

Economic Analysis of Crop Insurance Indemnities for Areas in Eastern Arkansas Affected by Summer Floods.

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Untimely flooding in June and July have adversely affected row crops in several counties in eastern Arkansas. Some of the hardest hit counties include Woodruff, Cross, and Monroe. This analysis quantifies net returns with and without flood damage to crops for a farm situation in which the farm is split into 500 acres of rice, soybeans, and corn. The analysis estimates returns by crop and farm without crop damage (the base farm) and returns by crop and farm for various levels of crop damage resulting from flood. The analysis also estimates crop insurance indemnities for alternative insurance products assuming various levels of crop yield damage for the farm.

Crop yield damage is assessed across the farm in 10% increments, ranging from 0% (no farm-level crop yield damage) to 100% (total farm-level crop yield damage). The higher levels of farm-level crop yield damage (50% and beyond) are extremes but are included for demonstration purposes. Consultation with state crop agronomists indicated the amount of damage for specific areas affected by flood could range anywhere from 10% to 100% (total loss) depending on the amount of time the crop is under water. However, farm-level damage from flooding is area specific and is unlikely to result in farm-level yield damage levels higher than 50%, although some farms in the affected areas may have suffered such yield losses. Soybeans appear to be most susceptible to flood. Soybeans can be under water no more than 24 hours. After that, yields start to decline rapidly. Rice can be underwater for less than 7 days and receive no more than a 10% yield loss. Beyond this period, beyond 10 days or so, yield losses could reach 50% or higher and could reach complete loss.

The types of crop insurance evaluated include the following:

- Catastrophic (CAT)
- 50% Revenue Protection (50% RP)
- 60% Revenue Protection (60% RP)
- 70% Revenue Protection (70% RP)

Catastrophic and 70% revenue protection are the most common policies sold in the flood-affected region.

Assumptions regarding calculation of indemnities for each crop insurance product are as follows:

- Actual Yields used in the Analysis – Calculated as the two year average yield by crop for the counties Cross, Jackson, Monroe, and Woodruff for the period 2012 and 2013
- Actual Production History (APH) Yields – Calculated as 10-year average yields by crop for the counties Cross, Jackson, Monroe, and Woodruff for the period 2004 to 2013.
- Actual and APH yields were adjusted upward by the 10 year standard deviation to reflect above average yields for each crop.

- Projected Prices for each crop – The 2014 projected prices determined for each crop announced in February by the USDA – Risk Management Agency
- Harvest Prices for each crop – Set at the projected 2014 price for each crop, as harvest prices will not be set by the USDA - RMA until later in the year (for rice using CBOT November futures prices during the month of September, for soybeans using the CBOT November futures prices during the month of October, and for corn using the CBOT December futures prices from August 15 through September 14).
- Farmer premiums were calculated by revenue coverage level using 2013 Federal Crop Insurance Corporation data by crop for Cross, Jackson, Monroe, and Woodruff Counties. Farmer premiums were averaged across counties by crop and revenue protection plan and represent the total premium for crop insurance coverage less the portion of the premium subsidized by the Federal Government (total premium – premium subsidy).

Data used to calculate crop insurance indemnities in the analysis are presented in Table 1.

Table 1. Variables Used to Estimate Crop Insurance Indemnities for Catastrophic and Various Revenue Protection Coverage Levels

Yields:	Rice (lbs/acre)	Soybeans (bu/acre)	Corn (bu/acre)
APH Yield	7,235	39.30	166.15
Actual Yield	7,638	48.01	189.58
Projected and Harvest Prices	Rice (\$/lb)	Soybean (bu/acre)	Corn (bu/acre)
Projected Price	0.139	11.14	4.53
Harvest Price	0.139	11.14	4.53
RP Coverage Level	Rice Premium (\$/acre)	Soybean Premium (\$/acre)	Corn Premium (\$/acre)
50 Percent	6.14	4.75	8.45
60 Percent	11.06	8.54	13.20
70 Percent	13.74	9.00	20.08

Crop prices, variable costs, and fixed costs are calculated by crop and for the 1,500 acre farm using 2014 crop enterprise budgets for Arkansas field crops. A 75-25 crop share is assumed for the farm in which the farmer receives 75 percent of the crop on rented land. Acres are split 80 percent rented and 20 percent owned (300 acres owned; 1,200 acres rented by crop-share). Whole farm returns assuming no flood damage are presented in Table 2.

Table 2. Whole Farm Returns Above Variable and Total Specified Expenses Assuming No Flood Damage.

