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Michigan State University
Cooperative Extension Service

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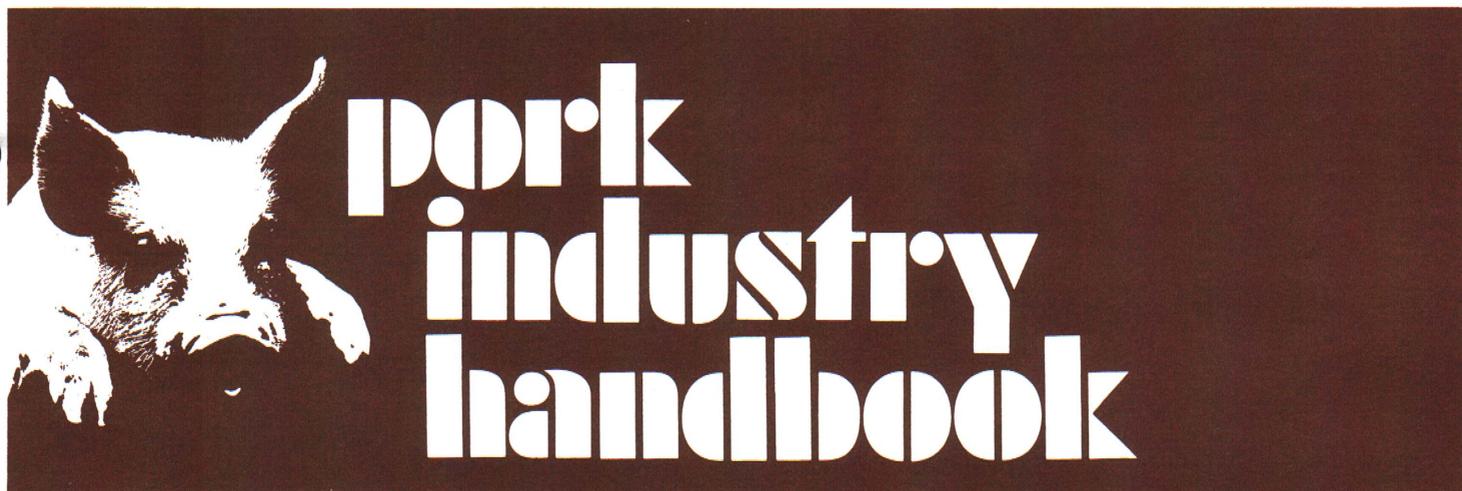
Bob Key, Princeton, Indiana

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COOPERATIVE EXTENSION SERVICE • MICHIGAN STATE UNIVERSITY

Using Futures Markets for Hedging

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Why Do Pork Producers Hedge?

A pork producer who is not familiar with futures markets and hedging may have many questions regarding how to use this pricing tool. But the most basic question is: why be interested in learning about futures markets? In other words, why do producers hedge?

To answer this question, it is first necessary to define futures markets and hedging. A live hog futures market is a market in which prices are established for live hogs that will not be deliverable until some time in the future. Any producer who uses the futures market to forward-price his hogs is hedging.

There are two basic reasons why a producer might want to forward-price hogs. First, the producer may feel that current quotes of futures market prices are higher than cash prices will be when his hogs are ready for delivery. Second, a producer may be unable, or unwilling, to accept the risks of prices lower than the current futures price, even if he thinks cash prices may be higher at delivery time.

The producer with the sole objective of getting the highest price will not price unless the forward-price offered exceeds his cash market price expectations. Thus, he must be in a position to accept the risk that his expected price is wrong. It should also be pointed out that a producer with this objective must accurately anticipate future prices to achieve his objective. He fails if he forward-prices at a price lower than he could have gotten later. He fails if he does not forward-price and later must sell his hogs at a price lower than he could have obtained by forward-pricing.

The producer with the objective of reducing price risk has a much greater chance of achieving his objective through forward-pricing. Such producers include those who choose not to produce unless they can forward-price

at a profit and those who may be required to hedge at profitable prices to obtain credit to finance their hog production. In either case, the producers will have no hogs to sell unless they have been forward-priced.

