MARYLAND COOPERATIVE EXTENSION
UNIVERSITY OF MARYLAND
COLLEGE PARK•EASTERN SHORE

Fact Sheet

Fact Sheet 492

Grain Marketing: Using Options

Introduction

Options are a relatively new grain marketing alternative worthy of investigation by grain producers. Options give grain producers the right, but not the obligation, to accept a price. Grain producers can use options to protect themselves against falling prices without losing the benefits of increasing prices.

Options are no more difficult to use than futures markets. However, options trading involves different terminology which can create initial difficulties for the neophyte. The grain producer can easily understand options trading once he is familiar with the terminology. To guide the grain producer in understanding and using options, Fact Sheet 498 gives a glossary of common terms used in the options market.

The Options

Market Some Characteristics

Several strategies are available for options trading, but before using any of them, the grain producer should learn and understand some characteristics of the options market. These characteristics include:

- ***The put options market and the call options market are separate entities.*** The number of puts sold must equal the number of puts purchased. The number of calls sold must equal the number of calls purchased. The number of puts sold or purchased is unrelated to the number of calls purchased or sold. The put and call markets are only related through the underlying commodity contract.
- ***Selling puts and/or calls involves more risk and requires more expertise*** than buying puts and/or calls, and are generally not used by producers in marketing their grain.
- ***Sellers of puts and/or calls are required*** to furnish margin money and make margin calls if conditions dictate.
- ***Premiums are determined*** by competitive bidding and fluctuate within and between trading days.
- ***Premiums may contain*** both intrinsic and time value elements. Prediction and/or evaluation of premium values before the expiration date is quite complex. Premium values at expiration are easy to understand.
- ***Strike prices do not fluctuate*** and are set for the life of the option.
- ***Commissions on options trading are computed*** on a per trade basis, whereas ***commissions on futures trading are computed*** on a per roundturn basis (one contract sold and later bought back, or vice versa).

Options Trading

The Process

When a producer purchases a put/call, he or she buys the right, but not the obligation, to sell/buy the underlying futures contract at the strike price before the expiration date. For this right, the producer pays a premium and a broker's fee for execution of trade. The seller of the put/call receives the premium, and also pays the broker a commission for executing the trade.

The premium fluctuates in value within and between trading days. If the price of the underlying futures contract goes up, other things equal, the premium for the put/call drops or goes up. Conversely, if the price of the underlying futures contract goes down, the premium for the put/call increases or decreases.

At anytime before the expiration date, the buyer of the put/call may decide to exercise the option. Upon exercise, the buyer of the put/call gets a short or long futures position in the underlying contract at the strike price. At this time, the trader is out of the options market, and is required to maintain margin money for his or her futures position. The seller of the put/call gets a long or short futures position, and is also out of the options market.

It is possible to exercise a put/call, but few producers do so. Instead, buyers of puts/call typically clear their options position by either selling the puts/calls or letting them expire. If the premium has value, buyers sell their option contracts before expiration, receive the premium, and pay a brokerage commission for execution of trade. Sellers of puts/calls then become buyers, pay the premium, and pay commission fees for execution of trade.

Options Quotes. These represent the value of premiums for puts and calls for different underlying futures contracts and different strike prices. The buyer of a put buys the right, but not the obligation, to sell the underlying futures contract at the strike price. For that right, the buyer pays a premium plus commissions to the broker for executing the options order.

Table 1. Option prices quoted on July 27,1988*

Strike Price	Calls-Settlement			Puts-Settlement		
	Sep-C	Dec-C	Mar-C	Sep-P	Dec-P	Mar-P
270	22	33	36	7	13	-
280	16	28	28	12	22	20
290	11	12	25	20	26	24
300	8	19	22	28	30	29

*Corn (Chicago Board of Trade) 5000 bushels; cents per bushel

Table 2. Futures prices quoted on July 27,1988*

Contract	Settlement Price
September	280
December	287
March-89	294

*Corn (Chicago Board of Trade) 5000 bushels; cents per bushel.

From the quotes given in Tables 1 and 2, a buyer of a December put with a 280 strike price, buys the right, but not the obligation, to sell a December futures contract at $2.80 per bushel anytime before the option expires (the 3rd Friday in November). For that right, the buyer pays $0.22 per bushel plus commissions. If the price of the December contract falls, the premium on the associated options increases. The buyer then sells the put option, receives the higher premium (the seller always receives the premium), and pays the broker's commission. If the price of the December contract increases, the associated premiums fall. The put buyer then lets the option expire (assuming the premium falls to zero), and loses the premium and commissions paid.

