disaster Assistance Program claims, 2013-2015

(a) Total outlays by year



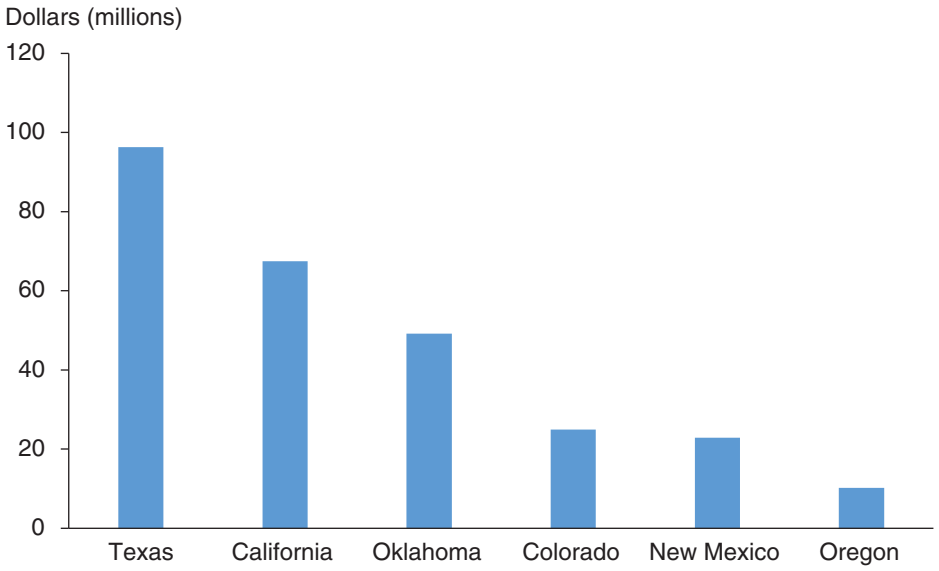
(b) Average outlays per claim



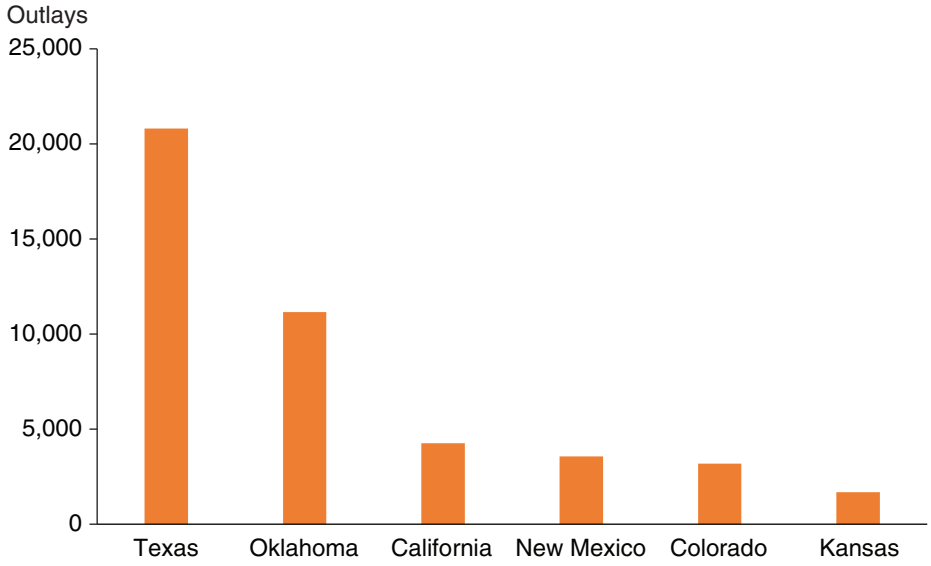
Source: U.S. Dept. of Agriculture, Farm Service Agency.

