Agricultural Economics
Staff Paper No. 88-35
April 1988

AN EXPANDED VIEW OF FORWARD PRICING OF CROPS AND LIVESTOCK--AN EXAMPLE ON NEW CROP CORN

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In the paper, "The Essence of Forward Pricing of Crops and Livestock," the basic tools for forward pricing with futures and options were presented. The handout labeled "Crop Marketing Alternatives" outlines a broader set of pricing tools available to crop producers along with the pros and cons. Several of these methods (cash market, forward contracts, hedging, repurchase hedge, and options) also apply to livestock. The purpose of this paper is to reinforce and expand upon the two documents mentioned. The focus will be on understanding Tables 1-6.

In Table 1, eight forward pricing alternatives are examined on new crop corn. The prices are hypothetical. The alternatives are as follows at planting time on May 1:

(1) Forward contract.

(2) Depend on government loan rate to establish a minimum price.

(3) Do nothing. Take chances on the cash market at harvest.

(4) Enter a basis contract with the local elevator for a set amount relative to December futures.

(5) Hedge, i.e., sell December futures.

(6) Buy a December put with a strike price of $2.40 per bushel.

(7) Buy a December put with a strike price of $2.60 per bushel.

(8) Forward contract and buy a December call with a strike price of $2.30.

TABLE 1

FORWARD PRICING ALTERNATIVES FOR NEW CROP CORN (CROP)

Date	Cash Market		Futures		Put Options			Forward Contract and Buy Calls	
5/1	Production Cost	$1.30-2.50	December (Futures Month)	2.40 (Sell)	December (Futures Month)			December (Futures Month)	
	Forward Contract Price (1)	2.02	Less:		Strike Price	2.40	2.60	Strike Price	2.30
	Basis Contract Relative to December (Futures Month)	-.38	Expected Basis[b]	-.30	Less:			Forward Contract Price	2.02
	Net Government Loan Rate (2)[a]	1.50	Brokerage Costs[c]	-.02	Option Premium	-.18 (Buy)	-.30 (Buy)	Less:	
	Expected Harvest Price		Equals Net Price Expected From Hedge	2.08	Expected Basis[b]	-.30	-.30	Option Premium	-.22 (Buy)
	Optimistic	2.50			Brokerage Costs[c]	-.03	-.03	Brokerage Costs[c]	-.03
	Average	2.00			Equals Minimum Selling Price Expected	1.89	1.97	Equals Minimum Selling Price	1.77
	Pessimistic	1.50							
	Harvest Price (3)		(Futures Month)	(Buy)	(Futures Month)				
	Net Price From Basis Contract = Futures + Basis Contract (4)		Actual Basis[d]		Option Premium	(Sell)	(Sell)		(Sell)
Net Price Received From Hedge and Options								Forward Contract Price	
Cash Price at Harvest									
Plus Net Returns From Futures and Options									
Sell and Buy (Futures) or Buy and Sell (Options)									
Less Brokerage Costs[c]									
Equals Net Price Received									
Equals Net Price Received			(5)			(6)	(7)		(8)

[a] Government loan rate less storage costs to maturity.
[b] The expected value, at harvest, of the cash price less the given futures.
[c] Commissions and interest on margins or premiums.
[d] The actual value, at harvest, of the cash price less the given futures.

Table 1 puts into perspective the information needed to make this decision. First, a producer should have some estimate of the production cost for the corn enterprise. This will vary substantially from farm to farm. In the example farm, a range was given from $1.30 to $2.50 per bushel. The $1.30 represents the direct or variable cost of production--seed, fertilizer, chemicals, fuel, repairs, drying, interest on operating capital, allowance for family labor--items directly related to acres planted. This represents the bare minimum price a producer should accept in any given year. Otherwise, the crop should not be produced or--the farmer should consider an alternative crop such as soybeans. As a matter of fact, farmers should approach planting decisions by comparing net margins over variable costs on alternative crops.[1/]

The $2.50 production cost represents the variable costs plus fixed expenses such as overhead, taxes and insurance, interest on farm mortgages, depreciation, and a reasonable return on capital including land. Producers may not be able to cover this cost each year, but in the long-run, an appropriate objective is to realize net prices at least equal to these total production costs. Knowing what these costs of production are enables farmers to judge with more precision when opportunities arise to "lock in" favorable prices.

Cash Market

The most assured forward price for corn producers in Table 1 is the forward contract price of $2.02 [Alternative (1)]. If the crop turns out to be at least as large as the amount contracted, the farmer will receive $2.02 from the buyer at harvest. This would be well above variable costs, but below

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[1/] Hilker, James H., J. Roy Black and Oran B. Hesterman, Break-Even Analysis for Comparing Alternative Crops, Extension Bulletin E-2021, Cooperative Extension Service, Michigan State University, August 1987.

the total production cost. This price would not be regarded as highly favorable.

The forward contract price of $2.02 on May 1 was $.38 under December futures which closed at $2.40. A farmer who would regard $.38 under December futures as favorable might enter a basis contract with the elevator. At any time between May 1 and harvest, the farmer could contact the elevator and establish December futures. With both December futures and the basis "locked in," the farmer would then have the equivalent of a forward contract. This alternative would look attractive if December futures rise after May 1 and if the basis weakens (widens). Information given in the table suggests that the basis is weak since expected basis (Futures column) is $.30 under December futures. Under this circumstance, a basis contract would not be recommended.

