CROP-HAIL INSURANCE RATEMAKING

Gary R. Josephson
Anita Klein
Therese M. Stom
Thomas Zacharias

CROP-HAIL INSURANCE RATEMAKING

By: Gary Josephson
Anita Klein
Therese Stom
Thomas Zacharias

ABSTRACT

Monetary loss as a result of hail damage to crops is a major hazard facing farmers in many areas of the United States. Crop-hail insurance provides a means for the farmer to protect his income from the consequences of this hazard.

The authors presume that knowledge of crop-hail ratemaking procedures is not widespread among casualty actuaries. This paper will attempt to introduce the reader to the basics of crop-hail insurance and some of the ratemaking procedures currently used in the industry. The paper begins with a brief background on the crop-hail industry, the standard crop-hail policy, claims adjustment, and data collection. The central focus of the paper is upon crop-hail pure premium estimation, the development of final rates, and an analysis of the pure premium estimation procedure.

BACKGROUND

Crop Hail Statistical Profile

The United States crop-hail insurance industry provided over $9 billion of protection in 1991 for a total premium of about $350 million. Insurance was written on about 200 crops with over 95 percent of the liability on five crop groups-corn and maize, soybeans, cotton, and tobacco (in order of magnitude). Over one third of the total coverage was on corn. The insurance in force is heavily affected by crop acreage and commodity prices.

Hail insurance was written in 41 states in 1991 with a heavy concentration in the Midwest. About half of the coverage was provided in five states--Illinois, Iowa, North Dakota, Minnesota, and Nebraska. The top 17 states accounted for over 90 percent of the insurance.

Premium rates charged vary by crop, location and type of policy. For the states with most of the liability, average rates per $100 of coverage range from $9.16 (Colorado) to $1.05 (Illinois). Much of the liability is in states with an average rate of less than $2.00 (Illinois, Indiana, Wisconsin, Michigan, Ohio, and Oregon).

The average policy premium was $1,056; ranging from a high of $4,503 in Arizona to a low of $420 in Tennessee. The premium per policy in the Midwestern States

averaged about $550 for Illinois and Indiana, $850 for Iowa, $1,340 for Minnesota, and $1,900 for North Dakota.

National Crop Insurance Services

For most states and crops, crop-hail rates are developed by National Crop Insurance Services ("NCIS"). NCIS' objectives are:

- Research
- Compilation of Statistics
- Ratemaking and Rate Filing
- Loss Adjustment Support
- Education

NCIS is the successor to two formerly separate organizations, National Crop Insurance Association ("NCIA"), and Crop-Hail Insurance Actuarial Association ("CHIAA"). NCIA formerly addressed the research, education and loss adjustment expense support needs of the crop-hail insurance industry. CHIAA served as the statistical, ratemaking and rate service organization for the industry.

NCIS develops rates (or loss costs) in 34 states. The frequency of rate filings in a given state is generally determined by the magnitude of the crop, and by state

insurance department requirements. For large premium volume states, rates are updated every three years. Smaller volume states receive revisions less frequently.

Crop-Hail insurance statistics are gathered from the application and, in the event of a loss, from the proof of loss form. The information collected from these forms is prescribed in the Statistical Plan. This plan is designed to collect enough information to provide actuarially sound rates and to complete informative statistical reports.

Descriptions of the important data records are included as Exhibit 1. Detail premium and loss data in this format is collected from member and subscriber companies. Summary data is collected from Alternate Statistical Reporter (ASR) companies. All reports and data files discussed in this paper refer to data submitted by these companies.

Currently, about 85 percent of all U.S. crop-hail statistics are reported to NCIS in detail or summary form.

THE CROP-HAIL POLICY

Policy Form and Coverages

Appendix A contains a sample crop-hail policy.

The basic policy form is a percentage of damage contract. An insured farmer will purchase insurance for a stated amount per acre. The amount will reflect both the expected yield of the crop as well as the anticipated price at harvest. For example, if:

Expected crop yield = 100 bushels / acre

Expected price = $2.50 per bushel

the anticipated value of the crop is $250 per acre.

