Supplementary Materials for:

"Management of multiple sources of risk in livestock production"

APPENDIX A: CONCEPTUTAL MODEL EXAMPLES

First, consider how animal health practices impact profit, holding live cattle price and all else constant. A relationship between feeder cattle quantity placed, Q^{FC}, and live cattle quantity produced, Q^{LC}, exists. Additionally, the relationship between feeder cattle pounds placed and live cattle pounds at finishing will be a function of animal health practices, $z = \{additional\ animal\ health\ practice\ (AH), standard\ practices\ (ST)\}$. For example, an additional animal health practice might be paying a premium to purchase cattle from a single, known source that may improve the health status of the entire pen of cattle being placed on feed.

While cattle are being fed they can potentially get sick and therefore their final finished weight is uncertain. Additionally, due to death loss, the total number of finished head is uncertain. Thus, the production function depends on the specific practices used,

$$Q_{AH}^{LC} = f(Q_{AH}^{FC}, x_{AH}; \tilde{e}) \quad \text{(A1)}$$

$$Q_{ST}^{LC} = g(Q_{ST}^{FC}, x_{ST}; \tilde{e}). \quad \text{(A2)}$$

Potentially, due to factors such as seasonality and other feedlot characteristics, $f(.)$ and $g(.)$ could be related. Therefore, profit functions can be written as:

$$\widetilde{\pi_{AH}} = \widetilde{P^{LC}} * f(Q_{AH}^{FC}, x_{AH}; \tilde{e}) - \widetilde{P_{AH}^{FC}} * Q_{AH}^{FC} - rx_{AH} - K \quad \text{(A3)}$$

$$\widetilde{\pi_{ST}} = \widetilde{P^{LC}} * g(Q_{ST}^{FC}, x_{ST}; \tilde{e}) - \widetilde{P_{ST}^{FC}} * Q_{ST}^{FC} - rx_{ST} - K \quad \text{(A4)}$$

where P^{LC} is live cattle price per hundred weight (cwt) (finished cattle, output), P_z^{FC} is feeder cattle price per cwt, Q_z^{LC} is total cwts of cattle produced (output 100 lbs), Q_z^{FC} is total cwts of feeder cattle purchased (input 100 lbs), and x_z is a vector of other input quantities. Other inputs costs, including feed costs, veterinary costs, and labor, will vary by pen and production practices used specifically for that pen. Therefore, additional animal health practices impact profit through differences in premiums paid for feeder cattle, production costs, and live cattle pounds produced.

Now, consider how price risk management strategies impact profitability, assuming animal health practices and all else constant. We assume operators are price takers. However, they can have some control over if and/or when they establish an expected sale and/or purchase price. A feedlot operator can hedge feeder cattle, live cattle, and corn prices using futures or

options market contacts (i.e., set an expected price or set a floor or ceiling price), enter into forward contracts, or utilize other tools such as livestock price or margin insurance. Alternatively, the operator can decide not to protect against adverse price movements and accept cash prices at the time of the cash sale. Utilizing price risk management tools allow producers to decrease price risk compared to accepting cash prices at time of sale. Consider the formula,

$$net\ price = futures\ price + basis. \tag{A5}$$

Hedging using futures contracts establishes the futures price component of equation (A5) and only allows basis risk. Basis risk is usually less than cash price risk. The use of forward contracts can establish both the futures price and basis, eliminating price risk.[1] Although futures market hedging and net price forward contracts can protect producers from adverse price movements, one downfall of futures hedging and forward contracts which set the net price is producers cannot benefit from favorable price movements. Thus, price risk management strategies impact input and output prices that directly impact profitability. For simplicity, assume feedlot operators either hedge both live cattle and feeder cattle prices or use cash markets where $H = hedged\ price$ and $C = cash\ price$. Then profit can be written as:

$$\widetilde{\pi_H} = \widetilde{P_H^{LC}} * G(Q^{FC}, x; \tilde{e}) - \widetilde{P_H^{FC}} * Q_{FC} - rx - K \tag{A6}$$

$$\widetilde{\pi_C} = \widetilde{P_C^{LC}} * G(Q^{FC}, x; \tilde{e}) - \widetilde{P_C^{FC}} * Q_{FC} - rx - K. \tag{A7}$$

Therefore, profit can vary based on differences in prices paid for cattle inputs and received for cattle outputs when using cash markets only versus hedging.

[1] While third party default risk is important, it introduces unnecessary complexities into the research question presented here and is ignored.

APPENDIX B: SURVEY INSTRUMENT

Following is a survey designed to obtain important information from U.S. feedlot operators. The survey is focused on assessing various aspects of risk management including incoming cattle purchases and outgoing cattle sales. We want to emphasize that your participation in this survey is entirely voluntary and highly encouraged. All your responses will be kept in strict confidence. Typical demographic questions are included to ensure our sample is representative of the U.S. feedlot industry and will remain strictly confidential. If you wish to provide comments please use the space at the end of the survey. We very much appreciate your assistance with this important project and look forward to receiving your completed survey. If you have any questions or comments regarding this survey, please feel free to contact Melissa McKendree (mgsm@ksu.edu) or Dr. Glynn Tonsor by email (gtonsor@ksu.edu) or by phone (785-532-1518).

Q1A Please describe your cattle operation by indicating the percentage of your operation devoted to each segment of the beef cattle industry (should sum to 100%)

_____ Seed Stock (1)

_____ Cow-calf (2)

_____ Backgrounding/Stocker (3)

_____ Feedlot (4)

_____ Other (please describe): (5)

Q1B Do you play a role in price risk management and/or animal health risk management decisions?

- o Yes, both price risk and animal health risk decisions (3)
- o Yes, price risk management decisions (1)
- o Yes, animal health risk management decisions (2)
- o No (4)

The following questions will refer to "your operation." Please answer the questions when considering the finishing feedlot(s) in your operation. If your operation includes multiple feedlots, please answer for them collectively.

Q2 Please answer the following questions:

	Never (1)	Sometimes (2)	About half the time (3)	Most of the time (4)	Always (5)
How often does your operation use futures markets to hedge corn for feeding? (1)					
How often does your operation use futures markets to hedge feeder cattle? (2)					
How often does your operation use futures markets to hedge fed cattle? (3)					

Q3 What is the average placement weight of calves your feeding operation places in March?

- o Under 600 lbs (1)
- o 600 to 699 lbs (2)
- o 700 to 799 lbs (3)
- o 800 to 899 lbs (4)
- o 900 lbs or more (5)

Q4 On average, what percentage of feeder cattle does your operation source from (should sum to 100%):

_____ Traditional auction (1)

_____ Satellite/video auction (2)

_____ Purchased direct from seller (ranch) (3)

_____ Home raised from own cow-herd (4)

_____ Custom fed, so I did not buy or own animals (5)

_____ Other(please describe): (6)

Q5 Compared to calves sourced from auctions with unknown backgrounds, how do you believe calves from a single source ranch perform (i.e. average daily gain, feed conversion, morbidity) in the feedlot?