Farmers participating in the Feed Grain Program have another guideline in their forward pricing decision--the government loan rate. In the example, the loan rate is assumed to be $1.77. Since farmers must store the crop for nine months, the net rate has storage costs deducted. Storage costs are assumed to be 3.0 cents per bushel per month for commercial storage plus 1.5 cents per bushel per month for foregone interest. However, since interest costs are forgiven if the farmer forfeits the grain to the government (CCC), the interest cost does not have to be deducted. The net loan rate then is $1.50 ($1.77 - .27). If farmers store on the farm, their net loan rate would be close to the official rate of $1.77 since most of the direct storage cost on the farm is foregone interest on the stored crop. If forward pricing opportunities are less than or only a little better than the government loan, downside price risks are minimal. Farmers might as well take their chances on the cash market.

Another guideline for forward pricing is the outlook. This information is available from many sources--farm magazines, commodity letters, advisory services, brokers, U.S. Department of Agriculture, Land Grant universities, etc. The price forecasts are often rather general and not specific to the market and date where and when a farmer plans to sell. Therefore, to fill in the blanks related to the "Expected Harvest Price," a farmer would have to digest market outlook information and come up with the implied price forecasts. As a suggestion, the optimistic forecast can be considered one in which the chances are only one in six that prices will be above that level. The pessimistic forecast is one in which chances are only one in six that prices will be below that level.

In the example, the average expected harvest price is $2.00; optimistic, $2.50; and pessimistic, $1.50. It happens that the distribution is symmetric, i.e., $\pm$ $.50. This doesn't have to be. If the average forecast was nearer, the loan rate of $1.77, the downside price risks might well be less than the upside price possibilities.

The upper left-hand block in Table 1, then, contains three guidelines for forward pricing decisions--production costs, net government loan rate and the price outlook. This information can be very helpful to farmers that must take these and other factors into account as they decide whether to forward price and how.

Hedging With Futures

Another forward pricing alternative is to hedge, i.e., sell futures. December futures was selected in the example because this is the nearest contract following harvest. The assumption was made in this example that the farmer was planning to sell at harvest and not store the crop. If storage was

to be considered, March, May or July futures of the succeeding calendar year could have been selected. Storage hedges will be discussed later in another paper.

On May 1, December futures traded at $2.40 per bushel. Should farmers sell December futures, they could deliver to Chicago (or Toledo with some discount) next December and receive $2.40. However, the cost and inconvenience would normally be such that farmers would be better off to sell their crop locally and buy back their December futures. Because this is the traditional procedure, knowing the usual relationship between local cash prices and December futures at harvest is necessary in order to evaluate hedging relative to other forward pricing tools.

The difference between prices at a particular cash market, such as the local elevator, and futures at a given time is called "basis." In equation form,

$$\text{Basis} = \text{Cash Price} - \text{Futures Price}$$

Since cash prices are usually below futures prices, "basis" is normally negative. Another way to set up the equation is as follows:

$$\text{Cash Price} = \text{Futures Price} - \text{Basis}$$

As shown in the Futures column in Table 1, the way farmers can interpret futures prices in terms of what they mean for local cash prices is to subtract expected basis from futures. Since hedging involves brokerage costs, those expenses must also be deducted. In the example, the expected basis is $-.30 and the brokerage costs are $.02, which when deducted from $2.40 results in a net price expected from the hedge of $2.08.

Unless farmers or local elevators keep historical basis records, coming up with "expected basis" may not be easy. For farmers in central Michigan,

the charts for the Saginaw terminal in the paper on "Basis--Key to Effective Forward Pricing" may be helpful. They could estimate their own basis if they knew how their local prices relate to Saginaw. If, for example, their local prices are usually $.05 under Saginaw, their expected basis figure would be $-.35 rather than $-.30.

Brokerage costs include commissions brokerages charge and foregone interest on margins required. Commissions generally range around $80-100 per 5,000 bushels for a "round turn." In the case of hedging with December futures, a round turn would include the initial sale and subsequent purchase. At $80 per 5,000 bushels, the cost is 1.6 cents per bushel; at $100, 2.0 cents. For hedgers, brokerages require margins which generally do not exceed 2-3 percent of the value of the contract. For a corn contract of 5,000 bushels, margins may be as low as $200, or 4 cents per bushel. The interest cost on 4 cents for six months at 8 percent per year interest would be about .2 cents (4 cents x .5 years x 8 percent interest per year).

Adding 1.6-2.0 cents for commissions to .2 cents for foregone interest would amount to total brokerage costs of 1.8-2.2 cents, or as given in the example, around 2 cents. The actual foregone interest cost could be more or less than the .2 cents, however. Should futures prices rise, additional margin would be required, since the farmers short position in futures would involve paper losses. When the equity in the farmer's margin account reached 75 percent of the initial margin requirement, funds would have to be added to bring the margin back to the initial level. This is termed a "margin call." Interest costs would exceed .2 cents per bushel. On the other hand, should futures fall, the farmer would have paper profits and could withdraw funds from the margin account and earn interest.

As an example, if a farmer sold one December futures contract for $2.40, the value of the contract would be $12,000 ($2.40 x 5,000 bushels). The initial margin with the broker is assumed to be $200. Should losses exceed $50, the farmer's equity in the margin would drop below $150, which is 75 percent of $200. The farmer would then be required to add to the margin to bring the amount up to $200. A $50 loss on a 5,000 bushel contract is only 1 cent. Therefore, a farmer is advised to have more than $200 at the broker to avoid frequent margin calls. If futures were to rise by 10 cents, $500 of additional margin would be needed. Typically, the broker would place the extra funds into an interest bearing money market account for ready access. If futures were to fall 10 cents, the farmer would have an additional $500 available for use or investment. Brokers offer to add such gains to their own money market programs.