The buyer of a call buys the right, but not the obligation, to buy the underlying futures contract at the strike price. For that right, the buyer pays a premium and commissions to the broker. From the quotes in Tables 1 and 2, a buyer of a December call with a 300 strike price, buys the right to buy a December futures contract at a price of $3.00 per bushel anytime before the option expires (the 3rd Friday in November). For that right, the buyer pays a $0.19 per bushel premium plus commissions. If the price of the December contract increases, the premium on the associated call options also increase. The buyer then sells the call option, receives the higher premium, and pays the broker's commission. If the price of the December contract falls, the associated premiums also fall. The call buyer then lets the option expire (assuming the premium falls to zero), and loses the premium and commissions paid.

Options Premiums. These consist of two factors: *intrinsic* value and *time* value. Intrinsic value for the premium associated with a particular put is equal to the strike price, minus the price of the underlying contract, or zero if is is a negative number. Intrinsic value for the premium associated with a particular call, is equal to the price of the underlying contract, minus the strike price. Time value, for both puts and calls, is equal to the premium value minus its intrinsic value. In general, the longer the amount of time remaining before expiration of the option, and the more volatile the underlying futures contract price, the greater the time value. Also, although premium values fluctuate within each day and from day to day, at expiration the premium will equal its intrinsic value.

From our example, the intrinsic values of the December puts are: $0.00, $0.00, $0.03 and $0.13 for strike prices of 270, 280, 290 and 300, respectively. The time values of the December puts are: $0.13, $0.22, $0.23 and $0.17, for strike prices of 270, 280, 290 and 300, respectively.

The intrinsic values of the December calls are: $0.17, $0.07, $0.00 and $0.00 for strike prices of 270, 280, 290 and 300, respectively. The time values of the December puts are: $0.16, $0.21, $0.23 and $0.19, for strike prices of 270, 280, 290 and 300, respectively

Options Marketing Strategies

Hedging Grain by Buying a Put Option

This marketing alternative provides protection against falling prices. The grain producer buys put options which are then sold or allowed to expire when he or she sells the grain. The producer may exercise the put option and establish a short position in the futures market, but this happens rarely. He or she can hedge grain before harvest to increase net returns at harvest, or after harvest to protect the price of stored grain.

If a producer holds the purchased puts until the expiration date, and has the physical grain or produces it, he or she can use the following formula to predict the minimum effective selling price:

Strike Price On Purchased Puts
+ Ending Basis

- Initial Premium Paid
- Commissions Paid
- Interest Lost on Expenses

_____

Minimum Effective Selling Price

A producer may receive a higher price if the market price increases, but the minimum effective selling price is the lowest price that is received subject to basis risk.

Since the hedge is placed before the ending basis is known, it is necessary to predict the ending basis. Many grain marketers use the average basis of the last 5 years. If the actual ending basis is larger than predicted, the minimum effective selling price is higher than predicted. Conversely, if the actual ending basis is less than predicted, the minimum effective selling price is lower than expected. Since basis is much easier to predict than price, risk is minimized.,

Example. On July 28, the premium for a December corn put with a strike price of $2.80 is $0.22 per bushel. A grain farmer expects to produce 20,000 bushels of corn. Local cash prices tend to be $0.15 above the December futures in November (basis equals $0.15 when the December put option expires). Assume that commission costs are $0.01 per bushel per trade, and interest on expenses is $0.01 per bushel. For complete option protection, the producer buys four put contracts, but for simplification, everything is computed on a per bushel basis. The producer's predicted minimum effective selling price is computed as follows:

Strike Price	$2.80
+ Ending Basis	0.15
- Premium Paid	0.22
- Commissions	0.02
- Interest	0.01

_____

Minimum Effective Selling Price = $2.70

The lowest price this producer receives is $2.70 subject to an accurate basis prediction. If the basis in November actually ends up being $0.17, the minimum price is $2.72; if the basis actually ends up being $0.12, the minimum price is $2.67.

