

Crop Insurance Program Models

Federal Crop Insurance Corporation (FCIC) operates under the legislative authority of the Federal Crop Insurance Act, as amended through April 4, 1996. FCIC was established by legislation (52 Stat. 72) in 1938 to provide farmers protection against low yields. In 1980, the Federal Crop Insurance Act was amended to allow expansion to several crops that were previously uninsured. This expansion created the need for FCIC to develop additional crop insurance models because the traditional model was not appropriate for expansion crops. Therefore, FCIC has developed several crop insurance models for the insured crops. Part of the current research and development efforts are directed toward new product development and new crop insurance models. To make the work with new crop insurance models more systematic and understandable, Research and Evaluation Division has developed the following inventory of the current crop insurance models.

1. Yield Guarantee products

- a. **Individual**
- b. **Mixed**
- c. **Area**

2. Revenue Guarantee products

- a. **Dollar**
- b. **Income Protection**
- c. **Replacement Coverage**

3. Percent-of-Damage Guarantee products

- a. **Lost Quantity**
- b. **Lost Value**

Yield Guarantees

This group of crop insurance products guarantees yield to the insured producer. The guarantee is a percentage of the yield calculated from historic yields (individual or area). Indemnities result from a shortfall of the guaranteed yield in the crop year insured. This yield shortfall is multiplied by an indemnity price selected by the insured before the insurance period begins. Within this group, there are three models: **Individual**, **Mixed**, and **Area**.

Individual Yield Model

This is the predominant model of FCIC multiple peril crop insurance plans. In 1996 there were 43 crops insured using this model.

I. Defining Attribute: The current individual yield for the insured year is compared to the expected individual yield. The expected individual yield is based on the historic average of the insured crop's production and acreage from previous years.

II. Guarantee: The insured's yield for the crop year insured will exceed a certain percentage of the insured's individual expected yield. This individual expected yield is the insured's historic average yield. This historic average yield is figured from the insured's continuous previous years of production and acreage. An example of the expected individual yield is shown in Figure 1.

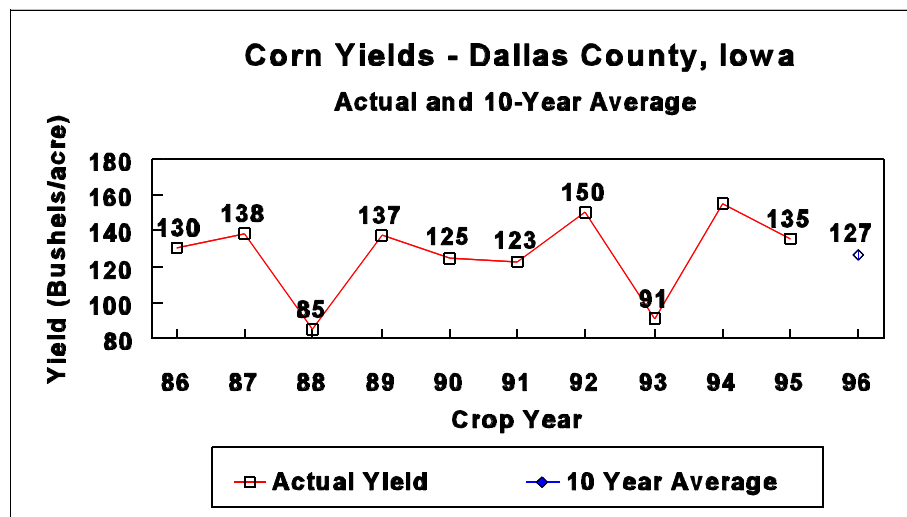


Figure 1 - Example of Ten Years of Crop History

This expected individual yield is calculated for each basic and optional unit from the insured's information about the planted acreage and harvested production of previous years (known as the insured's yield database). The yield database is at least the last four years production information and expands each year until there are ten records.

When less than four year's records are provided, proxy yields are added to the database for the missing years. Proxy yields are transitional yields ("T" yields) established by FCIC. The "T" yield for barley, corn, cotton, ELS cotton, grain sorghum, oats, rice, and wheat is the yield established by the Farm Service Agency. For other crops the "T" yield is established by FCIC by reference to another crop, or map location. The value of the "T" yield entered into the yield database depends on the number of actual records in the database. When no records are provided, the "T" yield is 65 percent of the proxy yield. When one year's record is provided, the "T" yield is 80 percent of the proxy yield. When two years of records are provided, the "T" yield is 90 percent of the proxy yield. When three years of records are provided, the "T" yield is 100 percent of the proxy yield.

The **Individual** Yield Model provides a production guarantee for each insurance unit. The production guarantee is calculated by using the coverage level selected by the insured before the risk period. The insured may select any 5 percent increment coverage level between 50 and 75

percent and that selection applies to all units of the county/crop combination on the policy. The unit guarantee is the individual expected yield (historic average yield) multiplied by the coverage level, multiplied by the acres insured, multiplied by the insured's share. The complement of coverage level would be the deductible that is self-insured by the producer. Figure 2 shows an example of the guarantee calculation.

Total Guarantee Corn -1996	
Individual Expected Yield	127 bushels/acre
Coverage Level	50 percent
Acreage	100 acres
Formula	
Individual Expected Yield x Coverage Level x acres = Total Guarantee	
Example	
127 bushel/acre x .50 x 100 acres = 6350 bushels	

Figure 2 - Example of Unit Guarantee

III. Liability: Guarantee times a certain percentage of FCIC maximum price times share.

The liability is the dollar amount that the insurance company will pay to the insured when there is zero yield. For each insurance period the guarantee is calculated by multiplying the per acre guarantee by the insured acres. The guarantee is then multiplied by the indemnity price (xx percent of the FCIC maximum price) and then by the insured's share in the insured acres to get the liability.

The insured acres are defined in the crop insurance policy. There are few limitations to the insurable land, thus nearly all acreage for commercial production is insurable. The largest limitation of insured acreage is the timely planting for the full guarantee. The guarantee is reduced for acreage that is not timely planted (as defined within the crop insurance policy).

The indemnity price is any value selected by the insured between 60 and 100 percent of the FCIC maximum price election. FCIC establishes a maximum price election several months before the insurance period for each crop.

Final liability is calculated using the insured's share in the crop at the time insurance begins. Share refers to the percentage division of the harvested crop between the tenant and landlord. Insured's who are owner-operators of the insured acreage would have a 100 percent insurance interest. Figure 3 gives an example of a liability calculation.