The net price expected from the hedge of $2.08 is obviously an estimate. The basis can vary as can the brokerage cost. It is particularly important to be aware of the "basis risk." While $-.30 has been the average difference between Saginaw cash prices and December futures at harvest since 1982, it has ranged between $-.20 and nearly $-.40.

Buying Puts

Another set of alternatives is to buy put options, the right to sell at given strike prices. For December, a number of strike prices are available. On March 24, 1988, for example, eight December corn puts were traded, ranging in 10 cent increments from $1.60 to $2.30. In the example in Table 1, two put options were analyzed. One of the puts was "at the money," i.e., the strike price of $2.40 was equal to the underlying December futures price of $2.40.

The premium for that contract was $.18, which, of course, was all "time value." As with hedging, the expected basis was $-.30 per bushel. The

brokerage cost was set at $.03, slightly more than for hedging. Deducting the premium, expected basis and brokerage costs from the strike price resulted in a minimum selling price expected of $1.89 per bushel.

As with hedging, basis risk is involved so that the minimum price is an estimate. While the brokerage costs were the same or close to those for hedging, the calculation does differ and the cost is less variable than for hedging. The commission for the purchase and sale of an option would generally not exceed $100. Some brokers charge more if they provide substantial advisory services. One brokerage house charges 5 percent of the premium for a purchase of put (or call) with a minimum of $30 and $40 to sell. Additional charges will be assessed if a farmer elects to exercise the option and take a short position in the futures market.

Since the maximum loss on the contract is the premium, $.18 in this case, the farmer is only obligated to furnish funds equal to the premium. The foregone interest cost would amount to about .9 cents per bushel for six months at 10 percent interest (18 cents x .5 years x 10 percent interest per year). Adding the commission and interest costs together results in a total cost of nearly 3 cents per bushel.

The second put option examined had a higher strike price ($2.60) and would provide a higher minimum price than would the put with the $2.40 strike price. The premium was $.30, the expected basis was again $-.30 and the brokerage cost was set at 3 cents. Because of the higher premium, the brokerage cost would be higher than for the put with the $2.40 strike price, but would in round numbers remain near 3 cents.

The $2.60 put would provide a minimum selling price expected 8 cents higher than the $2.40 put. Why would a farmer be interested in the $2.40 put? The reason is that should prices rise substantially, the net price would

be higher for the put with the lower premium, i.e., the $2.40 put. This is illustrated in Table 1a, assuming basis turns out to be $-.30 at harvest and no time value is left on the options.

Note that the $2.60 put provided a higher return if December futures at harvest turn out to be $2.40 or below. With the December futures above $2.40, the $2.40 put resulted in higher returns than did the $2.60 put. The margin was $.12, the difference between the purchase cost of the two puts. The decision of which put to buy is based on what minimum price is required and what direction the farmer thinks prices will go.

Forward Contract and Buy Calls

An alternative similar to buying puts is to forward contract and buy calls. The major difference is that "basis risk" is eliminated. In the example in Table 1, the producer locked in a cash price of $2.02 with a forward contract. The purchase of a call (the right to buy) provided the producer the opportunity to benefit from a price rise at a cost of the option premium and brokerage. On a call with a $2.30 strike price, the producer paid $.22 for the premium and $.03 for brokerage. This established a minimum selling price of $1.77 ($2.02 - $.22 - $.03). This is an absolute minimum since the forward contract eliminates basis risk.[2/]

The producer could establish a higher minimum price by purchasing calls that are at or out of the money. With December futures at $2.40, a call (right to buy) with a strike price of $2.30 is in the money. The intrinsic value is $.10 and the time value is $.12. If the producer were to buy a $2.50 call, the premium would be about $.12 and brokerage costs would be closer to

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[2/] An alternative not analyzed, but with similarities to buying puts or forward contracting and buying calls is to hedge and buy calls. However, basis risk remains and hedgers are subject to margin calls.

TABLE 1a

COMPARISON OF NET SELLING PRICES FROM BUYING
PUTS WITH DIFFERENT STRIKE PRICES

	December Futures at Harvest						
	$2.00	$2.20	$2.40	$2.60	$2.80	$3.00	$3.20
				$/bu.			
				Put With $2.40 Strike			
Cash Price ($.30 Under Futures)	1.70	1.90	2.10	2.30	2.50	2.70	2.90
- Option Premium at Purchase	-.18	-.18	-.18	-.18	-.18	-.18	-.18
+ Option Premium at Sale	+.40	+.20	0	0	0	0	0
- Brokerage Cost	-.03	-.03	-.03	-.03	-.03	-.03	-.03
= Net Selling Price	1.89	1.89	1.89	2.09	2.29	2.49	2.69
				Put With $2.60 Strike			
Cash Price ($.30 Under Futures)	1.70	1.90	2.10	2.30	2.50	2.70	2.90
- Option Premium at Purchase	-.30	-.30	-.30	-.30	-.30	-.30	-.30
+ Option Premium at Sale	+.60	+.40	+.20	0	0	0	0
- Brokerage Cost	-.03	-.03	-.03	-.03	-.03	-.03	-.03
= Net Selling Price	1.97	1.97	1.97	1.97	2.17	2.37	2.57

$.02. However, futures would have to rise more than with the $2.30 strike before the producer would realize a gain. This is illustrated in Table 1b, assuming different levels of December futures at harvest as was done with puts.