- Much worse (1)
- Somewhat worse (2)
- About the same (3)
- Somewhat better (4)
- Much better (5)

Q6 In the past 12 months, what do you believe is the average premium paid nationally in the market for feeder calves sourced from a single known ranch versus multiple unknown sources?

- Discount (1)
- No premium (2)
- Premium less than $1/cwt (3)
- $1 to $1.99/cwt premium (4)
- $2 to $2.99/cwt premium (5)
- $3 to $3.99/cwt premium (6)
- $4 to $4.99/cwt premium (7)
- $5 to $5.99/cwt premium (8)
- $6 to $6.99/cwt premium (9)
- $7 to $7.99/cwt premium (10)
- $8 to $8.99/cwt premium (11)
- $9 to $9.99/cwt premium (12)
- Premium greater than $10/cwt (13)

Q7 In the past 12 months, what percentage of finished cattle did your operation market as (should sum to 100%):

_____ Live weight, negotiated price (includes auctions) (1)

_____ Live weight, formula price (2)

_____ Live weight, forward contract (3)

_____ Dressed weight, negotiated price (4)

_____ Dressed weight, formula price (5)

_____ Dressed weight, forward contract (6)

_____ Grid (dressed, grade and yield) (7)

_____ Other (please describe): (8)

Q8 In the past 12 months, what percentage of the following pricing methods did your operation use for marketing finished cattle (should sum to 100%):

_____ Spot cash market (1)

_____ Forward contract or marketing agreement (2)

_____ Futures hedge (3)

_____ Options hedge (4)

_____ Livestock Risk Protection (LRP) Insurance (5)

_____ Livestock Gross Margin (LGM) Insurance (6)

_____ Other (please describe): (7)

Q9 How do you think the August 2017 live cattle futures contract will settle (at expiration in August)?

- o Settle price will be higher than today's trading price (1)
- o Settle price will be lower than today's trading price (2)
- o Settle price will be the same as today's trading price (3)

Display This Question:

If What are your price expectations for fed cattle between now and August 2017? Prices will increase Is Selected

Q9-A By how much do you expect the August 2017 live cattle price to increase by settle (at expiration in August)?

- o increase by less than $2/cwt (1)
- o increase by $2 to $4/cwt (2)
- o increase by $4 to $6/cwt (3)
- o increase by $6 to $8/cwt (4)
- o increase by $8 to $10/cwt (5)
- o increase by more than $10/cwt (6)

Display This Question:

If What are your price expectations for fed cattle between now and August 2017? Prices will decrease Is Selected

Q9-B By how much do you expect the August 2017 live cattle price to decrease by settle (at expiration in August)?

- o decrease by less than $2/cwt (1)
- o decrease by $2 to $4/cwt (2)
- o decrease by $4 to $6/cwt (3)
- o decrease by $6 to $8/cwt (4)
- o decrease by $8 to $10/cwt (5)
- o decrease by more than $10/cwt (6)

Q10 What is the historical nearby August fed cattle basis ($/cwt) in your area? (Please slide the purple circle to the appropriate basis) Note: Basis = local cash price - futures price

_____ August basis ($/cwt) (1)

Treatment 1

The following two questions look similar but importantly are different. Please complete both questions carefully. Research studies have found people to overstate their willingness to pay in hypothetical situations, such as this survey. It is important that you make your selection as if you were actually facing these choices in operation of your feed yard.

Q11.1 Single source feeder calves, originating from a single ranch of origin, are generally considered less risky than calves with unknown histories due to their better performance and lower morbidity at the feedlot. Suppose it is February 15th. You are looking to buy feeder steers for March placement with an expectation of August finish/sale. A sale lot of 150 feeder steers, which will weigh approximately 800 lbs each at placement, are available for purchase from a single known ranch for a premium of $ 0 /cwt over cattle purchased at an auction from unknown sources. Of the 150 head of feeder steers available from the single source ranch, how many would you purchase?

Q12.1 Single source feeder calves, originating from a single ranch of origin, are generally considered less risky than calves with unknown histories due to their better performance and lower morbidity at the feedlot. Suppose it is February 15th. You are looking to buy feeder steers for March placement with an expectation of August finish/sale. A sale lot of 150 feeder steers, which will weigh approximately 800 lbs each at placement, are available for purchase from a single known ranch for a premium of $ 0 /cwt over cattle purchased at an auction from unknown sources. The August CME live cattle futures contract is trading at $ 0/cwt (CME contract is for 40,000lb of live cattle). The expected local August basis is $ 0 /cwt. Of the 150 head of feeder steers available from the single source ranch, how many would you purchase?

Display This Question:

If Single source feeder calves, originating from a single ranch of origin, are generally considered less risky than calves with unknown histories due to their better performance and lower morbidity at... Text Response Is Greater Than 0

Q12B.1 Of the ${q://QID22/ChoiceTextEntryValue} feeder steers purchased, how many would you place under a futures hedge using the CME live cattle contract given the above information? Recall: The August CME live cattle futures contract is trading at $ 0/cwt (CME contract is for 40,000lb of live cattle). The expected local August basis is $ 0 /cwt.

Treatment 2

The following two questions look similar but importantly are different. Please complete both questions carefully. Research studies have found people to overstate their willingness to pay in hypothetical situations, such as this survey. It is important that you make your selection as if you were actually facing these choices in operation of your feed yard.

Q11.2 Single source feeder calves, originating from a single ranch of origin, are generally considered less risky than calves with unknown histories due to their better performance and lower morbidity at the feedlot. Suppose it is February 15th. You are looking to buy feeder steers for March placement with an expectation of August finish/sale. A sale lot of 150 feeder steers, which will weigh approximately 800 lbs each at placement, are available for purchase from a single known ranch for a premium of $ 0 /cwt over cattle purchased at an auction from unknown sources. Of the 150 head of feeder steers available from the single source ranch, how many would you purchase?

Q12.2 Single source feeder calves, originating from a single ranch of origin, are generally considered less risky than calves with unknown histories due to their better performance and lower morbidity at the feedlot. Suppose it is February 15th. You are looking to buy feeder steers for March placement with an expectation of August finish/sale. A sale lot of 150 feeder steers, which will weigh approximately 800 lbs each at placement, are available for purchase from a single known ranch for a premium of $ 0 /cwt over cattle purchased at an auction from unknown sources. The August CME live cattle futures contract is trading at $ 0 /cwt. A forward contract (with typical specifications for your area) is currently being offered with a basis of $ 0 /cwt tied to the August futures contract. Of the 150 head of feeder steers available from the single source ranch, how many would you purchase?