Liability Corn -1996	
Total Guarantee	6350 bushels
Price	\$2.65 per bushel
Share	100 percent
Formula	
Total Guarantee x Price x Share = Liability	
Example	
6,350 bushels x \$2.65/bushel x 1.000 = \$16828	

Figure 3 - Example of Liability Calculation

IV. Basis for rate making: Historic insurance experience distributed by yield spans.

The individual expected yield (historic average yield) of each insured is compared to yield spans to determine the appropriate rate for the insured. An example of the yield spans is shown in the following extract (Figure 4) from the 1996 Dallas County Iowa Corn Actuarial Document.

10/18/95	COUNTY ACTUARIAL TABLE								PAGE 1
	FCI-35 COVERAGE AND RATES 1996 AND SUCCEEDING CROP YEARS								
ST: IOWA (19)	CO: Dallas (049)				CROP: CORN (0041)				
TYPE: (029) Grain Only (029) Grain Only	PRAC: (002) Irrigated (003) Non-Irrigated								
APH YIELD (BU)	BASE PREMIUM BY COVERAGE LEVEL								
	RATE CLASS	.50	.55	.60	.65	.70	.75		
60.0 & Below	R01	0.067	0.073	0.081	0.092	0.112	0.142		
61.0 - 77.0	R02	0.057	0.062	0.069	0.079	0.096	0.121		
78.0 - 94.0	R03	0.045	0.049	0.055	0.063	0.076	0.096		
95.0 - 111.0	R04	0.038	0.042	0.046	0.052	0.064	0.081		
112.0 - 130.0	R05	0.033	0.036	0.040	0.045	0.056	0.070		
131.0 - 147.0	R06	0.030	0.032	0.036	0.040	0.050	0.063		
148.0 - 164.0	R07	0.027	0.030	0.033	0.038	0.046	0.058		
165.0 - 181.0	R08	0.026	0.027	0.031	0.036	0.043	0.055		
182.0 & Above	R09	0.025	0.026	0.030	0.035	0.042	0.052		

Figure 4 - Extract of 1996 Dallas County, Iowa Actuarial Table for Corn

V. Perils: Indefinite in time and broad.

The perils insured are not typical insurance perils because they represent yield limiting events that have extended duration with no defined beginning. For instance, drought, an insured peril, could start at planting (beginning of insurance period) and continue until harvest (end of the insurance period). The organization of the insurance policy lists perils that are covered and those that are not covered. The typical insured perils of this model that cause “unavoidable loss of production” during the insurance period are adverse weather conditions, fire, insects, wildlife, earthquake, volcanic eruption, or failure of the irrigation water supply due to an unavoidable cause occurring after the beginning of planting.

Typical uninsured perils are intentional acts of the insured that reduce yield. Examples are neglect, mismanagement, failure to follow good farming practices, etc.

VI. Acreage required to be covered: All crop acreage of which the insured has a share in the county.

Producers must insure their entire share of the crop acreage in the chosen county/crop combination. This policy condition prohibits any producer from excluding insurance on selected acreage within a farm or entire farm locations. Without this condition, an insured producer might insure acreage only where there was a chance of loss.

VII. Units: Insurance units of a crop are divided by county and sharing entity. They may be further divided by section, type or practice depending on the crop.

An insurance unit of a crop, commonly known as a “unit”, is the acreage of the insured crop in the county taken into consideration when determining the guarantee, premium, and indemnity for the acreage. A basic unit is one determined by entity. One hundred percent share in the crop would be one basic unit. Land shared with a landlord/tenant would be a basic unit. (For example: a tenant with two landlords insuring one crop in one county would have two basic units.) If the land of a basic unit was in multiple sections, an optional unit may be possible for each section. Units by type or practice may be available on some crops. The resulting units of this possible further division are called optional units.

VIII. How the expected yield is set: Individual yield history with a minimum of 4 years of records building to 5 or 10, depending on the crop.

A minimum of four years of acceptable production records is required in each data base to calculate the expected yield. If the insured provides less than four years of acceptable production records, a system of transitional yields will be used to provide the expected yield. After four consecutive years of acceptable production records are provided, the expected yield is a simple or weighted average, depending on the crop. When the number of years consecutive acceptable production records reaches 5 or 10, depending on the crop, the acceptable production records will come from the latest 5 or 10 consecutive years.

IX. Exclusions: Losses caused by the farmer, perils not listed in the policy, high-risk land, excluded practices.

Examples of exclusions are:

- Losses caused by the negligence, mismanagement, or wrongdoing of the farmer, a member of the farmer's family or household, the farmer's tenants, or the farmer's employees.
- Losses caused by the farmer not following recognized good farming practices.
- Losses where a farmer had planted a crop in an area that could be flooded by the backup of water from a governmental, public, or private dam or reservoir project.
- Losses caused by the failure or breakdown of the farmer's irrigation equipment or facilities.
- Losses caused by the farmer's failure to carry out a good irrigation practice.
- Where the farmer plants on land that has not had a crop planted or harvested in at least one of the three previous crop years.
- Where the farmer plants on land that has been strip mined, unless there is a written agreement to insure such land.
- Where the farmer fails to replant when it is practical to replant.
- Where the farmer plants the crop with another crop unless this is allowed by the crop provisions.
- Acreage where the farmer does not have adequate facilities and water to carry out a good irrigated practice at the time insurance attaches when only an irrigated practice is insured.
- High risk land when the farmer signs the option to exclude such land from insurance prior to the sales closing date of the crop being insured.
- Hail and fire as causes of loss when the farmer elects to exclude these losses on the crop insurance policy and covers them with an equal or greater amount of hail and fire insurance.

X. How the claims are calculated: Yield shortfall multiplied by indemnity price.

Indemnities are paid when the harvested and appraised production falls short of the unit guarantee. Harvested and mature appraised production is adjusted for moisture and quality. Moisture is adjusted to the percent listed in the crop provisions. The quantity of production is lowered for grain that is near sample grade due to insured causes. The indemnity amount is the bushel difference multiplied by the indemnity price. An example is given in Figure 5.