As indicated in Table 1b, the lower priced call resulted in higher net selling prices if futures were to decline, but lower net selling prices if futures were to rise.

Choosing the Appropriate Pricing Scheme

As of May 1, the pricing alternatives given in Table 1 were as follows:

(1) Forward contract at $2.02.

(2) Plan to take out a government loan which would provide a minimum net price of $1.50.

(3) Do nothing. Take chances on the cash market at harvest.

(4) Enter a basis contract at $.38 under December futures.

(5) Hedge with the expectation of a $2.08 price.

(6) Buy a December put with a strike price of $2.40, establishing an expected minimum selling price of $1.89.

(7) Buy a December put with a strike price of $2.60, establishing an expected minimum selling price of $1.97.

(8) Forward contract and buy a call with a strike price of $2.30, establishing a minimum selling price of $1.77.

There is no clear-cut "best" alternative. The choice depends on the farmer's inclination and ability to handle the risk of a price decline and the conviction of the producer concerning the price outlook. If the producer was eligible for a government loan and could survive should cash prices drop to $1.50 and was also bullish about the market, the appropriate alternative might well be to do nothing. The next best alternative for this producer might be to buy the $2.40 put.

TABLE 1b

COMPARISON OF NET SELLING PRICES FROM FORWARD CONTRACTING AND BUYING CALLS WITH DIFFERENT STRIKE PRICES

	December Futures at Harvest						
	$2.00	$2.20	$2.40	$2.60	$2.80	$3.00	$3.20
				$/bu.			
				Call With $2.30 Strike			
Forward Contract Price	2.02	2.02	2.02	2.02	2.02	2.02	2.02
- Option Premium at Purchase	-.22	-.22	-.22	-.22	-.22	-.22	-.22
+ Option Premium at Sale	0	0	+.10	+.30	+.50	+.70	+.90
- Brokerage Cost	-.03	-.03	-.03	-.03	-.03	-.03	-.03
= Net Selling Price	1.77	1.77	1.87	2.07	2.27	2.47	2.67
				Call With $2.50 Strike			
Forward Contract Price	2.02	2.02	2.02	2.02	2.02	2.02	2.02
- Option Premium at Purchase	-.12	-.12	-.12	-.12	-.12	-.12	-.12
+ Option Premium at Sale	0	0	0	+.10	+.30	+.50	+.70
- Brokerage Cost	-.02	-.02	-.02	-.02	-.02	-.02	-.02
= Net Selling Price	1.88	1.88	1.88	1.98	2.18	2.38	2.58

A producer who would be in financial trouble should the net price be below $2.00 would best forward contract or hedge. The expected net price is higher with the hedge, but there is no guarantee that basis will be $-.30. Should basis turn out to be $-.40, the net price would be $1.98. A producer needing a price of at least $1.95, but thinks prices are going higher might consider the $2.60 put.

Because the basis relative to new crop was weak on May 1 ($-.38 when the norm was $-.30), forward contracting, basis contracts and forward contracting and buying calls were not particularly attractive alternatives.

Scenario #1: Weak Basis, Price Decline

Assume December futures prices declined from $2.40 on May 1 to $1.73 on November 1, the peak of harvest. Assume also that the cash price was $1.40 implying that basis turned out to be $-.33. The basis was $.03 weaker than expected, but stronger than on May 1. With this scenario, the final results for the eight pricing alternatives can be calculated and compared in Table 1c. The numbers in the boxes are the net prices realized from the eight alternatives.

If a farmer held the basis contract into harvest (December futures could have been established earlier), the net price was $1.35 ($1.73 -.38). In the hedge, December futures were purchased at $1.73 having been sold at $2.40 for a profit of $.67. Deducting brokerage, the net gain was $.65 which, when added to the $1.40 harvest price provided a net price of $2.05. The $2.05 was $.03 less than expected because basis was $.03 weaker than expected.

As expiration on put options approaches, the premiums converge to the intrinsic value. The intrinsic value for a $2.40 put when the underlying futures was $1.73 would be $.67 ($2.40 - 1.73). For a $2.60 put, the intrinsic value would be $.87 ($2.60 - 1.73). Subtracting the respective

TABLE 1c

FORWARD PRICING ALTERNATIVES FOR NEW CROP CORN (CROP)

WEAK BASIS, PRICES DECLINE

Date	Cash Market		Futures		Put Options			Forward Contract and Buy Calls	
5/1	Production Cost	$1.30-2.50	December (Futures Month)	2.40 (Sell)	December (Futures Month)			December (Futures Month)	
	Forward Contract Price	(1) 2.02	Less:		Strike Price	2.40	2.60	Strike Price	2.30
	Basis Contract Relative to December (Futures Month)	-.38	Expected Basis[b]	-.30	Less:			Forward Contract Price	2.02
	Net Government Loan Rate	(2)[a] 1.50	Brokerage Costs[c]	-.02	Option Premium	-.18 (Buy)	-.30 (Buy)	Less:	
	Expected Harvest Price		Equals Net Price Expected From Hedge	2.08	Expected Basis[b]	-.30	-.30	Option Premium	-.22 (Buy)
	Optimistic	2.50			Brokerage Costs[c]	-.03	-.03	Brokerage Costs[c]	-.03
	Average	2.00			Equals Minimum Selling Price Expected	1.89	1.97	Equals Minimum Selling Price	1.77
	Pessimistic	1.50							
11/1	Harvest Price	(3) 1.40	December (Futures Month)	1.73 (Buy)	December (Futures Month)				
	Net Price From Basis Contract = Futures + Basis Contract	(4) 1.35	Actual Basis[d]	-.33	Option Premium	.67 (Sell)	.87 (Sell)		0 (Sell)
Net Price Received From Hedge and Options								Forward Contract Price	2.02
Cash Price at Harvest				1.40		1.40	1.40		
Plus Net Returns From Futures and Options									
Sell and Buy (Futures) or Buy and Sell (Options)			+.67		+.49		+.57	-.22	
Less Brokerage Costs[c]			-.02		-.03		-.03	-.03	
Equals Net Price Received				+.65		+.46	+.54		-.25
Equals Net Price Received			(5)	2.05		1.86 (6)	1.94 (7)	(8)	1.77