Under the standard policy form, indemnification for hail damage to crops will be based on the estimated percentage reduction in yield potential as a result of the damage. For example, if the adjuster determines that yield is reduced by 25%, the indemnification will be 25% of the amount insured. In the example above, if the full value of the crop ($250) is insured, the indemnification will be $62.50 per acre.

The policy is a coinsurance contract. If the farmer chooses to insure for less than the full value of the crop, the indemnification is reduced proportionately. In the above

example, if the crop is insured for $125 per acre, a 25% yield reduction would result in indemnification of $31.25 per acre, or half of the estimated loss.

Other policy forms exist. Exhibit 2 identifies several of the most common, and shows how they apply.

Claim Adjustment

Because of the diversity of agriculture in the United States, crop-hail claims adjustment is a fairly involved process. Monetary losses sustained from hail damage are a function of several variables: the type of crop; the stage of crop growth; and hail intensity, both size and force of the hail. Wind damage accompanied with a hailstorm will also be an important factor.

Three principal categories of plant damage are analyzed in the claims adjustment process. These are: (1) reduction in stand or total destruction of the crop; (2) mutilation which impairs plant function; and (3) direct damage to the fruit or product of the crop.

The task of the crop-hail claims adjuster is to sufficiently sample the acreage insured to determine the overall damage to the crop. In order to establish the extent of damage to plants, the adjuster utilizes charts that translate the indicated damage to the loss in yield. All field sampling involves one or more of the above-mentioned

categories, depending upon the stage of growth at the time of the storm. For most full season crops the adjustment is a prediction of future yield, in terms of percent of yield had there been no damage. For some crop areas the time of the hail season (majority of damaging storms) coincides with the maturity stage of growth (the single most vulnerable stage of growth).

An example of the Loss Instructions for corn is provided in Appendix B.

RATEMAKING METHODOLOGY

General Information

Crop-hail rates are derived using a pure premium approach. Pure premiums are called loss costs, and are calculated as the ratio of losses to exposure (insured values). Loss costs are typically expressed per $100 of exposure.

NCIS develops rates (or loss costs, in states which do not allow development of full rates) for each crop that has at least 25% of the statewide total liability. For most states, this results in two or sometimes three "base" crops.

Exhibit 3 is a summary of the crops for which separate analyses are performed in each of NCIS' 34 states.

Basic Rating Unit

The crop hail rating process is faced with a dilemma. Two fundamental concepts come into conflict in determining the appropriate rating base. On the one hand, because of meteorological influences on the hail hazard, which can vary significantly within relatively small areas, small rating areas are necessary.

On the other hand, because of the infrequency of hail losses in any specific location, larger volumes of data are needed to produce meaningful conclusions from the statistical data.

NCIS has addressed this dilemma by using the township as the basic rating unit in most states. This size unit is small enough (6 miles x 6 miles) that the rate can reflect unique meteorological influences.

The requirement for larger volumes of data is met by:

- Utilizing crop hail loss costs from 1948, and
- Incorporating broader geographic areas in the determination of the township rate. (This will be discussed in greater detail in the discussion of credibility.)

Data Conversion

As discussed above, crop hail insurance can be written on a number of policy forms. In order to increase the volume of the data used in deriving the rates, losses sustained under policy forms other than the base policy form are converted to the base policy form.

Exhibit 4 illustrates the derivation of the policy form conversion factor. Losses incurred under the basic form (Column 3) are recalculated to reflect the losses which would have been incurred under the alternative policy form (Column 4). The ratio of these two values is used to determine the conversion factor.

As Exhibit 4 illustrates, the ratio varies with the underlying rate. Presumably, this is a reflection of the fact that the low rate areas experience less severity of hail losses. Consequently the impact of a deductible in the low rate areas is greater than in the higher rated, higher severity areas.

Because of this relationship, a least squares line is fit to the actual ratios, producing the "Trend" values in Column 6.

