Analyzing Federal Farm Program and Crop Insurance Options to Assess Policy Design and Risk Management Implications for Crop Producers

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Abstract

Recent changes in federal farm programs and contemporary farm program proposals highlight an evolving shift in farm policy from income support to risk management. A mix of price- and revenue-based commodity programs as well as yield- and revenue-based insurance products provide crop producers a complex portfolio of risk management tools and choices. To make effective risk management decisions, crop producers must integrate farm programs and crop insurance alternatives in a comprehensive risk management decision-making framework. This work assesses the risk management performance and complementarity or substitutability of farm program and crop insurance options.

A novel representative farm model for Nebraska is used that incorporates national, state, district, county, and farm-level yield variables along with national and state-level price variables to accurately assess multiple farm program and crop insurance alternatives. The four-stage simulation model simultaneously estimates all necessary yield and price variables in a statistically-distributed and correlated framework. This allows for a consistent and complete analysis of alternative farm program and crop insurance choices and designs. The simulation produces crop revenue, farm program, and crop insurance results for eight representative farms indicative of the crop mix and productivity levels in each of the eight agricultural statistics districts in Nebraska.

The results demonstrate the risk management performance of alternative farm program and crop insurance choices for the eight representative farms in Nebraska. The analysis demonstrates the complementarity of farm programs with some crop insurance products and protection levels while showing potential substitutability or overlap with other products and protection levels. The results provide insight for more effective policy design, farm program participation, and farm-level risk management decision-making.

Background

Federal farm policy for program commodities has evolved over many decades and farm bills. From early price support and supply control mechanisms, federal policy has gradually transitioned to income support programs tied to price levels and as of 2008, revenue levels as well. A new transition also appears to be underway in federal policy with a shift from income support to risk management. Yield-based crop insurance has long been a part of the federal farm income safety net, but the modern growth and development of the sector, dating to the 1980 legislation that privatized crop insurance delivery through the legislation of 1994 and 2000 that expanded program opportunities and support and the concurrent development of revenue-based insurance policies tools, crop insurance has grown to the point that it is the largest component of the federal farm income safety net (Johnson and Monke 2013).

Current farm program legislation in Congress would continue this transition toward crop insurance with proposals to reduce spending on commodity programs while increasing crop insurance investments and programs. Both the U.S. House of Representatives bill H.R. 2642 and the U.S. Senate bill S. 954 would make program changes and reduce spending in commodity programs while adding spending in the crop insurance program, notably for a new supplemental crop insurance program (U.S. House of Representatives 2013, U.S. Senate 2013) .

The increased emphasis on crop insurance and the continued transition of commodity programs toward a focus on risk management constitutes a major change in farm program decisions for producers and potential impacts on production. Commodity programs and crop insurance are much more complex and closely integrated now than they have been historically. A given producer is faced not just with a commodity program decision and a crop insurance decision, but with an integrated decision that affects the producer's overall risk management portfolio. Understanding, analyzing, and making risk management decisions is a challenging task given the complex design and mix of farm programs and crop insurance policies. Figure 1, modified from Lubben and Novak (2010), provides a convenient schematic of the farm income safety net and the risk management decision matrix for producers, including current and proposed farm programs, crop insurance policies, and marketing decisions.

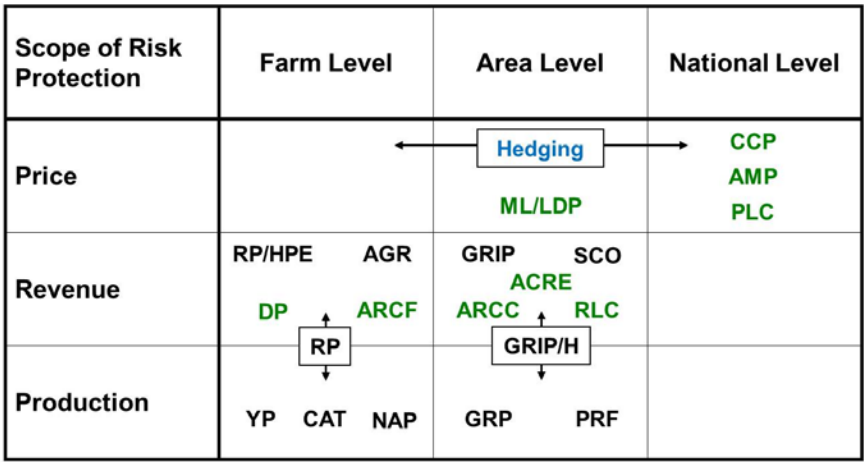

Figure 1. The Farm Income Safety Net

Current and proposed farm programs (shown as green acronyms in Figure 1) cover a range of price or revenue risk, from the national level to the farm level depending on the program. Crop insurance tools (shown as black acronyms in Figure 1) similarly cover a range of revenue or production risk at the farm or area level. The illustrated range of protection available and the potential overlap or substitutability of the different programs and policies demonstrate that risk management decisions are increasingly complex for the producer and should integrate both farm program and crop insurance decisions into a portfolio decision to achieve optimal results. The potential overlap or substitutability also suggests a possible concern with policy design to ensure programs are efficient and limit the possibility of overlap in coverage or duplicative support payments to producers. A study of the farm program and crop insurance tools and proposals in a farm-level simulation can provide the analysis to determine optimal producer participation and purchase decisions for risk management protection as well as efficient program design.