[a] Government loan rate less storage costs to maturity.
[b] The expected value, at harvest, of the cash price less the given futures.
[c] Commissions and interest on margins or premiums.
[d] The actual value, at harvest, of the cash price less the given futures.

costs for the options and brokerage charges resulted in net prices of $1.86 and $1.95, respectively. As with the hedge, the net prices were $.03 below the expected minimums because of the weak basis.

For the alternative of forward contracting and buying calls, the call became worthless at harvest. If you are holding a contract with the right to buy at $2.30 when the price of the underlying futures is $1.73, your contract has no value. The cost of the option was lost, plus brokerage, giving a net return of $1.77. This figure, however, was exactly the minimum expected because no basis variation was involved.

In retrospect, the most profitable alternative was to hedge, followed by forward contracting, buying a $2.60 put, buying a $2.40 put, forward contracting and buying calls, do nothing and entering a basis contract--in that order.

Scenario 2: Weak Basis, Prices Rise

The situation on May 1 is the same in Scenario #2 as Scenario #1. However, rather than falling, December futures are higher on November 1 than on May 1 (Table 2). Also, the basis turns out to be strong at $-.28 rather than $-.33. December futures were at $3.28 and the cash price was $3.00.

Under the hedge, buying back a contract at $3.28 which had been sold at $2.40 resulted in a loss of $.88. Adding brokerage made the total loss in futures $.90. Deducting $.90 from the $3.00 cash price netted the farmer $2.10 from the hedge. This was $.02 more than expected because the basis was $.02 stronger than expected.

With December futures at $3.28, both put options (right to sell at $2.40 and $2.60) became worthless. Deducting the costs of the two options and brokerage from the $3.00 received in the cash market netted the put holders $2.79 and $2.67, respectively. While the put holders were able to participate

TABLE 2

FORWARD PRICING ALTERNATIVES FOR NEW CROP CORN (CROP)

WEAK BASIS, PRICES RISE

Date	Cash Market		Futures		Put Options			Forward Contract and Buy Calls	
5/1	Production Cost	#1.30-2.50	December (Futures Month)	2.40 (Sell)	December (Futures Month)			December (Futures Month)	
	Forward Contract Price (1)	2.02	Less:		Strike Price	2.40	2.60	Strike Price	2.30
	Basis Contract Relative to December (Futures Month)	-.38	Expected Basis[b]	-.30	Less:			Forward Contract Price	2.02
	Net Government Loan Rate (2)[a]	1.50	Brokerage Costs[c]	-.02	Option Premium	-.18 (Buy)	-.30 (Buy)	Less:	
	Expected Harvest Price		Equals Net Price Expected From Hedge	2.08	Expected Basis[b]	-.30	-.30	Option Premium	-.22 (Buy)
	Optimistic	2.50			Brokerage Costs[c]	-.03	-.03	Brokerage Costs[c]	-.03
	Average	2.00			Equals Minimum Selling Price Expected	1.89	1.97	Equals Minimum Selling Price	1.78
	Pessimistic	1.50							
11/1	Harvest Price (3)	3.00	December (Futures Month)	3.28 (Buy)	December (Futures Month)				
	Net Price From Basis Contract = Futures + Basis Contract (4)	2.90	Actual Basis[d]	-.28	Option Premium	0 (Sell)	0 (Sell)		.98 (Sell)
Net Price Received From Hedge and Options								Forward Contract Price	2.02
Cash Price at Harvest				3.00		3.00	3.00		
Plus Net Returns From Futures and Options									
Sell and Buy (Futures) or Buy and Sell (Options)			-.88		-.18		-.30	+.76	
Less Brokerage Costs[c]			-.02		-.03		-.03	-.03	
Equals Net Price Received				-.90		-.21	-.33		+.73
Equals Net Price Received		(5) 2.10				2.79 (6)	2.67 (7)	(8)	2.75

[a] Government loan rate less storage costs to maturity.
[b] The expected value, at harvest, of the cash price less the given futures.
[c] Commissions and interest on margins or premiums.
[d] The actual value, at harvest, of the cash price less the given futures.

in the bull market, their net price was less than the alternative of doing nothing--less by the cost of the options and brokerage. Note also that the net price from the $2.40 strike put was greater than for the $2.60 strike put, opposite from Scenario #1 when prices fell. On a rising market, the lower priced put will net more by the difference in the option costs. In Scenario #2, the $2.40 put netted $.12 more than the $2.60 put. The $2.40 put was $.12 cheaper (including brokerage costs).

By forward contracting and buying calls, a farmer could also have participated in the bull market.[3/] While locked into a forward contract with the elevator at $2.02, the value of the call increased with the rise in futures. With December futures at $3.28, a call (right to buy) with a strike price of $2.30 would be worth $.98 as expiration approached. Having paid $.22 for the call, the net from the option was $.76 less $.03 brokerage for a $.73 gain. Adding the $.73 to the $2.02 forward contract netted the farmer $2.75. Had basis been normal when the farmer entered the forward contract, this alternative would have been more attractive in an up market than the put alternatives.