Other producers may make decisions to produce independent of their forward-pricing decisions and yet have an objective of reduced price risk. They forward-price anytime they are unwilling or unable to accept the risk of having to accept a lower price for their hogs than the price offered through forward-prices. For example, they may choose to forward-price to insure a certain return to management or profit. In any case, at some price level the risk of loss associated with a lower price outweighs the value of a potentially larger but uncertain profit that might occur without forward-pricing. Hedgers with this objective have a high probability of satisfaction from using the futures market. Of course, producers would prefer to get the maximum price and the minimum price risk simultaneously. But this rarely is possible. Producers may consider both objectives to be important, but in any given situation they will probably have to decide which is more important if they are to make a sound pricing decision.

Forward-pricing is not the only alternative to managing price risk. Floor-pricing or minimum-pricing through the options market provides a minimum price while allowing the producer to take advantage of any higher prices. Forward-pricing on the other hand will provide more price protection against lower prices than will floor-pricing, but also precludes gains from higher prices. The mechanics of floor-pricing are explained in fact sheet PIH-109 *Commodity Options as Price Insurance for Pork Producers*.

Many producers can forward-price through either the futures market or through forward cash contracts. In many areas packing plants and buying stations offer forward cash contracts which are a direct result of the futures

market. Since they charge for their services, prices offered through cash contracts are usually less than those offered using the futures market directly.

Another advantage of using the futures market to forward-price is added marketing flexibility. It is not necessary to deliver on the futures contract since it can be offset at any time. Cash contracts lock the producer into delivering the hogs contracted at the specified price. This can create problems when production fails to meet contracted levels or if hogs do not finish out on time.

Futures market forward-pricing offers further marketing flexibility compared to cash contracting by fixing prices without the commitment to deliver at a specific location. This allows the producer to shop around for even higher prices when ready to actually deliver the hogs. In effect the producer is able to separate when he prices from where he delivers. The producer maintains ownership of the hogs but has them priced. This may be of particular importance to producers who have few contracts available or have reason to question the financial stability of the cash contractor.

Disadvantages of using the futures market to forward-price include the necessity of putting up margin money (good faith money required to trade futures), the complexity of the market, and the knowledge required to trade contracts. Another disadvantage is the inability to lock in an exact price (the price relationship between futures and cash markets fluctuates within a small range making a precise determination of forward-prices offered impossible). Also, many producers desire to price less than the minimum standard contract called for in the futures markets. An example of this problem would be the producer with less than 15,000 pounds of hogs (the smallest hog futures contract).

The Arithmetic of Hedging

Hedging with futures is a means of forward-pricing. The method by which forward-pricing is achieved in the futures market may at first seem a bit complicated. But a thorough understanding of the arithmetic of hedging is essential in using the futures market to forward-price.

When a hedger uses the futures market, he takes an offsetting position in the futures market from the one he has in the cash market. For instance, when using the futures to forward-price he sells the appropriate number of contracts in the futures market to establish a price. The hedger sells because this is the opposite of his unpriced inventory position in the cash market. Another, and perhaps simpler, way to keep this straight is to think of hedging as pre-selling in the futures market. Then, when the product is actually ready for delivery in the cash market (the hogs are ready to go to the buying station or wherever they are normally sold), the hedger buys back the contracts in the futures market to offset or nullify the previous futures sale. He then delivers his product to the local market. Thus, any profits or losses made in the futures market are offset by gains or losses in the cash market. It's similar to a balancing scale—when one goes up the other goes down. In dollars, this puts the hedger back at the price originally desired.

In summary, a producer-hedger operates in two markets and the action can be illustrated as follows:

Cash Market	Futures Market
Commits inputs, etc. to produce	Sells futures contract to establish a price
Sells production in local market	Buys back futures contract

How Hedging Works

An example can illustrate exactly how the cash market balances the futures market. Let's assume a hog feeder is interested in hedging a part of the hogs he will be finishing out in early April. *The hedger is interested in the futures contract that matures closest to, but not before, the time his hogs will be ready for slaughter.* Since there is an April contract and his hogs will finish in April, he selects this futures contract. He knows by looking in the paper that April futures closed today at \$49.50. He knows how to trade futures contracts and has an account opened at a brokerage office. Now he faces two basic questions:

1. What does a futures quote of \$49.50 mean through a hedge?
2. Once the hedge price is known, how is it "locked in?"

Let's take a look at each of these questions. What does a futures price mean? The \$49.50 for an April contract tells us the price which could be locked in by delivering hogs to Peoria,¹ Illinois in April. Delivering hogs to Peoria, however, does not interest most producers. They want to lock in a price, but deliver hogs to the same local market to which they normally deliver. We do know that hog prices (and all commodities for that matter) are determined not in our town or county or state, but in a national market. Since Peoria, Illinois is a major national market we can assume that the price of hogs at our local market moves with the price at Peoria, which represents the futures market. Therefore, if hog prices go up at Peoria, prices at the local market should go up and vice versa. So if the hedger knows the relationship between the local prices and Peoria's price (which is the same as the futures market during the delivery period), then he can determine what the futures market is offering today for hogs sold in his local markets in April. This relationship is called basis. *Basis is the premium or discount used to adjust futures prices to local cash price levels.* For this example, assume that by looking at the difference between his local hog market and April futures prices over the last few years, he finds an average difference of $-\$1.50/\text{cwt}$. That is, hog prices at his local market in April are normally $\$1.50$ under the April futures prices on the same day.

Now, the hedger can adjust the futures price to reflect delivery in his cash market. Today (February 1) the April futures contracts closed at \$49.50. If in April the hedgers local market is $\$1.50$ under the April futures price, the future price means $\$49.50 - \1.50 or $\$48.00/\text{cwt}$. This is the price the futures market is offering on February 1 through hedging for the hogs delivered at the hedger's market in April.

Let's put this in terms of the two markets in which the hedger operates: the cash market and the futures market.

Date	Cash	Futures	Basis
Feb 1	Forward Price Target	April futures	$-\$1.50$
	=futures price less	at \$49.50	(estimated)
	basis or $\$49.50 -$		
	$\$1.50 = \48.00		

Locking in a Price Through a Hedge

Now that the hedger knows what the futures market is offering, how does he go about locking it in if he likes this price? Recall from the previous discussion, the hedger takes an opposite position in the futures from the one he or she has in the cash. In this case, the hedger would sell the number of contracts which covers the number of hogs

he wishes to forward-price. The hedger is in effect "pre-selling" his hogs in the futures market. Since each contract calls for 30,000 pounds on the Chicago Mercantile Exchange contract or 15,000 pounds on the MidAmerican Exchange, he can price a minimum of 65 head at 230 pounds on the MidAmerican contract, or 130 head on the Mercantile. Assume he wishes to price a group of 130 hogs. He will sell one Mercantile contract. By calling his broker and placing an order to sell one contract of April hogs at \$49.50, he now feels he has them priced at \$48.00 (\$49.50 less the \$1.50 estimated basis). Note that for this example the cost of hedging (brokerage and interest on margin) is ignored.

Now take the example forward in time. It is April and the hedger's hogs are ready to sell at the XYZ Hog Market. He takes his hogs to his local market, or wherever the price is best, and on the same day buys back his futures contract. The broker notifies him that he has bought a contract at \$55.00 while his hogs brought \$53.50 at the local sale. Now what has happened to his forward-price? Look at the results of the two markets again.

Date	Cash	Futures	Basis
Feb 1	Target Price through hedge: Futures - Basis or \$49.50 - \$1.50 = \$48.00/cwt.	Sold one Apr. hog at \$49.50/cwt.	-\$1.50/cwt. (est.)
Apr 10	Sold 130 head of hogs at XYZ market at \$53.50/cwt.	Bought one Apr. hog at \$55.00/cwt. Future results: Sold \$49.50 Bought \$55.00 resulting in loss of -\$5.50/cwt.	-\$1.50/cwt. (actual)

Actual price received: Cash price + gain or loss in Futures or \$53.50 - \$5.50 = \$48.00

The hedge resulted in a net price of \$48.00/cwt, just what the hedger had planned. The gain in the cash market (\$48.00 vs \$53.50) was just offset by the loss in the futures market, giving the anticipated target price. Of course, had he not hedged he would have received a higher price, but if he had known this back in February, why forward-price? In fact, if the hedger knows which way prices are going, why grow hogs? Just speculate in the futures and forget about all the production troubles.

What would have happened if prices had fallen between February 1 and April 10? Look at the action in each market.

