

Options: A Tool for Dairy Producers to Help Manage Price Risk

Alee L. Lynch

Agricultural Economics & Business

CASNR Research and Creative Achievements Program

Abstract

This project focused on teaching milk producers to utilize the futures and option market to help manage price risk. During this project, I evaluated producers' experience with the Dairy Options Pilot Program (DOPP). I gained a better understanding of the futures and option market and shared my research with Tennessee dairy producers.

Objectives

1. Personally interview floor traders at the Chicago Mercantile Exchange to determine what can be done to increase the use of milk futures and options by milk producers and to gain a greater understanding of how futures and options work by seeing it happen.
2. Evaluate four different strategies for pricing milk to demonstrate how different techniques would have worked during two periods.
3. Conduct a survey of milk producers who were trained under the DOPP to determine why they chose to participate or not participate in the program.
4. Visit the McMinn County Dairy Marketing Club to share my research with them and ask them about their experience with the DOPP.

Glossary of Terms

Call Option: A contract that gives its holder the right (but not the obligation) to buy the underlying asset at a certain price within a fixed period of time.

Exercise: To use the right conferred by an option.

In the Money: An option with intrinsic value. A call is in the money when the underlying futures price is above the exercise price. A put is in the money when the underlying futures price is below the exercise price.

Option: An agreement that gives its holder the right to buy or sell the underlying asset at the exercise price on or before the option's expiration date.

Out of the Money: An option with no intrinsic value is referred as out of the money.

Premium: The market price of an option. The amount paid by the buyer of the option to the seller of the option.

Put Option: Gives its holder the right (but not the obligation) to sell the underlying asset at a certain price within a certain period of time.

Strike Price: The price at which the underlying asset changes hands when an option is exercised.

(Trading Tactics 150 – 152)

Justifications

Milk producers are subject to very volatile prices. For example, over the past 15 years the price of milk in January has fluctuated between \$10 and \$16 per 100 pounds. For a 100-cow dairy with cows averaging 20,000 pounds of milk per year gross revenue would fluctuate \$120,000 (Managing Dairy Price Risk Using Milk Put Options). Every year milk prices follow similar cycles relating to peak production times. Milk producers are price takers because their industry is perfectly competitive, and they cannot regulate their supply in the short run due to the biological nature of their product. All farmers understand that breaking even is not good enough, but currently farmers have few resources available to them to help them make additional revenue on their product (Rawls).

Dairy options and futures can help the farmer manage the price risk involved in volatile market prices. The FAIR Act of 1996 authorized the U.S. Department of Agriculture Risk

Management Agency (RMA) to introduce the Dairy Options Pilot Program (DOPP) as an approach to familiarize farmers with the futures and options market. The DOPP program required a day of training, an application to participate, evidence of how much milk they had produced in the previous year, and for the participant to make arrangements with an approved broker. Through the program, the government provided 80% of the option premium and paid \$30 toward the cost of the brokerage commission. That left the producer responsible for only 20% of the option premium and the remaining balance for the brokerage commission. The DOPP Rules are that producers could only purchase Class III or Class IV milk options. Each producer can purchase put options as far out as 12 months from the date of training. Participants must hold their options for most of the full term of the option and choose strike prices that are less than the current price of the futures contract by a margin of 10 cents (Managing Dairy Price Risk Using Milk Put Options 3).

Research Trip to Chicago Mercantile Exchange

On my trip to Chicago with Dr. Emmitt Rawls, we took a tour of the Chicago Mercantile Exchange, Inc. (CME). Our tour guide was Tom Clark. He works with the CME Educational Outreach program. Mr. Clark showed me how to read the board to see the current strike prices and the volumes traded for all of the commodities. He took us to watch butter being traded and several of the other commodity pits. On the other side of the floor were the financial pits, and Mr. Clark told us about the different products offered at CME and pointed out the different types of people on the CME floor. In the dairy pit, he talked about how the low trading activity was not a positive indicator for the long-term success of the Dairy Market. CME tests commodities to see how they do on the floor, and if the trading volume is not high enough to validate their presence on the floor then it will be taken off the floor. Mr. Clark commented that some speculators were starting to visit the dairy pit because volatile prices create more opportunities for them to make money. Currently the speculators are very unfamiliar with the market indicators so they are slow to invest. The theory is that hedgers are the "meat" of a futures market, but speculators provide the necessary liquidity to help the market find the price.



Alee Lynch and Dr. Rawls with the MerCow at the Chicago Mercantile Exchange, Inc.



Alee Lynch and Tom Clark with the MerCow at the Chicago Mercantile Exchange, Inc.

Teaching Materials Developed

- **DOPP Research Data**

DOPP Period data was collected during Round 4, September 2003, and I followed all of the DOPP rules. The purpose of collecting these data was to illustrate to producers who did the DOPP training, but did not purchase options, how this would have worked. The basis is the cash price that a producer will receive for his milk minus the futures price. The \$2 basis assumed in this experiment has been the historical basis for this area (Rawls). All data was taken from historical CME market reports.