Indemnity Corn 1996	
Unit Guarantee	6350 bushels
Production to Count	5680 bushels
FCIC Established Market Price (indemnity Price)	\$2.65/bushel
Share	100 percent
Formula	
$(\text{Unit Guarantee} - \text{Production to Count}) \times \text{Indemnity Price} = \text{Unit Indemnity}$	
Example	
$(6350 \text{ bushels} - 5680 \text{ bushel}) \times \$2.65/\text{bushel} = \$1,776$	

Figure 5 - Indemnity Example

Product Examples: Actual Production History (barley, corn, cotton)

Mixed Yield Model

I. Defining Attribute: Individual yield guarantees are offered to producers based on the location of the insured acreage and crop. The insurance offer is determined by locating the risk area of the insured risk on a map. The major element in determining the insurance offer is the soil's production capability. Additional considerations such as susceptibility to flooding or drought, insured's loss experience and other related attributes also affect the offer.

II. Guarantee: The Individual's current yield will exceed a certain percentage of the area's average yield.

The producer selects the guarantee level of the insurance by selecting any value between 50, 65 and 75 percent of the area's average historic yield. The value selected is listed as the coverage level in the insurance documents. The complement of coverage level would be the deductible that is self insured by the producer.

III. Liability: Guarantee times a certain percentage of the FCIC maximum price.

The liability is calculated the same way as in the **Individual** yield model. However, the percentage the insured producer could choose normally is limited to three prices. These prices were generally called the high, middle and low price elections.

IV. Basis for rate making: Historic insurance experience distributed by map areas.

The previous 10 years yield and acreage data were used to determine the areas within the county. The number of areas in a county would vary depending on the yield variability information within the county determined by the field underwriters. The existing insurance experience history from the time a crop program was introduced into a county would be used to make the rate determinations. New county programs were usually tied to the experience of the surrounding county crop programs. The underwriters would usually start with a county average and go up and down from that average. An example extract of the resulting FCIC-35 is shown in Figure 6.

FORM FCI-35		UNITED STATES DEPARTMENT OF AGRICULTURE FEDERAL CROP INSURANCE CORPORATION COUNTY ACTUARIAL TABLE 1980 AND SUCCEEDING CROP YEARS					
CROP:	Corn	STATE:			Iowa 19		
PRACTICE:		COUNTY:			Dallas 049		
CLASSIFI-	PRODUCTION GUARANTEE PER ACRE [1]			PRICE ELECTION PER BU [2]			
CATION					\$1.70	\$2.00	\$2.25
	LEVEL 1	LEVEL 2	LEVEL 3		PREMIUM RATE PER ACRE		
	(BU)	(BU)	(BU)		(DOLLAR)	(DOLLAR)	(DOLLAR)
1	32.0				2.70	3.20	3.60
2	35.0				2.30	2.70	3.00
3	39.0				2.30	2.70	3.00
4	44.0				2.30	2.70	3.00
5	49.0				2.30	2.70	3.00
6	56.0				2.30	2.70	3.00
7	65.0				2.70	3.20	3.60
1		41.0			4.30	5.00	5.60
2		46.0			3.70	4.30	4.80
3		51.0			3.70	4.30	4.80
4		57.0			3.70	4.30	4.80
5		64.0			3.70	4.30	4.80
6		73.0			3.70	4.30	4.80
7		84.0			4.30	5.00	5.60
1			47.0		5.90	6.90	7.80
2			53.0		5.10	6.00	6.70
3			59.0		5.10	6.00	6.70
4			66.0		5.10	6.00	6.70
5			74.0		5.10	6.00	6.70
6			84.0		5.10	6.00	6.70
7			97.0		5.90	6.90	7.80

Figure 6 - Extract of 1980 Dallas County, Iowa Actuarial Table for Corn

V. Perils: Indefinite in time and broad.

The perils insured are not typical insurance perils because they represent yield limiting events that have extended duration with no defined beginning. For instance, drought, an insured peril, could

start at planting (beginning of insurance period) and continue until harvest (end of the insurance period). The organization of the insurance policy lists perils that are covered and those that are not covered. The typical insured perils of this model that cause “unavoidable loss of production” during the insurance period are adverse weather conditions, fire, insects, wildlife, earthquake, volcanic eruption, or failure of the irrigation water supply due to an unavoidable cause occurring after the beginning of planting.

Typical uninsured perils are intentional acts of the insured that reduce yield. Examples are neglect, mismanagement, failure to follow good farming practices, etc.

VI. Acreage required to be covered: All crop acreage which the insured has a share in the county. This is the same as for the **Individual** yield guarantee model.

VII. Units: Units of a crop are divided by county and sharing entity. They may be further divided by section, type or practice depending on the crop.

A unit of a crop is the acreage of the insured crop in the county taken into consideration when determining the guarantee, premium, and indemnity for the acreage. A basic unit is one determined by entity. One hundred percent share in the crop would be one basic unit. Land shared with a landlord/tenant would be a basic unit. (For example: a tenant with two landlords insuring one crop in one county would have two basic units.) If the land of a basic unit is in multiple sections, an optional unit may be possible for each section. Units by type or practice may be available on some crops. The resulting units of this possible further division are called optional units.

VIII. How the expected yield is set: Set by the Federal Crop Insurance Corporation (FCIC) for specific map locations.

The Federal Crop Insurance Corporation takes a county’s previous ten year’s production and acreage data for the county to calculate the county average yield. The county average is then adjusted by map area within the county by the field underwriters based on land characteristics, insurance experience, etc.

IX. Exclusions: Losses caused by the farmer, perils not listed in the policy, high-risk land, excluded practices. This is the same as the **Individual** yield model.

X. How the claims are calculated: Yield shortfall multiplied by indemnity price.

The indemnity is calculated the same way as in the **Individual** yield model.

Product examples: (No existing crops in 1996. Corn, wheat, soybeans, ect. Prior to 1980)

Area Yield Model

I. Defining Attribute: The current area yield is compared to the expected area yield. The basic example of this model is any Group Risk Plan (GRP) crop.

For insurance programs using this model, FCIC uses National Agricultural Statistics Service (NASS) data to develop an insurance offer for each county/crop combination and measure the indemnity. A long series of NASS yields is needed to develop insurance offers for county /crop combinations. Currently, FCIC develops county/crop insurance offers where over 30 years of NASS county yields are available and NASS has recorded over 15,000 acres (10,000 acres for peanuts) of the insured crop. Data about counties meeting this criteria is used by FCIC to establish an insurance offer for each county/crop combination.

II. Guarantee: The area's current yield will exceed a percentage of the area average yield.

This model guarantees that the area yield for the insured year will not be less than the area yield selected by the insured from those offered by FCIC.