Policy Alternatives

As Figure 1 shows, there is a range of safety net tools available to producers in terms of type of risk coverage as well as geographical scope of risk coverage. The partial transition of farm programs from price to revenue and from income support to risk management, coupled with the expansion of crop insurance from yield to revenue, provides a complicated mix and potential overlap in available tools. In

concept, the different programs and policies can be combined in a compatible and complementary strategy.

Current farm bill legislation in Congress continues some of the traditional focus on price-based income support, but also adds average-revenue based support as well, reforming the concept introduced as the Average Crop Revenue Election (ACRE) program in the 2008 Farm Bill. The House bill H.R. 2642 would provide producer a one-time election between Price Loss Coverage (PLC) and Revenue Loss Coverage (RLC). The PLC program mimics the existing Counter-Cyclical Payment (CCP), but with higher legislated target (reference) prices. The RLC program takes the ACRE concept and revises it to a county-based revenue guarantee tied to 85% of the average revenue level. In the Senate, S. 954 would focus commodity program support on an average revenue-based safety net revised from the current ACRE program. The Agriculture Risk Coverage (ARC) program would be available to producers with a one-time election between farm-level coverage (denoted at ARCF) or county-level coverage (denoted as ARCC). The protection under either would start at 88% of the average revenue level for the farm or county respectively. Underlying the ARC program would be the Adverse Market Payment (AMP) program, which would operate similar to the existing CCP program, but with a revised target (reference) price tied to 55% of average market prices (except for a fixed target price for rice and peanuts).

Both the House and Senate farm bill legislation would eliminate the Direct Payment (DP) program and the CCP program, although the underlying marketing loan program and loan deficiency payments (ML/LDP) would continue. Some of the budget savings from cutting DPs would fund an expansion of the crop insurance legislation to include the Supplemental Coverage Option (SCO), a county-based supplemental revenue insurance plan that could be purchased on top of an existing crop insurance policy to fill part of the insurance deductible gap in coverage for producers. Further complicating the insurance decision, the availability and coverage limits for SCO are impacted by the commodity program in effect. SCO is available to protect 90% of the average county revenue for producers enrolled in the PLC program as well as those not enrolled in a commodity program at all. SCO is available at 78% of the average county revenue for producers enrolled in ARCF or ARCC, but is not available to producers enrolled in RLC.

Figure 2 presents an idealized diagram of the proposed 2013 Farm Bill commodity programs and crop insurance policies. Given producer expectations and historical average revenue levels, the combination of commodity programs, supplemental insurance, and underlying crop insurance appears to provide blanket coverage against the risk of revenue losses due to price and yield losses.