Figure 9
Total outlays, 2013-2015

(a) Total outlays by State



(b) Total count of outlays

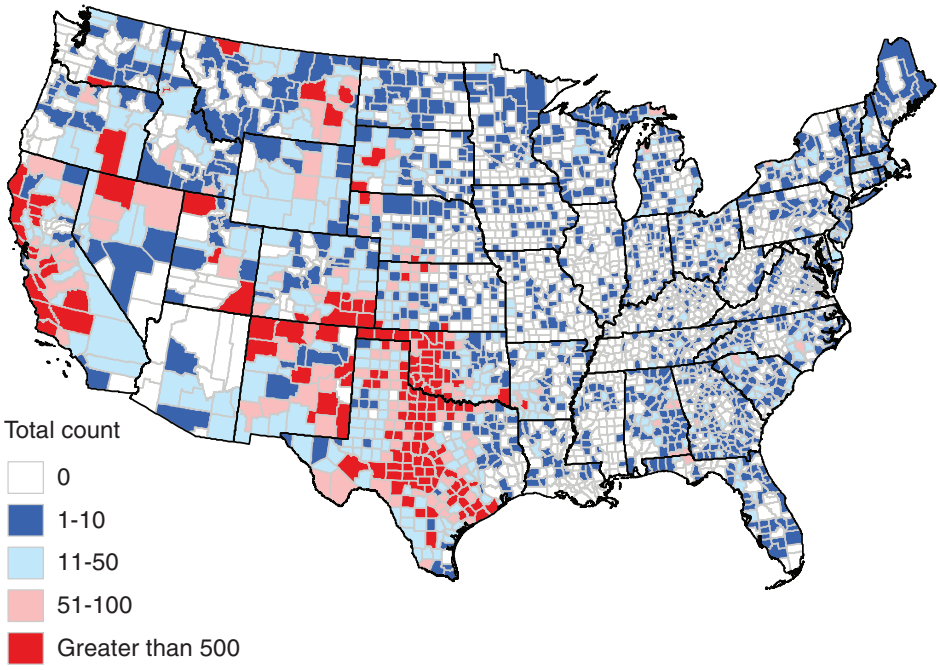


Source: U.S. Dept. of Agriculture, Farm Service Agency.

Figure 10

Noninsured Crop Disaster Assistance Program (NAP) outlays in the contiguous United States, 2013-2015

(a) NAP count of outlays



(b) NAP outlay dollar amounts

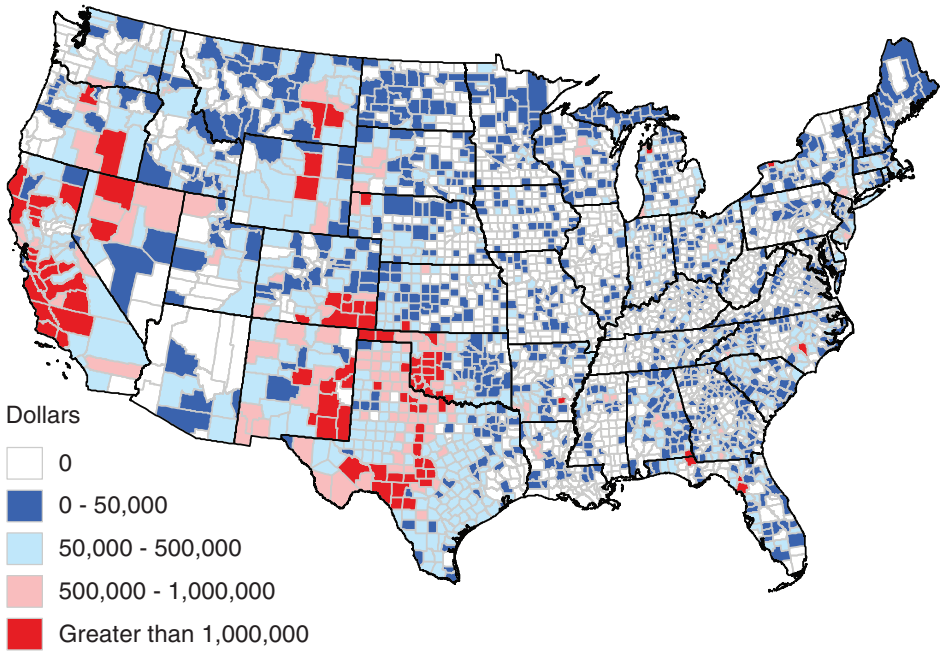
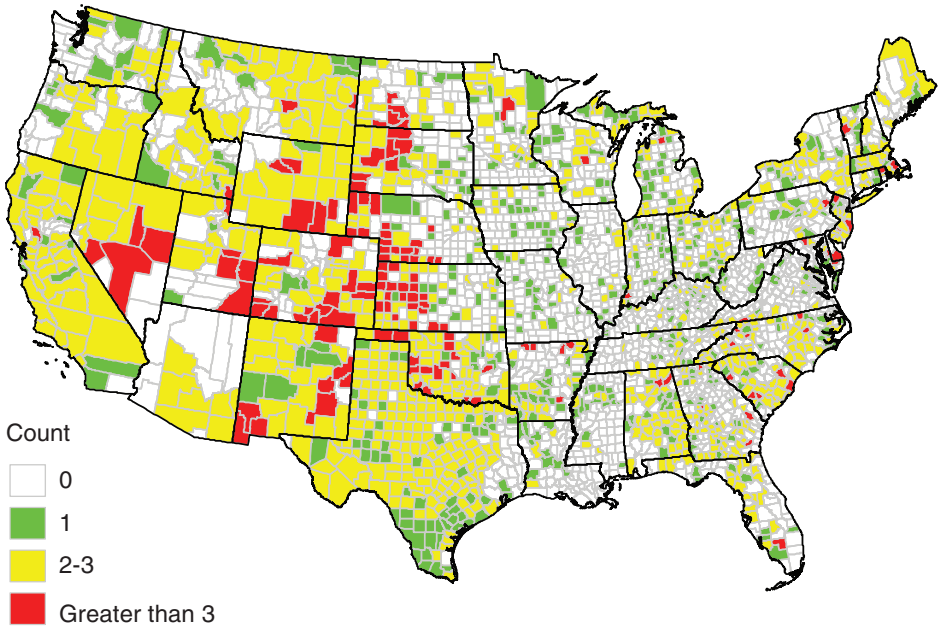