Converted losses are then calculated as:

$$\frac{\text{Losses under alternative policy form}}{\text{Policy Form Conversion Factor}}$$

In addition to conversion of losses to allow experience from different policy forms to be included in the rate analysis, data from crops other than the base crop are also included. Crops with similar susceptibility to hail, and consequently similar loss costs, are grouped together. In most instances, data for similar crops are combined without adjustment. For a few crops, data is converted to the level of the base crop. Exhibit 5 shows the calculation of a crop conversion factor. In this illustration, wheat is the base crop, and barley is the converted crop. From the data on Exhibit 5, barley losses would be divided by 1.50 to convert to the loss cost level of the base crop (wheat). Unlike the policy form conversions there is no need to vary the factor by rate.

Catastrophe Adjustment

Despite the lengthy experience period underlying the derivation of the township loss costs (over forty years), the impact of one severe loss year can have a marked impact on a township's historical loss cost. Exhibit 6 illustrates this. The exhibit displays the loss cost history for a large township. The exhibit shows that, even after twenty years of accumulated history, changes of more than 10% in the cumulative loss cost ratio from one year to the next are not uncommon. (This is an atypical township in that losses have occurred in the majority of years. For many townships, the majority of years have no losses. For a typical township the impact of a single year on the accumulated loss costs would be more pronounced.)

In order to add stability to the township loss costs, NCIS employs a capping procedure, which is called a catastrophe adjustment. In the procedure, losses in excess of a specified catastrophe threshold are removed from the township history, and built back over a broader base. (The build back will be discussed in a later section).

The catastrophe threshold is a multiple of each township's median non-zero loss cost. The multiple which is used for a particular crop and state is determined from the ratio:

$$\frac{\text{Township Variance Eliminated by capping}}{\text{Township Losses Eliminated by capping}}$$

(Township variance refers to the variance of annual loss costs within a township. This is averaged over all townships, before and after capping, to derive the numerator of the ratio. As noted above, the losses in excess of the threshold are removed from the township loss cost and built back over a broader base.)

The value (multiple of the median) which produces the greatest value of this ratio (which is called the test statistic), is used as the catastrophe threshold. In essence, the maximum test statistic reflects the most efficient threshold, that is, the greatest variance reduction per dollar of loss eliminated. In the event that the test statistic is

not maximized at levels of loss reduction greater than 1%, the multiple which produces a 1% reduction in losses is used as the default threshold.

The calculation of the test-statistic is shown on Exhibit 7. Exhibit 7a illustrates the calculation for the township data which was presented on Exhibit 6. This is for illustration only. The catastrophe procedure does not require calculation of the test statistic for individual townships.

Exhibit 7b shows the values of the test statistic as calculated on a statewide basis. The test statistic is greatest, in this instance, at a catastrophe threshold of 18.1 times the median (non-zero) loss cost. Each township's losses are thus capped at this level, with losses in excess of this threshold spread back using the distribution procedure discussed in a later section.

Credibility

Studies performed by CHIAA and NCIS have suggested that an individual township's data has little credibility. Roth's paper (see bibliography) provided the remarkable statistic that, for the largest townships in Kansas, approximately 1250 years of data would be required to achieve 95% confidence that a township's historical loss cost was within $0.50 of the true mean.

Nevertheless, as discussed earlier, meteorological differences can affect the hail hazard over relatively small areas. Consequently, NCIS has adopted a "surrounding township" approach for determining the township loss cost. Each township is

aggregated with the adjacent eight townships (defined as nine-township), as well as the "next adjacent" sixteen townships (defined as twenty-five township). This can be visualized as follows:

25T	25T	25T	25T	25T
25T	9T	9T	9T	25T
25T	9T	TOWNSHIP	9T	25T
25T	9T	9T	9T	25T
25T	25T	25T	25T	25T

NCIS has examined formulae in which credibility varies with the total exposure (insured crop values) underlying each geographic entity's loss cost. The results did not produce any clear relationships between exposure and credibility. This can be explained, in part, by the fact that exposure is defined as insured crop value which is the product of the following components:

Acres insured

Yield per acre

Price per unit of production

Percentage of yield insured

The effect of the latter three components may have masked any true relationship between exposure and credibility.