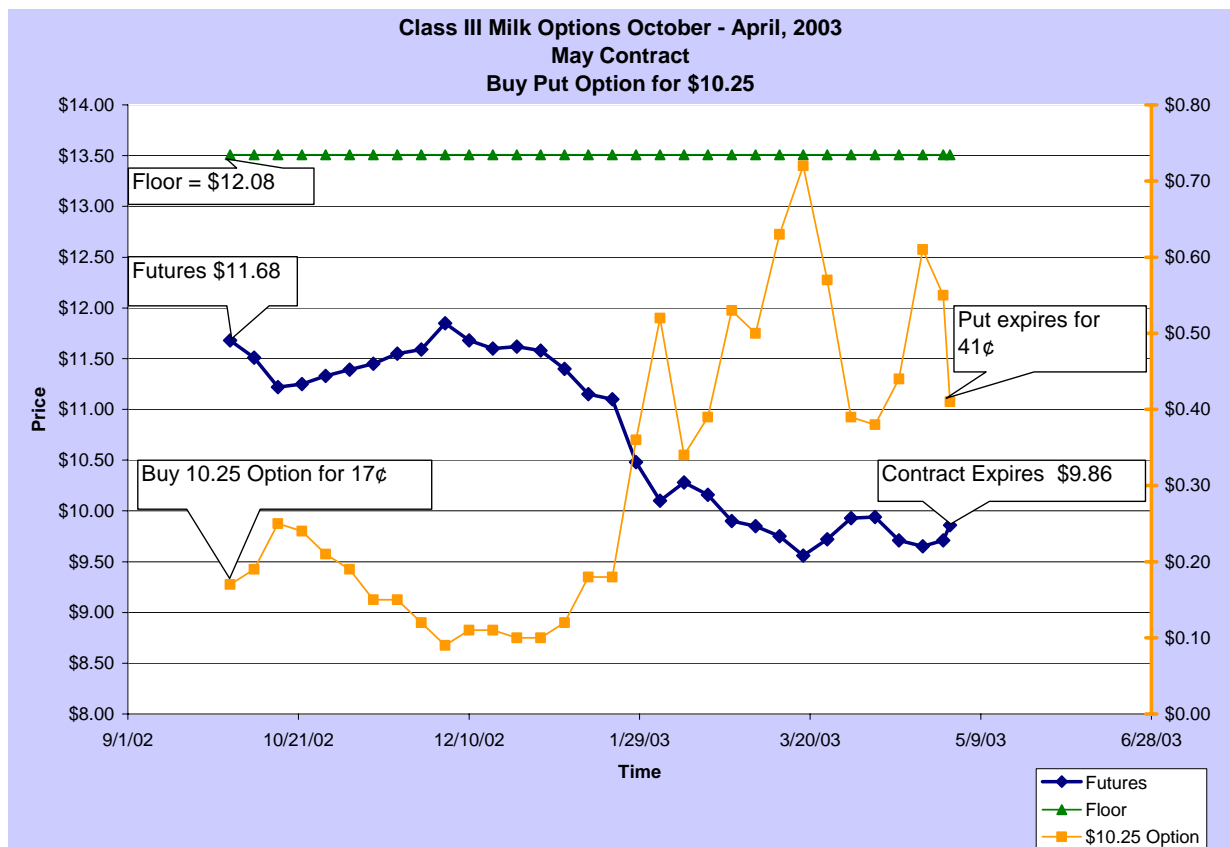


Figure 1: Class III Milk Options October – April, 2003 May Contract. Buy a Put Option for \$10.25 Strike Price.

Figure 1: A put is the right to sell a futures contract at a set strike price before the expiration.

This graph really shows the inverse relationship of the futures market and put options. The floor establishes a minimum price that the producer can expect. If the market had increased then the put would have decreased in value. In this scenario the declining futures market was offset by the increase in the value of the put. To calculate the floor:

Strike Price	\$10.25
Put Premium	(\$0.17)
Basis	\$2
Floor	\$12.08

Futures Price	\$9.86
Put Premium	(\$0.17)
Put Expiration	41¢
Basis	\$2
Floor	\$12.10

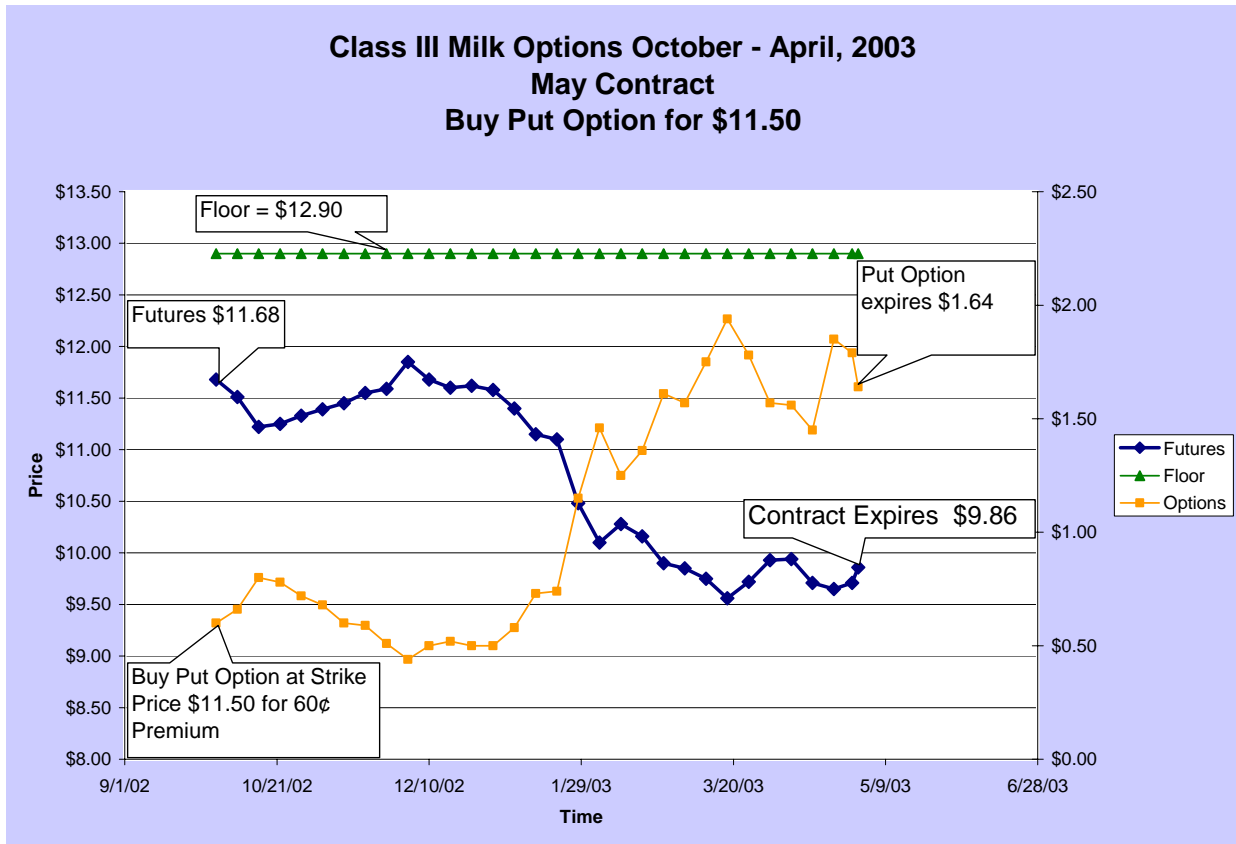


Figure 2: Class III Milk Options October – April, 2003 May Contract. Buy a Put Option for \$11.50 Strike Price.

Figure 2: The same concepts apply for this put option. Notice that this put at an \$11.50 strike price has a much higher premium at \$.60 but because the market dropped, so much the expensive price insurance paid off. To calculate the floor:

Strike Price	\$11.50
Put Premium	(\$.60)
Basis	<u>\$2</u>
Floor	\$12.90

To check to see if the floor worked, the \$2 basis is added, to the ending value of the futures contract and plus/minus the net value of the put option.