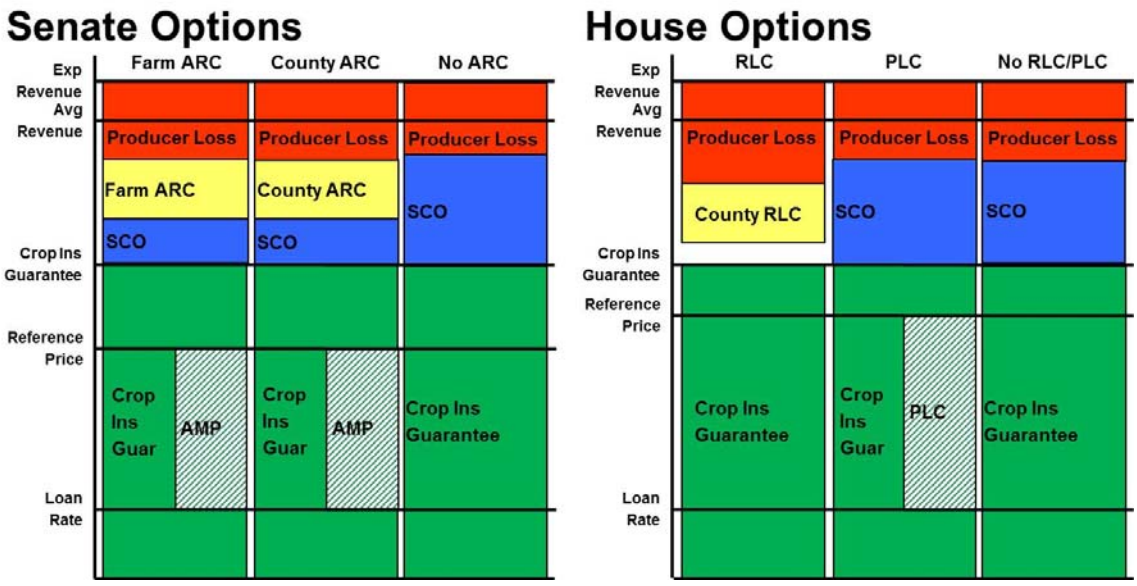

Figure 2. 2013 Farm Bill Safety Net Proposals

In the figure, the producer's underlying crop insurance selection provides the primary support against revenue losses below expectations, although it may fully overlap the price-loss coverage as proposed by either the Senate AMP program or the House PLC program and the underlying marketing loan program. Above the crop insurance coverage, producers could elect to participate in a shallow-loss revenue program, either the Senate ARC program or the House RLC program that bases protection on the revenue band between 78 and 88% or 75 and 85% of average revenue respectively. The remaining gap between the Senate ARC program and the underlying crop insurance coverage could be filled with a reduced SCO program. Alternatively, producers could purchase SCO coverage to cover shallow revenue losses below 90% of average revenue and above the underlying crop insurance coverage if they participate in the House RLC program or stay out of the commodity program entirely. Finally, under the

House RLC program, SCO is not an option and thus, a gap in revenue protection emerges unless it is filled with a higher level of crop insurance coverage.

While all of these programs and policies appear to provide full coverage for price or revenue losses below targeted levels, these tools are not necessarily fully compatible or complementary because of differences in the program parameters. Table 1 provides a detailed description and comparison of the different parameters for the different safety net programs.

Table 1. Farm Income Safety Net Programs and Parameters

Program	Parameters				
	Risk Protection Level	**Price Component**	**Yield Component**	**Guarantee Level**	**Payment/Subsidy Rate**
Average Crop Revenue Election (ACRE) Program	State Revenue	2-Year Average	5-Year Olympic Average	90%	85% of Planted Acres
Counter-Cyclical Payment (CCP) Program	National Price	Target Price	Program Payment Yield (CCP)	-	85% of base acres
Direct Payment (DP) Program	-	Payment Rate	Program Payment Yield (DP)	-	85% of base acres
Marketing Loan (ML) Program	National/County Price	Loan Rate	Actual Production	-	100% of actual production
Agriculture Risk Coverage - Farm (ARCF)	Farm Revenue	5-year Olympic Average	5-year Olympic Average	88%	65% of planted acres
Agricultural Risk Coverage - County (ARCC)	County Revenue	5-year Olympic Average	5-year Olympic Average	88%	80% of planted acres
Adverse Market Payment (AMP) Program	National Price	55% of 5-Year Olympic Average	Program Payment Yield (DP Yield?)	-	85% of base acres
Revenue Loss Coverage (RLC)	County Revenue	5-year Olympic Average	5-year Olympic Average	85%	85% of planted acres
Price Loss Coverage (PLC)	National Price	Reference Price	Program Payment Yield (CCP Yield)	-	85% of planted acres
Supplemental Coverage Option (SCO)	County Revenue	Base/ Harvest Price	County Actual Production History	0-90%	65% of premium
Individual Crop Insurance (YP, RP, RP/HPE)	Farm Yield/Revenue	Base/ Harvest Price	Farm Actual Production History	50-85%	38-80% of premium
Group Crop Insurance (GRP, GRIP, GRIP/HPO)	County Yield/Revenue	Base/ Harvest Price	County Actual Production History	70-90%	55-64% of premium

The numerous differences in calculations, guarantee levels, and payment/subsidy rates make it complex to directly analyze risk management strategies that integrate multiple programs and thus, difficult to implement an effective risk management portfolio and make optimal risk management decisions. For example, producers could face the option of participating in the ARC program and purchasing a reduced level of SCO coverage or staying out of ARC and purchasing full SCO coverage. In a year when the current price is above the 5-year Olympic average, the full SCO strategy may dominate whereas ARC plus a reduced SCO could be optimal when the current price is below the 5-year Olympic average. Similarly, the ARC or RLC revenue safety nets would look more attractive after consecutive years of good yield results going into the 5-year Olympic average as opposed to multiple years of bad yields, such as could happen in parts of the country due to lingering drought conditions. While the revenue safety net might be very relevant during the bad yield years, it would also provide less protection relative to expected yield and revenue levels in following years.

Furthermore, with the mix of programs and program parameters, it is likely that programs could either leave gaps in revenue protection or actually overlap and provide protection from multiple programs for the same loss. This potential gap or overlap presents a challenge to producers in making effective risk management decisions and to policymakers in developing effective public policies.

This paper uses simulation analysis to study the current mix of farm program proposals coupled with supplemental and underlying crop insurance policies to analyze optimal producer risk management strategies. A subset of these risk management strategies is then analyzed further to explore potential overlaps in protection that should be of interest to policymakers. Combining farm program alternatives with different levels of underlying crop insurance and complementary supplemental coverage produces 24 alternative risk management strategies for the simulation analysis as shown in Table 2.