For each county/crop combination, the insured needs to make two selections; 1) a coverage level between 65 and 90 percent of the expected yield, and 2) an amount of protection per acre between 60 and 100 percent of the maximum amount of protection established by FCIC. The expected county yield multiplied by the coverage level is the yield threshold (trigger yield) for indemnities. When the NASS yield for the county/crop combination is below the trigger yield an indemnity is paid. The maximum dollar amount of protection is established by FCIC at 150 percent of the county/crop expected revenue (FCIC's expected county yield multiplied by the FCIC maximum price election for the insured commodity).

III. Liability: A percentage of the FCIC maximum protection per acre.

As stated above, the insured selects an amount of protection per acre between 60 and 100 percent of the maximum amount of protection established by FCIC.

An example of the liability is shown in Figure 7.

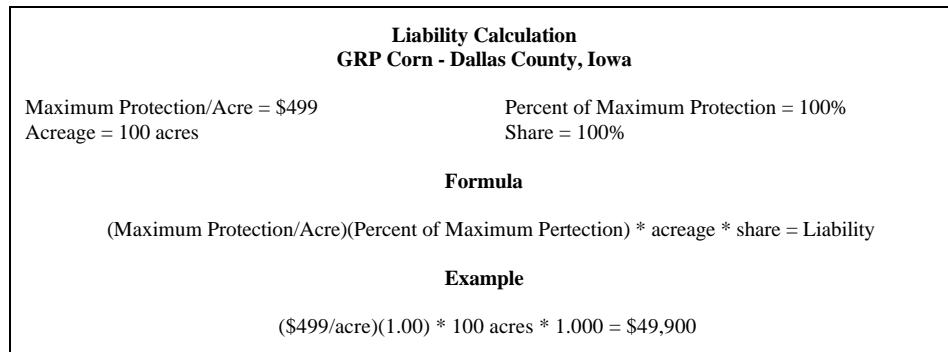


Figure 7 - Liability Calculation

IV. Basis for rate making: NASS historic county yields.

Thirty years of NASS historic yields are used to develop the expected yield for the county. A county must have at least 30 years of yield data. An example of the thirty years and the expected yield are shown in Figure 8.

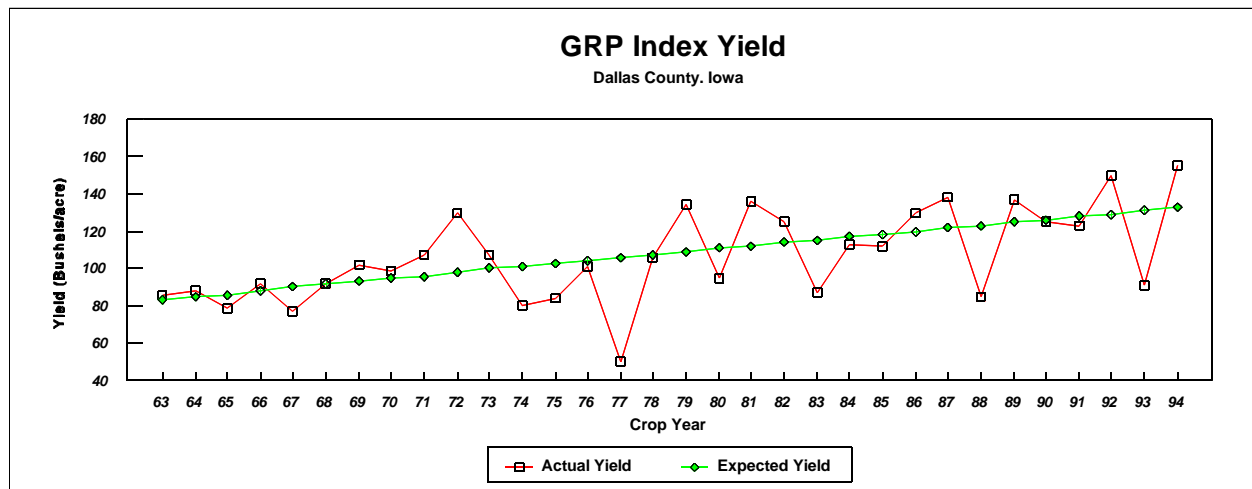


Figure 8 - Example of 30 Year County Crop History

An example of how the expected yield and the rates are given in each county is shown in the example actuarial in Figure 9.

FCI-35		GRP COUNTY COVERAGE AND RATE TABLE			
		1996 CROP YEAR			
STATE: IOWA (19)		CROP: CORN			
(141)					
		COUNTY: DALLAS (49)			
TYPE: No Type Specified (997)		PRACTICE: No Practice Specified (997)			
		Expected County Yield		:	135.7 Bushel
		Maximum Protection /acre		:	\$499
		Limited Subsidy Amount/Acre		:	\$2.99
		Maximum Subsidy/Acre		:	\$5.14
Coverage Level	70%	75%	80%	85%	90%
Trigger Yield	95.0	101.8	108.6	115.4	122.1
Unsubsidized Rate	1.20	1.80	2.60	3.50	4.70
Maximum subsidy applies at \$474 (or above) for the 80 percent coverage level.					
Maximum subsidy applies at \$449 (or above) for the 85 percent coverage level.					
Maximum subsidy applies at \$424 (or above) for the 90 percent coverage level.					

Figure 9 - Example of GRP Actuarial

An example of the premium calculation is shown in Figure 10.

Premium Calculation	
GRP Corn - Dallas County, Iowa	
Maximum Protection/Acre = \$499	Percent Max Protection Selected = 100%
Coverage Level = 90%	Trigger Yield = 122.1 bushels/acre
Unsubsidized Rate = 4.70	Maximum Subsidy/Acre = \$5.14
Limited Subsidy Amount/Acre = \$2.99	
Formulas	
Liability * unsubsidized rate = Total Premium	
Total Premium - (Applicable Subsidy * acres * share) = Producer Premium	
Examples	
$\$49,900 * (4.70/100) = \$2,345$	
$\$2,345 - (5.14/\text{acre} * 100 * 1.000) = \1831	

Figure 10 - Premium Calculation

V. Perils: Indefinite in time and broad.

The perils that would affect the actual county NASS yield are assumed to be both definite and indefinite in time and very broad. It is very unlikely that uninsured causes would have much of an effect on the NASS production and acreage estimates that make up the NASS yield for the county. The counties selected for GRP meet minimum acreage and minimum number of producers requirements to prevent any moral hazard.

VI. Acreage required to be covered: All crop acreage which the insured has a share in the county. This is the same as the **Individual** yield guarantee model.