Display This Question:

If Single source feeder calves, originating from a single ranch of origin, are generally considered... Text Response Is Greater Than 0

Q12B.2 Of the ${q://QID24/ChoiceTextEntryValue} feeder steers purchased, how many would you place under a forward contract (with typical specification for your area) given the above information? Recall: The August CME live cattle futures contract is trading at $ 0 /cwt. A forward contract (with typical specifications for your area) is currently being offered with a basis of $ 0 /cwt tied to the August futures contract.

Treatment 3

The following two questions look similar but importantly are different. Please complete both questions carefully. Research studies have found people to overstate their willingness to pay in hypothetical situations, such as this survey. It is important that you make your selection as if you were actually facing these choices in operation of your feed yard.

Q11.3 Single source feeder calves, originating from a single ranch of origin, are generally considered less risky than calves with unknown histories due to their better performance and lower morbidity at the feedlot. Suppose it is February 15th. You are looking to buy feeder steers for March placement with an expectation of August finish/sale. A sale lot of 150 feeder steers, which will weigh approximately 800 lbs each at placement, are available for purchase from a single known ranch for a premium of $ 0 /cwt over cattle purchased at an auction from unknown sources. Of the 150 head of feeder steers available from the single source ranch, how many would you purchase?

Q12.3 Single source feeder calves, originating from a single ranch of origin, are generally considered less risky than calves with unknown histories due to their better performance and lower morbidity at the feedlot. Suppose it is February 15th. You are looking to buy feeder steers for March placement with an expectation of August finish/sale. A sale lot of 150 feeder steers, which will weigh approximately 800lb each at placement, are available for purchase from a single known ranch for a premium of $ 0 /cwt over cattle purchased at an auction from unknown sources. The August CME live cattle futures contract is trading at $ 0 /cwt (CME contract is for 40,000lb of live cattle). The expected local August basis has a ${e://Field/Percent1} % chance of being less (weaker) than $ 0, and a 100% chance of being greater (stronger) than $ 0. Of the 150 head of feeder steers available from the single source ranch, how many would you purchase?

Display This Question:

If Single source feeder calves, originating from a single ranch of origin, are generally considered less risky than calves with unknown histories due to their better performance and lower morbidity at... Text Response Is Greater Than 0

12B.3 Of the ${q://QID47/ChoiceTextEntryValue} feeder steers purchased, how many would you place under a futures hedge using the CME live cattle contract given the above information? Recall: The August CME live cattle futures contract is trading at $ 0 /cwt (CME contract is for 40,000lb of live cattle). The expected local August basis has a ${e://Field/Percent1} % chance of being less (weaker) than $ 0, and a 100% chance of being greater (stronger) than $ 0.

Treatment 4

Research studies have found people to overstate their willingness to participate in hypothetical situations, such as this survey. It is important that you make your selection as if you were actually facing these choices in operation of your feed yard.

Q11.4 Suppose it is February 15th. You just purchased a lot of 150 feeder steers weighing approximately 800 lbs each for March placement with an expectation of August finish/sale. The August CME live cattle futures contract is trading at $ 0 /cwt (CME contract is for 40,000lb of live cattle). How many head would you place under each of the following output pricing strategies?

_____ A futures hedge with an expected local August basis of $ 0/cwt. (1)

_____ A forward contract (with typical specifications for your area) with a basis of $ 0 /cwt tied to the August futures contract. (2)

_____ Other output pricing strategy (e.g., options, Livestock Risk Protection, formula pricing, etc.) (3)

_____ I would accept the local cash price at time of sale in August (4)

Treatment 5

Research studies have found people to overstate their willingness to participate in hypothetical situations, such as this survey. It is important that you make your selection as if you were actually facing these choices in operation of your feed yard.

Q11.5 Suppose it is February 15th. You just purchased a lot of 150 feeder steers weighing approximately 800 lbs each for March placement with an expectation of August finish/sale. The August CME live cattle futures contract is trading at $ 0 /cwt (CME contract is for 40,000lb of live cattle). How many head would you place under each of the following output pricing strategies?

_____ A futures hedge where the expected local August basis has a ${e://Field/Percent1}% chance of being less (weaker) than $ 0, and a 100% chance of being greater (stronger) than $ 0. (1)

_____ A forward contract (with typical specifications for your area) with a basis of $ 0 /cwt tied to the August futures contract. (2)

_____ Other output pricing strategy (e.g., options, Livestock Risk Protection, formula pricing, etc.) (3)

_____ I would accept the local cash price at time of sale in August (4)

Treatment 6

Research studies have found people to overstate their willingness to participate in hypothetical situations, such as this survey. It is important that you make your selection as if you were actually facing these choices in operation of your feed yard.

Q11.6 Single source feeder calves, originating from a single ranch of origin, are generally considered less risky than calves with unknown histories due to their better performance and lower morbidity at the feedlot. Suppose it is February 15th. You just purchased a lot of 150 feeder steers weighing approximately 800 lbs each for March placement with an expectation of August finish/sale. The steers were sourced from a single known ranch for a premium of $ 0/cwt over cattle purchased at an auction from unknown sources. The August CME live cattle futures contract is trading at $ 0/cwt (CME contract is for 40,000lb of live cattle). How many head would you place under each of the following output pricing strategies?

_____ A futures hedge with an expected local August basis of $ 0 /cwt. (1)

_____ A forward contract (with typical specifications for your area) with a basis of $ 0 /cwt tied to the August futures contract. (2)

_____ Other output pricing strategy (e.g., options, Livestock Risk Protection, formula pricing, etc.) (3)

_____ I would accept the local cash price at time of sale in August (4)

Treatment 7

Research studies have found people to overstate their willingness to participate in hypothetical situations, such as this survey. It is important that you make your selection as if you were actually facing these choices in operation of your feed yard.

Q11.7 Single source feeder calves, originating from a single ranch of origin, are generally considered less risky than calves with unknown histories due to their better performance and lower morbidity at the feedlot. Suppose it is February 15th. You just purchased a lot of 150 feeder steers weighing approximately 800 lbs each for March placement with an expectation of August finish/sale. The steers were sourced from a single known ranch for a premium of $ 0/cwt over cattle purchased at an auction from unknown sources. The August CME live cattle futures contract is trading at $ 0 /cwt (CME contract is for 40,000lb of live cattle). How many head would you place under each of the following output pricing strategies?

_____ A futures hedge where the expected local August basis has a ${e://Field/Percent1}% chance of being less (weaker) than $ 0, and a 100% chance of being greater (stronger) than $ 0. (1)

_____ A forward contract (with typical specifications for your area) with a basis of $ 0 /cwt tied to the August futures contract. (2)

_____ Other output pricing strategy (e.g., options, Livestock Risk Protection, formula pricing, etc.) (3)

_____ I would accept the local cash price at time of sale in August (4)

Q13 Please rate your level of agreement or disagreement with the following statements.