Date	Cash	Futures	Basis
Feb 1	Target price through hedge: Futures - Basis or \$49.50 - \$1.50 = \$48.00/cwt.	Sold one Apr. hog at \$49.50/cwt.	-\$1.50/cwt. (est.)
Apr. 10	Sold 130 head of hogs at XYZ market at \$45.00/cwt.	Bought one Apr. hog at \$46.50/cwt. Futures results: Sold \$49.50 Bought \$46.50 resulting in gain of \$3.00/cwt.	-\$1.50/cwt. (actual)

Actual price received: Cash price + gain or loss in Futures or \$45.00 + \$3.00 = \$48.00.

Again, the hedger received the \$48.00 target price even though prices fell from the placement of the hedge until April. Why? Because the loss in the cash market (\$48.00 vs \$45.00) was offset by a gain in the futures (\$49.50 vs

\$46.50), giving the hedger a target price of \$48.00/cwt for his hogs.

Note two things from this example: On April 10, the difference between the local cash price and the April futures is \$1.50/cwt, the exact basis the producer estimated back in February. Second, the net price received equals the target price. In other words, the hedge locked in exactly the price wanted, resulting in a perfect hedge. Regardless of which direction prices go, as long as the basis is estimated correctly the hedge will lock in the target price.

What happens when the actual basis is different from the estimated basis? The following "basis error" example illustrates this situation.

Date	Cash	Futures	Basis
Feb 1	Target price: Futures-Basis or \$49.50 - \$1.50 = \$48.00/cwt.	Sell one Apr. hog futures at \$49.50/cwt.	-\$1.50/cwt. (est.)
Apr. 10	Sold 130 head of hogs at XYZ market at \$45.50/cwt.	Bought one Apr. hog at \$46.50/cwt. Futures results: sold \$49.50 Bought \$46.50 resulting in gain of \$3.00/cwt.	-\$1.00/cwt. (actual)

Actual price received: Cash price + futures gain or loss or \$45.50 + \$3.00 = \$48.50

What has happened? The cash price received at the local auction was actually \$.50/cwt higher relative to April futures than expected, hence the net price is 50 cents greater than the target price (\$48.50 vs 48.00). Notice, this is the same difference as the estimated - \$1.50 basis on February 1 and the actual basis of - \$1.00 on April 10.

The moral to the story is that hedging locks in a price exactly as long as the estimate of the basis is correct. However, in most practical situations there will be a small difference between the actual and estimated basis. The net price and target price will differ by the error in estimating basis. This is why the beginning section stated that by hedging through futures, a price within a small range could be locked in.

For our example, we have used a pork producer's hedge. The hedge works the same way for all commodities. To establish a price, the production hedger "pre-sells," or sells, the number of future contracts to cover the production he wishes to hedge. Then when he is actually ready to sell his production wherever he wants, he buys back his futures contracts. The hedger will receive the hedge target price plus or minus the amount the actual basis differs from the estimated basis.

Hedging and Basis

Since hedging accuracy is dependent on forecasting basis, the successful hedger must have an understanding of the factors affecting basis. In general, four factors must be taken into account when determining the hedger's basis: time, location, quality, and market. The time dimension of the basis is usually limited to the time the hedger expects to deliver his hogs at his local cash market and the nearby futures. During the delivery period of a contract (usually the first of the contract month to roughly the twentieth of the month), the cash price at the futures market delivery point and the futures price should differ by only a small amount. Thus, the basis difference during the futures market delivery contract month reflects only locational or

quality differences. Because hogs are nonstorable, basis differences in months other than the delivery month will reflect the general direction expected in prices and therefore may be harder to anticipate. For example, the difference between the cash price of hogs in January (for which there is no futures contract) and the February futures contract will depend on the futures market's anticipation of the supply of and demand for hogs in February vs the actual supply and demand in January. If the market expected a decrease in February marketings compared to January, (and thus a higher hog price in February) the February futures price could be higher than the January cash price. This would result in a negative January basis (January cash price lower than the nearby February futures). The opposite situation could result in a positive basis (cash price higher than futures). As the cash-marketing time approaches the futures contract delivery time, the basis becomes more predictable because the element of market direction is absent. Hedgers anticipating delivery in months other than the delivery contract months will need to adjust for anticipated market direction in determining their basis.