Suppose that at expiration in November, the December futures price is $2.50 and the local cash price is $2.65. The premium at expiration is always equal to the options' intrinsic value. In this instance, the intrinsic value is $0.30 ($2.80 minus $2.50), which is also equal to the premium. The producer sells the puts, and receives the premium of $0.30. Total commission costs are $0.02 per bushel ($0.01 for buying the put and $0.01 for selling the put). Interest cost is $0.01 per bushel. The producer then sells the cash grain for $2.65 in the local market. The net price for the grain is $2.70 ($2.65 for the cash grain sold, minus $0.22 for the initial premium paid, minus $0.02 for commission costs, minus $.01 for interest, plus $0.30 for the premium received).

Suppose that at expiration in November, the December futures price is $4.00 and local cash prices are $4.15. The December corn put loses its intrinsic value since the futures price is above the strike price. The producer lets the put option expire, and is only responsible for $0.01 in commissions. The net price the producer receives is $3.91 ($4.15 for the cash grain sold, minus $0.22 for the initial premium paid, minus $0.01 for commission costs, minus $0.01 for interest). The producer's price is reduced by $0.24 for having the insurance protection. In fact, $0.24 is the maximum the producer can lose by buying this put.

Suppose the producer experiences a total crop failure. If November cash prices end up being $4.15 with a basis of $0.15, the producer loses an additional $0.24 because of options trading. If November cash prices end up being $2.65 with a basis of $0.15, the producer gets an additional $0.05 per bushel ($0.30 from the premium received, minus $0.22 for the initial premium paid, minus $0.02 for commission costs, minus $0.01 for interest costs) to offset production losses.

Hedging grain by buying a put option has its advantages and disadvantages. They include:

Advantages

1. ***Eliminates*** price risk.
2. ***Allows*** producer to take advantage of rising prices.
3. ***Omits*** margin requirements.
4. ***Extends*** marketing year.
5. ***Has*** high liquidity. A producer may quickly and easily reverse his or her position to take advantage of temporary price declines.

Disadvantages

1. ***Contains*** basis risk.
2. ***Necessitates*** buying put in 1,000- or 5,000-bushel increments.
3. ***Requires*** more knowledge than cash trading techniques.
4. ***Involves*** a lot of data because there are several options on each futures contract.
5. ***Entails*** possible higher costs.
6. ***Minimizes*** protection against falling prices. Since option contracts expire the month before the underlying futures contract, there could be a month when the producer's grain is unprotected against falling prices. (The producer can use available strategies to prevent this, but these methods are complex and require a higher level of marketing skills.)

Hedging by buying puts is not the best for everyone, but the technique offers advantages that all grain producers should understand and consider.

Hedging Grain by Buying a Call Option

This purchasing alternative provides protection against rising prices. It is particularly appropriate for use by poultry and livestock producers, who either do not raise grain or do not raise sufficient grain for their needs. In this case, a producer buys call options which are resold or allowed to expire when he or she buys needed grain. A producer may exercise the call option instead of reselling the call option, and establish a long position in the futures market, but few actually exercise their option contracts.

If a producer decides to hold the purchased calls until the expiration date, he or she can use this formula to predict the maximum effective purchase price:

Strike Price On Purchased Calls
+ Ending Basis
+ Initial Premium Paid
+ Commissions Paid
+ Interest Lost on Expenses

_____
Maximum Effective Purchase Price

A grain buyer pays a lower price if the market price decreases, but the maximum effective purchase price is the highest price that is paid subject to basis risk.

Since the hedge is placed before the ending basis is known, it is necessary to predict the ending basis. Many grain purchasers use the average basis of the last 5 years. If the actual ending basis is larger than predicted, the maximum effective purchase price is higher than predicted. Conversely, if the actual ending basis is less than predicted, the maximum effective purchase price is lower than expected. Since basis is much easier to predict than price, risk is minimized.

Example. The current December corn futures price is $2.87, and the premium for a December corn call with a strike price of $3.00 is $0.19 per bushel. Assume that the grain buyer needs 20,000 bushels of corn in November, and expects local cash corn prices to be $0.15 above the December futures in November (basis equals $0.15 when the December call option expires). Commission cost is $0.01 per bushel per trade, and interest on expenses is $0.01 per bushel. The producer buys four call contracts for complete protection, but for simplification, everything is computed on a per bushel basis. The producer's predicted maximum effective purchase price is computed as follows:

Strike Price	$3.00
+ Ending Basis	0.15
+ Premium Paid	0.19
+ Commissions	0.02
+ Interest	0.01
Maximum Effective Purchase Price	$3.37

The highest price this grain buyer pays is $3.37 subject to an accurate basis prediction. If the basis in November actually ends up being $0.17, the maximum price is $3.39. If the basis actually ends up being $0.12, the maximum price is $3.34.