	Strongly Disagree (1)	Disagree (2)	Somewhat disagree (3)	Neither agree nor disagree (4)	Somewhat agree (5)	Agree (6)	Strongly agree (7)
I usually like "playing it safe" (for instance, "locking in a price") instead of taking risks for market prices for fed cattle. (1)							
When selling/marketing fed cattle, I prefer financial certainty to financial uncertainty. (2)							
When selling/marketing fed cattle, I am willing to take higher risks in order to realize higher average returns. (3)							
I like taking financial risks with my feeding operation. (4)							
I accept more risk in my feedlot than other feedlot operators. (5)							
With respect to the conduct of business, I dislike risk. (6)							

Q14 What was the average cost of gain for feeder cattle placed over the past 12 months on your operation?

- o Less than $60/cwt (1)
- o $60 to $64.99/cwt (2)
- o $65 to $69.99/cwt (3)
- o $70 to $74.99/cwt (4)
- o $75 to $79.99/cwt (5)
- o $80 to $84.99/cwt (6)
- o $85/cwt to $89.99/cwt (7)
- o Over $90.00/cwt (8)

Q15 How important are the following traits for the feeder cattle you buy?

	Extremely important (13)	Very important (14)	Moderately important (15)	Slightly important (16)	Not at all important (17)
Weaned at least 30 days (1)					
Weaned at least 45 days (2)					
Vaccination history (3)					
Third-party health verified (4)					
Animal care/handling practices (5)					
Castrated (6)					
Dehorned (7)					
Implanted (8)					
Specific sire/genetic information (9)					
Breed background information (10)					
Reputation of seller (11)					
Weight (12)					
Frame (13)					
Condition (14)					
Number of head in a lot (15)					
Uniformity of head in a lot (16)					
Sex of animal (17)					
Age and source verified (18)					
Naturally raised (19)					
Organically raised (20)					
Non-hormone treated (21)					

Q16 In what state does your operation primarily feed cattle?

- o Alabama (1)
- o Alaska (2)
- o Arizona (3)
- o Arkansas (4)
- o California (5)
- o Colorado (6)
- o Connecticut (7)
- o Delaware (8)
- o Florida (9)
- o Georgia (10)
- o Hawaii (11)
- o Idaho (12)
- o Illinois (13)
- o Indiana (14)
- o Iowa (15)
- o Kansas (16)
- o Kentucky (17)
- o Louisiana (18)
- o Maine (19)
- o Maryland (20)
- o Massachusetts (21)
- o Michigan (22)
- o Minnesota (23)
- o Mississippi (24)
- o Missouri (25)
- o Montana (26)
- o Nebraska (27)
- o Nevada (28)
- o New Hampshire (29)
- o New Jersey (30)
- o New Mexico (31)
- o New York (32)
- o North Carolina (33)
- o North Dakota (34)
- o Ohio (35)
- o Oklahoma (36)
- o Oregon (37)
- o Pennsylvania (38)
- o Rhode Island (39)
- o South Carolina (40)
- o South Dakota (41)
- o Tennessee (42)
- o Texas (43)
- o Utah (44)
- o Vermont (45)
- o Virginia (46)
- o Washington (47)
- o West Virginia (48)
- o Wisconsin (49)
- o Wyoming (50)

Q17 For the feeding operation I am the:

- o Owner and manager (1)
- o Owner (2)
- o Manager (3)
- o Other (please specify): (4) _____

Q18 I am _____ years old.

Q19 The best description of my educational background is:

- o Did not obtain high school diploma (1)
- o High school graduate (2)
- o Some college (3)
- o Technical training (Certification or Associates Degree) (4)
- o Bachelor's (B.S. or B.A.) College Degree (5)
- o Graduate or Professional Degree (M.S., Ph.D., D.V.M., Law School) (6)
- o Other (please describe): (7) _____

Q20 What percentage of the cattle fed on your operation in the last 12 months were (should sum to 100%):

_____ Commercial beef cattle (1)

_____ Dairy cattle (2)

_____ Beef and dairy cross cattle (3)

_____ Other (please describe): (4)

Q21 How many fed cattle were sold on your operation in the last 12 months?

- o Less than 1,000 head (1)
- o 1,000 to 1,999 head (9)
- o 2,000 to 3,999 head (2)
- o 4,000 to 7,999 head (3)
- o 8,000 to 15,999 head (4)
- o 16,000 to 23,999 head (5)
- o 24,000 to 31,999 head (6)
- o 32,000 to 49,999 head (7)
- o More than 50,000 head (8)

Q22 Of the animals placed on feed in the last 12 months, what percentage of calves placed did your operation own (as opposed to someone outside the operation retaining ownership)?

- 0% (1)
- 1 to 20% (2)
- 21 to 40% (3)
- 41 to 60% (4)
- 61 to 80% (5)
- 81 to 100% (6)

Q23 What is the one-time capacity of your feedlot?

- Less than 1,000 head (1)
- 1,000 to 1,999 head (9)
- 2,000 to 3,999 head (2)
- 4,000 to 7,999 head (3)
- 8,000 to 15,999 head (4)
- 16,000 to 23,999 head (5)
- 24,000 to 31,999 head (6)
- 32,000 to 49,999 head (7)
- More than 50,000 head (8)

Q24 How easy were the survey questions to understand?

- Extremely easy (20)
- Somewhat easy (21)
- Neither easy nor difficult (22)
- Somewhat difficult (23)
- Extremely difficult (24)

Q25 Thank you for your participation! Please leave any additional comments here:

APPENDIX C: METHODS AND RESULT FOR TREATMENTS 4 TO 7

Methodology: Output price risk hedging scenarios (treatments 4 to 7)