Table 2. Risk Management Strategies (Scenarios) for Simulation Analysis

Program or Product	Scenario 1	Scenario 2	Scenario 3	Scenario 4
Farm Program	No Program	No Program	No Program	No Program
Supplemental Coverage Option (SCO)	90-0	90-65	90-75	90-85
Crop Insurance	0	RP 65	RP 75	RP 85

Program or Product	Scenario 5	Scenario 6	Scenario 7	Scenario 8
Farm Program	ACRE	ACRE	ACRE	ACRE
Supplemental Coverage Option (SCO)	-	-	-	-
Crop Insurance	0	RP 65	RP 75	RP 85

Program or Product	Scenario 9	Scenario 10	Scenario 11	Scenario 12
Farm Program	ARCF	ARCF	ARCF	ARCF
Supplemental Coverage Option (SCO)	78-0	78-65	78-75	-
Crop Insurance	0	RP 65	RP 75	RP 85

Program or Product	Scenario 13	Scenario 14	Scenario 15	Scenario 16
Farm Program	ARCC	ARCC	ARCC	ARCC
Supplemental Coverage Option (SCO)	78-0	78-65	78-75	-
Crop Insurance	0	RP 65	RP 75	RP 85

Program or Product	Scenario 17	Scenario 18	Scenario 19	Scenario 20
Farm Program	RLC	RLC	RLC	RLC
Supplemental Coverage Option (SCO)	-	-	-	-
Crop Insurance	0	RP 65	RP 75	RP 85

Program or Product	Scenario 21	Scenario 22	Scenario 23	Scenario 24
Farm Program	PLC	PLC	PLC	PLC
Supplemental Coverage Option (SCO)	90-0	90-65	90-75	90-85
Crop Insurance	0	RP 65	RP 75	RP 85

Data and Methods

This study models 8 representative grain and oilseed farms across Nebraska to simulate expected crop revenue, farm program payments, and net crop insurance indemnities under 24 different scenarios. The representative farms were created to reflect average cropping patterns and productivity factors seen across the 8 National Agricultural Statistical Service (NASS) Agricultural Statistics Districts in Nebraska. One county within each district is identified as representative of the district and one farm is modeled to be representative of each county and district. The districts and representative counties are shown in Figure 3

and include: Norwest 10 - Morrill, North 20 - Holt, Northeast 30 - Wayne, Central 50 - Sherman, East 60 - Butler, Southwest 70 - Hayes, South 80 - Kearney, and Southeast 90 - Saline.

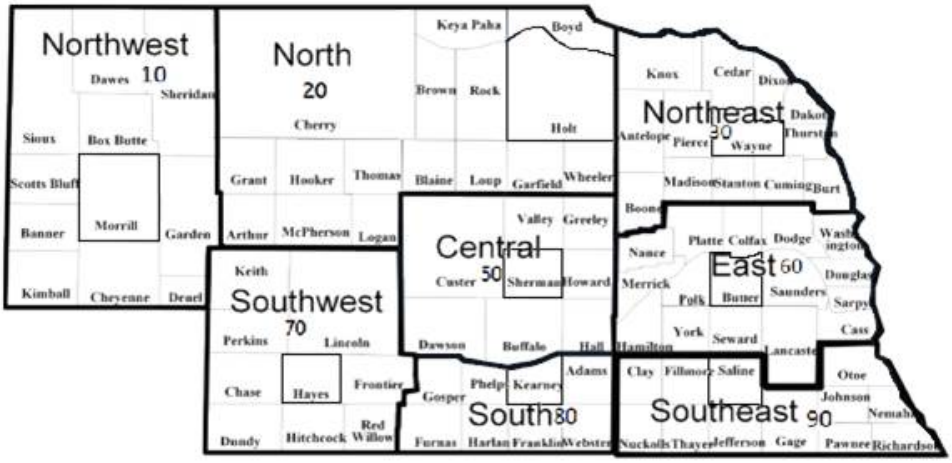

Figure 3. Nebraska Farm Income and Risk Management Model

To define average size and scale of Nebraska farm operations, the model uses 2007 Census of Agriculture data on cropland acres and total number of operators sorted according to farm income ranges (National Agricultural Statistics Service 2009). Using operations with gross sales above $100,000, total cropland acres and producers at the district level were aggregated from county level data to determine the number of cropland acres per representative farm. Annual yield and harvested acreage series maintained by NASS for the nation, state, districts, and counties allowed for identification of recent cropping and irrigation patterns practices across different aggregations (USDA National Agricultural Statistical Service 2011). Table 3 presents the acres and cropping mixture of the 8 representative farms based upon the averages and analysis of NASS data sets developed for this simulation.

Crop yield data was obtained from historical yield data published by NASS (2013) and farm-level yield variability estimates implied from crop insurance premium estimates for the 2013 production year (Farmdoc 2013). Historical commodity futures data was obtained from the Commodity Research Bureau (2011) to determine seasonal volatility of prices. Marketing Year Average (MYA) prices were collected from the World Agricultural Supply and Demand Estimates (WASDE) report published by USDA Economic

Research Service as of March 2013 in order to estimate a comparison of farm program and crop insurance decisions consistent with yield and price expectations entering the 2013 production year.