VII. Units: Units are divided by county

All the insurable acreage in which you have a share in the county will constitute your unit for the group risk plan. The insurance provided by this model applies to all the acreage of the insured crop in the county in which the insured has a share on the date coverage begins. The insured acreage must be planted prior to the final planting date listed in the FCIC Actuarial Table.

VIII. How the expected yield is set: Historic county yield data.

As stated previously thirty years of NASS historic yields are used to develop the expected yield for the county. An example of the thirty years and the expected yield are shown in Figure 7.

IX. Exclusions: None

X. How the claims are calculated:

The payment that the insured receives is calculated as shown in Figure 11.

Indemnity Calculation GRP Corn - Dallas County, Iowa	
County Expected Yield = 135.7 bushels/acre	Coverage Level Selected = 90%
Trigger Yield = 122.1	Percent Max Amount of Protection Selected = 100%
Max Amount of Protection = \$499	Preliminary Payment Yield = 100 bushels/acre
Final Payment Yield = 102 bushels/acre	Acreage = 100 acres
Share = 100 %	
Preliminary Payment Calculation Formula	
$\text{Liability} * ((.9(\text{trigger Yield}) - (\text{preliminary payment yield})) \div .9(\text{trigger yield})) * .667 * \text{share} = \text{Indemnity}$	
Example	
$\$49,900 * ((.9 (122.1) - (100)) \div .9 (122.1)) * .667 * 1.000 = \2995	
Final Payment Calculation Formula	
$(\text{liability} * ((\text{trigger yield} - \text{final payment yield}) \div \text{trigger yield} * \text{share}) - \text{Preliminary Payment} = \text{Indemnity}$	
Example	
$(\$49,900 * ((122.1-102)\div122)*1.000)- \$2995 = \$6035$	

Figure 11 - Indemnity Calculation

Revenue Guarantees

This group of crop insurance products indemnifies the insured producer when the measured damage exceeds the deductible amount selected. Within this group, there are three models: **Dollar, Income Protection, and Replacement Coverage.**

Dollar Model

This model of FCIC multiple peril crop insurance provides protection against declining revenues due to damage that causes a yield shortfall and there is no price increase in the market. FCIC is also in In 1996 there were six crops insured using this model.

I. Defining Attribute: FCIC established area revenue.

FCIC establishes the dollar revenue guarantee based upon information from several sources about the cost of production, expected market prices, and yields.

II. Guarantee: The individual's revenue will exceed a percentage of the revenue set by FCIC.

The individual's expected revenue is established by FCIC using data about cost of production, expected market prices and yields. The producer selects a percentage of this revenue where the percentage is the choice of coverage levels between 60 and 75 percent.

III. Liability: FCIC established revenue times coverage level percentage.

Prior to the insurance period, the producer makes two selections: 1) the county/crop combination and 2) coverage level. These selections apply to all the crop, defined in the Crop Provisions, in which the insured has a share in the county.

IV. Basis for rate making: Historic insurance experience distributed by yield spans.

V. Perils: Indefinite in time, broad perils plus limited downward price movement.

VI. Acreage required to be covered: All crop acreage in the county in which the insured has a share.

All insurable acreage occupied by the insured crop is insured, whether reported or not. This is an underwriting technique to reduce adverse selection within the program and provide the insurance provider with risk dispersion. Risk dispersion is an important consideration for this model, because insuring broad areas will increase the likelihood that not all risks will be damaged by an insured event.

VII. Units: Units by county, and sharing entity may be further divided by section, type, or

practice.

For each county/crop combination, the insured producer is required to insure all the land in the county, however this may be divided into smaller tracts or units for crop insurance. The first division of units is by sharing entity. Crop acreage shared with different entities is a separate unit. For instance, a landlord of acreage in one county with three tenants would have a unit for each tenant consisting of the acreage farmed by each tenant. This level of units are called “basic.”

Basic units may be divided by the rules of each crop provision. Units resulting from this election are called “optional” because they are at the option of the insured and must be requested at the time acreage is reported and records of planted acreage and harvested production must be available for each optional unit.

VIII. How the expected yield is set: Individual yield history with minimum 4 years of records building to 10.

IX. Exclusions: Non-producing physical units; damage caused by uninsured perils.

Units of no commercial value are not insured. The threshold of commercial value is listed in the Crop Provisions. Consequential damage is covered when caused by a primary covered peril.

X. How claims are calculated: Percent of damage minus the deductible, multiplied by the amount of protection. Damage is the evaluation of totally and partially destroyed property.

The percent of damage is the determination of the damage by the evaluation of the adjuster. The adjuster is provided with procedure for sampling and methods to quantify damage through specific measurements. For instance, a tree that is uprooted would be evaluated as 100 percent damaged, however a tree that has one limb removed would have 20 percent damage, but a tree with 4 out of 5 limbs removed would be 100 percent damaged.

Product Example: Fresh Market Tomatoes.

Income Protection Model

I. Defining Attribute: Value of individual revenue adjusted for harvest price.

This model includes price as a variable along with yield. The yield is determined the same way as for the **Individual** Yield Guarantee model. The price is determined using data from the Chicago Board Of Trade grain crop futures settlement prices or other pricing mechanism. This model insures producers against low income events due to either low yield or low price. This model will not provide an indemnity if there is a low yield but the price is sufficiently high to offset loss of income due to the low yield. This model will provide an indemnity at a higher yield if the price is low enough to pull the revenue below the revenue guarantee.

II. Guarantee: The individual's revenue will exceed a certain percentage of the projected revenue.

The projected revenue will be the individual's average historic yield multiplied by the harvest-time futures price discovered in the commodity market or other mechanism prior to the insurance period.

III. Liability: Projected revenue times the coverage level.

The insured can pick a coverage level percentage to be insured at. This coverage level times the Projected Revenue (APH yield times the projected price) becomes the liability/acre for the insured.

IV. Basis for rate making: Individual yield history, county yield, national yield trend, and historic market prices.

The individual yield history is provided by the producer on all the acreage that the producer shares within the county. This history is used to calculate the normal APH yields and revenue trigger levels.

National or regional data is used to establish the yield trend.

The county yield data is used along with the national or regional data to come up with expected county yields.

The historic price data are used to estimate the variability in prices of the commodity.

V. Perils: Indefinite in time, broad perils plus downward price movement.

Essentially the **Individual** yield guarantee model plus downward price.