Futures	\$9.86
Put Premium	(\$.60)
Put Expiration	\$1.64
Basis	<u>\$2</u>
Floor	\$12.90

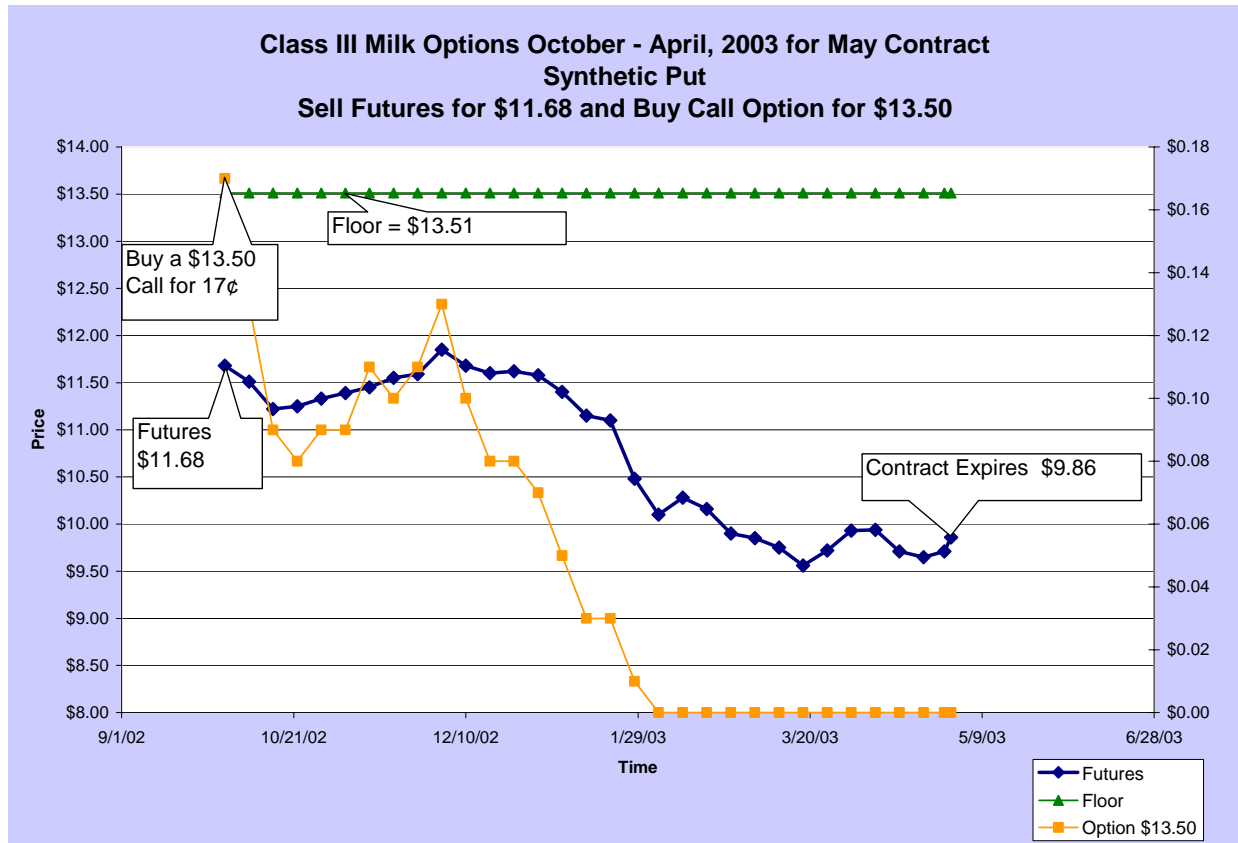


Figure 3: Class III Milk Options October – April, 2003 May Contract. Synthetic Put.

Figure 3: To place a synthetic put a futures contract must be sold and buy a call option. A call gives the producer the right to buy a futures contract at a set strike price. In this scenario, we sold a futures contract at \$11.68 and bought a call at a \$13.50 for 17 cents. By selling a futures contract, we locked in a price of \$11.68 and then bought a futures contract at the end for \$9.86. Our net gain on the futures transaction was \$1.82. The call option has a direct relationship with the futures market, meaning that as the futures market increases so does the call option premium. A synthetic put allows the producer to set a floor price by selling a futures contract but also allows the producer to take advantage of increases in the market. Another advantage of a synthetic put is that it permits the producer to create a higher floor price at a lower cost. Comparing this synthetic put against the previous two put options will notice that the premium

was either equal to or lower than the puts and the floor price is higher. A disadvantage is that if the market increases then the producer will have to make margin calls. However, the improvement in the premium of the purchased call would off set some of the costs. The \$13.50 strike price was selected because it was economical. To calculate the floor:

Futures	\$11.68
Call Premium	(\$0.17)
Basis	<u>\$2</u>
Floor	\$13.51

To check the floor at the end of the period:

Sell Futures	\$11.68
Buy Futures	<u>(\$9.86)</u>
<i>Net Futures</i>	\$1.82
Buy Futures	\$9.86
Call Premium	(\$0.17)
Call Expire	(\$0)
Basis	<u>\$2</u>
Floor	\$13.51