Table 3. Cropland Acres on Representative Farms

Cropland Acres	District 10 Farm	District 20 Farm	District 30 Farm	District 50 Farm	District 60 Farm	District 70 Farm	District 80 Farm	District 90 Farm
Corn Irrigated	373	891	230	795	319	703	559	280
Corn Dryland	0	157	380	127	273	283	172	378
Soybeans Irrigated	0	329	148	206	174	97	304	174
Soybeans Dryland	0	0	304	0	260	0	0	378
Winter Wheat	874	0	0	0	0	522	167	0
Total	1,247	1,377	1,062	1,128	1,026	1,604	1,201	1,209

Based on the historical data, trend projections, and variability from trend, a stochastic model was developed to generate yield and price distributions and allow for the analysis of expected crop revenue under alternative farm program and crop insurance scenarios. The model was developed and estimated in a four-stage process, starting with a correlated simulation of national and state yield deviations along with national price deviations for the 5 crops of interest in the model. In the second stage, district yield deviations were estimated and correlated to state and other district yield deviations through regression equations based on a directed search and ordering of linear correlations among the variables using Directed Acyclic Graph (DAG) components of the Tetrad IV software to find statistically significant relationships and determine causality (Spirtes et al. 2005). In the third stage, county yield deviations were regressed on district yield deviations. Finally, in the fourth stage, representative farm were simulated around county yields using a stochastic component representing farm-level variability implied by crop insurance premium rates consistent with Miranda's (1991) implied volatility model for the 2013 production year. The development of the model is more fully described in Jansen, Stockton, and Lubben (2012).

The simulation involving the representative farms was constructed and analyzed in the Microsoft Office 2010 Excel platform using the software add-on Simulation & Econometrics to Analyze Risk (SIMETAR) developed at Texas A&M University (Schumann, Feldman, and Richardson 2011). The scenarios studied in the simulation were previously listed in Table 2. Economic variables of interest, including yield, price, revenue, farm program payments, and crop insurance net indemnities were recorded

on a per farm and per acre basis for each representative farm for each simulation. Each scenario was simulated 500 times using the SIMETAR software. The resulting statistics provide the basis for a thorough economic and statistical analysis as discussed by Richardson and Outlaw (2008). A previous application of the model to the problem of farm program, crop insurance, and marketing decisions (Jansen, Lubben, and Stockton 2012) demonstrates the usefulness of the model in analyzing the farm program and crop insurance question posed in this paper.

Results

The model and simulation analysis provides means to study the 24 risk management strategies based on a planting-time analysis of yield and price expectations for 2013 in Nebraska. The results for nonirrigated corn on the representative farm in Butler County (District 60 - East Nebraska) provide a specific case study to illustrate the performance of the risk management strategies and the potential program overlap. Summary results for alternative farm program payments, SCO payments, and crop insurance net indemnity payments are reported in Tables 4, 5, and 6 respectively.

Table 4. Farm Program Payments per Acre for Nonirrigated Corn

Farm Program	None	ACRE	ARCF	ARCC	RLC	PLC
Mean	0.00	5.31	15.87	12.77	10.81	0.00
StDev	0.00	19.90	20.53	21.61	20.89	0.00
CV	0.00	374.81	129.40	169.20	193.25	0.00
Min	0.00	0.00	0.00	0.00	0.00	0.00
Max	0.00	148.69	44.47	54.73	56.17	0.00

The results in Table 4 show average payments between the various commodity program alternatives. A modified ACRE program is included as a reference to allow the comparison of the change from a state-level guarantee to a county- or farm-level guarantee, but only after ACRE was modified to represent a 5-year Olympic average price as with ARC and PLC. The actual Nebraska ACRE guarantee for nonirrigated corn in 2013 was relatively higher due to the use of a 2-year average price, but was also limited by the 10 percent cap on changes from 2012, thus it was not directly comparable to the new program proposals. The analysis demonstrates the importance and relevance of geography to producers,

as the farm-level protection in ARCF outperforms the county-level protection in ARCC or RLC, which in turn, outperform the protection of the adjusted ACRE program. PLC by itself provides no protection for Nebraska nonirrigated corn producers as 2013 price expectation were so far above PLC protection levels that simulated prices did not trigger a PLC payment. Similarly the AMP component of ARCF or ARCC also did not trigger under any of the simulations.

Table 5. Supplemental Coverage Option Net Indemnity Payments per Acre for Nonirrigated Corn

SCO Band	90-0	90-65	90-75	90-85	78-0	78-65	78-75	-
Mean	15.63	14.57	11.77	5.25	4.72	3.61	1.31	0.00
StDev	55.20	46.25	34.26	13.67	29.73	17.62	5.33	0.00
CV	353.14	317.36	291.07	260.29	630.05	488.26	407.62	0.00
Min	-8.11	-6.89	-5.35	-2.32	-3.12	-1.85	-0.53	0.00
Max	325.25	186.14	113.00	37.27	240.11	85.14	19.98	0.00

Table 5 shows net indemnity payments under the SCO insurance program for various alternative coverage bands, presuming producers matched SCO to the farm program and crop insurance selections. Table 6 similarly shows net indemnity payments under 4 alternative levels of RP crop insurance.