As a result, credibility is generally assigned on the basis of geographic size. For most townships, "Final Average Loss Cost (FALC)" is derived as a weighted average of:

Township limited loss cost (10% weight);

Surrounding nine-township limited loss cost (15% weight);

Surrounding twenty-five township limited loss cost (75% weight).

Exceptions apply if the total exposure for any of the three geographical units falls below specified thresholds.

Exhibit 8 shows the calculation of the FALC for a number of townships.

As a final note, rates are made by township primarily in the larger volume states. In lower volume states, rates are made by county, Crop Reporting District ("CRD") or State. In the county states, the FALC is 100% of the county loss cost if the exposure (cumulative liability) is $1,250,000 or greater. For low liability counties, the CRD loss cost is used. For CRD and state rates, 100% weight is given to the geographical exposure unit.

Catastrophe Redistribution

In a previous section, we described the process used to identify catastrophe losses, which are removed from the township loss cost prior to calculation of the FALC. The catastrophe redistribution is a two level process.

The first level of redistribution is to the Crop Reporting District ("CRD"). Each state is divided into seven to ten CRD's (by the U.S. Department of Agriculture). Catastrophe losses (that is losses in excess of the catastrophe threshold discussed in Section D) are aggregated for all townships in a CRD. The CRD Redistribution Factor ("CRD-RF") is calculated as:

$$1.0+ \frac{\text{Total Catastrophe losses in CRD}}{\text{Total Limited Losses in CRD}}$$

A similar calculation is performed at the statewide level.

Each township FALC (derived as in the previous section) is multiplied by the CRD-RF, with the exception that the CRD-RF is limited to:

$$1.0 + [\ (\text{Statewide RF} - 1.0) \times 2\ ]$$

The second level of redistribution applies only if the limitation to the CRD-RF comes into play. In this case, any catastrophe losses which are not redistributed in level 1 are distributed based on the following:

$$1.0+ \frac{\text{Total Level 2 Catastrophe losses}}{\text{Total Limited Losses + Level 1 Cat Losses}}$$

This redistribution is illustrated on Exhibit 9. In this example, the statewide level 1 redistribution factor is 1.0986. Thus, each Crop Reporting District's level 1 redistribution factor is limited to 1.197 (1+2x(.0986)). As the exhibit illustrates, the level 1 factor for CRD 80 exceeds 1.197, and therefore this limitation applies. Level 2 losses reflect CRD 80 catastrophe losses which exceed the limit. The level 2 losses (1,746,671) represent 1.4% of the sum of the limited losses and level 1 catastrophe losses ($125,127,861). Thus, the level 2 redistribution factor is 1.014.

Each township's FALC is then multiplied by:

Level 1 Factor x 1.014

Expense Load

For those states for which NCIS publishes rates, the next step is the conversion of loss costs to rates. This is accomplished by dividing the catastrophe adjusted FALC by an Anticipated Loss Ratio (ALR).

The ALR varies by state, including provisions for loss adjustment, general, commissions and profit. ALR's ranging from 60% to 65% are common to most NCIS states.

The ALR further varies with the magnitude of the rate, with higher rated townships requiring a lower expense ratio than lower rated townships. Exhibit 10 is an example of a schedule of ALR's by rate class.

Limitations on Rate Changes

Once the rates (or loss costs) have been calculated, the final step is to limit the amount of the change from present rates. In general, three constraints are imposed on the final rate:

- Rate cannot increase or decrease by more than a fixed dollar amount;

- Rate cannot increase or decrease by more than a specified percentage;

- Rate cannot exceed a specified maximum for the state, or be less than a specified minimum.

The specific values of these constraints may vary by state and crop.

Test for BIAS in FALC

Several of the major elements of the ratemaking formula were newly implemented in 1990. In order to determine whether the changes may have introduced biases in the determination of the FALC, NCIS performed tests of the resulting loss costs, both

before and after the catastrophe redistribution. A description, of the tests is presented in Appendix C, along with a summary of the results.

CONCLUSION

The process which has been described above has been generalized in a number of areas. Some of the more common variations have been described. Other less common departures from the standard approach exist for specific crops or unique situations.