In retrospect, the most profitable alternative was to do nothing, followed by a basis contract, a $2.40 put, a forward contract and purchase of a $2.30 call, a $2.60 put, a hedge and a forward contract. The lowest net was a government loan, but the holder would have sold the corn at $3.00 and paid back the loan. In a sense, the government loan is like buying puts or forward contracting and buying calls. The loan sets a lower bound on price, but

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[3/] Another way to participate in a bull market is to forward contract and buy December futures. This would net more than options because no premiums are paid. However, this would not establish a minimum price and farmers would be at risk in a declining market.

allows the farmer to participate in a bull market. Major differences are, of course, that the options may offer higher minimum prices, but lower returns in a bull market since premiums must be paid to buy the option.

Scenario #3: Weak Basis, Prices Stable

Rather than December futures falling or rising, prices are stable in Scenario #3 (Table 3). Basis turned out to be $-.30, exactly as expected. December futures remained at $2.40 and the harvest cash price was $2.10.

The basis contract turned out to be the same as the forward contract--$2.02. The hedge resulted in no gain or loss except for brokerage costs. The net of $2.08 was just as expected because basis was as expected. The $2.40 put remained at the money and was worthless on November 1. The $2.60 put was still in the money with an intrinsic value of $.20. Both puts resulted in returns at the minimum. The alternative of forward contracting and buying calls netted $1.87, 10 cents over the minimum.

In retrospect, the most profitable alternative was to do nothing, followed closely by hedging, then forward contracting and basic contracts, then the $2.60 put, the $2.40 put and finally forward contracting and buying calls.

In most cases, use of options will be second or third best relative to other alternatives when prices rise or fall significantly and worse when prices are stable. When futures are stable, option buyers pay option sellers the time value, but do not gain from either more valuable options or higher cash prices.

Scenarios #4, #5 and #6: Strong Basis; Prices Decline, Rise and Remain Stable

For Scenarios #4, #5 and #6 in Tables 4, 5 and 6, the situations are similar as for Scenarios #1, #2 and #3 except that the harvest basis is strong at planting time. Rather than the forward contract on May 1 being $.38 under

TABLE 3

FORWARD PRICING ALTERNATIVES FOR NEW CROP CORN (CROP)

WEAK BASIS, PRICES STABLE

Date	Cash Market		Futures		Put Options			Forward Contract and Buy Calls	
5/1	Production Cost	$1.30-2.50	December (Futures Month)	2.40 (Sell)	December (Futures Month)			December (Futures Month)	
	Forward Contract Price (1)	2.02	Less:		Strike Price	2.40	2.60	Strike Price	2.30
	Basis Contract Relative to December (Futures Month)	-.38	Expected Basis[b]	-.30	Less:			Forward Contract Price	2.02
	Net Government Loan Rate (2)[a]	1.50	Brokerage Costs[c]	-.02	Option Premium	-.18 (Buy)	-.30 (Buy)	Less:	
	Expected Harvest Price		Equals Net Price Expected From Hedge	2.08	Expected Basis[b]	-.30	-.30	Option Premium	-.22 (Buy)
	Optimistic	2.50			Brokerage Costs[c]	-.03	-.03	Brokerage Costs[c]	-.03
	Average	2.00			Equals Minimum Selling Price Expected	1.89	1.97	Equals Minimum Selling Price	1.77
	Pessimistic	1.50							
11/1	Harvest Price (3)	2.10	December (Futures Month)	2.40 (Buy)	December (Futures Month)				
	Net Price From Basis Contract = Futures + Basis Contract (4)	2.02	Actual Basis[d]	-.30	Option Premium	0 (Sell)	.20 (Sell)		.10 (Sell)
Net Price Received From Hedge and Options								Forward Contract Price	2.02
Cash Price at Harvest				2.10		2.10	2.10		
Plus Net Returns From Futures and Options									
Sell and Buy (Futures) or Buy and Sell (Options)			0		-.18		-.10	-.12	
Less Brokerage Costs[c]			-.02		-.03		-.03	-.03	
Equals Net Price Received				-.02		-.21	-.13		-.15
Equals Net Price Received			(5)	2.08		1.89 (6)	1.97 (7)	(8)	1.87

[a] Government loan rate less storage costs to maturity.
[b] The expected value, at harvest, of the cash price less the given futures.
[c] Commissions and interest on margins or premiums.
[d] The actual value, at harvest, of the cash price less the given futures.

TABLE 4

FORWARD PRICING ALTERNATIVES FOR NEW CROP CORN (CROP)

