

## Fall 2002 Livestock Revenue Insurance Alternatives, How Did they Perform?

Two livestock revenue insurance alternatives, Livestock Risk Protection (LRP) and Livestock Gross Margin (LGM), were introduced in Iowa in July 2002. These products represent new alternatives to market risk management tools offered by the CME and CBOT. Insurance policies purchased in July 2002 expire in January 2003. To help producers weigh the merits of these programs, Iowa State University extension evaluated the outcome of LRP and LGM policies purchased in July to cover hogs marketed between August 2002 and January 2003. These outcomes were then compared to similar risk management strategies using options on futures prices. The comparison assumed 204 head were marketed each month, enough to comprise a lean hog futures contract.

### Summary of the Insurance Products

LRP protects livestock producers from declining hog prices by guaranteeing a specified price level. Available coverage levels range from 70 to 95 percent of prevailing market prices. Coverage can be purchased year round and is available in four endorsement periods; 90, 120, 150, and 180 days. Indemnity payments are triggered if the cash price index<sup>1</sup> at the end of the endorsement period falls below the guaranteed price. LGM was designed to protect producers from both declining hog prices and rising feed prices. The program divides the year into two insurance periods; February through July, and August through January. Each insurance period is further divided into six marketing periods that coincide with the calendar months. An LGM policy guarantees the gross margin per head (revenue minus feed cost) for each marketing month within the insurance period. The gross margin guarantee levels are determined by lean hog, corn, and soybean meal futures prices prevailing when the policy is purchased; and are available at 85, 90, 95, and 100 percent coverage. USDA Risk Management Agency publishes the monthly gross margin guarantees and premiums for the upcoming insurance period on January 15<sup>th</sup> and July 15<sup>th</sup>. The enrollment deadlines are January 31<sup>st</sup> and July 31<sup>st</sup>. At sign-up, the producer designates the type of operation (farrow to finish or finish only), and specifies the number of planned marketings during each month of the insurance period.

### Livestock Risk Protection vs. Lean Hog Put Options

Table 1 presents the transaction dates, premiums, and payouts for the LRP scenario. In this example, a policy including all four-endorsement periods was purchased July 15, 2002. The maximum coverage levels available were \$40.00, \$38.21, \$38.00, and \$37.90 per cwt for the marketing months October through January, respectively. Lower coverage levels were not included in this analysis. The premiums ranged from \$847 for the 90-day endorsement period to \$1,415 for the 180-day endorsement period. The premium for a policy that includes all available endorsement periods totaled \$4,727. The realized price index at the end of each endorsement period ranged from \$1 to \$4 per cwt higher than the guaranteed price. Consequently, no indemnity payments were triggered. The cumulative net return to price protection (indemnity payments minus premiums) using LRP was \$-4,727, or \$-5.79 per head.

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<sup>1</sup> The cash index is a volume weighted average price reported by AMS for the final two days of the endorsement period. The report can be found at [http://www.ams.usda.gov/mnreports/lm\\_hg213.txt](http://www.ams.usda.gov/mnreports/lm_hg213.txt). This is same series used to settle the CME lean hog contract.

Table 2 shows the outcome of the put option strategy comparable to the LRP example. In this scenario, four put options on lean hog futures were purchased on July 15. Each option contract was purchased at the lowest strike price available with delivery months corresponding to the LRP endorsement periods. The price floors, however, were still \$1 to \$2 above the highest coverage levels available under LRP. The individual contract premiums were higher than LRP for the October, November, and December delivery months but lower than LRP for January. Cumulative premiums paid for contracts covering the four marketing months totaled to \$5,688, exceeding the premiums paid for the LRP policy by \$961, or \$1.77 per head marketed. A federal subsidy reduces the cost of LRP, as the pre-subsidy premiums are nearly identical to the premiums for the option strategy in Table 2. The contract exercised in November yielded \$180, while the contracts covering October, December, and January marketings expired at virtually no value. *Overall, the net return to price protection was \$-5,487, \$760 (\$0.92 per head) less than the return offered by LRP alternative.*

Table 1. Outcome of a Livestock Risk Protection Policy purchased July 15, 2002.