Like other Property-Casualty coverages, the crop-hail ratemaking methodology has evolved over time. The methodology is monitored by NCIS, and by the crop-hail industry through company participation in National and Local Committees and industry groups.

BIBLIOGRAPHY

Brown, Philip S., "Crop-Hail Insurance", Society of Chartered Property and Casualty Underwriters (1967 publication)

Roth, Richard J., "The Rating of Crop-Hail Insurance", Proceedings of the Casualty Actuarial Society, Volume XLVII (1960), pages 108-146.

National Crop Insurance Services, "Crop-Hail Insurance Statistics and Rating Methods", 1989 Edition.

Data Elements

A list of detail data elements collected by NCIS follows. It includes all fields currently collected, and some fields which were used in the past, but are no longer obtained. See Exhibits 1 and 2 for computer record descriptions.

Acres: Acres of crop grown and insured for a loss record.

Amount of Loss: Total dollar loss for this crop.

Card: Card number. '1' used for premium record. '2' or '4' used to indicate loss record. A '2' loss record is used for percentage losses (loss is indicated as a percent of total) and a '4' is used for tonnage losses (loss is indicated in number of tons lost).

Cause of Loss: A code (peril code) used to indicate the cause of loss. The most common codes follow. These are not all peril codes, and the codes can vary by state for the lesser used peril codes.

1 - Hail
6 - Transit
7 - Fire
8 - Windshatter without hail

NCIS CPU: Year, month and day this record was received by NCIS. No statistical value.

Company: A numeric code assigned to a company per year. Will always be unique for any year/company. Usually will be unique across companies.

County: Numeric county code.

Crop: Numeric crop code. For example,

1 - Wheat
2 - Barley
3 - Rye
4 - Oats
5 - Flax
6 - Corn

For a complete list of crop codes, write NCIS.

Date of Storm: Month and day that the loss occurred.

Date Application Signed: Date the application was signed.

Discount: Discount percentage applied to the rate for any kind of premium discount, such as a cash discount.

Index: NCIS assigned sequence number to make the record key information unique, if necessary. No statistical value.

Insurance (liability): Amount of insurance from the application.

Insurance Applying to Loss: On loss records, only the amount of insurance which applied to the loss is recorded.

Insurance per Acre: Amount of liability per acre.

Interest: On tonnage loss forms, the insured's percentage interest in the crop. Used in arithmetic to compute total loss.

Item Number: Company item number, if needed.

Percent Loss: Total loss given as a percentage from the proof of loss form.

Policy Form: A code to indicate the type of coverage. These codes vary by state and year but will always be unique within state and year. For example,

Oklahoma, 1988 coverages

01 - Basic coverage form, NCIS filed rates
52 - Basic coverage form, independently filed rates
85 - 10 percent disappearing deductible form, independently filed rates (DX10 IF)
43 - 20 percent deductible, increasing payment form, NCIS filed (XS20IP)

For a complete list of policy form codes by state, write NCIS.

Policy Number: Company assigned number for a policy. This number should always be unique for a company/state/year combination.

Premium Discount: Code used to indicate percentage discount when computing premium. For example,

0 - No discount

Gross premium reported (premium dollars do not reflect the discount)

5 - 4% discount
6 - 20% discount
7 - 25% discount

Net premium reported

I - 4% discount
D - 20% discount
C - 25% discount

Premium: Premium dollars from the application.

Price per Ton: Used on tonnage loss records to compute total loss.

Range: Numeric code for the range portion of the location of the crop being covered by this policy.

Rate: Percentage rate used to compute premium, obtained from the application.

Social Security Number: Insured's social security number.

State: Two character state code. For example,

01 - Alabama
02 - Arizona

Status: System status when record received. No statistical value.

Township: township code of the location of the crop being covered.

Type: Indicates type of record received. Same usage as CARD.