Variable	Rice	Soybeans	Corn	Total
Price	\$13.89/cwt	\$11.80/bu	\$4.35/bu	
Yield	76 cwt/acre	48 bu/ac	190 bu/acre	
Acres	500	500	500	1500
Item	Rice	Soybeans	Corn	Total
Crop Revenue	424,347	226,628	329,877	980,852
Less Production Expenses	295,863	148,382	285,816	730,061
Returns Less Production Expenses	128,484	78,246	44,062	250,791
Less Fixed Costs				132,450
Returns Above Total Specified Expenses				118,341

Prices, variable, and fixed expenses obtained from 2014 crop enterprise budgets. Returns for the farm assume a 75-25 crop share arrangement on rented land. Owned land equals 300 acres; rented land equals 1,200 acres.

The following four tables (Tables 3 – 6) present estimated crop insurance indemnities by coverage level and farm-level damage percent on a per-acre basis. Data in the tables highlight the fact that a significant portion of the farm must have suffered crop yield damage before crop insurance indemnities are triggered. Crop yield damage for the farm must be as high as 40 to 60% depending on the crop insurance product before indemnities are triggered.

Tables 7 – 9 present farm-level net indemnities, returns above variable costs plus net indemnities, and returns above total specified costs plus net indemnities by crop, insurance policy, and farm-level crop yield damage percent. Table 9 shows that estimated returns above variable costs begin to drop off substantially between 10 to 30% crop yield damage, while Table 8 shows crop insurance indemnities do not trigger until the 40 to 50% farm-level crop yield damage mark for most crops.

Interpretation of results: A few comments need to be made to correctly interpret the results of the analysis. First of all, not all expenses have been included in the analysis. For example, rice levees may have been washed away by flooding and may need to be reestablished once waters have receded and ground is dry enough to rework. Also, replanting costs have not been included. Rice and corn are well beyond the replanting window, but there may still be time to replant some soybean fields, though the planting window is nearly done even for soybeans. In addition, many soybean fields have been replanted numerous times due to flooding (in some instances as many as 3 to 4 times). These expenses have not been included in the analysis. Nor have expenses associated with additional herbicide and fungicide treatments been added due to replanting.

Crop insurance indemnities in this analysis were estimated based on farm-level crop damage for each crop. This was done because most crop insurance is purchased using enterprise units. Premiums are cheaper with the enterprise unit classification, but this means losing a field to flood may not appreciably reduce the actual yield for the farm enough to trigger indemnity payments. Thus indemnities are less frequent with enterprise units than with other insurable units. Therefore, the overall damage in production needs to be large for the whole enterprise unit in order for a payment to be triggered even at higher buy-up coverage levels. Farmers can partition farms into basic units. For example, owned land and cash rented land could be one basic unit, while crop share land could be another. Crop share land from two different landlords could also be grouped into two basic units. Premiums are higher for basic units than for enterprise units. Farms could also be split into optional units. If the farm has land in different township sections, the farm could be split up into optional units. For example, if the farm owns and cash rents land in one township section and also owns and cash rents land in another township section, the farm could be split into two optional units as opposed to including all the land in one basic unit or one enterprise unit. Operational units could also be split into irrigated and non-irrigated acreage as well. Optional units have the largest premiums and are the most costly of the three unit classifications.

Table 3. Total Crop Insurance Indemnities from Catastrophic (CAT) Coverage by Crop Yield for Farm-Level Crop Damage Ranging from 0 to 100 Percent by Crop.

Crop Yield Damage Percent	Rice (\$/acre)	Soybean (\$/acre)	Corn (\$/acre)
0%	0	0	0
10%	0	0	0
20%	0	0	0
30%	0	0	0
40%	0	0	0
50%	0	0	0
60%	43	3	18
70%	101	32	65
80%	160	62	113
90%	218	91	160
100%	277	120	207

Note: The premium for CAT coverage is subsidized 100% by the Federal Government. However, producers must pay a \$300 administrative fee for each crop insured in each county.

Table 4. Total and Net Indemnities at 50 Percent Revenue Protection for Farm-Level Crop Yield Damage Ranging from 0 to 100 Percent.

Crop Yield Damage Percent	Rice (\$/acre)	Soybean (\$/acre)	Corn (\$/acre)
Total Indemnities at 50% Coverage Level			
0%	0.00	0.00	0.00
10%	0.00	0.00	0.00
20%	0.00	0.00	0.00
30%	0.00	0.00	0.00
40%	0.00	0.00	0.00
50%	0.00	0.00	0.00
60%	78.14	4.96	32.80
70%	184.31	58.45	118.68
80%	290.48	111.94	204.56
90%	396.66	165.43	290.44
100%	502.83	218.91	376.33
Net Indemnities at 50% Coverage Level ^a			
0%	-6.14	-4.75	-8.45
10%	-6.14	-4.75	-8.45
20%	-6.14	-4.75	-8.45
30%	-6.14	-4.75	-8.45
40%	-6.14	-4.75	-8.45
50%	-6.14	-4.75	-8.45
60%	72.01	0.21	24.35
70%	178.18	53.70	110.23
80%	284.35	107.19	196.11
90%	390.52	160.67	281.99
100%	496.69	214.16	367.88

^a Net indemnities equal total indemnities less the premium for the coverage level.