Locational differences in basis may also exist. Simply put, anything that affects the local supply and demand balance relative to the futures market delivery point's supply and demand will affect the basis. For instance, the opening or closing of a local slaughter plant may have little impact on the national demand for hogs which determines the futures price, but can impact the price received locally. Delays in local marketings due to field work demands in the spring or inclement weather during the winter can also affect basis. That is, local buyers may be willing to pay more relative to the national market price due to a reduced local supply. Locational differences in the basis other than those mentioned above are usually rather predictable over time. Transportation cost involved in moving hogs from one market to another limits all locational basis differences. For these reasons, reasonably accurate forecast of locational basis differences close to, or during, the delivery period of the contract can be made using historical average differences of prices between the hedgers local market and the nearby futures price.

Quality is another determinant of basis. The futures market price stands for a specific quality of hog. The hedger's basis estimate should reflect any anticipated discount or premium due to delivery of a differing quality of hog locally. For instance, the basis estimate should reflect any discount associated with heavy or light hogs or grade differences not accounted for in the original basis price comparison. Normally, the use of the current quality discount, or premium, will provide the hedger with an adequate forecast of the quality component of his basis.

Several studies have shown that the use of the recent three or five year average of the local basis, adjusted for quality differences, is as accurate a forecast of the basis as more sophisticated forecast techniques. The important information from historical basis studies is the variability in the cash/futures difference. For instance, a hedger that knows that the difference between hogs sold locally and the futures price has averaged $-.50/\text{cwt.}$ during the last three years but has varied from $.50/\text{cwt.}$ above futures to 2.00 below, may conclude that he would expect to net $$.50/\text{cwt.}$ less than the futures price by hedging. However, he would realize there is some chance of receiving a price through a hedge as much as $\$2.00/\text{cwt.}$ less than the current futures price. Most state Extension services provide historical basis information. Potential hedgers should keep their own basis records by recording on a periodic

schedule their local cash prices and the closing nearby futures price for that day.

Rather than relying on a historical basis difference, those producers close to the futures market delivery points may localize the futures by subtracting the cost of delivery. Delivery costs include additional transportation to the delivery point, additional shrink, delivery marketing cost, quality discounts and delivery point discounts to markets other than Peoria.

The Hedging Decision

The decision to hedge or not to hedge is a difficult one. In the final analysis it will depend on the producer's evaluations of a given market situation relative to his forward-pricing objectives and strategy.

Much of the recent futures market research has dealt with the tradeoff between higher prices and lower price risk in developing optimal hedging strategies. Variability of production, basis error, and risk preference of the hedger all influence the hedging decision. Another area of research has centered on using technical analysis of futures market price trends to price at more favorable futures price levels. Details of these hedging strategies have been made available periodically through trade publications and State University research and Extension reports. These strategies are much too varied and complex to outline here.

However, the decision process outlined below is relevant to any true hedge regardless of objective or strategy. The focus is on two questions. First, what price is the futures market offering for my hogs? And second, how much potential profit does that price represent? For any producer using futures markets to forward-price hogs rather than speculate on price changes, these questions are basic.

The first step in any hedging process is to "localize" the futures price. Localizing translates the quoted futures price into a net hedged price for the hedger's hogs delivered to the local market. An important part of this step is adjusting the futures price to account for the "basis" as outlined in the previous section on the arithmetic of hedging.

Another factor in localizing the futures price is to account for hedging cost. Hedgers must trade futures contracts through brokers. The brokerage fee which covers both the sell and buy transaction, usually amounts to about $\$.25/\text{cwt.}$ of hogs hedged.

The hedger trades futures contracts on margin. This means that the hedger must deposit a portion of the value of the contract (usually 5-10%) at the time he sells a contract. If the futures price moves up, he must deposit more money to cover the total value of the price change. If it moves down, he may draw out money in the amount of the total value of the change. In this way, the initial margin amount is maintained in the hedger's account and is returned when the hedge is completed. Thus, margin cost is the interest cost on the margin money, since it draws no interest while on deposit. (Treasury bills may be used as initial margin, thus avoiding this interest cost.) Assuming that the market is no more likely to move against the hedger than it is to move in his favor, the interest cost may be estimated on the initial margin requirement. With an initial requirement of $\$1,000/\text{contract}$ and a 12% annual interest rate, margin costs would amount to about $\$.13/\text{cwt.}$ of hogs hedged for 4 months. Total hedging cost might be estimated to amount to about $\$.35$ to $\$.45/\text{cwt.}$, including both brokerage fees and interest on margin money.