	Marketing Month				Total
	Oct	Nov	Dec	Jan	
Head Marketed	204	204	204	204	
Purchase Date	7/15/02	7/15/02	7/15/02	7/15/02	
Endorsement Length (days)	90	120	150	180	
Price Guarantee (\$/cwt)	40.00	38.21	38.00	37.90	
Premium (\$)	847	1,215	1,250	1,415	4,727
Realized Index Price (\$/cwt)	43.56	39.88	43.93	42.58	
Indemnity Payment (\$)	0.00	0.00	0.00	0.00	0.00
Net Return (\$)	-847	-1,215	-1,250	-1,415	-4,727
Net Return (\$/Head)	-4.15	-5.96	-6.13	-6.94	-5.79

Table 2. Outcome of a lean hog option strategy with coverage comparable to the LRP example from Table 1.

	Marketing Month				Total
	Oct	Nov	Dec	Jan	
Head Marketed	204	204	204	204	
Date Purchased	7/15/02	7/15/02	7/15/02	7/15/02	
Strike Price (\$/cwt)	42.00	40.00	40.00	40.00	
Contract Delivery Month	Oct 02	Dec 02	Dec 02	Feb 03	
Premium (\$)	2.90	3.95	3.95	3.42	
Total Premium (\$)	1,160	1,580	1,580	1,368	5,688
Date Sold	10/15/02	11/14/02	12/13/02	01/15/03	
Exercise Price (\$/cwt)	0.025	0.45	0.025	0.002	
Total Exercise Value (\$)	10	180	10	1	211
Net Return (\$)	-1,150	-1,400	-1,570	-1,367	-5,487
Net Return (\$/Head)	-5.59	-6.86	-7.70	-6.70	-6.72

### **Livestock Gross Margin vs. Put/Call Combination Strategy**

Table 3 shows the details and outcome of the LGM scenario. Consistent with the LRP example, the LGM example assumed 204 head were marketed each month. Unlike LRP, however, LGM coverage was available during the August and September marketing months. Premiums were

\$7,278 and \$7,215 (\$5.94 and \$5.89 per head) for 100 percent coverage in the farrow to finish (F-F) and finish only (F) alternatives, respectively. As the marketing period unfolded, indemnity payments accrued during August and September, when hog prices crashed and feed prices were rising. Indemnity accruals during August alone were large enough to offset the premium paid to cover the entire insurance period. The December lean hog contract, however, rallied after the September Quarterly Hogs and Pigs Report eased fears of a fourth quarter price meltdown. Consequently, the accumulated indemnity balance was eliminated by the end of the insurance period. The net return to risk management was \$-7,278 and \$-7,215 for the farrow to finish and finish only policies, respectively. On a per head basis, the net return was \$-5.94 and \$-5.89, respectively.

Table 3. Gross margin guarantees and indemnity payments for Livestock Gross Margin Insurance Sold July 15, 2002 at 100% coverage.

	Farrow to Finish Enterprise Premium = \$7,278 (\$5.94 per Head)				Finishing Enterprise Premium = \$7,215 (\$5.89 per Head)			
	Gross Margin Guarantee	Realized Gross Margin	Indemnity	Cumulative Indemnity Payment	Gross Margin Guarantee	Realized Gross Margin	Indemnity	Cumulative Indemnity Payment
	-----Dollars per Head-----							
August	57.20	51.12	6.08	6.08	63.41	57.64	5.77	5.77
September	47.21	46.14	1.07	7.15	53.96	53.05	0.91	6.68
October	37.36	41.17	-3.81	3.34	46.32	46.88	-0.56	6.12
November	34.41	35.62	-1.21	2.13	43.44	42.79	0.65	6.77
December	31.56	30.92	0.64	2.77	40.58	43.95	-3.37	3.41
January*	34.28	40.78	-6.50	0.00	42.73	53.68	-10.95	0.00

\*The realized gross margin values for January marketed hogs are preliminary. Official values will not be available until the February 03 contract expires.