Table 6 Crop Insurance Net Indemnity Payments per Acre for Nonirrigated Corn

Crop Insurance	0	RP 65	RP 75	RP 85
Mean	0.00	14.69	23.96	25.54
StDev	0.00	62.61	83.07	106.13
CV	0.00	426.09	346.65	415.55
Min	0.00	-3.84	-7.22	-24.25
Max	0.00	493.79	575.08	642.71

Table 7 combines farm program payments and SCO net indemnity payments to evaluate the impact of changes in the proposed 2013 Farm bill legislation. The farm program alternatives and SCO coverage levels are matched together as allowed, including alternatives matched to various levels of crop insurance coverage, which limits the lower band for SCO and which is included in later discussion.

Table 7. Farm Program Payments and Supplemental Coverage Option Net Indemnity Payments per Acre for Nonirrigated Corn

Farm Program	No Program	No Program	No Program	No Program
SCO Band	90-0	90-65	90-75	90-85
Mean	15.63	14.57	11.77	5.25
StDev	55.20	46.25	34.26	13.67
CV	353.14	317.36	291.07	260.29
Min	-8.11	-6.89	-5.35	-2.32
Max	325.25	186.14	113.00	37.27
Farm Program	**ACRE**	**ACRE**	**ACRE**	**ACRE**
SCO Band	**-**	**-**	**-**	**-**
Mean	5.31	5.31	5.31	5.31
StDev	19.90	19.90	19.90	19.90
CV	374.81	374.81	374.81	374.81
Min	0.00	0.00	0.00	0.00
Max	148.69	148.69	148.69	148.69
Farm Program	**ARCF**	**ARCF**	**ARCF**	**ARCF**
SCO Band	**78-0**	**78-65**	**78-75**	**-**
Mean	20.59	19.48	17.17	15.87
StDev	40.16	30.38	22.61	20.53
CV	195.07	155.99	131.66	129.40
Min	-3.12	-1.85	-0.53	0.00
Max	284.58	125.63	64.06	44.47
Farm Program	**ARCC**	**ARCC**	**ARCC**	**ARCC**
SCO Band	**78-0**	**78-65**	**78-75**	**-**
Mean	17.49	16.38	14.08	12.77
StDev	44.76	35.08	25.39	21.61
CV	255.95	214.16	180.35	169.20
Min	-3.12	-1.85	-0.53	0.00
Max	294.85	139.87	74.69	54.73
Farm Program	**RLC**	**RLC**	**RLC**	**RLC**
SCO Band	**-**	**-**	**-**	**-**
Mean	10.81	10.81	10.81	10.81
StDev	20.89	20.89	20.89	20.89
CV	193.25	193.25	193.25	193.25
Min	0.00	0.00	0.00	0.00
Max	56.17	56.17	56.17	56.17
Farm Program	**PLC**	**PLC**	**PLC**	**PLC**
SCO Band	**90-0**	**90-65**	**90-75**	**90-85**
Mean	15.63	14.57	11.77	5.25
StDev	55.20	46.25	34.26	13.67
CV	353.14	317.36	291.07	260.29
Min	-8.11	-6.89	-5.35	-2.32
Max	325.25	186.14	113.00	37.27

The results in Table 7 show that ARCF still dominates the analysis over ARCC and RLC, but PLC becomes a viable alternative because of the eligibility for full SCO participation. ARCF couples the farm program with SCO starting at 78%, but PLC (as well as the no farm program option) allows SCO starting at 90%. Adding in crop revenue and crop insurance net indemnity payments, Table 8 provides the full

picture for producers for the 24 risk management strategies analyzed.

Table 8. Crop Revenue, Farm Program Payments, and Crop Insurance Net Indemnity Payments per Acre for Nonirrigated Corn