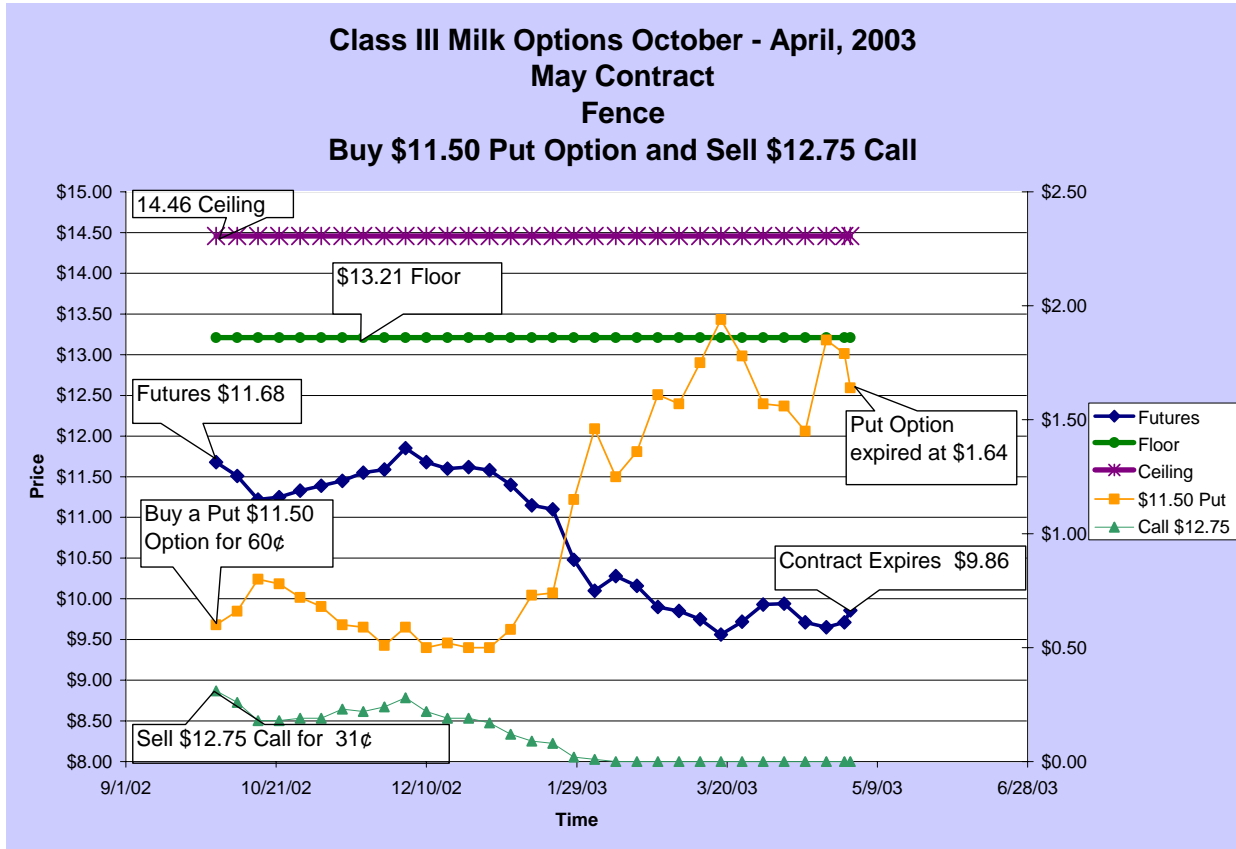


Figure 4: Class III Milk Options October – April, 2003 May Contract. Fence.

Figure 4: To create a fence you must buy a put option and sell a call option. The fence sets a floor and a ceiling to the price. Producers may consider a fence is they want to lessen the cost of the put option. When you sell a call option, you take in money but when you buy an option, you spend money. The disadvantage of a fence is that the call makes the producer liable for margin calls.

To calculate the floor:

Strike Price	\$11.50
Put Premium	(\$.60)
Call Premium	\$.31
Basis	<u>\$2</u>
Floor	\$13.21

To calculate the ceiling:

Strike Price	\$12.75
Put Premium	(\$.60)
Call Premium	\$.31
Basis	<u>\$2</u>
Ceiling	\$14.46

As a result, of these four examples during the DOPP 4 period producers who participated in the DOPP training could see how the use of options could have been utilized to their advantage

- **Current Research Data**

When I began my project, the Class III and IV milk markets were high so we decided to track its progress. With record milk prices, there was a significant opportunity to manage price risk.

This data shows one of the most teachable moments. The circumstances shown in Figures 5 – 8 would have benefited producers greatly if they had acted. I still followed the DOPP rules and assumed a \$2 basis. I considered four pricing strategies using the same reasoning as the DOPP period charts.

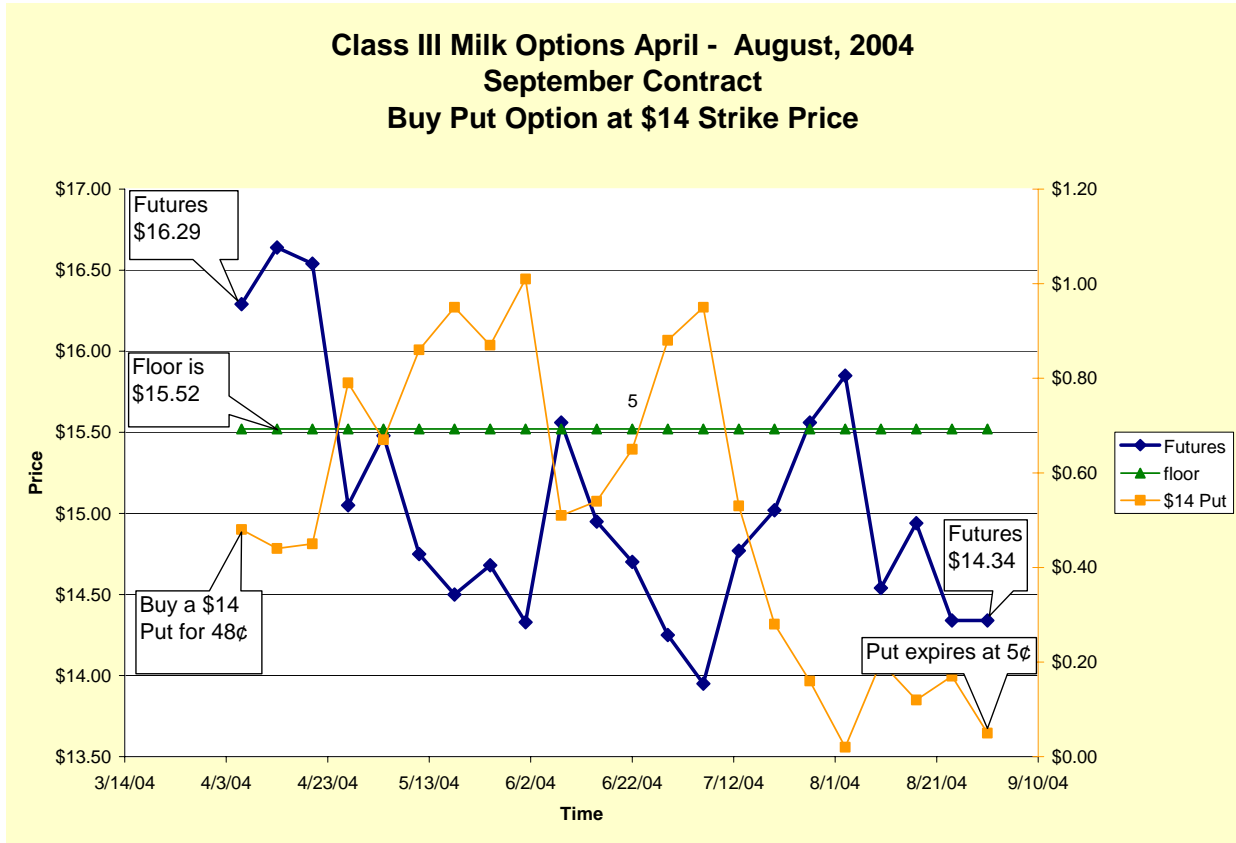


Figure 5: Class III Milk Options April – August, 2004. September Contract. Buy Put Option at \$14 Strike Price.

Calculate beginning floor price:

Strike Price	\$14
Put Premium	(\$0.48)
Basis	<u>\$2</u>
Floor	\$15.52

Calculate ending floor price:

Futures	\$14.34
Put Premium	(\$0.48)
Put Expired	\$0.05
Basis	<u>\$2</u>
Floor	\$15.91

The price we got for our milk in this scenario ended up being more than the floor price.