Since LGM protects producers from both falling hog prices and rising feed prices, a comparable risk management strategy is a combination of a put option on the lean hog contract, and call options on corn and soybean meal. The premiums and exercise values for the call options were allocated to each marketing month based on the relationship between feed requirements and the volume specification for corn and soybean meal futures contracts. In the F-F policy, each batch of 204 hogs consumed 53 percent of a 5,000-bushel corn contract and 18 percent of a 100-ton soybean meal contract. In the F policy, feed requirements were 42 and 15 percent of the corn and soybean meal contracts, respectively. The time intervals between corn and soybean meal delivery and hog marketing dates were also an important issue. The LGM program assumes feed procurement is evenly divided between the second and third month preceding the marketing date. For example, the feed consumed by hogs targeted for November marketing is purchased in August and September. Likewise, the feed required by hogs marketed in August and September was procured in May, June, and July. Since the example assumes initial trades occurred on July 15, the feed consumed by hogs marketed in August and September, along with half the feed consumed by October hogs was not covered by the risk protection strategy.

Table 4 shows the outcome of the combined put/call option strategy. The contract delivery months and trading dates for the lean hog put options were identical to the option strategy presented in the LRP example. Coverage levels, however, were one strike price higher. The

premiums paid on the six lean hog put options totaled \$9,908 while the combined exercise value was \$5,321. Consequently, the net return contributed by put options was \$-4,587, or \$-3.75 per head. Risk management on the feed costs offered a positive net return as corn prices surged in August and September amid drought concerns in the Corn Belt and downward revisions in USDA corn harvest estimates. Premiums on the corn call options totaled \$998 for the F-F policy and \$801 under the F policy. Exercise values amounted to \$2,397 and \$1,925 for F-F and F policies, respectively, thereby generating a net return of \$1,124 and \$1,339. Soybean meal rallies were not as impressive. The combined premiums for options on all three commodities totaled \$11,387 under F-F and \$11,087 under the F scenario. Combined exercise values totaled \$8,124 and \$7,502, generating a net return of \$-3,585 and \$-3,263, or \$-2.67 and \$-2.93 per head for F-F and F policies, respectively. *These results suggest the net return to risk management was \$2.96 and \$3.26 per head greater than the return offered by LGM.*

Table 3. Outcome of the combined put/call option strategy.

	Marketing Month						Total
	Aug	Sept	Oct	Nov	Dec	Jan	
<b>Lean Hog Contract</b>							
Premium (\$)	748	1,540	1,540	1,980	1,980	2,120	9,908
Exercise Value (\$)	1,500	3,430	20	360	10	1	5,321
Net Return (\$)	752	1,890	(1,520)	(1,620)	(1,970)	(2,119)	(4,587)
Net Return (\$/Head)	3.69	9.26	(7.45)	(7.94)	(9.66)	(10.39)	(3.75)
<b>Corn Contract</b>							
Far. to Fin. Enterprise							
Premium (\$)			119	238	293	349	998
Exercise Value (\$)			568	1,048	692	90	2,397
Net Return (\$)			449	810	399	(259)	1,399
Net Return (\$/Head)			2.20	3.97	1.95	(1.27)	1.14
Finish Only Enterprise							
Premium (\$)			95	191	235	280	801
Exercise Value (\$)			456	842	555	72	1,925
Net Return (\$)			360	651	320	(208)	1,124
Net Return (\$/Head)			1.77	3.19	1.57	(1.02)	0.92
<b>Soybean Meal Contract</b>							
Far. to Fin. Enterprise							
Premium (\$)			23	92	171	192	480
Exercise Value (\$)			40	71	115	178	406
Net Return (\$)			17	(21)	(56)	(14)	(74)
Net Return (\$/Head)			0.08	(0.10)	(0.27)	(0.07)	(0.06)
Finish Only Enterprise							
Premium (\$)			19	74	128	155	377
Exercise Value (\$)			32	57	93	72	256
Net Return (\$)			14	(17)	(35)	(84)	(122)
Net Return (\$/Head)			0.07	(0.08)	(0.17)	(0.41)	(0.10)
<b>Combined Farrow to Finish</b>							
Premium (\$)	748	1,540	1,682	2,310	2,445	2,661	11,387
Exercise Value (\$)	1,500	3,430	628	1,480	817	269	8,124