Suppose that at expiration in November, the December futures price is $3.50 and the local cash price is $3.65. The premium at expiration is always equal to the options' intrinsic value. In this instance, the intrinsic value is $0.50 ($3.50 minus $3.00), which is also equal to the premium. The grain buyer sells the calls, and receives the premium of $0.50. Total commission costs are $0.02 per bushel ($0.01 for buying the call and $0.01 for selling the call). Interest cost is $0.01 per bushel. The purchaser then buys the cash grain for $3.65 in the local market. The net price he or she pays for the grain is $3.37 ($3.65 for the cash grain sold, plus $0.19 for the initial premium paid, plus $0.02 for commission costs, plus $.01 for interest, minus $0.50 for the premium received).

Suppose that at expiration in November, the December futures price is $2.50 and local cash prices are $2.65. The December corn call loses intrinsic value since the futures price is below the strike price. The producer lets the call option expire, and is only responsible for $0.01 in commissions. The net price the buyer pays is $2.86 ($2.65 for the cash grain bought, plus $0.19 for the initial premium paid, plus $0.01 for commission costs, plus $0.01 for interest). Hence, the price the buyer pays increases by $0.21 for having the insurance protection. In fact, $0.21 is the maximum the grain buyer can lose by buying this call.

Hedging grain by buying a call option, has the same advantages and disadvantages as hedging grain by buying a put option. Hedging by buying calls is not the best for everyone. However, the technique offers advantages that all grain purchasers, who do not raise sufficient grain for their needs, should understand and consider.

Speculating by Buying a Call Option

This marketing alternative allows grain producers to gain from increasing prices. Here, a producer sells grain at harvest and buys sufficient call options to equal the grain sold. Storage and interest costs are eliminated. If prices later increase, the call is sold and the producer profits from the transaction. If prices fall, the producer allows the option to expire, loses the premium and commissions costs, and gives up the interest. Some people refer to this strategy as ***storing paper.*** Since the grain is sold, the farmer becomes a speculator rather than a hedger in the commodity markets—a more risky position.

When speculating by buying a call option, the producer can compute the return earned per bushel by using this formula:

Final Premium Received When Calls Are Sold
- Initial Premium Paid
- Commissions Paid
- Interest Lost on Expenses

_____
Return From Speculating by Buying a Call

At the time the calls are purchased, the producer knows the initial premium and commissions cost, and the interest lost on expenses. The only unknown factor is the final premium received when the calls are sold.

If the calls are held to maturity, the premium equals its intrinsic value. For a call, intrinsic value is equal to the futures price of the underlying contract, minus the strike price of the call option if the difference is positive. If the difference is either negative or equal to zero, the option has no intrinsic value.

Example. Suppose that at harvest, a March corn call with a $3.25 strike price has a premium of $0.25. Assume that commission costs are $0.01 per bushel per trade, and interest lost because of the money invested is $0.01 per bushel. The farmer sells 20,000 bushels of corn at harvest, but still expects corn prices to increase. He or she purchases four May corn calls, but for simplification, in this example everything is computed on a per bushel basis.

Suppose that at expiration in February, the March futures price is $3.75. Since the options premium at expiration is always equal to its intrinsic value, the February expiration premium is $0.50 ($3.75 minus $3.25). The producer sells the call options, and receives a return of $0.22 per bushel ($0.50 from the premium received, minus $0.25 for the premium paid, minus $0.02 for commissions, minus $0.01 for interest expense). The producer benefits from the increase in grain prices even though he or she no longer owns cash grain.

Suppose that at expiration of the options contract in February, the March corn futures price is $2.75. Since the strike price of the purchased calls is higher than the futures price of the underlying contract, the intrinsic value, and hence the premium, is zero. The producer lets the options expire, and loses $0.27 per bushel ($0.25 for the premium paid, plus $0.01 in commissions, plus $0.01 in interest expense). Only $0.01 in commissions is lost because only one options transaction occurred. The maximum loss this producer receives is $0.27 per bushel.