Figure 10

Noninsured Crop Disaster Assistance Program (NAP) outlays in the contiguous United States, 2013-2015—continued

(c) Average count of outlays per producer



Source: U.S. Dept. of Agriculture, Farm Service Agency.

Risk Reduction Through NAP

Using the methodology described in the appendix, we simulate feed-corn prices and yields to examine how NAP affects a producer's revenue. NAP is usually associated with specialty crops; however, the data required to perform this risk analysis are not available for specialty crops. Therefore, feed corn, which has ample data on prices and yields, is used as an example. Most specialty crops have higher yield risk than the feed corn grown in the Corn Belt. Therefore, the analysis focuses on Bell County, TX, which has higher yield risk compared to counties in the Corn Belt.

Given 2015 prices, the expected revenue for a representative producer in Bell County, TX, is $428 per acre, with a lower bound for revenue of $113 per acre,[8] as shown in table 9. The average total revenue is only slightly higher with NAP Basic or NAP with 65-percent Buy-Up coverage, by $8 and $13 per acre, respectively. However, NAP has a large impact on the producer's revenue risk and the lower bound of the producer's gross revenue. The lower bound of gross revenue is $184 per acre with NAP Basic and $267 per acre with NAP Buy-Up, both substantially higher than the lower bound without any support ($113 per acre). The coefficients of variation, the standard deviation of revenue divided by the average revenue, give a standardized measure of risk. Under 2015 conditions, NAP Basic reduces risk by 8 percent, and NAP Buy-Up reduces risk by 21 percent.

Table 9

Revenue and revenue risk under three Noninsured Crop Disaster Assistance Program (NAP) scenarios for a representative corn producer in Bell County, TX

	Average revenue ($/acre)	Revenue lower bound ($/acre)	Percent revenue risk change (from a base of no support)
No support	428	113	-
NAP Basic	436	184	8
NAP Buy-Up	441	267	21

Note: The lower bound is of a 95-percent confidence interval of gross revenue plus the net NAP payment (excluding the service fee). These results reflect an individual who is not a socially disadvantaged, limited-resource, or beginning farmer or rancher. The payment calculations of both NAP Basic and NAP Buy-Up do not include the service fee, but the premium is subtracted from the NAP Buy-Up payment.

Source: U.S. Dept. of Agriculture, Economic Research Service results based on a simulation model.

[8]This value is the lower bound of the 95-percent confidence interval, which is calculated by sorting the 10,000 possible revenues for each representative farmer from smallest to largest. The 9,500 revenues that fall in the middle of the 10,000 sorted revenues form the 95-percent confidence interval. The smallest revenue in the 95-percent confidence interval is called the lower bound, and the largest revenue is called the upper bound. The confidence intervals presented here do not assume any particular distribution of the underlying data (that is, the empirical confidence intervals are nonparametric). The lower bound of the confidence interval is more informative of downside risk than the coefficient of variation. Use of the lower-bound value to compare riskiness across programs is similar in concept to the value-at-risk (VAR) approach used in financial risk management.