STRONG BASIS, PRICES DECLINE

Date	Cash Market		Futures		Put Options			Forward Contract and Buy Calls	
5/1	Production Cost	$1.30-2.50	December (Futures Month)	2.40 (Sell)	December (Futures Month)			December (Futures Month)	
	Forward Contract Price (1)	2.20	Less:		Strike Price	2.40	2.60	Strike Price	2.30
	Basis Contract Relative to December (Futures Month)	-.20	Expected Basis[b]	-.30	Less:			Forward Contract Price	2.20
	Net Government Loan Rate (2)[a]	1.50	Brokerage Costs[c]	-.02	Option Premium	-.18 (Buy)	-.30 (Buy)	Less:	
	Expected Harvest Price		Equals Net Price Expected From Hedge	2.08	Expected Basis[b]	-.30	-.30	Option Premium	-.22 (Buy)
	Optimistic	2.50			Brokerage Costs[c]	-.03	-.03	Brokerage Costs[c]	-.03
	Average	2.00			Equals Minimum Selling Price Expected	1.89	1.97	Equals Minimum Selling Price	1.96
	Pessimistic	1.50							
11/1	Harvest Price (3)	1.40	December (Futures Month)	1.65 (Buy)	December (Futures Month)				
	Net Price From Basis Contract = Futures + Basis Contract (4)	1.45	Actual Basis[d]	-.25	Option Premium	.75 (Sell)	.95 (Sell)		0 (Sell)
Net Price Received From Hedge and Options								Forward Contract Price	2.20
Cash Price at Harvest				1.40		1.40	1.40		
Plus Net Returns From Futures and Options									
Sell and Buy (Futures) or Buy and Sell (Options)			+.75		+.57		+.65	-.22	
Less Brokerage Costs[c]			-.02		-.03		-.03	-.03	
Equals Net Price Received				+.73		+.54	+.62		-.25
Equals Net Price Received			(5)	2.13		1.94 (6)	2.02 (7)	(8)	1.95

[a] Government loan rate less storage costs to maturity.
[b] The expected value, at harvest, of the cash price less the given futures.
[c] Commissions and interest on margins or premiums.
[d] The actual value, at harvest, of the cash price less the given futures.

TABLE 5

FORWARD PRICING ALTERNATIVES FOR NEW CROP CORN (CROP)

STRONG BASIS, PRICES RISE

Date	Cash Market		Futures		Put Options			Forward Contract and Buy Calls	
5/1	Production Cost	$1.30-2.50	December (Futures Month)	2.40 (Sell)	December (Futures Month)			December (Futures Month)	
	Forward Contract Price (1)	2.20	Less:		Strike Price	2.40	2.60	Strike Price	2.30
	Basis Contract Relative to December (Futures Month)	-.20	Expected Basis[b]	-.30	Less:			Forward Contract Price	2.20
	Net Government Loan Rate (2)[a]	1.50	Brokerage Costs[c]	-.02	Option Premium	-.18 (Buy)	-.30 (Buy)	Less:	
	Expected Harvest Price		Equals Net Price Expected From Hedge	2.08	Expected Basis[b]	-.30	-.30	Option Premium	-.22 (Buy)
	Optimistic	2.50			Brokerage Costs[c]	-.03	-.03	Brokerage Costs[c]	-.03
	Average	2.00			Equals Minimum Selling Price Expected	1.89	1.97	Equals Minimum Selling Price	1.96
	Pessimistic	1.50							
11/1	Harvest Price (3)	3.00	December (Futures Month)	3.25 (Buy)	December (Futures Month)				
	Net Price From Basis Contract = Futures + Basis Contract (4)	3.05	Actual Basis[d]	-.25	Option Premium	0 (Sell)	0 (Sell)		.95 (Sell)
Net Price Received From Hedge and Options								Forward Contract Price	2.20
Cash Price at Harvest				3.00		3.00	3.00		
Plus Net Returns From Futures and Options									
Sell and Buy (Futures) or Buy and Sell (Options)			-.85		-.18		-.30	+.73	
Less Brokerage Costs[c]			-.02		-.03		-.03	-.03	
Equals Net Price Received				-.87		-.21	-.33		+.70
Equals Net Price Received			(5)	2.13		2.79 (6)	2.67 (7)	(8)	2.90

[a] Government loan rate less storage costs to maturity.
[b] The expected value, at harvest, of the cash price less the given futures.
[c] Commissions and interest on margins or premiums.
[d] The actual value, at harvest, of the cash price less the given futures.

TABLE 6

FORWARD PRICING ALTERNATIVES FOR NEW CROP CORN (CROP)

STRONG BASIS, PRICES STABLE

Date	Cash Market		Futures		Put Options			Forward Contract and Buy Calls	
5/1	Production Cost	$1.30-2.50	December (Futures Month)	2.40 (Sell)	December (Futures Month)			December (Futures Month)	
	Forward Contract Price (1)	2.20	Less:		Strike Price	2.40	2.60	Strike Price	2.30
	Basis Contract Relative to December (Futures Month)	-.20	Expected Basis[b]	-.30	Less:			Forward Contract Price	2.20
	Net Government Loan Rate (2)[a]	1.50	Brokerage Costs[c]	-.02	Option Premium	-.18 (Buy)	-.30 (Buy)	Less:	
	Expected Harvest Price		Equals Net Price Expected From Hedge	2.08	Expected Basis[b]	-.30	-.30	Option Premium	-.22 (Buy)
	Optimistic	2.50			Brokerage Costs[c]	-.03	-.03	Brokerage Costs[c]	-.03
	Average	2.00			Equals Minimum Selling Price Expected	1.89	1.97	Equals Minimum Selling Price	1.96
	Pessimistic	1.50							
11/1	Harvest Price (3)	2.15	December (Futures Month)	2.40 (Buy)	December (Futures Month)				
	Net Price From Basis Contract = Futures + Basis Contract (4)	2.20	Actual Basis[d]	-.25	Option Premium	0 (Sell)	.20 (Sell)		.10 (Sell)
Net Price Received From Hedge and Options									
Cash Price at Harvest				2.15		2.15	2.15	Forward Contract Price	2.20
Plus Net Returns From Futures and Options									
Sell and Buy (Futures) or Buy and Sell (Options)			0		-.18		-.10	-.12	
Less Brokerage Costs[c]			-.02		-.03		-.03	-.03	
Equals Net Price Received				-.02		-.21	-.13		-.15
Equals Net Price Received			(5)	2.13		1.94 (6)	1.89 (7)	(8)	2.05

[a] Government loan rate less storage costs to maturity.
[b] The expected value, at harvest, of the cash price less the given futures.
[c] Commissions and interest on margins or premiums.
[d] The actual value, at harvest, of the cash price less the given futures.