Exhibit 2

CROP-HAIL INSURANCE

ILLUSTRATION OF ALTERNATIVE POLICY FORMS

Define: R = Yield Reduction (percent)
P = Amount payable

XS10 – EXCESS OVER 10% LOSS

P = (R - 10%)

DX10 -- 10% DISAPPEARING DEDUCTIBLE

	R	< 10%	P = 0%
10% <	R	< 50%	P = 1.25 X (R - 10%)
	R	> 50%	P = R

XS101P -- EXCESS OVER 10% LOSS - INCREASING PAYMENT

	R	< 10%	P = 0%
10% <	R	< 70%	P = (R - 10%)
	R	> 70%	P = (R - 10%) + (R - 70%)
			P </= 100%

(in this form, when yield reduction exceeds 70%, an additional 1% is paid for each percent of yield reduction in excess of 70%)

DXS5 - EXCESS OVER 5% DISAPPEARING AT 25%

	R	< 5%	P = 0%
10% <	R	< 25%	P = (R - 5%) x 1.25
	R	> 25%	P = R

State	Separately Rated Crops
Alabama	Cotton
Arizona	Cotton
Arkansas	Cotton Wheat Soybeans Rice
Colorado	Wheat Corn Potatoes
Florida	Tobacco
Georgia	Tobacco Cotton
Idaho	Wheat Barley Potatoes Peas Tree Fruit
Illinois	Corn Soybeans
Indiana	Tobacco Corn Soybeans
Iowa	Corn Soybeans
Kansas	Wheat Corn
Kentucky	Tobacco
Louisiana	Cotton

State	Separately Rated Crops
Michigan	Corn, Wheat Tree Fruit
Minnesota	Corn, Wheat Soybeans
Mississippi	Cotton
Missouri	Cotton Wheat Soybeans Corn Tobacco
Montana	Wheat Barley
Nebraska	Corn, Wheat
New Mexico	Cotton Wheat
North Carolina	Tobacco Cotton Tree Fruit
North Dakota	Wheat
Ohio	Corn, Wheat Soybeans Tobacco
Oklahoma	Wheat
Oregon	Wheat
South Carolina	Tobacco Cotton Tree Fruit

State	Separately Rated Crops
South Dakota	Corn Wheat
Tennessee	Burley Tobacco Dark Tobacco
Texas	Cotton Wheat Maize
Utah	Wheat
Virginia	Tobacco
Washington	Wheat Tree Fruit
Wisconsin	Corn Potatoes Tobacco
Wyoming	Wheat

NATIONAL CROP INSURANCE SERVICES 11/7/91

POLICY FORM COMPARISON ANALYSIS
MINNESOTA SOYBEANS 1957-1990

	Base form: BASIC		Analyzed form: XS10IP		
(1)	(2)	(3)	(4)	(5)	(6)
1991 Rate Area	Liability* (nearest $1000)	Actual Losses (nearest $1000)	Computed Losses (nearest $1000)	Policy Form Factor: Actual	Trend
6.00	5,404	1,145	727	0.63	0.58
6.50	1,920	405	253	0.62	0.59
7.00	6,982	1,530	985	0.64	0.59
7.50	5,365	812	428	0.53	0.60
8.00	10,755	2,031	1,218	0.60	0.60
8.50	6,756	1,240	727	0.59	0.61
9.00	30,558	5,436	3,143	0.58	0.62
9.50	5,120	1,002	611	0.61	0.62
10.00	17,972	3,720	2,384	0.64	0.63
10.50	7,828	1,758	1,146	0.65	0.63
11.00	28,615	6,168	3,939	0.64	0.64
11.50	14,530	2,884	1,701	0.59	0.64
12.00	21,919	4,959	3,220	0.65	0.65
12.50	23,708	5,170	3,297	0.64	0.66
13.00	46,325	11,527	7,841	0.68	0.66
13.50	31,155	7,444	4,912	0.66	0.67
14.00	36,065	8,285	5,454	0.66	0.67
14.50	26,197	6,208	4,183	0.67	0.68
15.00	42,731	10,827	7,449	0.69	0.68
15.50	24,797	6,695	4,729	0.71	0.69
16.00	47,698	12,383	8,595	0.69	0.70
17.00	40,135	10,632	7,445	0.70	0.71
18.00	23,177	7,401	5,662	0.76	0.72
19.00	27,733	8,052	5,875	0.73	0.73
STATE	533,444	127,713	85,922	0.67	