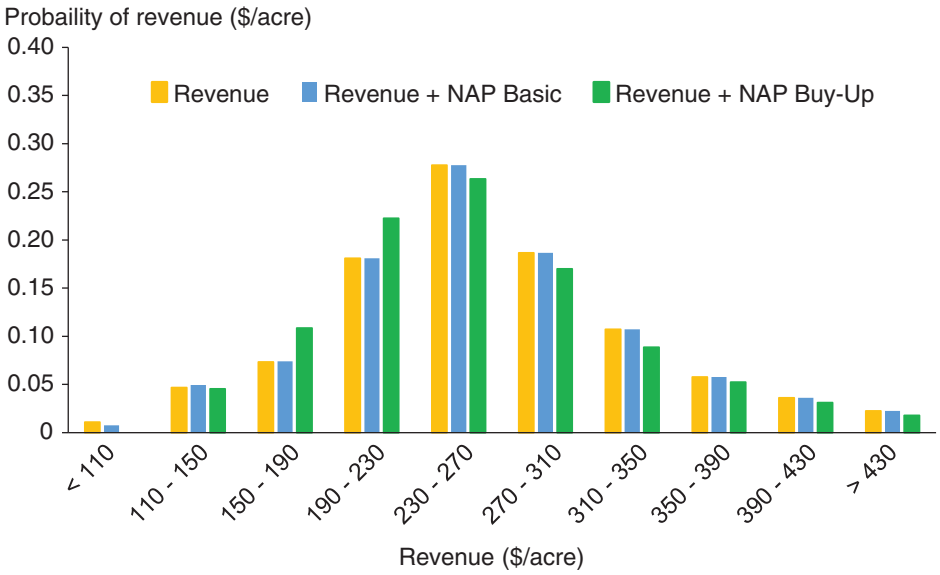
Figure 11 compares feed-corn revenues with no support to NAP Basic and NAP Buy-Up for a representative corn producer of Bell County, TX. Figure 11a shows the probability distribution without marketing or production contracts (i.e., the price of the crop is locked in before harvest with a buyer). Because NAP Basic only pays 55 percent of the average market price, the probability of avoiding low revenue is only slightly higher with NAP Basic. For NAP with 65-percent Buy-Up coverage, the probability of total revenue falling into the $0 to $110 range is zero. Also, the probability of revenue between $150 and $230 per acre is greater for NAP Buy-Up compared to NAP Basic or no support. The probabilities for revenue outcomes greater than the expected revenue are slightly lower with NAP Buy-Up compared to the other two options because NAP Buy-Up has a premium.

Although feed corn, our example, is infrequently contracted, many NAP-eligible crops operate through marketing or production contracts. With these contracts, the producer does not suffer from downside price risk, but only from downside yield risk. Therefore, the producer is less likely to suffer from very low revenue than when operating without a contract. With price remaining constant, the probability distribution with contracts is concentrated closer to the expected revenue (fig. 11b) compared to the distribution without contracts (fig. 11a). With a production or marketing contract, the probability of revenue below $150 per acre is zero if the producer purchases NAP Buy-Up.

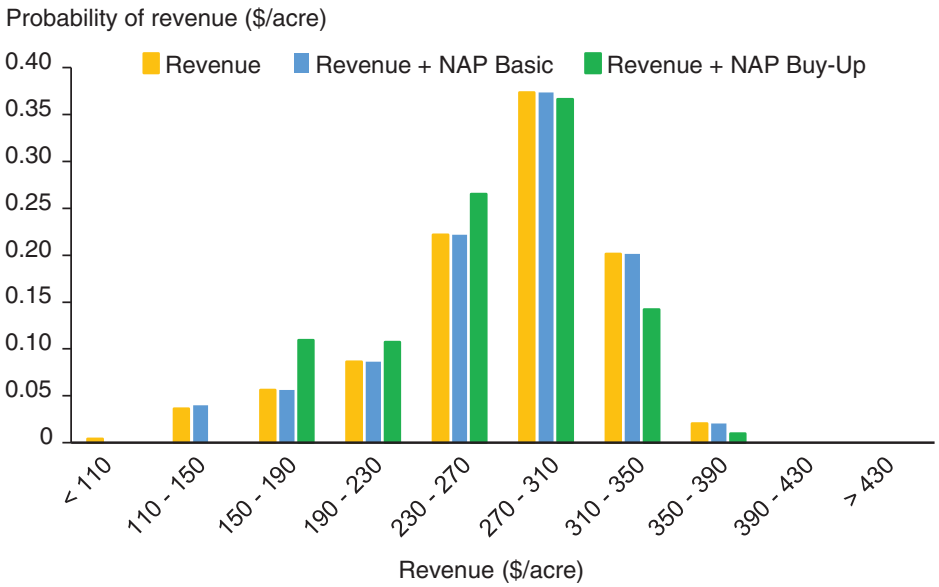
Figure 11

Probability distribution for corn revenue of a representative farmer in Bell County, TX, without and with forward contracting