For treatments 4 to 7, the latent variables of interest are total head placed in each output price risk management strategy out of the 150 feeder steers purchased: futures hedge ($FutHedge_i^*$), forward contract ($ForwardCont_i^*$), other ($Other_i^*$), and none, spot market at time of sale ($Spot_i^*$). The total head in the four output price risk management tools must sum to 150. A multivariate system can be modeled as:

$$FutHedge_i^* = \boldsymbol{X}_i'\boldsymbol{\beta}_{FutHedge} + \varepsilon_{FutHedge,i} \quad (8)$$

$$ForwardCont_i^* = \boldsymbol{X}_i'\boldsymbol{\beta}_{\text{ForwardCont}} + \varepsilon_{ForwardCont,i} \quad (9)$$

$$Other_i^* = \boldsymbol{X}_i'\boldsymbol{\beta}_{\text{Other}} + \varepsilon_{Other,i} \quad (10)$$

$$Spot_i^* = \boldsymbol{X}_i'\boldsymbol{\beta}_{\text{Spot}} + \varepsilon_{Spot,i} \quad (11)$$

where the relationships between the observed and latent variables are:

$$FutHedge_i = \begin{cases} FutHedge_i^* & if\ 0 \le FutHedge_i^* \le 150 \\ 0 & if\ FutHedge_i^* < 0 \\ 150 & if\ FutHedge_i^* > 150 \end{cases} \quad (12)$$

$$ForwardCont_i = \begin{cases} ForwardCont_i^* & if\ 0 \le ForwardCont_i^* \le 150 \\ 0 & if\ ForwardCont_i^* < 0 \\ 150 & if\ ForwardCont_i^* > 150 \end{cases} \quad (13)$$

$$Other_i = \begin{cases} Other_i^* & if\ 0 \le Other_i^* \le 150 \\ 0 & if\ Other_i^* < 0 \\ 150 & if\ Other_i^* > 150 \end{cases} \quad (14)$$

$$Spot_i = \begin{cases} Spot_i^* & if\ 0 \le Spot_i^* \le 150 \\ 0 & if\ Spot_i^* < 0 \\ 150 & if\ Spot_i^* > 150. \end{cases} \quad (15)$$

In equations (8), (9), (10), and (11), $\boldsymbol{X}_i'$ is a vector of information given in the scenario and explanatory variables for each individual i, $\boldsymbol{\beta}_m$ (where $m = FutHedge, ForwardCont, Other, Spot$) are coefficient estimate vectors, and $\varepsilon_{m,i} \sim N(0, \sigma_m^2)$. Since the four dependent variables sum to 150, only three equations (8, 9, and 11) are estimated jointly. When modeled jointly, the error terms $\varepsilon_{FutHedge,i}$, $\varepsilon_{\text{ForwardCont},i}$ and $\varepsilon_{\text{Spot},i}$ are specified following a multivariate normal distribution with zero mean, standard deviations $\sigma_{FutHedge}^2$, $\sigma_{\text{ForwardCont}}^2$ and σ_{Spot}^2, and correlation ρ_{mn}.

Feedlot operators vary in their experience with alternative marketing methods and their relationships with finished cattle buyers. These factors likely not only effect observed selections in our survey, but may be endogenous to our decisions of central interest. Accordingly, the system of equations above can be extended as:

$$FutHedge_i^* = \boldsymbol{X}_i'\boldsymbol{\beta}_{FutHedge} + \gamma_{1,FutHedge}PastHedge_i + \gamma_{2,FutHedge}PastForward_i + \varepsilon_{FutHedge,i} \quad (16)$$

$$ForwardCont_i^* = \boldsymbol{X}_i'\boldsymbol{\beta}_{\text{ForwardCont}} + \gamma_{1,\text{ForwardCont}}PastHedge_i + \gamma_{2,\text{ForwardCont}}PastForward_i + \varepsilon_{ForwardCont,i} \quad (17)$$

$$Spot_i^* = \boldsymbol{X}_i'\boldsymbol{\beta}_{\text{Spot}} + \gamma_{1,\text{Spot}}PastHedge_i + \gamma_{2,\text{spot}}PastForward_i + \varepsilon_{Spot,i} \quad (18)$$

$$PastHedge_i = \boldsymbol{Z}_i'\boldsymbol{\delta}_{\text{PastHedge}} + \varepsilon_{PastHedge,i} \quad (19)$$

$$PastForward_i = \boldsymbol{Z}_i'\boldsymbol{\delta}_{PastForward} + \varepsilon_{PastForward,i} \quad (20)$$

where $PastHedge_i$ and $PastForward_i$ are variables indicating percent of past live cattle that were marketed using futures hedge and forward contracts. $\boldsymbol{Z}_i'$ is a vector explanatory variables, and γ and δ are parameter vectors to be estimated.

Results: Treatments 4 to 7

In the output oriented treatments, treatments 4 and 5 are the base treatments where no feeder cattle source information is provided. Treatments 6 and 7 include an information shock that feeder steers were purchased from a single source and given a random source premium.

No sourcing information given (treatments 4 and 5)

In treatments 4 and 5, feedlot operators are asked which output pricing strategies they would implement for a lot of 150 steers purchased on February 15th for March placement. The difference between treatments 4 and 5 is how basis information was presented for futures hedging –unambiguous basis in treatment 4 and ambiguous basis in treatment 5.

Pooled model results with a treatment dummy variable and interaction terms are shown in Appendix Table C.1 (Model G). Ambiguous basis (versus unambiguous presentation) did not impact head placed under each output pricing strategy in treatments 4 and 5. The significant ρ estimates indicate that the equations should be estimated jointly, including past behavior. This confirms past hedging behavior endogeneity. In the past hedging and forward contracting

equations, custom feeders place fewer head under futures hedges, and risk averse producers place more head under both futures hedging and forward contracts.

For the main three equations (futures hedge, forward contract and spot market), the AME for each treatment are of main interest (Table C.2). The AME are decomposed average marginal effects for each treatment. For example, the AME for treatment 4 come only from treating those in treatment 4 as if they were in treatment 4 and those who were in treatment 5 only as if they were in treatment 5. Comparing the decomposed AME across treatments 4 and 5, none of the AMEs are statistically different from each other. For example, in the forward contract equation, the past forward contract percent marginal effect confidence interval is [0.34, 1.48] for treatment 4 and [0.39, 1.24] for treatment 5. Since these two confidence intervals overlap, they are considered not statistically different. This is consistent with the treatment interaction terms being jointly not statistically significant.

Single source information given (treatments 6 and 7)

In treatments 6 and 7, participants are informed that feeder steers came from a single source and given the premium paid (information shock). As with treatments 4 and 5, the difference between treatments 6 and 7 is the ambiguous expected futures hedge basis in treatment 7. The pooled model results for treatment 6 and treatment 7 (model H) are found Table C.3. Here the ambiguous versus unambiguous presentation impacted coefficient estimates across the two treatments. The significant ρ coefficients confirms the five equations need to be estimated jointly.

Decomposed AMEs (treating treatment 6 as treatment 6 and treatment 7 as treatment 7) for treatments 6 and 7 are shown in Table C.4. The ambiguous versus unambiguous basis presentation did not affect AME, as none are statistically different across the two treatments. Only two AME are statistically significant. A 1% increase in past futures hedging percent increases the head placed under a futures hedge by over one in both treatments.

The source premium marginal effects can be used as a within treatment test of the relationship between animal health and output price risk mitigation. However, our findings do not support the hypothesis of a relationship between animal health and output price risk mitigations as the source premium AME are not significant in any equation.