	Marketing Month						Total
	Aug	Sept	Oct	Nov	Dec	Jan	
Net Return (\$)	752	1,890	(1,054)	(831)	(1,627)	(2,392)	(3,263)
Net Return (\$/Head)	3.69	9.26	(5.17)	(4.07)	(7.98)	(11.73)	(2.67)
Combined Finish Only							
Premium (\$)	748	1,540	1,654	2,246	2,343	2,556	11,087
Exercise Value (\$)	1,500	3,430	508	1,259	659	145	7,502
Net Return (\$)	752	1,890	(1,146)	(986)	(1,684)	(2,411)	(3,585)
Net Return (\$/Head)	3.69	9.26	(5.62)	(4.83)	(8.26)	(11.82)	(2.93)

### Conclusions and Implications

The conclusions of this analysis can be summarized as follows:

- Insurance premiums were substantially lower than the premiums in the comparative option strategies.
- LRP offered a higher return to risk management than its corresponding option strategy.
- The combined put/call option strategy offered a higher return to risk management than LGM.
- None of the products offered a positive net return to risk management or a profitable price.

These results apply only to the marketing strategies and time periods covered in the analysis. The outcome favoring the put/call combination strategy over LGM was a result of seasonal price patterns that vary from year to year. In LGM, the indemnity payments are based, in part, on expiration prices of the lean hog futures contract corresponding to the month the hogs are marketed. For off-contract marketing months, such as September, the lean hog price used in the indemnity calculation is the mid-point between the prices in the preceding and following contract months. This interpolation grossly misrepresented actual September 2002 prices. Shortly after the August contract expired at \$48.25, hog prices declined precipitously. The October contract bottomed at \$30.05 during Labor Day week but gradually recovered to \$45.02 by expiration on October 15. The interpolated September price was \$46.73, \$11 higher than the actual mid-September price and too high to trigger an indemnity payment. Conversely, the put option covering September marketings appreciated to \$8.58 per cwt by September 13<sup>th</sup>, generating an indemnity equivalent of \$3,430, or \$16.80 per head. Had the October contract remained in the mid \$40 range throughout August and September, the put option covering September marketings would have expired at no value and the net return to risk protection using the put/call option strategy would have been nearly equivalent to LGM. Other situations, such as altering the number of hogs marketed during the off-contract months, could also impact the outcome.

Another important difference between LGM and options is that LGM uses cross-month averaging in the indemnity payment calculation. In other words, positive premiums in one month can be offset by negative premiums in another. This is analogous to option contracts incurring a liability by the amount they expire out of the money. This feature reduces the risk to the underwriter and is reflected in the cost, at least partially explaining why the premium for LGM was 36 percent less than the premium required to execute an option strategy with comparable coverage.

The insurance products considered in this study may offer advantages over futures and options that were not quantified in the analysis. For example, LRP and LGM are better suited to smaller producers whose marketings are insufficient to fill a futures contract. Insurance coverage is available for any number of hogs marketed. Conversely, a lean hog contract is standardized at 40,000 lbs. Using futures to protect a marketing batch smaller than the contract adds a speculative element and may increase rather than reduce risk exposure. The put/call option strategy used in this analysis implicitly assumed the corn and soybean meal futures contracts are divisible among marketing batches. This assumption is valid only if producers feed and market enough hogs to fill the remainder of the contracts.

One feature distinguishing LRP from the other alternatives considered in this analysis is that indemnity payments are based on a cash price index rather than futures prices, thereby covering basis risk. LGM indemnity payments are based on futures prices, leaving LGM policyholders fully exposed to basis risk. Technically, more accurate evaluation would compare net price received rather than return to risk management. Since LRP did not generate indemnity payments, however, this issue was not a factor.

None of the risk management alternatives considered in this analysis generated indemnity payments larger than the premiums, suggesting the unprotected cash market offered the best outcome. Producers should not interpret this conclusion as a case against adopting price protection. Adverse events in a particular year could devastate the equity position of a producer. This outcome simply suggests prices performed as well as expected at the beginning of the insurance period. Furthermore, the insurance products did not promise or deliver profitable prices during 2002. The outlook at the beginning of the insurance period called for prices well below the cost of production through the first quarter of 2003. A risk management product that rescues producers from an unprofitable projection does not exist. In general, producers should examine risk management products carefully and consider their own unique circumstances before committing to a particular strategy. Furthermore, the decision criteria should consider price expectations for the upcoming marketing period rather than the past.

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