(a) Corn is not contracted for a predetermined price



(b) Corn is sold under contract for a predetermined price



Note: These results reflect an individual who is not a socially disadvantaged, limited resource, or beginning farmer or rancher. The payment calculations of both Noninsured Crop Disaster Assistance Program (NAP) Basic and NAP Buy-Up do not include the service fee, but the premium is subtracted from the NAP Buy-Up payment.
Source: U.S. Dept. of Agriculture, Economic Research Service results based on simulation model.

Conclusions

Agricultural producers use various private and public mechanisms to mitigate their revenue risks. Federal crop insurance provides coverage for many crops in many regions, but some crops and regions are not covered under this program. The Agricultural Act of 2014 allows producers to purchase additional protection for yield losses through NAP Buy-Up coverage when Federal crop insurance is not available.

From 2014 to 2015, the number of NAP applications increased by over 70,000 for individual crops, with Buy-Up coverage constituting 16 percent of the applications. Approximately one-third of NAP applications were for specialty crops in 2015. In comparison, less than 10 percent of the 2.2 million Federal crop insurance applications sold were for specialty crops that year (RMA 2015a). Buy-up coverage has been purchased by approximately one-third of fruit and vegetable producers who enrolled in NAP in 2015. The three crops examined—cherries, pecans, and squash—show varying levels of NAP enrollment unique to their varied production settings. Nearly two-thirds of NAP applications for cherries in 2015 had Buy-Up coverage. NAP enrollment for pecans increased over sixfold from 2014 to 2015. From 2014 to 2015, squash dropped from the third- to fourth-highest commodity in NAP enrollment despite nearly tripling its enrollment.

NAP enrollment doubled from 2014 to 2015 for producers classified as beginning, socially disadvantaged, or limited resource. Service fees are waived completely for these farmers.

Using a high-risk, feed-corn producer in Texas as an illustrative example, simulations show revenue risk reduced by over 20 percent when the producer purchases NAP Buy-Up coverage compared to 8 percent for NAP Basic. NAP Basic and NAP Buy-Up were also shown to increase the lower bound for gross revenue by approximately 50 and 100 percent, respectively, compared to no support.

Adding Buy-up coverage to NAP was an unprecedented change in the scheme of Federal risk management tools for specialty crops and other noninsurable crops. Further work could examine how NAP availability affects producers' choice of which crops they grow.

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Appendix—Methodology for Statistical Simulation

For our study, we collected data from several sources. Corn yield data for Bell County, TX, were collected from USDA's National Agricultural Statistics Service (NASS, 2016). These yield data span the years 1975 to 2014. Projected prices and harvest prices for corn were gathered for 1975 to 2014 from USDA's Risk Management Agency (RMA, 2015b) and the Chicago Board of Trade for 1975 to 2010. The Bell County base premium rate for federal crop insurance applications for corn was also collected from RMA.

For the modeling and simulation, we followed the methodology described by Cooper and Delbecq (2014). The Bell County yield time series for corn is regressed on a time-dummy variable. The univariate distribution for the time series of the de-trended county yields and the univariate distribution of the deviates of the prices are estimated. The deviates for the prices are the differences between the projected prices and the harvest prices. The covariance matrix among the county yields and the deviates of prices are calculated. The function that connects these univariate distributions together to create the multivariate distribution is called a copula function. There are 10,000 random draws of yields and prices simulated from the copula function. One random draw is a vector containing a simulated corn yield for Bell County and one simulated price deviate.

From the county base premium rate, we can derive the farm-level variation for the county. The methodology for the derivation is described by Coble and Dismukes (2008). Using this farm-level variation, the idiosyncratic risk for a representative producer for Bell County can be deduced. A standard deviation is found for the random draws of idiosyncratic variation that are added to simulated county yields so that the simulated base premium rate equals the RMA base premium rate for a representative farmer in the county. This process generates a simulated yield data set for a representative corn producer in Bell County. As mentioned earlier, 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's base premium rates provides idiosyncratic variation. Using the simulated prices and yields, we then calculate the revenue for the representative producer as well as the NAP Basic and NAP Buy-Up payments.