

Analysis of the Supplemental Coverage Option

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Agenda

- Provide overview of the Supplemental Coverage Option (SCO)
- Determine indemnities under the program
- Incorporate indemnities into FAPRI-MU's U.S. stochastic model to gauge market impacts

Overview of SCO

- Both the House (H.R. 2642) and Senate (S. 954) have passed bills that included versions of SCO
- “Shallow loss” area insurance that producers could purchase in addition to regular policy
 - The House bill specifies that it should operate at the county level
 - The Senate bill does not define area, but county is assumed
 - Farm loss is irrelevant for determining indemnities

SCO parameters

	House		Senate	
	PLC	RLC	ARC	No ARC
Maximum coverage level	90%	n.a.	78%	90%
Lower end of coverage	Ind. insurance coverage level	n.a.	Ind. insurance coverage level	Ind. insurance coverage level
Premium subsidy	65%	n.a.	65%	65%

- Program specifics depend upon both bill and Title I option election
- Program is intended to operate actuarially fairly and funding would be provided to fully cover administrative expenses
- Available to program commodities

Calculating SCO indemnities

- With a targeted average loss ratio of one, the premium should equal the average indemnity
- Estimate indemnities from 2014 to 2022 for corn, soybeans and wheat
- Yields used in calculations
 - 1980 to 2012 yields per planted acre from NASS (per harvested for corn and wheat)
 - FSA ACRE data used to augment recent years
 - If county did not have at least 15 observations in the last 20 years, it was dropped

Calculating SCO indemnities, cont'd

- Yields, continued
 - Each county and state yield were regressed against a linear trend to get both forecasted yields and standard deviation of errors
 - Missing county residuals were estimated by regressing county yields against state yields
 - Using Latin hypercube, 500 normally distributed draws were obtained for each county, crop and year
 - Normal easy to work with
 - RMA assumes yield normality for farm yields

Calculating SCO indemnities, cont'd

- Prices taken from FAPRI-MU stochastic baseline
 - Model consists of approximately 2,000 equations for crops, livestock, biofuels, etc.
 - Correlated draws of selected exogenous variables (both supply and demand shifters) used to generate 500 solutions for endogenous variables
 - Thus 500 farm prices for each commodity in each year

Calculating SCO indemnities, cont'd

- FAPRI-MU farm average price projections per bushel (March baseline), marketing year

	14/15	15/16	16/17	17/18	18/19	19/20	20/21	21/22	22/23
Corn	4.69	4.73	4.79	4.83	4.88	4.88	4.87	4.84	4.82
Soybeans	11.25	10.98	11.22	11.47	11.67	11.65	11.69	11.69	11.68
Wheat	6.19	5.95	6.01	6.11	6.28	6.35	6.34	6.30	6.36

Standard deviations in 2015/16:

\$1.06/bu. for corn

\$2.52/bu. for soybeans

\$1.17/bu. for wheat

Calculating SCO indemnities, cont'd

- Correlating county yields and national prices
 - Lowest level of aggregated yields in FAPRI-MU model is 15 states
 - We obtained correlations between these states and national prices for last year of baseline
 - Correlations for all state detrended yields obtained from historical NASS data

Calculating SCO indemnities, cont'd

- The missing state correlations for each crop were obtained by utilizing the following correlation matrix, Ω :

$$\Omega_{17 \times 17} = \begin{bmatrix} 1 & v_i' & \rho_{1,17} \\ v_i & m & p \\ \rho_{17,1} & p' & 1 \end{bmatrix}$$

Where:

- p is a 15×1 vector of state yield to national price correlations from the FAPRI model
- m is the 15×15 matrix of state yield correlations from the FAPRI baseline
- v_i 15×1 vector of state yield correlations between state i and the states in the FAPRI model from the detrended NASS data
- $\rho_{1,17}$ is the unknown correlation between the yield for state i and the national price for the crop (note $\rho_{1,17} = \rho_{17,1}$)

Calculating SCO indemnities, cont'd

- By assuming that the partial correlation between state i yield and the national price is zero, $\rho_{1,17}$ can be solved for by finding the value of $\rho_{1,17}$ that sets the (1,17) minor (or cofactor) to zero, i.e.

$$\text{Solve } \det \begin{bmatrix} v_i & m \\ \rho_{17,1} & p' \end{bmatrix} = 0 \text{ for } \rho_{17,1}.$$

- Proof in appendix 1 of paper.