December futures, it is only $.20 under. The basis contract likewise is $.20 under rather than $.30 under. To help evaluate the alternatives, the actual basis at harvest was set at $-.25 in all three scenarios. This basis is stronger than normal and stronger than the $-.30 expected, but $.05 weaker than on May 1.

In the results, forward contracting, the basis contract, and forward contracting and buying calls compared more favorably than was the case in Scenarios #1, #2 and #3. In Table 4, for example, the forward contract price was $2.20 compared to the expected net price from the hedge of $2.08. Those farmers needing the protection that forward contracts or hedging can offer should select forward contracts in this case. Not only is the net price likely to be higher than with hedging, there is no basis risk.

Farmers needing downside price protection, but wanting to participate in a bull market, would be advised to forward contract and buy calls. While the minimum is slightly less than a $2.60 put, the minimum is assured with the forward contract and call purchase.

Farmers who can handle the risk of a price decline should consider the basis contract. This is still a speculative position, but has some promise of netting a higher price than doing nothing.

Conclusion

In some forward pricing situations, the choice of which alternatives are the most promising and which alternatives to avoid may be clear. However, in most cases the proper course depends on the circumstances relating to the individual farm, its operator and family. Careful attention needs to be given to production costs, the outlook, the farm's financial position, family goals and the operator's willingness and inclination to handle price risks. In any

case, farmers need to understand the forward pricing alternatives, their consequences and which ones best fit the farm's current situation.

A set of tables are appended which can be used to evaluate forward pricing alternatives on new crop corn, wheat or soybeans, and on fed cattle and hogs.

APPENDIX

FORWARD PRICING ALTERNATIVES FOR NEW CROP _____ (CROP)

Date	Cash Market	Futures	Put Options	Forward Contract and Buy Calls
_____	Production Cost _____ Forward Contract Price (1) ☐ Basis Contract Relative to _____ (Futures Month) _____ Net Government Loan Rate (2)[a] ☐ Expected Harvest Price Optimistic _____ Average _____ Pessimistic _____	_____ (Futures Month) _____ (Sell) Less: Expected Basis[b] _____ Brokerage Costs[c] _____ Equals Net Price Expected From Hedge _____	_____ (Futures Month) Strike Price _____ _____ Less: Option Premium _____ (Buy) _____ (Buy) Expected Basis[b] _____ _____ Brokerage Costs[c] _____ _____ Equals Minimum Selling Price Expected _____ _____	_____ (Futures Month) Strike Price _____ Forward Contract Price _____ Less: Option Premium _____ (Buy) Brokerage Costs[c] _____ Equals Minimum Selling Price _____
_____	Harvest Price (3) ☐ Net Price From Basis Contract = Futures + Basis Contract (4) ☐	_____ (Futures Month) _____ (Buy) Actual Basis[d] _____	_____ (Futures Month) Option Premium _____ (Sell) _____ (Sell)	_____ (Sell)
Net Price Received From Hedge and Options Cash Price at Harvest _____ Plus Net Returns From Futures and Options Sell and Buy (Futures) or Buy and Sell (Options) _____ _____ Less Brokerage Costs[c] _____ _____ Equals Net Price Received _____ Equals Net Price Received (5) ☐			_____ _____ _____ _____ _____ _____ ☐ (6) ☐ (7)	Forward Contract Price _____ _____ _____ _____ _____ _____ (8) ☐

[a] Government loan rate less storage costs to maturity.
[b] The expected value, at harvest, of the cash price less the given futures.
[c] Commissions and interest on margins or premiums.
[d] The actual value, at harvest, of the cash price less the given futures.

FORWARD PRICING ALTERNATIVES FOR FED CATTLE OR HOGS

Date	Cash Market	Futures	Put Options	Forward Contract and Buy Calls
_____	Production Cost — Per Head / Per Cwt.[a] Feeder Feed Other Total Forward Contract Price for _____ (Date) (1) ☐ Expected Cash Price for _____ (Date) Optimistic Average Pessimistic	(Futures Month) (Sell) Less: Expected Basis[b] Brokerage Costs[c] Equals Net Price Expected From Hedge	(Futures Month) Strike Price Less: Option Premium (Buy) (Buy) Expected Basis[b] Brokerage Costs[c] Equals Minimum Expected Selling Price	(Futures Month) Strike Price Forward Contract Price Less: Option Premium (Buy) Brokerage Costs[c] Equals Minimum Selling Price
_____	Cash Price (2) ☐	(Futures Month) (Buy) Actual Basis[d]	(Futures Month) Option Premium (Sell) (Sell)	(Sell)
Net Price Received From Hedge and Options Cash Price Plus Returns From Futures and Options Sell and Buy (Futures) or Buy and Sell (Options) Less Brokerage Costs[c] Equals Net Returns Equals Net Price Received		(3) ☐	(4) ☐ (5) ☐	Forward Contract Price (6) ☐

[a] Per cwt. of liveweight of finished cattle or hogs.
[b] The expected value, at time of cash sale, of the given cash price less the futures price.
[c] Commissions and interest on margins or premiums.
[d] The actual value, at time of cash sale, of the given cash price less the futures price.