VI. Acreage required to be covered: All crop acreage in the county in which the insured has a share.

All insurable acreage occupied by the insured crop is insured, whether reported or not. This is an underwriting technique to reduce adverse selection within the program and provide the insurance provider with risk dispersion. Risk dispersion is an important consideration for this model, because insuring broad areas will increase the likelihood that not all risks will be damaged by an insured event.

VII. Units: Units are divided by county

All the insurable acreage in which you have a share in the county will constitute your unit for the

Income Protection revenue model. The insurance provided by this model applies to all the acreage of the insured crop in the county in which the insured has a share on the date coverage begins. The insured acreage must be planted prior to the final planting date listed in the FCIC Actuarial Table.

VIII. How the expected yield is set: Individual yield history with minimum 4 years of records building to 10.

IX. Exclusions: Losses caused by the farmer, perils not listed in the policy, high-risk land, excluded practices. This is the same as the **Individual** Yield Guarantee Model

X. How claims are calculated: Individual Revenue minus harvested revenue.

Harvest revenue is the harvested and appraised yield, reduced for low quality, multiplied by the harvest-time price discovered in the commodity market at the end of the risk period.

Product Examples: Income Protection, Avocados.

Replacement Coverage Model

I. Defining Attribute: Both individual and guarantee revenue adjusted for harvest price.

II. Guarantee: The individual's revenue will exceed a certain percentage of the final revenue.

The final revenue is the individual's average historic yield multiplied by the higher of the harvest-time futures price discovered in the commodity market before the risk period begins or the actual market price discovered at the end of the risk period.

III. Liability: Final revenue times the coverage level

IV. Basis for rate making: Historic experience distributed by yield spans plus a rate for variability.

V. Perils: Indefinite in time, broad perils plus upward and downward price movement.

VI. Acreage required to be covered: All crop acreage in the county in which the insured has a share.

All insurable acreage occupied by the insured crop is insured, whether reported or not. This is an underwriting technique to reduce adverse selection within the program and provide the insurance provider with risk dispersion. Risk dispersion is an important consideration for this model, because insuring broad areas will increase the likelihood that not all risks will be damaged

by an insured event.

VII. Units: Units by county, and sharing entity, may be further divided by section, type, or practice.

VIII. How the expected yield is set: Individual yield history with minimum 4 years of records building to 10.

IX. Exclusions: Losses caused by the farmer, perils not listed in the policy, high-risk land, excluded practices. This is the same as the **Individual** yield guarantee model.

X. How claims are calculated: Individual revenue minus harvested revenue.

Harvest revenue is the harvested and appraised yield, reduced for low quality, multiplied by the harvest-time price discovered in the commodity market at the end of the risk period.

Product Example: Crop Revenue Coverage.

Percent-of-Damage Guarantees

This group of crop insurance products indemnifies the insured producer when the measured damage exceeds the deductible amount selected. Within this group, there are two models: **Lost Quantity and Lost Value**.

Lost Quantity Model

This model of FCIC multiple peril crop insurance provides protection for perennial plants such as trees. This model is currently being transitioned from insurable acres to insurable trees as the basis for units. Since tree populations are very stable between years and within the growing season, grove owners can establish their amount of protection. Measuring insurance by insurable trees counts. Since this model insures the grove owner's tree inventory, it does not use the insured acre attributes of other models. Therefore, there is a shift in the term "unit" from acres to trees. FCIC is also in In 1996 there were six crops insured using this model.

I. Defining Attribute: Indemnities are triggered by physical units lost.

Physical units as used in this model are trees.

II. Guarantee: The percent of damage measured in physical units will not exceed the policy deductible.

III. Liability: Stated dollar amount not to exceed FCIC's maximum unit price times the number of physical units times coverage level.

Prior to the insurance period, the producer makes two selections: 1) the dollar amount (Amount of Protection) and 2) coverage level. These selections apply to all the crop, defined in the Crop Provisions, in which the insured has a share in the county. The Amount of Protection is the amount that will be paid in the event that the insured crop is totally destroyed by a covered peril and used to calculate the premium. The policy limits the Amount of Protection to the number of trees before the loss multiplied by the maximum price per tree listed by FCIC in the Actuarial Table.

The deductible is the complement of the coverage level. For example, an insured selecting the 75 percent coverage level would have 25 percent deductible coverage.

The maximum Amount of Protection is the result of multiplying FCIC's maximum unit price times the number of physical units times the coverage level.

IV. Basis for rate making: Frequency and severity of insured perils plus historic insurance experience.

The perils covered by this model generally events that can be documented by weather station records or other third party verification. Therefore, there is a long data series available about the frequency and severity of the covered peril. Official weather records date back to the early 1900's.

A damage model is developed for insured crops for each insured peril. The elements of this model predict damage at different degrees of severity. Often this model is developed in conjunction with regional crop experts.

V. Perils: Definite in time, narrow perils only. (Freeze, hurricane, hail, and others)

Covered perils of this model are generally specific weather events that occur within a relatively short time. These perils are also recorded by the National Weather Service. Additionally, covered perils tend to be indiscriminate about location or crop.

VI. Acreage required to be covered. All crop acreage in the county in which the insured has a share.

All insurable acreage occupied by the insured crop is insured, whether reported or not. This is an underwriting technique to reduce adverse selection within the program and provide the insurance provider with risk dispersion. Risk dispersion is an important consideration for this model, because insuring broad areas will increase the likelihood that not all risks will be damaged by an insured event.

VII. Units. Units by crop, county, and sharing entity.

Units are all the acreage required to be covered in the county, item VI. Units may be divided by each sharing entity that generally is each different landlord.

VIII. How the expected yield is set. Insured's choice not exceeding FCIC limit per physical unit. The expected yield is the yield potential of the crop before damage. Since the damage is measured in the percent of crop removed, there is little need to precisely know the yield potential before damage.

IX. Exclusions. Non-producing physical units; damage caused by uninsured perils.

Units of no commercial value are not insured. The threshold of commercial value is listed in the Crop Provisions. Consequential damage is covered when caused by a primary covered peril.

X. How claims are calculated. Percent of damage minus the deductible, multiplied by the amount of protection. Damage is the evaluation of totally and partially destroyed property.

The percent of damage is the determination of the damage by the evaluation of the adjuster. The adjuster is provided with procedure for sampling and methods to quantify damage through specific measurements. For instance, a tree that is uprooted would be evaluated as 100 percent damaged, however a tree that has one limb removed would have 20 percent damage, but a tree with 4 out of 5 limbs removed would be 100 percent damaged.