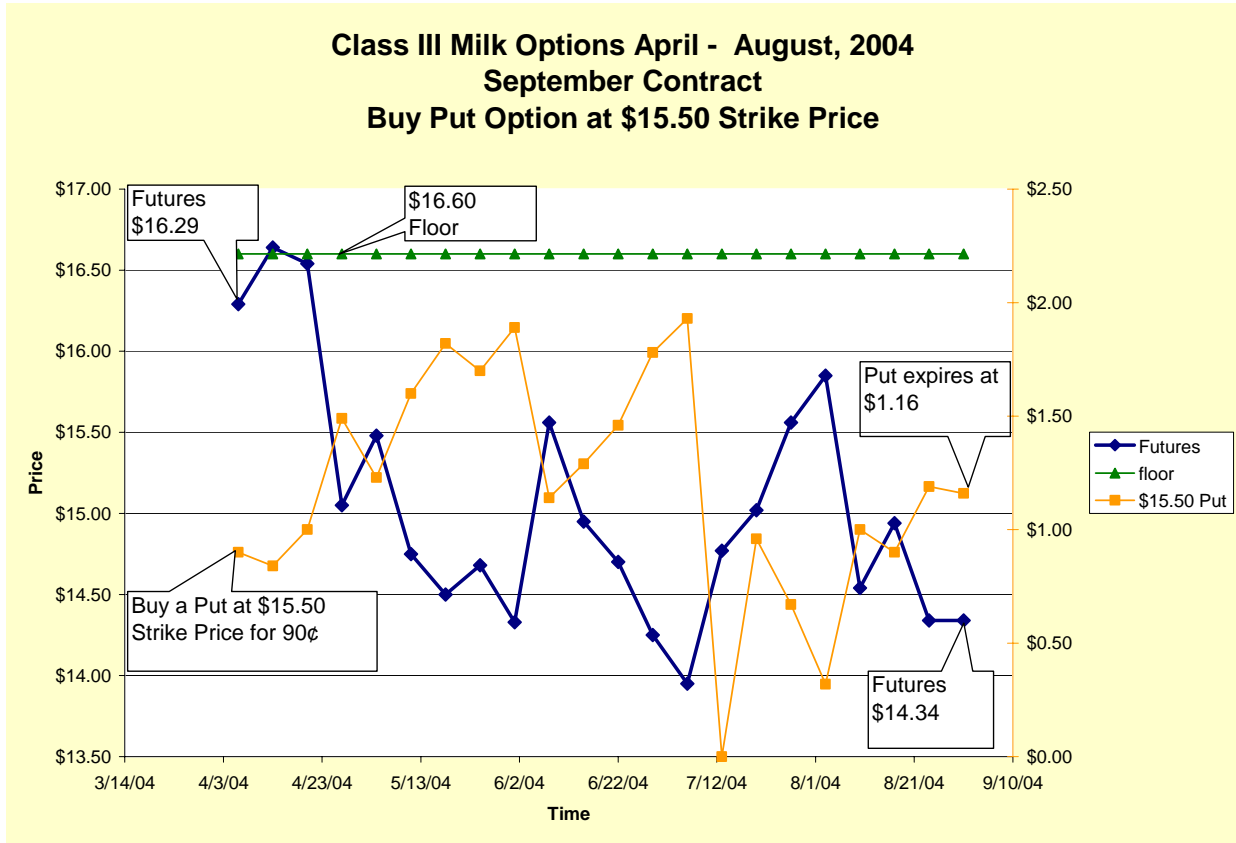


Figure 6: Class III Milk Options April – August, 2004. September Contract. Buy Put Option at \$15.50 Strike Price.

Calculate the floor:

Strike Price	\$15.50
Put Premium	(90¢)
Basis	<u>\$2</u>
Floor	\$16.60

Check the floor:

Futures	\$14.34
Put Premium	(90¢)
Put Expired	\$1.16
Basis	<u>\$2</u>
Floor	\$16.60

**Class III Milk Options April - August, 2004
September Contract
Synthetic Put
Sell Futures for \$16.29 and Buy a Call Option at \$18 Strike Price**

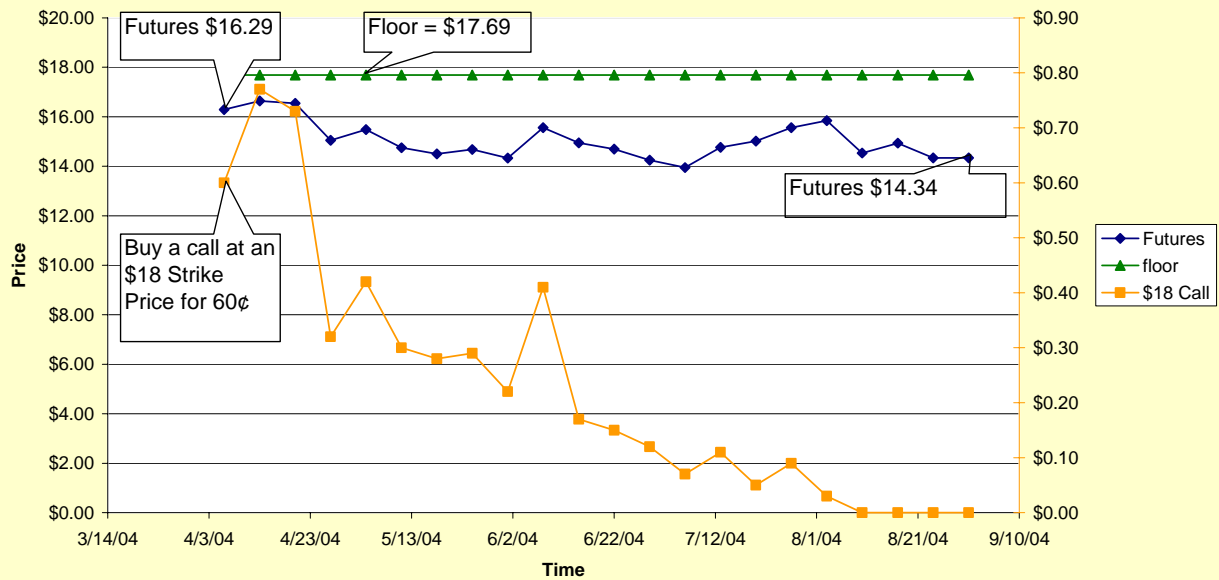


Figure 7: Class III Milk Options April – August, 2004. September Contract. Synthetic Put.