The second step in the hedging process is to estimate costs of production. A hedger should have an estimate of this minimum pricing level. Prices at various levels above variable costs represent varying levels of returns to fixed or unavoidable costs, returns to management, and profit. A producer who has an accurate estimate of both variable and fixed costs and definite objectives with respect to management returns and profit is in a position to evaluate accurately the profitability of any futures price offered, thus facilitating his hedging decision.

Whether the producer will hedge at any localized price level above his variable cost depends on his forward-pricing objective and his pricing strategy. In general, producers are more likely to hedge when futures prices are higher relative to future expected cash prices, when producers have less confidence in their ability to predict cash prices, and when producers are more averse to price risk. Producers who use forward-pricing as a basis for management decisions are also more likely to price and produce when futures prices are higher relative to production costs.

The decision to hedge or not to hedge is an individual decision. However, the producer who has not reached a conclusion regarding his primary hedging objective and has not developed a strategy for achieving that objective has little chance of success.

Do's and Don't's of Hedging

The Do's

- Become thoroughly familiar with the futures markets and how to use them in hedging before attempting to hedge. (This fact sheet is barely a start toward the information you will need to hedge effectively).
- Try a few hedges "on paper" if you are unconvinced that futures price changes will be offset by local market prices for hogs.
- Know your objective and the probability of achieving it before you hedge.
- Hedge only a small portion of your anticipated production, if possible, until you are convinced that hedging can do what you want it to do for you.
- Hedge by selling futures contracts that mature nearest to but not before you expect to deliver your hogs. Basis is predictable with most accuracy when comparing local market price with futures price for the same month; for example, February futures prices quoted during February compared to local market prices during February.
- Be prepared to meet all calls for additional margin money; otherwise, you cannot be assured of completing the hedge.

- Know your production cost, including feed, labor, medication, buildings, overhead, etc.
- Consider forward-pricing feed when you forward-price your hogs to reduce risk of rising production costs.
- Remember that a pork producer who does not forward-price is, in a sense, a speculator. He commits cost to production and speculates that price will be high enough to cover those costs.
- Buy futures to offset your previous sale at the same time you establish a price for your hogs at the local market. A delay of even one day or possibly even an hour can make a difference in the hedging outcome.
- Find a broker who understands hedging and knows your objectives to handle your hedging account.
- Find a good banker who understands hedging to finance production and hedging activities.

The Don't's

- Don't confuse hedging with futures market speculation. Speculators are concerned only with profits or losses in the futures market.
- Don't change pricing objectives in the middle of a hedge.
- Don't lift the hedge by offsetting the futures contract until the hogs are ready for delivery to the local market. Lifting the hedge prior to delivery returns you to a speculative position on the price of your hogs.
- Don't try to outguess the market. Once you have hedged it makes no difference which way prices move as long as futures prices and local cash prices are offsetting.
- Don't sell futures in amounts greater than the number of hogs you are confident you can produce. To do so means you are speculating on the difference.
- Don't fail to offset futures commitments when you price your hogs in the local market. This makes you a speculator because you no longer have any hogs to sell.
- Don't hedge unless you have, or have made arrangements to get, enough margin money to complete the hedge. Inability to meet a margin call might force you to lift your hedge at the worst possible time. A \$10/cwt. change in futures price represents \$3,000 on a 30,000 lb. contract.
- Don't let your broker make decisions for you. He doesn't share your profits or losses. Above all, don't let a broker talk you into speculation when you want to hedge.
- Don't let a price that is perfectly acceptable slip away while you are waiting for futures prices possibly to go a few cents higher.

Live Hog Futures Contract Specifications

UNITS OF TRADING: 30,000 lb. (Chicago Mercantile Exchange Contract); 15,000 lb. (MidAmerica Exchange Contract)

*GRADES: USDA No. 1, No. 2, and up to 10 head of No. 3 barrows and gilts. Average weight 210-240 lbs.

*DELIVERY POINT: Peoria, Illinois

USUAL DELIVERY MONTHS: February, April, June, July, August, October and December.

*Deliverable at quoted contract price; other grades, weights and locations are deliverable at a discount to the quoted price.

¹Delivery can also be made at other locations but require a discount to the futures price. See the Contract Specification section.



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