Suppose that at expiration in February, the March corn futures price is $3.50. Since the underlying futures price is higher than the strike price, the options have intrinsic value. Intrinsic value, and hence the pre-mium, equal $0.25 ($3.50 minus $3.25). In this instance, the producer loses money, but does not lose the maximum amount. The loss equals $0.03 ($0.25 from the premium received, minus $0.25 for the premium paid, minus $0.02 in commissions, minus $0.01 in interest expense).

The break-even price for a producer speculating by buying a call can be calculated by using this formula:

Strike Price of the Call Option
+ Premium Paid
+ Commissions
+ Interest Lost on Expenses

_____
Break-even Price for Speculating by Buying a Call

The underlying futures price should increase higher than the break-even price for the producer to make money. In the example, the break-even price is $3.53 ($3.25 strike price, plus $0.25 for the premium paid, plus $0.02 for commissions, plus $0.01 for interest expense).

Speculating by buying a call option has its advantages and disadvantages. They include:

Advantages

1. ***Takes*** advantage of rising prices.
2. ***Eliminates*** storage and interest costs.
3. ***Omits*** margin requirements.
4. ***Extends*** the marketing year.
5. ***Has*** high liquidity.
6. ***Limits*** maximum losses.

Disadvantages

1. ***Necessitates*** buying calls in 1,000- or 5,000-bushel increments.
2. ***Requires*** a higher level of trading knowledge and skills.
3. ***Involves*** a lot of data.
4. ***Increases*** costs because of premium.
5. ***Entails*** financial losses if prices fall.

Speculating by buying calls is not the best for all situations, but the technique does have its advantages. Grain producers should understand and consider this method.

Hedging Deficiency Payments by Buying a Call

Grain producers participating in government price support programs, may sometimes find it advantageous to hedge their deficiency payment. Deficiency payments are computed as the lesser of the target price minus the loan rate, or the target price minus the 5-month average grain price. Hence, if grain prices increase above the loan rate, the deficiency payment declines in direct proportion to the price increases. Since calls can be used to provide protection against price increases, they also can protect the grain producer against declines in the deficiency payment.

To take advantage of this technique, producers must decide to hedge the grain before futures prices rise above the target price for the grain under consideration. If this condition is met, the producer can use the formulas discussed in the section on "Speculating by Buying Call Options," to determine returns from buying calls for alternative price levels. The producer can then make hedging decisions accordingly.

Speculating by Buying a Put Option

This purchasing alternative allows grain buyers to gain from decreasing prices. A buyer, in this instance, buys grain at harvest, and buys sufficient put options to equal the grain purchased. If prices later decrease, the put is sold, and the buyer profits from the transaction. If prices rise, the buyer allows the option to expire. He or she loses the cost of the premium, commissions and the interest. It is unusual for grain prices to decline after harvest; therefore, grain buyers should have sufficient reason to justify use of this purchasing alternative. This option is also called buying paper. Since the grain buyer has already purchased the grain, buying puts is speculation, and contains all of its inherent risks.

The following formula will help the grain buyer compute the return earned per bushel from speculating by buying a put option:

Final Premium Received When Puts Are Sold
- Initial Premium Paid
- Commissions Paid
- Interest Lost on Expenses

_____
Return from Speculating by Buying a Put

The initial premium paid, commissions paid, and the interest lost on expenses are known at the time the puts are purchased. The only unknown factor is the final premium received when the puts are sold.

If the puts are held to maturity, the premium equals its intrinsic value. For a put, intrinsic value is equal to the strike price of the put option, minus the futures price of the underlying futures contract if the difference is positive. If the difference is either negative or equal to zero, the option has no intrinsic value.

Example. Suppose that at harvest, a March corn put with a $3.50 strike price has a premium of $0.25. Commission costs are $0.01 per bushel per trade, and interest lost because of the money invested is $0.01 per bushel. Assume that the buyer bought 20,000 bushels of corn at harvest, and expects corn prices to decrease. He or she could purchase four May corn puts, but for simplification, everything is computed on a per bushel basis.

Suppose that at expiration in February, the March futures price is $3.00. Since the options premium at expiration is always equal to its intrinsic value, the February expiration premium is $0.50 ($3.50 minus $3.00). The grain buyer sells the put options, and receives a return of $0.22 per bushel ($0.50 from the premium received, minus $0.25 for the premium paid, minus $0.02 for commissions, minus $0.01 for interest expense). The buyer benefits from the decrease in grain prices, and still benefits from gaining access to the grain at harvest.