Calculating SCO indemnities, cont'd

- County residual to national price correlations still missing
- Former method has trouble solving this many variables
 - Instead use a 3x3 matrix and use state yield as “bridge” variable such that $\rho_{c,p} = \rho_{s,p} * \rho_{s,c}$ where c is the county yield, p is the national price, and s is the state yield
 - In this case, $\rho_{s,p} * \rho_{s,c}$ is the midpoint of possible values for $\rho_{c,p}$ and imposes a partial correlation of zero
 - Proof in appendix 2 of paper

Calculating SCO indemnities, cont'd

- A correlation matrix is built for each commodity with all county yields and national prices
- Matrix is both overspecified and combines multiple data sources, so PSD fails
 - Use Higham (2002) to find nearest “true” correlation matrix
- Use Iman and Conover’s (1982) method to rearranged prices and yields to impose correlation
 - Given that FAPRI-MU’s prices are exogenous, a reordering algorithm is more appropriate than a data generating algorithms that use copulas

Calculating SCO indemnities, cont'd

■ Futures prices

- Harvest price obtained directly from farm price
 - Corn: harvest price = farm price + \$.088
 - Soybeans: harvest price = farm price + \$.054
 - Wheat: harvest price = $1.109 \times \text{farm price} - \0.163
- Planting price based used random draws from log-normal distribution centered on the harvest price
 - Historical volatility calculated based upon 1980 to 2011 market outcomes
 - Volatilities: 0.1843 for corn, 0.1715 for soybeans and 0.1816 for wheat

Calculating SCO indemnities, cont'd

- We assumed that 2012 crop insurance participation rates would continue

Coverage level	Corn	Soybeans	Wheat
50%	6.6%	8.5%	9.0%
55%	0.3%	0.4%	0.6%
60%	1.9%	1.8%	4.8%
65%	6.8%	7.0%	15.0%
70%	20.1%	21.2%	35.0%
75%	29.2%	31.3%	24.6%
80%	22.1%	20.5%	6.5%
85%	10.9%	7.6%	4.1%
90%	2.1%	1.7%	0.4%

Calculating SCO indemnities, cont'd

- Assumed SCO participation rates across commodities based upon prior analysis.