Farm Program	No Program	No Program	No Program	No Program
SCO Band	90-0	90-65	90-75	90-85
Crop Insurance	0	RP 65	RP 75	RP 85
Mean	771.14	784.77	791.24	786.30
StDev	251.91	225.83	213.61	200.74
CV	32.67	28.78	27.00	25.53
Min	96.99	442.72	510.66	566.38
Max	1,551.20	1,548.59	1,546.75	1,532.74
Farm Program	**ACRE**	**ACRE**	**ACRE**	**ACRE**
SCO Band	**-**	**-**	**-**	**-**
Crop Insurance	**0**	**RP 65**	**RP 75**	**RP 85**
Mean	760.81	775.51	784.78	786.35
StDev	262.53	233.60	219.18	201.33
CV	34.51	30.12	27.93	25.60
Min	52.67	449.61	516.01	568.72
Max	1,559.32	1,555.48	1,552.10	1,535.07
Farm Program	**ARCF**	**ARCF**	**ARCF**	**ARCF**
SCO Band	**78-0**	**78-65**	**78-75**	**-**
Crop Insurance	**0**	**RP 65**	**RP 75**	**RP 85**
Mean	776.09	789.67	796.64	796.91
StDev	245.07	218.07	206.38	190.62
CV	31.58	27.61	25.91	23.92
Min	65.81	492.23	559.95	613.18
Max	1,556.20	1,553.63	1,551.57	1,535.07
Farm Program	**ARCC**	**ARCC**	**ARCC**	**ARCC**
SCO Band	**78-0**	**78-65**	**78-75**	**-**
Crop Insurance	**0**	**RP 65**	**RP 75**	**RP 85**
Mean	772.99	786.58	793.54	793.81
StDev	254.33	227.49	215.10	198.46
CV	32.90	28.92	27.11	25.00
Min	76.08	447.76	515.49	568.72
Max	1,556.20	1,553.63	1,551.57	1,535.07
Farm Program	**RLC**	**RLC**	**RLC**	**RLC**
SCO Band	**-**	**-**	**-**	**-**
Crop Insurance	**0**	**RP 65**	**RP 75**	**RP 85**
Mean	766.31	781.01	790.28	791.85
StDev	259.98	231.21	216.90	199.19
CV	33.93	29.60	27.45	25.16
Min	65.82	449.61	516.01	568.71
Max	1,559.32	1,555.48	1,552.10	1,535.07
Farm Program	**PLC**	**PLC**	**PLC**	**PLC**
SCO Band	**90-0**	**90-65**	**90-75**	**90-85**
Crop Insurance	**0**	**RP 65**	**RP 75**	**RP 85**
Mean	771.14	784.77	791.24	786.30
StDev	251.91	225.83	213.61	200.74
CV	32.67	28.78	27.00	25.53
Min	96.99	442.72	510.66	566.38
Max	1,551.20	1,548.59	1,546.75	1,532.74

A careful analysis of Table 8 shows ARCF participation with corresponding SCO and crop insurance participation) does indeed provided the greatest mean revenue for nonirrigated corn on the representative farm in Butler County for 2013. ARCF, which covers revenue losses in a band from 78-88%, combined with SCO from 75-78% and RP at 75% provides a mean revenue of $796.74 with a standard deviation of $206.38. ARCF plus RP at 85% (and thus, no SCO) actually provides slightly greater mean revenue at $796.91 and a smaller standard deviation at $190.62, but also introduces a theoretical overlap in coverage between 78-85%, given ARCF covers 78-88% and RP covers 85%. A mean-variance chart (Figure 4) provides another picture of this comparison, showing these two strategies dominate the others.

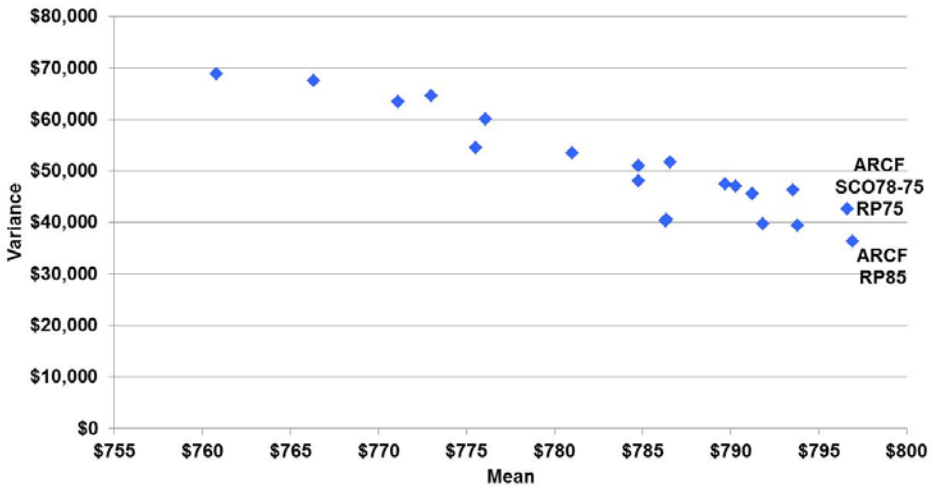

Figure 4. Mean-Variance Analysis of Risk Management Strategies per Acre for Nonirrigated Corn

While ARCF may be the dominant farm program alternative for nonirrigated corn in Butler County, Nebraska in 2013, the policy question remains as to whether and to what extent other programs may overlap with ARCF. By definition, SCO is only available at 78% since ARCF covers 78-88%, so the two programs appear compatible without overlap as originally suggested in Figure 2. Given the two programs vary in both their yield guarantees (5-year Olympic farm average for ARCF, county actual production history for SCO) and their price guarantees (5-year Olympic average for ARCF, base insurance price for

SCO), the actual performance of ARCF and SCO will vary year to year as the yield and price references change and could overlap or leave gaps in effective risk management protection for producers.

Of more significance is the possible participation in ARCF and purchase of RP at 85%. While prohibitions on this are not specified in the legislation, the combination would appear to create a specific overlap between 78-85%, although here too, the two programs vary in price protection (5-year Olympic average for ARCF, base insurance price for RP), so the effective protection could vary.