To test the core hypothesis that a relationship between animal health risk and output price risk exists, the 95% confidence intervals from the decomposed average marginal effects are

compared across the base treatments and those with the single source information shock.[2] Specifically, treatment 4 AME are compared to analogous treatment 6 AME (both treatments have unambiguous basis), and treatment 5 to treatment 7 (both treatments have ambiguous basis). No differences in AME confidence intervals for the CME price, expected hedge basis, forward contract basis, past futures hedging percent, and past forward contracting percent in parallel equations are found using Table C.2 and Table C.4. Also, recall the insignificant source premium AME in model H (within model test). Therefore, there is no evidence that the single source information shock changes the AME of the output hedging information.

[2] Schenker and Gentleman (2001) found that comparison of 95% confidence intervals is more conservative than standard methods of significance testing when the null hypothesis is true and falsely rejects the null hypothesis more frequently when the null hypothesis is false.

Table C.1 Coefficient estimates for pooled treatments 4 and 5, output price scenarios, no source information was given (Model G)

	Futures Hedge	Forward Contract	Spot	Past hedging percent	Past forward contract percent
CME price	3.07	-2.20	-1.61		
	(4.12)	(5.70)	(2.89)		
CME price * treatment 4	-3.31	11.47	-4.34		
	(6.11)	(7.92)	(4.17)		
Expected hedge basis	2.53	-7.67	1.82		
	(5.99)	(7.75)	(4.19)		
Expected hedge basis * treatment 4	-0.15	17.50	2.13		
	(8.54)	(11.10)	(5.53)		
Forward contract basis	-3.78	-0.53	7.90*		
	(5.42)	(6.80)	(4.21)		
Forward contract basis * treatment 4	6.77	13.23	-4.80		
	(7.68)	(8.53)	(5.86)		
Past futures hedging percent	1.14	0.12	-1.96		
	(1.55)	(2.76)	(1.66)		
Past forward contract percent	0.33	4.19**	-3.49***		
	(1.25)	(2.05)	(1.01)		
Treatment 4	327.60	-1163.35	455.47		
	(622.43)	(812.43)	(426.57)		
Capacity 1000+				6.13	5.59
				(6.88)	(4.86)
Risk averse				10.57*	18.56***
				(5.41)	(5.20)
Custom feeder				-17.48***	11.43
				(4.41)	(9.60)
Intercept	-334.77	94.37	274.11	9.31**	-0.84
	(416.04)	(573.53)	(288.34)	(4.58)	(3.93)

Sigma	94.16***	152.04***	106.9***	24.84***	28.56***
	(11.16)	(43.83)	(23.08)	(2.85)	(2.98)
		Rho m2	**Rho m3**	**Rho m4**	**Rho m5**
Rho 1n		-0.57**	0.02	0.15	0.02
		(0.28)	(0.32)	(0.47)	(0.45)
Rho 2n			-0.68***	0.1.00	-0.72***
			(0.16)	(0.52)	(0.25)
Rho 3n				0.04	0.77***
				(0.47)	(0.210)
Rho 4n					-0.32***
					(0.07)
Rho 5n					
N	78				
SBC/BIC	2950.18				
Pseudo-loglikelihood	-1359.64				

Table notes: Robust standard errors in (). * p<0.10, ** p<0.05, *** p<0.01

Table C.2 Decomposed average marginal effects for output price risk oriented questions where no source information is given (Treatments 4 and 5; Model G)

	Futures Hedge		**Forward Contract**		**Spot**	
	Treatment 4 (unambiguous basis)	Treatment 5 (ambiguous basis)	Treatment 4	Treatment 5	Treatment 4	Treatment 5
CME price	-0.10	1.30	2.01	-0.43	-2.29**	-0.61
	(1.74)	(1.75)	(1.22)	(1.09)	(1.07)	(1.11)
	[-3.52, 3.32]	[-2.13, 4.74]	[-0.39, 4.41]	[-2.56 1.71]	[-4.39, -0.19]	[-2.79 1.57]
Expected hedge basis	0.96	1.07	2.13	-1.49	1.52	0.69
	(2.54)	(2.53)	(1.61)	(1.62)	(1.48)	(1.58)
	[-4.02, 5.94]	[-3.89, 6.04]	[-1.02, 5.29]	[-4.66 1.68]	[-1.38, 4.42]	[-2.41, 3.79]
Forward contract basis	1.21	-1.60	2.75**	-0.10	1.19	3.01*
	(2.23)	(2.33)	(1.30)	(1.32)	(1.60)	(1.63)
	[-3.160, 5.59]	[-6.17 2.97]	[0.20, 5.30]	[-2.69 2.49]	[-1.95, 4.33]	[-0.20, 6.21]
Past futures hedging percent	0.46	0.48	0.03	0.02	-0.76	-0.75
	(0.59)	(0.61)	(0.60)	(0.54)	(0.54)	(0.58)
	[-0.70 1.62]	[-0.71 1.67]	[-1.15 1.21]	[-1.04 1.08]	[-1.81, 0.30]	[-1.88, 0.38]
Past forward contract percent	0.13	0.14	0.91***	0.81***	-1.35***	-1.33***
	(0.51)	(0.54)	(0.29)	(0.21)	(0.46)	(0.39)
	[-0.87 1.14]	[-0.92 1.20]	[0.34 1.48]	[0.39 1.24]	[-2.25, -0.44]	[-2.10, -0.56]

Table notes: Standard errors are reported in (). 95% confidence intervals reported in []. * p<0.10, ** p<0.05, *** p<0.01.

Table C.3 Coefficient estimates for pooled treatments 6 and 7, output price scenarios, source information was given (Model H)

	Futures Hedge	Forward Contract	Spot	Past hedging percent	Past forward contract percent
Source premium	0.46	5.48	-8.03		
	(7.19)	(8.00)	(4.34)		
Source premium *treatment 6	7.71	-27.06	6.27		
	(10.35)	(18.35)	(6.30)		
CME price	-1.37	11.72*	4.59		
	(4.11)	(4.97)	(2.75)		
CME price * treatment 6	3.95	-13.92*	-7.04		
	(5.39)	(6.16)	(3.60)		
Expected hedge basis	11.68*	0.81	3.47		
	(5.75)	(6.23)	(4.44)		
Expected hedge basis * treatment 6	-2.40	-34.03*	-0.88		
	(8.30)	(13.52)	(5.81)		
Forward contract basis	10.10	5.76	-12.82**		
	(7.65)	(6.95)	(4.65)		
Forward contract basis * treatment 6	-19.78*	9.47	13.38*		
	(10.06)	(10.15)	(6.37)		
Past futures hedging percent	5.45	-6.40	-1.91		
	(5.40)	(29.90)	(14.42)		
Past futures hedging percent*treatment 6	-0.43	1.99	1.70*		
	(1.11)	(1.12)	(0.76)		
Past forward contract percent	-2.12	17.08	-9.11		
	(11.87)	(60.63)	(30.00)		
Past forward contract percent *treatment 6	-0.27	1.02	-0.01		
	(0.80)	(0.79)	(0.61)		