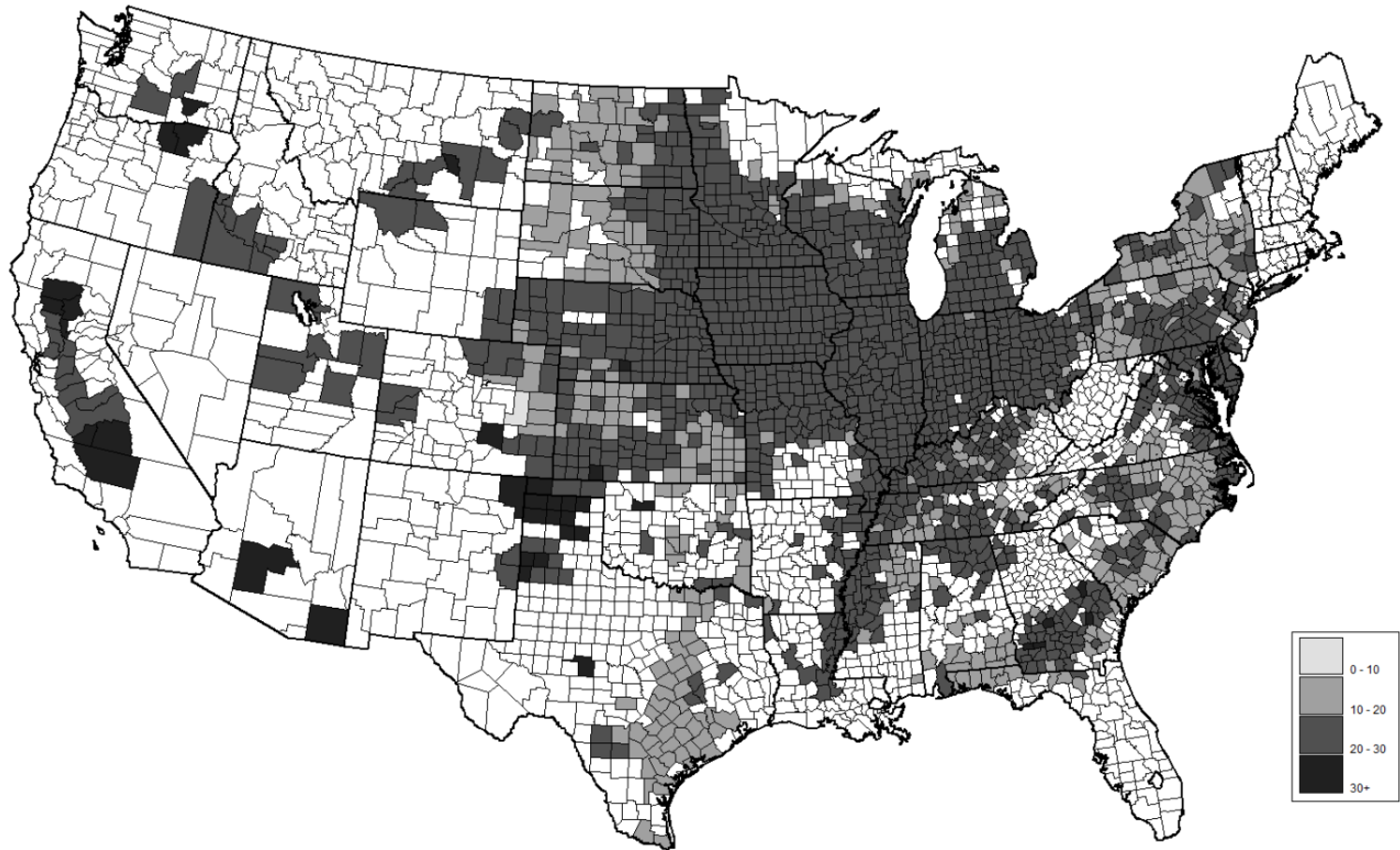
		10% deductible Senate	22% deductible Senate
	House		
Corn	30%	10%	45%
Soybeans	30%	10%	45%
Wheat	40%	10%	45%

- National average SCO indemnities were calculated by weighting each county by its share of 2009-11 area