Table 5. Total and Net Indemnities at 60 Percent Revenue Protection for Farm-Level Crop Yield Damage Ranging from 0 to 100 Percent.

Crop Yield Damage Percent	Rice (\$/acre)	Soybean (\$/acre)	Corn (\$/acre)
Total Indemnities at 60% Coverage Level			
0%	0.00	0.00	0.00
10%	0.00	0.00	0.00
20%	0.00	0.00	0.00
30%	0.00	0.00	0.00
40%	0.00	0.00	0.00
50%	72.53	0.00	22.18
60%	178.71	48.75	108.06
70%	284.88	102.23	193.94
80%	391.05	155.72	279.83
90%	497.22	209.21	365.71
100%	603.39	262.70	451.59
Net Indemnities at 60% Coverage Level ^a			
0%	-11.06	-8.54	-13.20
10%	-11.06	-8.54	-13.20
20%	-11.06	-8.54	-13.20
30%	-11.06	-8.54	-13.20
40%	-11.06	-8.54	-13.20
50%	61.47	-8.54	8.98
60%	167.64	40.21	94.86
70%	273.82	93.69	180.74
80%	379.99	147.18	266.62
90%	486.16	200.67	352.50
100%	592.33	254.16	438.39

^a Net indemnities equal total indemnities less the premium for the coverage level.

Table 6. Total and Net Indemnities at 70 Percent Revenue Protection for Farm-Level Crop Yield Damage Ranging from 0 to 100 Percent.

Crop Yield Damage Percent	Rice (\$/acre)	Soybean (\$/acre)	Corn (\$/acre)
Total Indemnities at 70% Coverage Level			
0%	0.00	0.00	0.00
10%	0.00	0.00	0.00
20%	0.00	0.00	0.00
30%	0.00	0.00	0.00
40%	66.93	0.00	11.56
50%	173.10	39.04	97.45
60%	279.27	92.53	183.33
70%	385.44	146.02	269.21
80%	491.61	199.50	355.09
90%	597.79	252.99	440.97
100%	703.96	306.48	526.86
Net Indemnities at 70% Coverage Level ^a			
0%	-13.74	-9.00	-20.08
10%	-13.74	-9.00	-20.08
20%	-13.74	-9.00	-20.08
30%	-13.74	-9.00	-20.08
40%	53.19	-9.00	-8.51
50%	159.36	30.04	77.37
60%	265.53	83.53	163.25
70%	371.70	137.02	249.13
80%	477.88	190.51	335.01
90%	584.05	243.99	420.90
100%	690.22	297.48	506.78

^a Net indemnities equal total indemnities less the premium for the coverage level.

Table 7. Total Net Indemnities by Crop, Coverage Option, and Farm Level Crop Damage Percent

Insurance Policy	Crop Yield Damage Percent										
	0%	10%	20%	30%	40%	50%	60%	70%	80%	90%	100%
Net Rice Indemnities											
CAT	-300	-300	-300	-300	-300	-300	21,189	50,386	79,583	108,780	137,977
50% RP	-3,068	-3,068	-3,068	-3,068	-3,068	-3,068	36,003	89,088	142,174	195,260	248,346
60% RP	-5,531	-5,531	-5,531	-5,531	-5,531	30,737	83,822	136,908	189,994	243,080	296,166
70% RP	-6,870	-6,870	-6,870	-6,870	26,595	79,680	132,766	185,852	238,938	292,024	345,109
Net Soybean Indemnities											
CAT	-300	-300	-300	-300	-300	-300	1,065	15,774	30,483	45,192	59,901
50% RP	-2,376	-2,376	-2,376	-2,376	-2,376	-2,376	105	26,849	53,593	80,337	107,081
60% RP	-4,270	-4,270	-4,270	-4,270	-4,270	-4,270	20,103	46,847	73,591	100,334	127,078
70% RP	-4,498	-4,498	-4,498	-4,498	-4,498	15,022	41,766	68,510	95,254	121,997	148,741
Net Corn Indemnities											
CAT	-300	-300	-300	-300	-300	-300	8,719	32,337	55,954	79,572	103,189
50% RP	-4,224	-4,224	-4,224	-4,224	-4,224	-4,224	12,174	55,115	98,056	140,997	183,938
60% RP	-6,602	-6,602	-6,602	-6,602	-6,602	4,488	47,429	90,370	133,311	176,252	219,193
70% RP	-10,039	-10,039	-10,039	-10,039	-4,257	38,684	81,625	124,566	167,507	210,448	253,389
Total Net Indemnities Across Crops											
CAT	-900	-900	-900	-900	-900	-900	30,973	98,497	166,021	233,544	301,068
50% RP	-9,668	-9,668	-9,668	-9,668	-9,668	-9,668	48,282	171,053	293,824	416,594	539,365
60% RP	-16,403	-16,403	-16,403	-16,403	-16,403	30,955	151,354	274,125	396,896	519,667	642,437
70% RP	-21,407	-21,407	-21,407	-21,407	17,839	133,386	256,157	378,927	501,698	624,469	747,239