Treatment 6	-439.88	1434.02*	705.88*		
	(537.26)	(648.55)	(359.76)		
Capacity 1000+				7.38	1.56
				(5.26)	(6.67)
Risk averse				15.83*	6.72
				(6.42)	(8.75)
Custom feeder				-3.35	3.23
				(7.68)	(16.59)
Intercept	91.17	-1532.65*	-195.13	3.54	14.61*
	(460.96)	(765.16)	(418.29)	(3.46)	(6.99)
Sigma	167.55	579.07	280.29	23.83***	32.22***
	(329.11)	(2252.32)	(1056.29)	(2.51)	(2.97)
		Rho m2	**Rho m3**	**Rho m4**	**Rho m5**
Rho 1n		-0.73	0.55	-0.77***	0.62
		(1.23)	(2.030)	(0.15)	(1.32)
Rho 2n			-0.96***	0.52	-0.97***
			(0.28)	-0.97***	(0.08)
Rho 3n				-0.35	0.97***
				(1.11)	(0.18)
Rho 4n					-0.34***
					(0.07)
Rho 5n					
N	78				
SBC/BIC	2970.40				
Pseudo-loglikelihood	-1343.61				

Table notes: Robust standard errors in (). * p<0.10, ** p<0.05, *** p<0.01

Table C.4 Decomposed average marginal effects for output price risk oriented questions where source information is given (Treatments 6 and 7; Model H)

	Futures Hedge		**Forward Contract**		**Spot**	
	Treatment 6 (unambiguous basis)	Treatment 7 (ambiguous basis)	Treatment 6	Treatment 7	Treatment 6	Treatment 7
Source Premium	1.82	0.10	-1.37	0.35	-0.27	-1.28
	(1.55)	(1.60)	(2.78)	(0.92)	(0.90)	(1.55)
	[-1.22, 4.85]	[-3.03, 3.23]	[-6.82, 4.08]	[-1.46 2.15]	[-2.04 1.50]	[-4.31 1.76]
CME price	0.57	-0.31	-0.14	0.74	-0.38	0.73
	(0.71)	(0.95)	(0.35)	(1.70)	(0.67)	(0.78)
	[-0.82 1.96]	[-2.16 1.55]	[-0.83, 0.55]	[-2.58, 4.07]	[-1.70, 0.94]	[-0.79 2.25]
Expected hedge basis	2.06	2.59	-2.11	0.05	0.40	0.55
	(1.62)	(2.05)	(4.41)	(0.40)	(0.84)	(0.89)
	[-1.11, 5.23]	[-1.43, 6.62]	[-10.76, 6.53]	[-0.74, 0.84]	[-1.25 2.06]	[-1.19 2.30]
Forward contract basis	-2.15	2.24	0.97	0.37	0.09	-2.04
	(1.95)	(2.15)	(1.92)	(0.79)	(0.74)	(2.01)
	[-5.97 1.66]	[-1.97, 6.45]	[-2.80, 4.74]	[-1.17 1.91]	[-1.37 1.54]	[-5.98 1.90]
Past futures hedging percent	1.12*	1.21**	-0.28	-0.41	-0.03	-0.30
	(0.64)	(0.53)	(1.40)	(1.13)	(2.31)	(2.59)
	[-0.14 2.38]	[0.16 2.26]	[-3.02 2.45]	[-2.62 1.81]	[-4.56, 4.50]	[-5.37, 4.76]
Past forward contract percent	-0.53	-0.47	1.15	1.08	-1.42	-1.45
	(2.41)	(2.38)	(1.62)	(1.62)	(2.50)	(3.31)
	[-5.26, 4.19]	[-5.13, 4.19]	[-2.03, 4.33]	[-2.09, 4.25]	[-6.32, 3.49]	[-7.93, 5.03]

Table notes: Standard errors are reported in (). 95% confidence intervals reported in []. * p<0.10, ** p<0.05, *** p<0.01.

APPENDIX D: SINGLE SOURCE PERCEPTIONS AND CROSS TABULATIONS

We asked participants their perceptions of how single source calves perform versus cattle of unknown backgrounds. Over 50% stated somewhat better and 34% stated much better. Therefore, overall participants' perceptions align with the aforementioned research regarding the better performance of single source cattle and wording of the choice questions.

Table D.1 Participants' response to "Compared to calves sourced from auctions with unknown backgrounds, how do you believe calves from a single source ranch perform (i.e. average daily gain, feed conversion, morbidity) in the feedlot?"

	Number Reporting	**Percent Reporting**
Much worse	1	0%
Somewhat worse	5	2%
About the same	34	12%
Somewhat better	145	52%
Much better	95	34%
Total	**280**	**100%**

Furthermore, we asked participants "In the past 12 months, what do you believe is the average premium paid nationally in the market for feeder calves sourced from a single known ranch versus multiple unknown sources?" (Table D.2). This was the sixth question on the survey, shown before the choice experiment. Only 8% of producers in the sample believed there was a discount or no premium for single source cattle. Using the midpoint of each of the premium intervals, producers believed the average premium was $3.90/cwt. Thus, overall producers in the sample agree that there is a value for single source calves. As such the design of the choice experiment using premiums for single source cattle should not be a concern.

Table D.2 Participants' response to "In the past 12 months, what do you believe is the average premium paid nationally in the market for feeder calves sourced from a single known ranch versus multiple unknown sources?"

	Number Reporting	Percent Reporting
Discount	1	0%
No premium	22	8%
Premium less than $1/cwt	6	2%
$1 to $1.99/cwt premium	40	14%
$2 to $2.99/cwt premium	48	17%
$3 to $3.99/cwt premium	37	13%
$4 to $4.99/cwt premium	37	13%
$5 to $5.99/cwt premium	49	18%
$6 to $6.99/cwt premium	10	4%
$7 to $7.99/cwt premium	6	2%
$8 to $8.99/cwt premium	3	1%
$9 to $9.99/cwt premium	7	3%
Premium greater than $10/cwt	10	4%
	276	**100%**

A reviewer aptly pointed out that stocker producers have conceivably already taken a large part of the health risk out of animals when they commingle cattle and then sell large lots either through a traditional auction, satellite/video auction or some other method to feedlot operators. However, when we asked survey respondents, "Compared to calves sourced from auctions with unknown backgrounds, how do you believe calves from a single source ranch perform (i.e. average daily gain, feed conversion, morbidity) in the feedlot?" and "What is the average placement weight of calves your feeding operation places in March?" 86% of respondents on average indicated single source cattle performed somewhat better/much better across all placement weights. Feeder placement weights are in Table D.3 and cross tabulations are in Table D.4. Furthermore, Person χ^2 tests show there is not a statistically significant difference in views on single source animals by average placement weights. If stocker producers had taken risk out of commingled cattle, expectations would be that heavier (higher proportion of stocker) calves at placement would be past the weaning stress period, health challenges associated with commingling, etc., and thus single source would not be as important as placement weight increases. Since we find that single source was still considered important at all placement

weights there is additional evidence of the value of single known source feeder cattle to feedlot buyers.