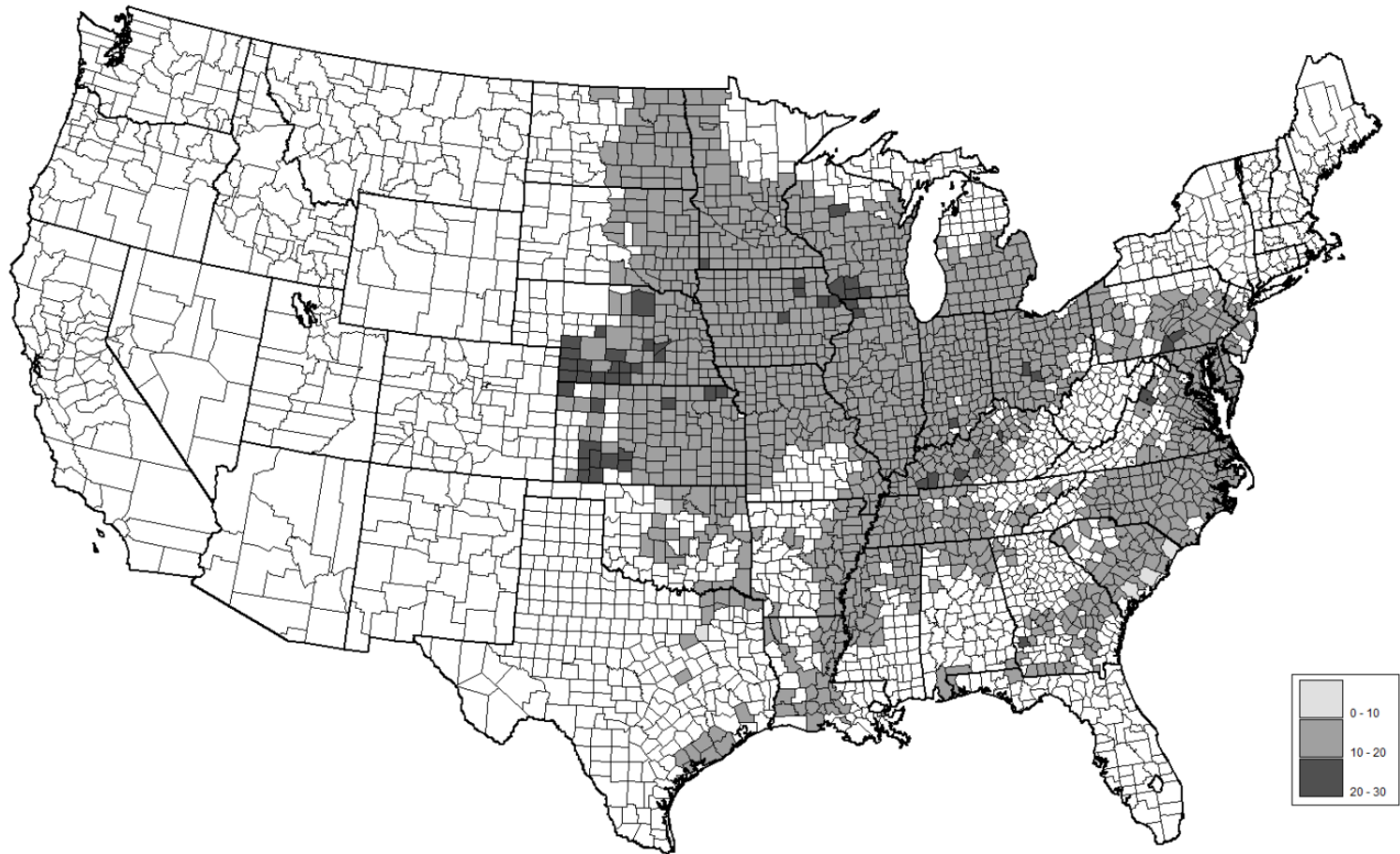
SCO national 2014-2018 average raw gross payment rates for participants, dollars per planted acre