To calculate the floor:

Futures	\$16.29
Call Premium	(\$0.60)
Basis	<u>\$2</u>
Floor	\$17.69

To check the floor at the end of the period:

Sell Futures	\$16.29
Buy Futures	<u>(\$14.34)</u>
<i>Net Futures</i>	\$1.95
Buy Futures	\$14.34
Call Premium	(\$0.60)
Call Expire	\$0
Basis	<u>\$2</u>
Floor	\$17.69

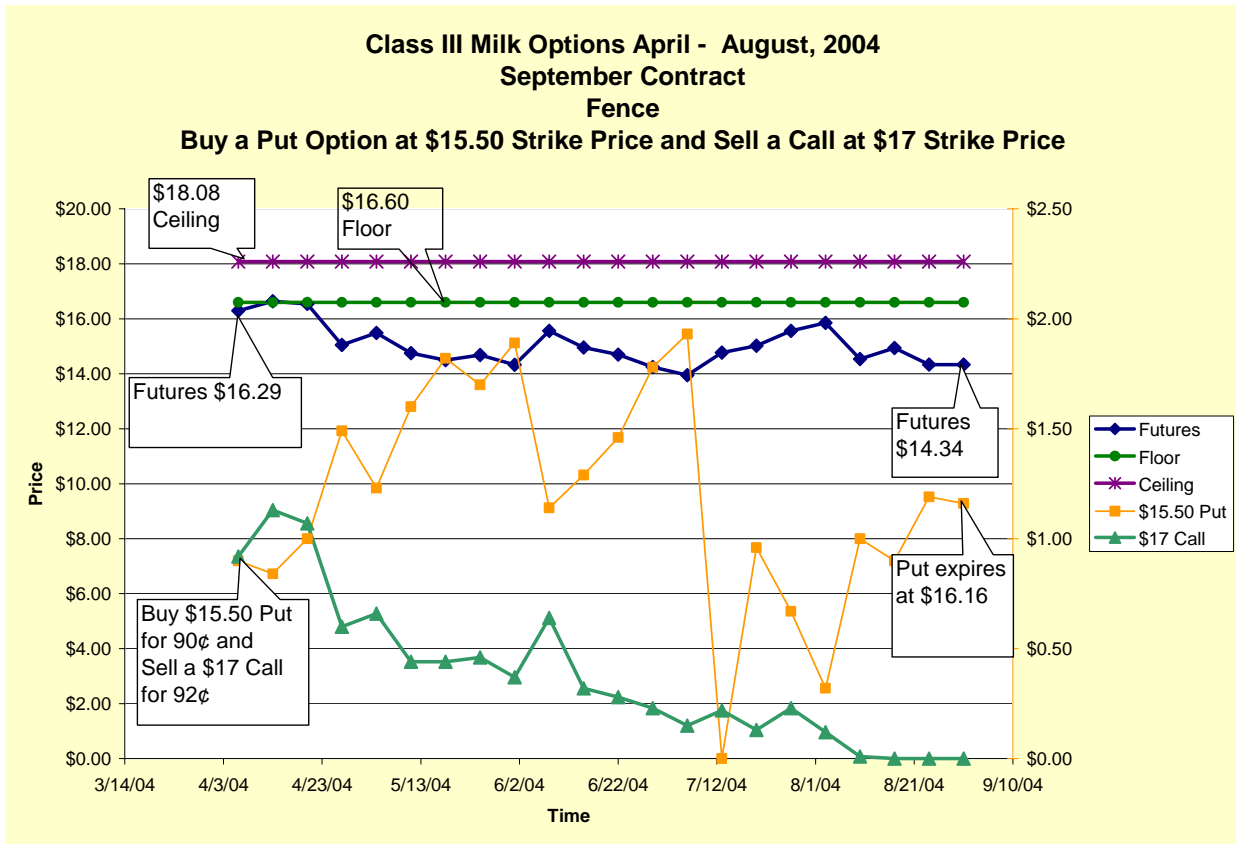


Figure 8: Class III Milk Options April – August, 2004. September Contract. Fence.

To calculate the floor:

Strike Price	\$15.50
Put Premium	(\$0.90)
Call Premium	\$0.92
Basis	\$2
Floor	\$16.60

To calculate the ceiling:

Strike Price	\$17.00
Put Premium	(\$0.90)
Call Premium	\$0.92
Basis	\$2
Ceiling	\$18.08

Surveys

The following survey was sent to all of the dairy producers in East Tennessee who participated in the DOPP training. With the question is the graph or comment that shows their responses.

1. Did you buy put options in the DOPP? If **yes**, then please answer the following (If no, please skip to question 3):

Was your relationship with the broker satisfactory? ___ Yes or ___ No

- All had satisfactory relationship with their broker

Did the options you purchased increase in value? ___ Yes or ___ No

- All of their put options increased in value; two purchased more than one put and one decreased

Prior to training did you have previous experience with futures and

Options? ___ Yes or ___ No

If yes, in ___ grain ___ livestock ___ milk

- One had previous experience with futures and options

Which of the following have you used to manage price risk for *milk* since DOPP?

___ Futures ___ Options ___ Forward Price Contracts ___ None

- One producer managed price risk for milk by using futures and options

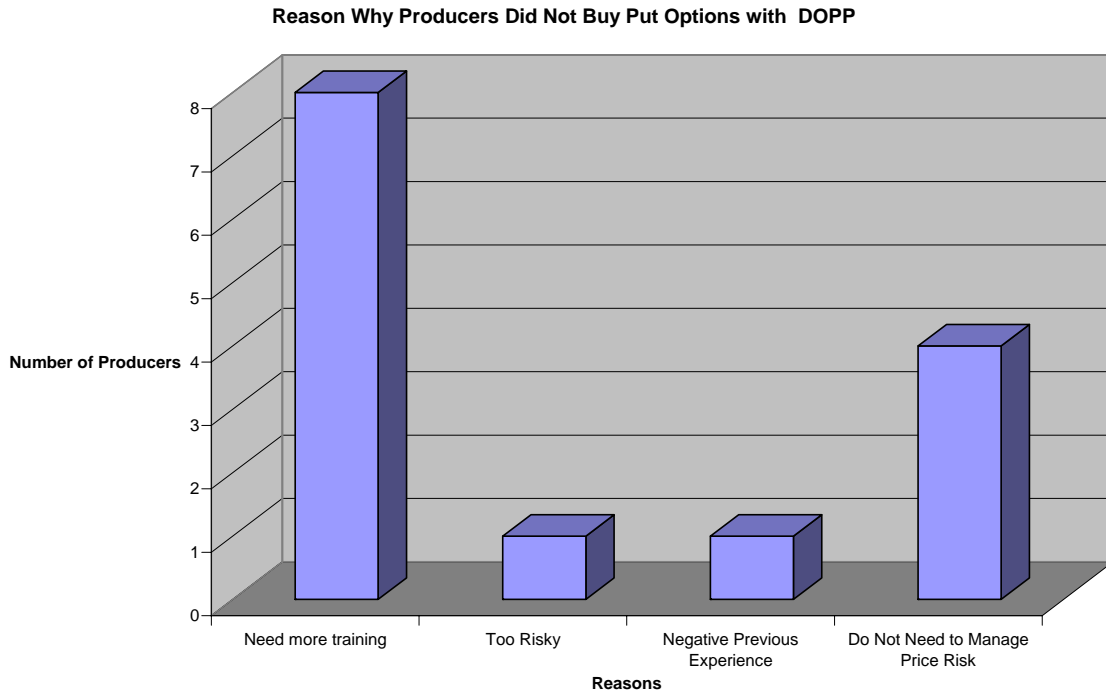
Which of the following have you used to manage price risk for *feed* since DOPP?