Suppose that at expiration of the options contract in February, the March corn futures price is $4.00. Since the futures price of the underlying contract is higher than the strike price of the options contract, the intrinsic value, and hence the premium, will be zero. The grain buyer lets the options expire, and loses $0.27 per bushel ($0.25 for the premium paid, plus $0.01 in commissions, plus $0.01 in interest expense). Only $0.01 in commissions is lost because only one options transaction occurred. The maximum loss this grain buyer receives is $0.27 per bushel.

Suppose that at expiration in February, the March corn futures price is $3.25. Since the underlying futures price is lower than the strike price, the options have intrinsic value. Intrinsic value, and hence the premium, will equal $0.25 ($3.50 minus $3.25). In this instance, the buyer loses money, but does not lose the maximum amount. The loss equals $0.03 ($0.25 from the premium received, minus $0.25 for the premium paid, minus $0.02 in commissions, minus $.01 in interest expense).

The break-even price for a grain buyer speculating by buying a put can be calculated by using this formula:

Strike Price of the Put Option
- Premium Paid
- Commissions
- Interest Lost on Expenses

_____
Break-even Price for Speculating by Buying a Put

The underlying futures price should fall lower than the break-even price for the producer to make money. In our example the break-even price is $3.22 ($3.50 strike price minus $0.25 for the premium paid, minus $0.02 for commissions, minus $0.01 for interest expense).

Speculating by buying a put option has the advantages and disadvantages of speculating by buying a call option, with some exceptions. A producer who speculates by buying a put option takes advantage of falling prices. But he or she has the disadvantage of experiencing financial losses if prices rise, and it is unusual for grain prices to decline after harvest.

Speculating by buying puts is not the best for many situations, but the technique offers advantages at times. Grain producers should understand and consider this alternative also.

Summary

This fact sheet presented terminology commonly used in trading options, and showed their applications in the grain market. It did not present methods of comparing the value of different options offered for the same contract. This subject is more complex and is beyond the scope of this fact sheet. It did not present examples in which options were not held to maturity. Predicting options premiums before maturity is also beyond the scope of this fact sheet.

This fact sheet did not discuss either the mechanics of selling options contracts. Selling options contract can be a useful tool in grain marketing, but it requires a higher level of knowledge from the options writer than from the buyer of options. However, the reader is encouraged to study options trading in more detail, and to gain the expertise to successfully write options when conditions indicate that the strategy is advantageous.

The desirability of using options depends on a number of factors, such as the grain marketer's willingness and ability to accept risk. The size of the premium, the market outlook, and the expected volatility of the market affect the value of specific option alternatives. Nevertheless, options provide benefits and flexibility that are not available with other grain marketing alternatives. They can provide the opportunity to increase returns from grain marketing, and decrease or at least manage the associated risk. The grain farmer who does not take advantage of options limits his or her marketing potential.

This Extension fact sheet is one in a series of grain marketing fact sheets. The series is designed to cover many topics essential to effective grain marketing. Other fact sheets in the series are:

FS 484 Developing a Grain Marketing Plan
FS 485 Grain Marketing: Using Balance Sheets
FS 486 Grain Marketing: Helpful Hints
FS 487 Grain Marketing: Storage Decisions
FS 488 Grain Marketing: The Futures Market
FS 489 Understanding Grain Basis
FS 490 Grain Marketing Alternatives

FS 491 Grain Futures: Questions and Answers
FS 493 Evaluating Grain Marketing Alternatives
FS 494 Crop Pricing Summary
FS 495 Maryland Corn: Historical Basis and Price Information
FS 496 Maryland Soybeans: Historical Basis and Price Information
FS 497 Maryland Wheat: Historical Basis and Price Information
FS 498 Producers' Guide to Grain Marketing Terminology

Grain Marketing: Using Options

by

James R. Russell
agricultural marketing specialist
James C. Hanson
farm management specialist
Department of Agriculture and Resource Economics

Issued in furtherance of Cooperative Extension work, acts of May 8 and June 30, 1914, in cooperation with the U.S. Department of Agriculture, University of Maryland, College Park, and local governments, Thomas A. Fretz, Director of Maryland Cooperative Extension, University of Maryland.

1989