	House	Senate
Corn	27.68	9.53
Soybeans	17.25	5.46
Wheat	14.28	5.70

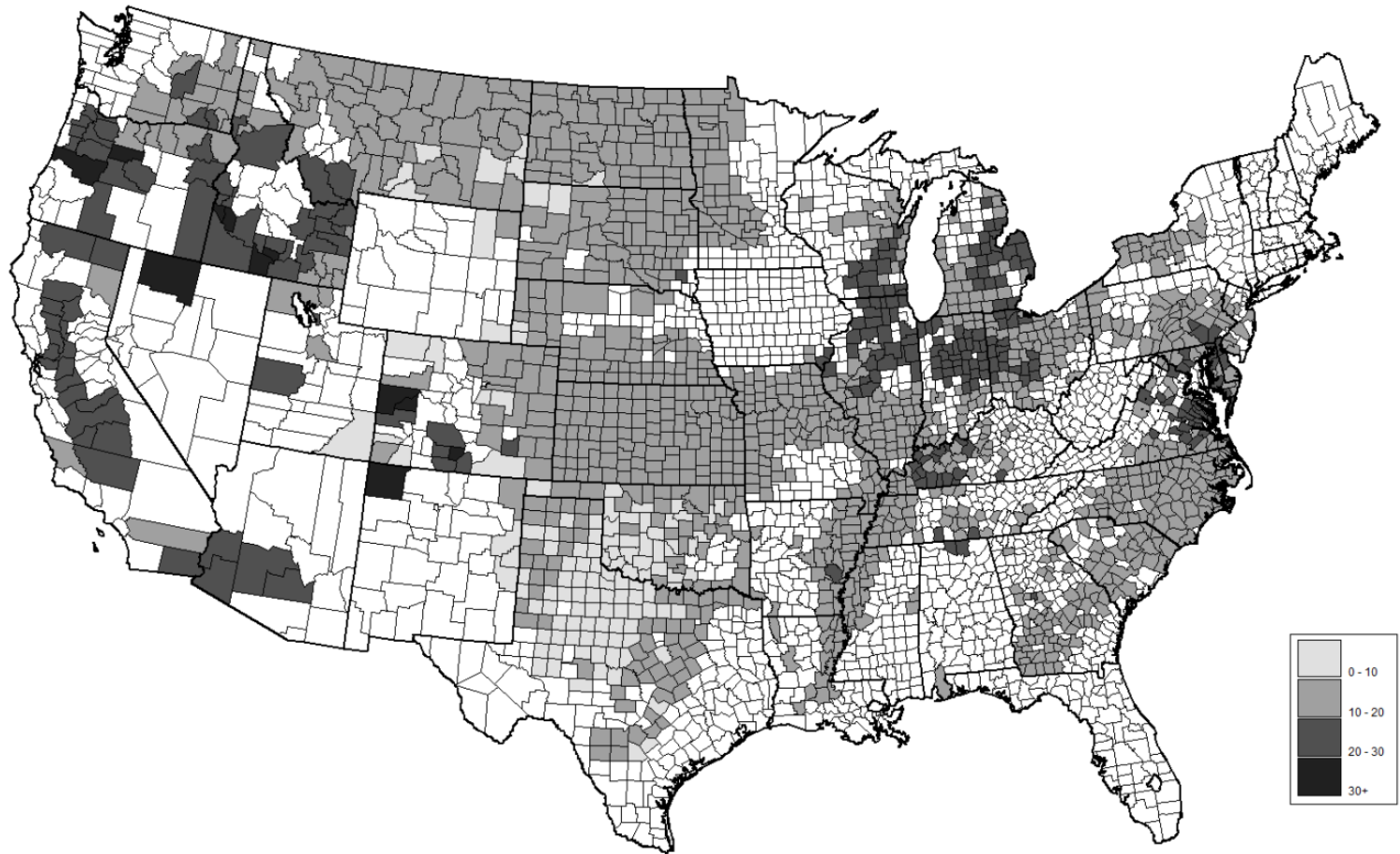
Corn average SCO national 2014-2018 average gross indemnities for participants under the House bill, dollars per planted acre



Soybean average SCO national 2014-2018 average gross indemnities for participants under the House bill, dollars per planted acre



Wheat average SCO national 2014-2018 average gross indemnities for participants under the House bill, dollars per planted acre



SCO in FAPRI-MU models

- SCO indemnities included for the 500 model iterations
 - The program's gross indemnities are the raw payment rate multiplied by the one plus 60% times the 2007 to 2011 prevented planted acreage
- Premiums were set to the average of the 500 indemnities
- SCO extended to barley, oats, peanuts, rice, sunflowerseed and sorghum by comparing relative payments in ARC or RLC
- Other features of farm bills were included.
 - Scenarios run with and without SCO
 - ARC is assumed to have 100% participation rate without SCO

Program net indemnities, 2014-2018 average, dollars per acre for participating producers

		10% deductible Senate	22% deductible Senate
	House		
Corn	18.20	18.20	3.61
Soybeans	11.30	11.30	1.86
Wheat	9.46	9.46	2.51
Upland cotton	n.a.	n.a.	n.a.
Sorghum	6.80	6.80	1.33
Barley	7.88	7.88	1.45
Rice	13.72	13.72	2.55
Peanuts	16.48	16.48	2.50