Table D.3. Participants' response to "What is the average placement weight of calves your feeding operation places in March?"

	Number Reporting	**Percent Reporting**
Under 600 lbs	66	24%
600 to 699 lbs	80	29%
700 to 799 lbs	75	27%
800 to 899 lbs	47	17%
900 lbs or more	7	3%
Total	**275**	**100%**

Table D.4. Cross tabulation of "What is the average placement weight of calves your feeding operation places in March?" and "Compared to calves sourced from auctions with unknown backgrounds, how do you believe calves from a single source ranch perform (i.e. average daily gain, feed conversion, morbidity) in the feedlot?"

		What is the average placement weight of calves your feeding operation places in March?				
		Under 600 lbs	600 to 699 lbs	700 to 799 lbs	800 to 899 lbs	900 lbs or more
Compared to calves sourced from auctions with unknown backgrounds, how do you believe calves from a single source ranch perform (i.e. average daily gain, feed conversion, morbidity) in the feedlot?	Much worse	1.5%	0.0%	0.0%	0.0%	0.0%
	Somewhat worse	0.0%	2.5%	2.7%	2.1%	0.0%
	About the same	18.5%	7.5%	10.8%	12.8%	14.3%
	Somewhat better	47.7%	58.8%	54.1%	44.7%	28.6%
	Much better	32.3%	31.3%	32.4%	40.4%	57.1%

Pearson chi2(16) = 12.89; Pr = 0.68

Another pertinent comment suggested that there are producers who market feeder cattle after commingling them from multiple sources who have a reputation for putting together low risk cattle from a health standpoint. We agree. However, when we asked survey respondents, "Compared to calves sourced from auctions with unknown backgrounds, how do you believe calves from a single source ranch perform (i.e. average daily gain, feed conversion, morbidity) in the feedlot?" and "How important is seller reputation for the feeder cattle you buy?" 86% of respondents on average indicated single source cattle performed somewhat better/much better across all importance levels of seller reputation. Producer views on importance of seller reputation when buying feeder cattle are in Table D.5 and cross tabulations are in Table D.6. Furthermore, Person χ^2 tests show there is not a statistically significant difference regarding views on single source animals by level of importance of seller reputation. If reputation of sellers who had experience commingling low risk lots was a clear substitute (from an animal health perspective) for single source calves, we would expect a lower percentage of respondents indicating somewhat better/much better to single source if they also thought seller reputation was important (a negative relationship).

Table D.5. Participants' response to "How important is seller reputation for the feeder cattle you buy?"

	Number Reporting	**Percent Reporting**
Not at all important	9	3%
Slightly important	19	7%
Moderately important	74	27%
Very important	122	45%
Extremely important	49	18%
	273	**100%**

Table D.6. Cross tabulation of "How important is seller reputation for the feeder cattle you buy?" and "Compared to calves sourced from auctions with unknown backgrounds, how do you believe calves from a single source ranch perform (i.e. average daily gain, feed conversion, morbidity) in the feedlot?"

		How important is seller reputation for the feeder cattle you buy?				
		Not at all important	Slightly important	Moderately important	Very important	Extremely important
Compared to calves sourced from auctions with unknown backgrounds, how do you believe calves from a single source ranch perform (i.e. average daily gain, feed conversion, morbidity) in the feedlot?	Much worse	0.0%	0.0%	0.0%	0.0%	2.0%
	Somewhat worse	0.0%	0.0%	1.4%	1.7%	2.0%
	About the same	11.1%	15.8%	6.8%	13.2%	16.3%
	Somewhat better	55.6%	52.6%	66.2%	48.8%	36.7%
	Much better	33.3%	31.6%	25.7%	36.4%	42.9%

Pearson chi2(16) = 16.12; Pr = 0.44

APPENDIX E: MODELS A-F COEFFICIENT ESTIMATES

Table E.1 Historical direct from seller coefficent estimates (N=278)

	Model A	Model B
Spot marketing percent	-0.16***	-0.15**
	(0.06)	(0.06)
Capacity 1000+		11.51**
		(4.92)
Risk averse		-4.33
		(4.58)
Custom feeder		-6.33
		(5.54)
Intercept	20.86***	17.04**
	(3.78)	(6.90)
Sigma	34.64***	34.40***
	(2.05)	(2.06)
N	278	278
SBC	1955.37	1963.84
Log- likelihood	-969.24	-965.04
Predicted correlation	0.15	0.17

Table notes: Robust standard errors in (). * p<0.10, ** p<0.05, *** p<0.01

Table E.2 Historical spot marketing of finished cattle coefficient estimates

	Model C	Model D
Direct seller percent	-0.29**	-0.25**
	(0.12)	(0.11)
Capacity 1000+		
		(5.20)
Risk averse		
		(4.96)
Custom feeder		3.56
		(6.82)
Intercept	57.67***	83.72***
	(3.64)	(4.71)
Sigma	45.20***	41.37***
	(1.73)	(1.89)
N	278	278
SBC	2554.13	2528.32
Log- likelihood	-1268.62	-1247.28
Predicted correlation	0.15	0.42

Table notes: Robust standard errors in (). * p<0.10, ** p<0.05, *** p<0.01

Table E.3 Pooled feeder cattle purchasing treatment coefficient estimates (treatments 1 to 3)

Model	E		F	
	Question A	Question B	Question A	Question B
Source premium	-25.05***	-21.99***	-25.88***	-21.83***
	(4.00)	(4.22)	(3.92)	(4.16)
CME price		0.26		0.58
		(2.17)		(2.25)
Basis		12.45***		12.41***
		(2.94)		(2.93)
Capacity 1000+			-38.80*	-40.56*
			(23.37)	(23.81)
Custom feeder			90.82***	46.76
			(33.10)	(35.39)
Risk averse			8.88	0.75
			(21.32)	(23.64)
Purchased single source before			-1.41	10.83
			(22.18)	(24.65)
Intercept	159.64***	84.08	172.37***	61.85
	(19.08)	(228.45)	(26.04)	(233.91)
Sigma	110.81***	111.86***	107.48***	109.81***
	(9.42)	(9.47)	(9.31)	(9.30)
Rho	0.63***		0.62***	
	(0.08)		(0.08)	
N	123		123	
SBC/BIC	1639.66		1668.37	
Pseudo-loglikelihood	-798.17		-793.28	

Table notes: Robust standard errors in (). * p<0.10, ** p<0.05, *** p<0.01