___ Futures ___ Options ___ Forward Price Contracts ___ None

- Two have acquired forward price contracts for feed

2. If you **did not** buy put options with DOPP select from the following why you did not participate:

- a. Need more training
- b. Too risky
- c. Negative previous experience
- d. Do not need to manage price risk

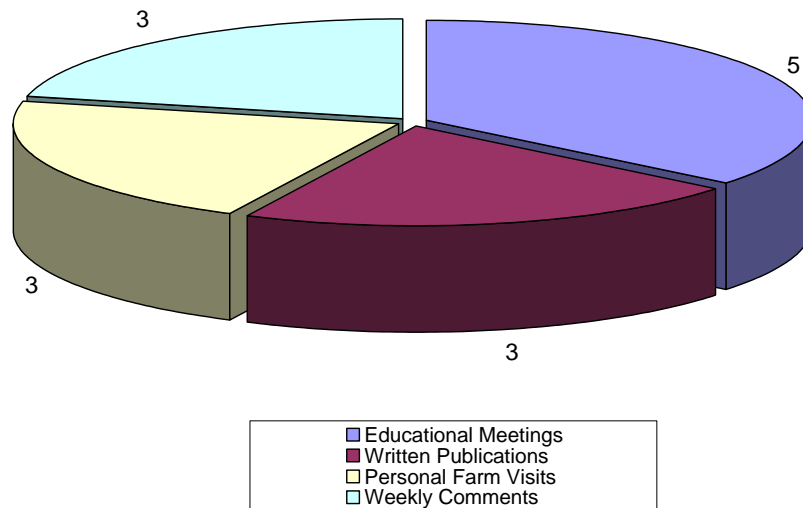


note: one producer selected all of the choices and another listed that they had another job

3. What can extension do to increase dairy producer's interest in learning about risk management methods?

Rank in order of preference:
Educational meetings _____
Written publications _____
Personal farm visits _____
Weekly comments _____

Extension Assistance



4. (optional) If you participated please estimate the value in dollars of the DOPP to your operation.

- *Estimates ranged from \$500 to \$15,000*

Also, please estimate the worth of the training (in dollars).

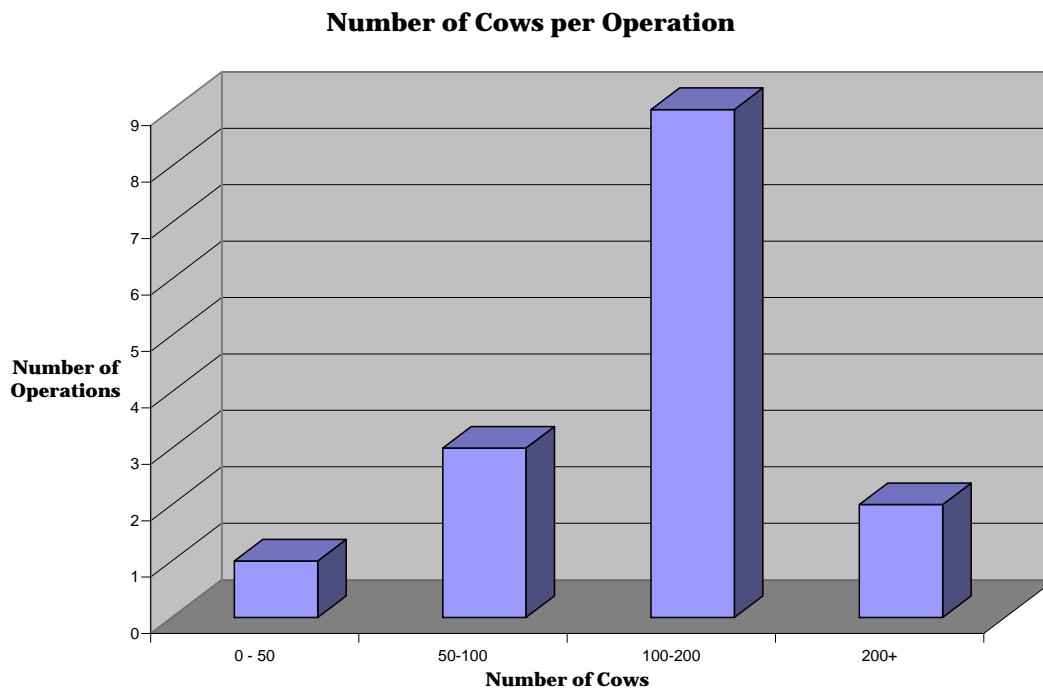
- *Estimates ranged from \$200 to \$10,000*

Demographic information

The following is only to give us a clearer picture of who participated in the program.

Size of operation (number of cows)

0-50 50-100 100-200 200+

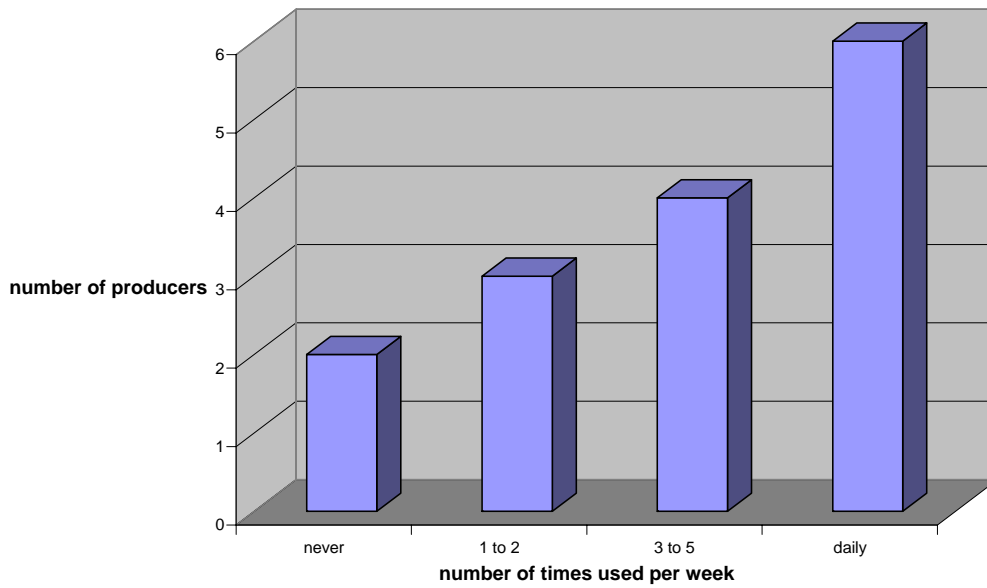


Please write the county where your operation is located. _____

How often do you use the internet?