Table 9 provides a final comparison of the alternative risk management strategies analyzed for potential program overlap. ARCF, SCO, and RP are shown across RP protection levels. In addition, PLC, SCO, and RP are also shown to study the potential overlap of SCO tied to county yields and RP tied to farm yields. The potential overlap is exposed when the sum of safety net payments exceeds the producer's actual crop revenue losses. Starting with expected crop revenue (E[CR]) equal to expected yield times expected price for the crop year, we can split the 500 simulations into cases where actual crop revenue exceeds expected crop revenue and where it falls below 100% or 90% of expected crop revenue. The latter is included as a reference point given the various policy tools that reference a guarantee tied to 90% of some benchmark revenue level.

Table 9. Percent of Times Net Safety Net Payments Exceed Loss by Crop Revenue Scenario for Nonirrigated Corn

Crop RevenueScenario	Safety Net Payments		
Farm Program	ARCF	ARCF	ARCF
SCO Band	78-65	78-75	0
Crop Insurance	RP 65	RP 75	RP 85
CR > E[CR]	2.90%	2.49%	0.00%
CR < E[CR]	0.39%	0.39%	0.00%
CR < 90%*E[CR]	5.91%	0.39%	0.000%
Farm Program	PLC	PLC	PLC
SCO Band	90-65	90-75	90-85
Crop Insurance	RP 65	RP 75	RP 85
CR > E[CR]	11.20%	9.96%	7.88%
CR < E[CR]	6.18%	2.70%	1.16%
CR < 90%*E[CR]	11.33%	2.70%	1.16%

Looking at the results in Table 9, the combination of ARCF and RP at 85% actually doesn't show any overlap, but ARCF with lower levels of RP and corresponding levels of SCO do show limited cases of overlap where the sum of safety net payments exceeds the actual revenue loss. These limited cases likely

point to unique cases where county losses triggered large SCO payments regardless of farm level losses. The largest overlap actual shows up with PLC, where SCO and RP appear to fit together (as in Figure 2), but SCO starts at 90% protection. Large county losses could trigger large SCO payments, even if farm level losses are smaller. In fact, the results show safety net payments nearly 10% of the time when crop revenue exceeds expectations, which predominantly would come from large county losses and large SCO payments even when farm revenue met or exceeded expectations.

The analysis suggests that the farm- versus county-level protection of the safety net programs is more relevant to the concerns of program overlap than are the specific reference levels in the various safety net programs. These concerns are not new, as the ACRE program contained a farm-level revenue trigger to address the concerns that payouts based on a state-level loss could be paid to producers regardless of farm-level revenue. The farm- versus county-level protection presents a potential overlap precisely because county losses could trigger payments even when farm losses are minimal or nonexistent. This is true of currently available area-based insurance plans (GRP, GRIP, PRF) as well, but is of particular interest because of the ability to stack the SCO policy on top of underyling farm-level coverage and the proposed 65% premium subsidy rates for SCO and could be a concern with ARCC and RLC as well, albeit at slightly lower trigger levels.

The fact that the farm-level protection of ARCF does not show as much overlap with RP, even though the two cover overlapping percentages of farm revenue seems more surprising. However, the lack of apparent potential overlap in the 2013 simulation could be a product of the differences in guarantees between the two products. ARCF protects a band of 78-88% of the farm-level average revenue based on a 5-year Olympic average yield and price. RP protects up to 85% of farm-level average revenue based on the farms actual production history (APH) based on the higher of the base futures price or harvest-time futures price for that year. Over time, the farm's APH, (not using trend yield-adjusted insurance) which could be a 10-year simple average, should likely lag the 5-year Olympic average yield which in turn should lag the expected yield, but could vary based on recent yield experience (123.5 bushels/acre, 151 bushels/acre, and 137.9 bushels/acre respectively in the simulation). Similarly, the expected price for the 2013 simulation, the crop insurance base price, and the 5-year Olympic average price could all vary as

well ($5.53/bushel, $5.65/bushel, and $5.15/bushel respectively in the simulation). Combined, the varying yield and price parameters dictate the effective protection provided by the two tools and while they reference overlapping percentage levels, they actually provide protection at substantially different levels.

Conclusion

A gradual shift in farm program focus from price-based income supports toward revenue-based risk management tools has changed the risk management environment for producers. Coupled with the proposed expansion of crop insurance tools, the risk management portfolio is more complex and integrated than ever. In this environment, optimal risk management decisions rely on sound analysis of the entire portfolio of programs and policies as opposed to program-by-program decisions. This work assesses the risk management performance and complementarity or substitutability of farm program and crop insurance options as part of the portfolio available to producers.

Using a representative farm model that incorporates all relevant levels of price and yield variables, the study provides a complete analysis of the risk management performance of alternative farm program and crop insurance choices for the eight representative farms in Nebraska. The analysis suggests the ARCF program is the most beneficial for the nonirrigated corn producers in Butler County (District 60 - East Nebraska). ARCF coupled with 75% or 85% RP and the corresponding SCO coverage outperformed all other strategies in both mean and variance. Concerns about potential overlap in programs also proved to be small with the ARCF program, but were more pronounced with the PLC program that allowed SCO coverage up to 90%. The results provide insight for effective policy design, farm program participation, and farm-level risk management decision-making.

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