Product Examples: Florida Trees, Florida Citrus.

Lost Value Model

This model of FCIC multiple peril crop insurance plan provides insurance coverage for containerized nursery crops. Containerized nursery is potted plants that are held in inventory until the plant reaches marketable size then marketed in the wholesale market. In 1996, the only crop insured under this model was nursery that is containerized stock.

I. Defining Attribute: Indemnities are triggered by dollar loss.

II. Guarantee: The percent of damage measured in dollars will not exceed the policy deductible.

III. Liability: Inventory times wholesale prices times coverage level.

Prior to the insurance period, the producer selects a dollar amount (Amount of Protection) and a coverage level that will apply to all the crop, defined in the Crop Provisions, in which the insured has a share in the county. The Amount of Protection is the amount that will be paid in the event that the insured crop is totally destroyed by a covered peril and used to calculate the premium. The deductible is the complement of the coverage level. For example, an insured selecting the 75 percent coverage level would have 25 percent deductible coverage.

The maximum Amount of Protection is the result of multiplying the grower's wholesale price for each insured species times the number of physical units times the coverage level.

IV. Basis for rate making: Frequency and severity of insured perils plus historic insurance experience.

The perils covered by this model generally events that can be documented by weather station records or other third party verification. Therefore, there is a long data series available about the frequency and severity of the covered peril. Official weather records date back to the early 1900's.

V. Perils: Definite in time, broad perils.

The most frequent perils covered by this model are generally specific weather events that occur within a relatively short time. These perils are also recorded by the National Weather Service. Additionally, covered perils tend to be indiscriminate about location or crop.

VI. Acreage required to be covered. All containers in the county in which the insured has a share.

All insurable acreage occupied by the insured crop is insured, whether reported or not. This is an underwriting technique to reduce adverse selection within the program and provide the insurance provider with risk dispersion. Risk dispersion is an important consideration for this model, because insuring broad areas will increase the likelihood that not all risks will be damaged by an insured event.

VII. Units. Units by county, sharing entity, and location.

Units are all growing locations within a five-mile radius of the insured growing location. Growing locations outside the five-mile radius may be included as part of the unit or be insured as a separate unit. Units are also divided by each sharing entity.

VIII. How the expected yield is set. Insured's choice not exceeding FCIC limit per physical unit. The expected yield for this model is the total market value of the insured crop for the unit, before damage. The market value is 90 percent of the value if the crop was sold in the market. The 10 percent reduction represents marketing expenses like packing, shipping, sales commission, and others.

IX. Exclusions.

Unlisted plant species, undersized containers, damage caused by uninsured perils.

X. How claims are calculated. Dollar damage minus deductible. The dollar damage is the value

of totally and partially destroyed property.

Product Example: Nursery.

Appendix A

Crop	Model
Almonds	Individual Yield Guarantee
Apples	Individual Yield Guarantee
Barley	Individual Yield Guarantee
Barley	Area Yield Guarantee
Blueberries	Individual Yield Guarantee
Canola	Individual Yield Guarantee
Canning and Processing Beans	Individual Yield Guarantee
Citrus (Arizona-California)	Individual Yield Guarantee
Citrus (Florida)	Lost Quantity Percent of Damage Guarantee
Corn	Individual Yield Guarantee
Corn	Area Yield Guarantee
Corn	Income Protection Revenue Guarantee
Corn	Replacement Coverage Revenue Guarantee
Cotton	Individual Yield Guarantee
Cotton	Area Yield Guarantee
Cotton	Income Protection Revenue Guarantee
Cranberries	Individual Yield Guarantee
Dry Beans (Including Bush for Seed)	Individual Yield Guarantee
ELS Cotton	Individual Yield Guarantee
Figs	Individual Yield Guarantee
Flax	Individual Yield Guarantee
Florida Trees	Lost Quantity Percent of Damage Guarantee
Forage Production	Individual Yield Guarantee
Forage Production	Area Yield Guarantee
Forage Seeding	Lost Quantity Percent of Damage Guarantee
Grain Sorghum	Individual Yield Guarantee
Grain Sorghum	Area Yield Guarantee
Grapes	Individual Yield Guarantee
Hybrid Corn Seed	Dollar Revenue Guarantee
Hybrid Sorghum Seed	Dollar Revenue Guarantee
Macadamia Nuts	Individual Yield Guarantee
Macadamia Trees	Lost Quantity Percent of Damage Guarantee
Nursery	Lost Value Percent of Damage Guarantee
Oats	Individual Yield Guarantee
Onions	Dollar Revenue Guarantee
Peas (Dry and Green)	Individual Yield Guarantee
Peaches	Individual Yield Guarantee
Peanuts	Individual Yield Guarantee
Peanuts	Area Yield Guarantee
Pears	Individual Yield Guarantee

Appendix A

Crop	Model
Peppers	Dollar Revenue Guarantee
Plums	Individual Yield Guarantee
Popcorn	Individual Yield Guarantee
Potatoes	Individual Yield Guarantee
Prunes	Individual Yield Guarantee
Raisins	Dollar Revenue Guarantee
Rice	Individual Yield Guarantee
Rye	Individual Yield Guarantee
Safflowers	Individual Yield Guarantee
Soybeans	Individual Yield Guarantee
Soybeans	Area Yield Guarantee
Soybeans	Replacement Coverage Revenue Guarantee
Stonefruit (Apricots, Nectarines and Peaches)	Individual Yield Guarantee
Sugarcane	Individual Yield Guarantee
Sugar Beets	Individual Yield Guarantee
Sunflowers	Individual Yield Guarantee
Sweet Corn (Canning and Freezing)	Individual Yield Guarantee
Sweet Corn (Fresh Market)	Dollar Revenue Guarantee
Table Grapes	Individual Yield Guarantee
Texas Citrus (Fruit)	Individual Yield Guarantee
Texas Citrus Trees	Lost Quantity Percent of Damage Guarantee
Tobacco (Production Guarantee) Types 41 & 32 - Pennsylvania Types 51 & 61 - Connecticut Types 51, 52, & 61 - Massachusetts Type 32 - Maryland Type 31 - North Carolina Type 31 - Virginia Type 31 - West Virginia	Individual Yield Guarantee
Tobacco (Production Guarantee) except types listed above	Individual Yield Guarantee
Tobacco (Quota)	Dollar Revenue Guarantee
Tomatoes (Canning and Processing and Fresh Market Guaranteed Production Plan)	Individual Yield Guarantee
Tomatoes (Fresh Market)	Dollar Revenue Guarantee
Walnuts	Individual Yield Guarantee
Wheat	Individual Yield Guarantee
Wheat	Area Yield Guarantee
Wheat	Income Protection Revenue Guarantee