_____ never _____ 1-2 times/week _____ 3-5 times/week _____ daily

Internet Use



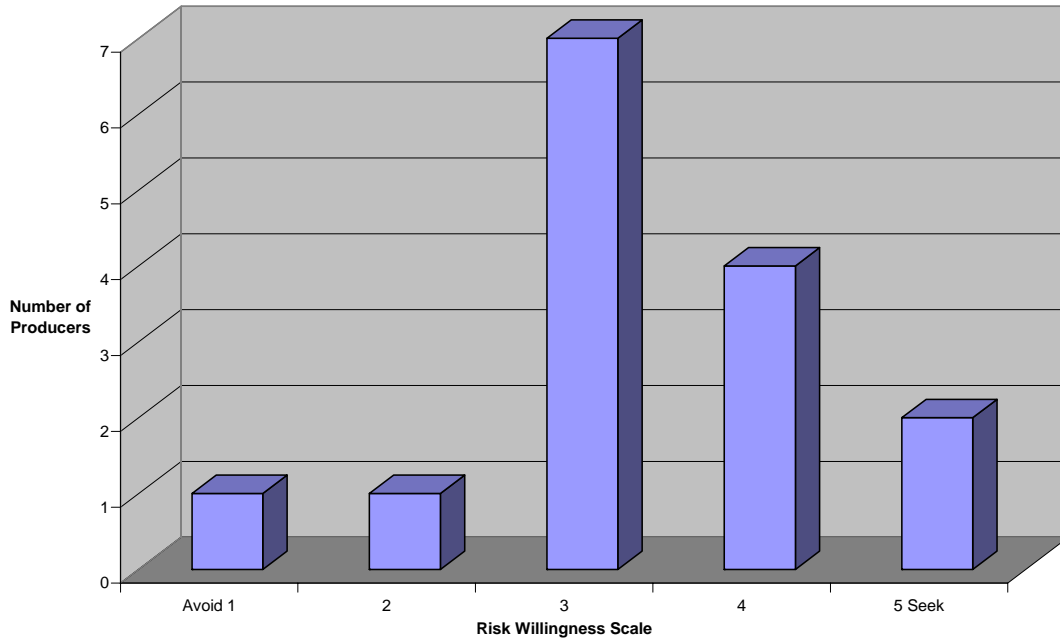
Please list the age of operator who attended the training. _____

On a scale of 1 to 5, what is your willingness to take on risk?

1 is to avoid it and 5 is to actively seek it (check one).

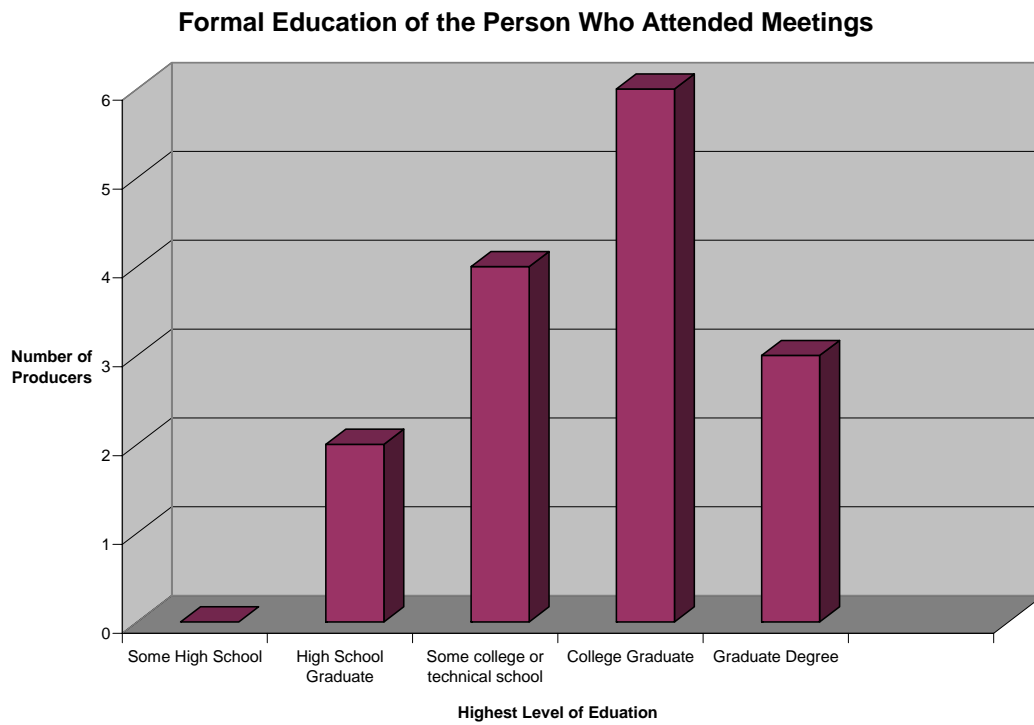
1 2 3 4 5

Producers Self Evaluation of Willingness to Take on Risk



Level of formal education of the person who attended the meetings:

- _____ Some High School
- _____ High School Graduate
- _____ Some college or technical school
- _____ College graduate
- _____ Graduate degree



This was a survey conducted at a McMinn County Dairy Marketing Club Meeting.

ON A SCALE OF 1 (low) TO 5 (high) PLEASE RANK THE FOLLOWING LEARNING EXPERIENCES AS FAR AS THEIR HELPING YOU LEARN HOW THE MILK FUTURES AND OPTIONS MARKETS WORK

1. Use of five market strategies to simulate market decisions for a previous time using historical numbers.
 - *All of the producers scored these two questions at a 4 or a 5.*
2. Milk marketing game to see which producer could price their milk for the highest average price.
 - *All of the producers scored these two questions at a 4 or a 5.*
3. Twice-monthly meetings to review fundamental situation and outlook, and to review pricing opportunities.
 - *All of the producers scored these two questions at a 4 or a 5 except one producer requested meeting once a month versus twice a month.*
4. Trip to Chicago to visit the Chicago Mercantile Exchange.
 - *Not all producers had gone to Chicago. One felt that it was more of a reward than an educational experience but all of the other producers rated the trip at a 4 or a 5.*
5. Outside speakers such as the broker from Knoxville and the teleconference with Blemling.
 - *Most producers rated this at a 4 or 5 but one producer commented that speakers were more rewarding than educational.*

Summary

As a result of this research experience, I have gained greater insight into the futures and options markets. Through the review of strategies of the DOPP period and the current period, I observed the relationships between options and futures. These relationships make the concept of purchasing options to manage price risk a logical decision for producers. I plan to share these observations from the DOPP and current periods with the DOPP participants. The survey taken should be useful information for the Extension Service to direct programs teaching the concepts of the commodity market that will benefit producers the most. The visit to the Chicago Mercantile Exchange gave me a great understanding of how risk is managed for financials and commodities. While I was at the CME, I learned of potential job opportunities for Agricultural Economists.

Works Cited

“Managing Dairy Price Risk Using Milk Put Options”. United States Department of Agriculture Risk Management Agency.

Rawls, Emmit L., and John C. Campbell. “Basics of Futures and Options to Manage Price Risk”. Knoxville: University of Tennessee Agricultural Extension Service, 2000.

Trading Tactic A Livestock Futures Anthology. Ed. Todd Lofton. Chicago: Chicago Mercantile Exchange, 1986.