Table 8. Whole Farm Returns Above Variable Costs Plus Total Net Indemnities by Crop, Coverage Option, and Farm-Level Crop Damage Percent

Insurance Policy	Crop Yield Damage Percent										
	0%	10%	20%	30%	40%	50%	60%	70%	80%	90%	100%
Rice Net Returns Above Variable Costs Plus Net Indemnities											
CAT	128,184	90,077	51,971	13,865	-24,242	-62,348	-78,966	-87,875	-96,784	-105,693	-114,603
50% RP	125,416	87,310	49,203	11,097	-27,010	-65,116	-64,152	-49,172	-34,193	-19,214	-4,234
60% RP	122,953	84,847	46,740	8,634	-29,472	-31,312	-16,332	-1,353	13,627	28,606	43,586
70% RP	121,614	83,508	45,401	7,295	2,653	17,632	32,612	47,591	62,570	77,550	92,529
Soybean Net Returns Above Variable Costs Plus Net Indemnities											
CAT	77,946	55,883	33,821	11,758	-10,305	-32,367	-53,065	-60,418	-67,772	-75,125	-82,479
50% RP	75,870	53,807	31,745	9,682	-12,381	-34,443	-54,025	-49,343	-44,662	-39,980	-35,299
60% RP	73,976	51,913	29,851	7,788	-14,275	-36,337	-34,027	-29,346	-24,664	-19,983	-15,302
70% RP	73,747	51,685	29,622	7,560	-14,503	-17,046	-12,364	-7,683	-3,001	1,680	6,361
Corn Net Returns Above Variable Costs Plus Net Indemnities											
CAT	43,762	14,395	-14,972	-44,338	-73,705	-103,072	-123,419	-129,168	-134,917	-140,666	-146,416
50% RP	39,837	10,471	-18,896	-48,263	-77,629	-106,996	-119,964	-106,390	-92,815	-79,241	-65,667
60% RP	37,460	8,093	-21,274	-50,640	-80,007	-98,283	-84,709	-71,135	-57,560	-43,986	-30,412
70% RP	34,023	4,656	-24,711	-54,077	-77,662	-64,088	-50,513	-36,939	-23,365	-9,791	3,784
Total Net Returns Above Variable Costs Plus Net Indemnities											
CAT	249,891	160,355	70,820	-18,716	-108,251	-197,787	-255,450	-277,462	-299,473	-321,485	-343,497
50% RP	241,123	151,587	62,052	-27,484	-117,019	-206,555	-238,140	-204,905	-171,670	-138,435	-105,200
60% RP	234,388	144,853	55,317	-34,218	-123,754	-165,932	-135,068	-101,833	-68,598	-35,363	-2,128
70% RP	229,384	139,848	50,313	-39,223	-89,512	-63,501	-30,266	2,969	36,204	69,439	102,674

Table 9. Whole Farm Returns Above Total Specified Costs Plus Total Net Indemnities by Coverage Option and Farm Level Crop Damage Percent

Insurance Policy	Crop Yield Damage Percent										
	0%	10%	20%	30%	40%	50%	60%	70%	80%	90%	100%
Net Returns Above Total Specified Costs Plus Net Indemnities											
CAT	117,441	27,905	-61,630	-151,166	-240,701	-330,237	-387,900	-409,912	-431,923	-453,935	-475,947
50% RP	108,673	19,137	-70,398	-159,934	-249,469	-339,005	-370,590	-337,355	-304,120	-270,885	-237,650
60% RP	101,938	12,403	-77,133	-166,668	-256,204	-298,382	-267,518	-234,283	-201,048	-167,813	-134,578
70% RP	96,934	7,398	-82,137	-171,673	-221,962	-195,951	-162,716	-129,481	-96,246	-63,011	-29,776

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