Appendix B

Federal Crop Insurance Corporation

Crop Insurance Program Models

	Yield Guarantees			Revenue Guarantees			Percent-of-Damage Guarantees	
Model Name	Individual	Mixed	Area	Dollar	Income Protection	Replacement Coverage	Lost Quantity	Lost Value
Defining Attributes	Current individual yield vs. expected individual yield.	Current individual yield vs. expected area yield.	Current area yield vs. expected area yield.	FCIC established area revenue.	Value of individual revenue adjusted for harvest price.	Both individual and guarantee adjusted for harvest price.	Indemnities are triggered by physical units lost.	Indemnities are triggered by dollar loss.
Guarantee	The individual's current yield will exceed X% of the individual's average historic yield.	The individual's current yield will exceed X% of the area's average yield.	The area's current yield will exceed X% of the area average yield.	The individual's revenue will exceed X% of the revenue set by FCIC.	The individual's revenue will exceed X% of the projected revenue. Projected revenue is individual's average historic yield multiplied by the harvest-time futures price discovered in the commodity market before the risk period begins.	The individual's revenue will exceed X% of the final revenue. Final revenue is individual's average historic yield multiplied by the higher of the harvest-time futures price discovered in the commodity market before the risk period begins or the actual market price at the end of the risk period.	The percent of damage measured in physical units will not exceed the policy deductible.	The percent of damage measured in dollars will not exceed the policy deductible.
Examples	Actual Production History (APH) Corn	Most FCIC programs prior to 1980	Group Risk Plan (GRP) Corn	Fresh Market Tomatoes	Income Protection (IP) Corn Pilot	Crop Revenue Coverage (CRC) Corn Pilot	Florida Fruit Tree Pilot	Nursery
Liability	Guarantee times X% of FCIC maximum price.	Guarantee times X% of FCIC maximum price	X % of FCIC maximum protection per acre.	FCIC established revenue times coverage level percentage.	Projected revenue times coverage level.	Final revenue times coverage level.	Stated dollar amount not to exceed FCIC's maximum unit price times number of physical units times coverage level.	Inventory times wholesale prices times coverage level.
Basis for rate making.	Historic insurance experience distributed by yield spans.	Historic insurance experience distributed by map areas.	NASS historic county yields.	Historic insurance experience distributed by yield spans.	Individual yield history, county yield, national yield trend, and historic market prices.	Historic insurance experience distributed by yield spans plus the rate for price variability.	Frequency and severity of insured perils plus historic insurance experience.	Frequency and severity of insured perils plus historic insurance experience.

Appendix B

Federal Crop Insurance Corporation Crop Insurance Program Models

	Yield Guarantees			Revenue Guarantees			Percent-of-Damage Guarantees	
Model Name	Individual	Mixed	Area	Dollar	Income Protection	Replacement Coverage	Lost Quantity	Lost Value
Perils	Indefinite in time, broad perils. (Drought, plant disease, heat, etc. plus definite perils.)	Indefinite in time, broad perils.	Indefinite in time, broad perils.	Indefinite in time, broad perils plus limited downward price movement.	Indefinite in time, broad perils plus downward price movement.	Indefinite in time, broad perils plus upward and downward price movement.	Definite in time, narrow perils only. (Freeze, hurricane, hail, and others)	Indefinite in time, broad perils.
Common Underwriting Provisions								
Acreage required to be covered.	All crop acreage in the county in which the insured has a share.	Same	Same	Same	Same	Same	Same	All containers in the county in which the insured has a share.
Units	Units by county, and sharing entity, may be further divided by section, type, or practice.	Units by crop, county, and sharing entity.	Units by county	Units by county, and sharing entity, may be further divided by section, type, or practice.	Units by county, and sharing entity, may be further divided by section, practice or type.	Units by county, and sharing entity, may be further divided by section, type, or practice.	Units by crop, county, and sharing entity.	Units by county, sharing entity, and location.
How the expected yield is set.	Individual yield history with minimum 4 years of records building to 10.	Set by FCIC for specific map locations.	Historic county yield data.	Individual yield history with minimum 4 years of records building to 10.	Individual yield history with minimum 4 years of records building to 10.	Individual yield history with minimum 4 years of records building to 10.	Insured's choice not exceeding FCIC limit per physical unit.	Nursery's wholesale price times plant inventory.
Exclusions	Losses caused by farmer, perils not listed in policy, high-risk land, excluded practices.	Losses caused by farmer, perils not listed in policy, high-risk land, excluded practices.	None.	Losses caused by farmer, perils not listed in policy, high-risk land, excluded practices.	Losses caused by farmer, perils not listed in policy, high-risk land, excluded practices.	Losses caused by farmer, perils not listed in policy, high-risk land, excluded practices.	Non producing physical units; damage caused by uninsured perils.	Unlisted plant species; undersized containers; damage caused by uninsured perils and .

Appendix B

Federal Crop Insurance Corporation Crop Insurance Program Models

	Yield Guarantees			Revenue Guarantees			Percent-of-Damage Guarantees	
Model Name	Individual	Mixed	Area	Dollar	Income Protection	Replacement Coverage	Lost Quantity	Lost Value
How claims are calculated.	Yield shortfall multiplied by indemnity price. Yield is the harvested and appraised production, reduced for low quality.	Yield shortfall multiplied by indemnity price Yield is the harvested and appraised production, reduced for low quality.	Yield shortfall minus deduct. (both stated as percents) multiplied by amount of protection. County yield is the National Agricultural Statistics Service (NASS) estimate.	Individual revenue minus harvested revenue. Harvested revenue is the harvested and appraised yield, reduced for low quality, multiplied by the greater of the FCIC price or the market price.	Individual revenue minus harvested revenue. Harvest revenue is the harvested and appraised yield, reduced for low quality, multiplied by the harvest-time price discovered in the commodity market at the end of the risk period.	Individual revenue minus harvested revenue. Harvest revenue is the harvested and appraised yield, reduced for low quality, multiplied by the harvest-time price discovered in the commodity market at the end of the risk period.	Percent of damage minus the deductible, multiplied by the amount of protection. Damage is the evaluation of totally and partially destroyed property.	Dollar damage minus deductible. Damage is totally and partially destroyed property.