Percent change in farm prices from addition of SCO

	House	Senate
Corn	-0.34%	-0.09%
Soybeans	-0.19%	-0.03%
Wheat	-0.47%	-0.16%
Upland cotton	0.15%	0.05%
Sorghum	-0.31%	-0.08%
Rice	-0.25%	-0.08%
Oats	-0.17%	-0.04%
Barley	-0.50%	-0.10%
Sunflower seed	-0.09%	-0.02%
Peanuts	-0.91%	-0.18%

Percent change in acreage from addition of SCO

	House	Senate
Corn	0.08%	0.02%
Soybeans	0.03%	0.00%
Wheat	0.35%	0.13%
Upland cotton	-0.27%	-0.08%
Sorghum	0.15%	0.03%
Rice	0.23%	0.08%
Oats	-0.19%	-0.02%
Barley	0.27%	0.05%
Sunflower seed	0.11%	0.06%
Peanuts	0.40%	0.09%
Sugar beets	-0.04%	-0.01%
Sugarcane	0.00%	0.00%
12 major crops	0.11%	0.03%

Conclusions

- SCO results in 10 year fiscal net outlay of \$5.765 bil. for Senate and \$9.839 bil. for House
- The marginal effects of adding SCO in both bills is rather small as the changes in prices and area for both bills is less than 1%
- Actual results are likely to differ for many reasons such as different participation rates than assumed here or different market circumstances

Bonus slides

- Following slides are from FAPRI-MU's analysis of the House and Senate farm bills
- Report #06-13 at www.fapri.missouri.edu

Corn returns (p. 19, Table 10)

(dollars, weighted for participation)

	Baseline (2014-18 avg.)	House change vs. baseline	Senate change vs. baseline
Market sales/a.	797.30	-3.99	-5.44
Marketing loans/a.	0.00	0.00	0.00
ACRE/a.	4.22	-4.22	-4.22
ARC or RLC/a.	0.00	+10.93	+20.89
PLC/a.	0.00	+6.00	0.00
Insurance net indemnities/a.	26.50	+5.03	+2.94
Sum of above	828.02	+13.75	+14.17
DPs/base a.	23.38	-23.38	-23.38
CCPs or AMPs/base a.	0.00	0.00	+0.72
Sum per base a.	23.38	-23.38	-22.66

Rice returns (p. 20, Table 10)

(dollars, weighted for participation)

	Baseline (2014-18 avg.)	House change vs. baseline	Senate change vs. baseline
Market sales/a.	1047.37	-20.37	+10.03
Marketing loans/a.	0.00	0.00	0.00
ACRE/a.	0.37	-0.37	-0.37
ARC or RLC/a.	0.00	+0.14	+1.09
PLC/a.	0.00	+75.64	0.00
Insurance net indemnities/a.	12.53	+6.33	+7.46
Sum of above	1060.26	+61.37	+18.21
DPs/base a.	95.93	-95.93	-95.93
CCPs or AMPs/base a.	0.04	-0.04	+31.54
Sum per base a.	95.98	-95.98	-64.39

Budgetary outlays (p. 23, Table 12)

(FY 2014-23 total, million dollars)

	Baseline (2014-23 total)	House change vs. baseline	Senate change vs. baseline
CCC net outlays	92,288	-27,812	-28,151
Corn	22,644	-9,576	-7,495
Soybeans	7,808	-2,887	-1,203
Wheat	12,222	-6,828	-7,442
Upland cotton	9,016	-5,505	-6,405
Rice	4,213	-2,016	-2,989
Crop insurance	85,806	+15,206	+10,036
STAX net ind.	0	+2,636	+2,637
SCO net ind.	0	+9,839	+5,969
CCC + crop ins.	178,095	-12,605	-18,115

CBO estimates for these provisions: House: -\$15.9 billion; Senate: -\$16.4 billion.

Thanks!

- FAPRI-MU website: www.fapri.missouri.edu for farm bill report (#6-13)
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