* Liability with loss

Exihibit 5

NATIONAL CROP INSURANCE SERVICES 9/7/89

CROP COMPARISON ANALYSIS
MINNESOTA 1948 - 1988

1990 RATE AREA	LIABILITY (nearest $1000) Base WHEAT	Crop 2 BARLEY	LOSS COST Base WHEAT	Crop 2 BARLEY	LOSS COST AS % OF BASE L/C Crop 2 BARLEY
2.00	43,315	12,254	0.40	0.88	220 %
2.25	9,498	2,662	0.54	1.33	246
2.50	74,888	22,041	0.87	1.07	123
2.75	49,885	20,152	1.19	2.08	175
3.00	28,033	10,381	2.58	4.01	155
3.25	62,837	22,698	2.03	3.24	160
3.50	76,069	28,203	1.67	2.55	153
3.75	38,535	12,111	1.66	3.68	222
4.00	108,518	48,539	2.02	3.00	149
4.50	106,479	43,374	2.54	3.53	139
5.00	81,573	41,009	2.90	4.26	147
5.50	56,667	26,156	3.06	4.96	162
6.00	36,989	16,122	3.31	3.78	114
6.50	41,271	18,944	4.40	4.97	113
7.00	32,436	15,083	4.15	6.22	150
7.50	20,277	12,533	5.14	5.46	106
8.00	6,557	3,799	4.56	7.25	159
8.50	13,163	6,221	3.85	5.28	137
9.00	15,888	9,277	4.68	6.60	141
TOTALS AND AVERAGES	902,878	371,559	2.36	3.64	150 %*
			INDICATED CROP FACTOR:		1.50

* Weighted by designated liability

Exhibit 6

HISTORICAL TOWNSHIP LOSS COSTS

102N 28W, FARIBAULT COUNTY, MINNESOTA

Year	Liability (000)	Loss Cost Year	Loss Cost Cumulative	Percent Change
48	11	5.99	5.99	
49	10		3.14	-91%
50	14		1.88	-67%
51	21	8.23	4.26	56%
52	20	7.40	5.09	16%
53	33		3.55	-43%
54	42		2.56	-39%
55	30	11.77	4.09	37%
56	14	7.42	4.33	6%
57	55	18.18	7.37	41%
58	105	22.82	11.94	38%
59	74	0.08	9.90	-21%
60	72	0.14	8.49	-17%
61	49	18.48	9.38	9%
62	56	1.43	8.65	-8%
63	73	25.99	10.51	18%
64	133	0.15	8.82	-19%
65	122	2.46	7.99	-10%
66	156	0.06	6.85	-17%
67	186	35.82	11.07	38%
68	224	0.70	9.52	-16%
69	273	0.79	8.18	-16%
70	196	0.77	7.44	-10%
71	231	8.07	7.51	1%
72	370	62.74	15.46	51%
73	456		13.13	-18%
74	497	0.98	11.42	-15%
75	456		10.11	-13%
76	645	3.38	9.17	-10%
77	787	0.19	7.86	-17%
78	1338	41.31	14.49	46%
79	345	4.59	14.01	-3%
80	574	19.41	14.42	3%
81	1041	21.82	15.30	6%
82	1026	1.61	13.86	-10%
83	873	46.22	16.52	16%
84	1132	1.44	15.07	-10%
85	335	13.41	15.02	-0%
86	558	5.21	14.59	-3%
87	170	3.34	14.44	-1%
88	184	3.31	14.28	-1%
89	121	10.81	14.30	0%
90	167	0.35	14.12	-1%

Exhibit 7A

	YEAR	LIABILITY (000)	LOST COST	Loss Cost Limited to 5 X Median	7.5 X Median	10 X Median
	49	10				
	50	14				
	53	33				
	54	42				
	73	456				
	75	456				
	66	156	0.06	0.06	0.06	0.06
	59	74	0.08	0.08	0.08	0.08
	60	72	0.14	0.14	0.14	0.14
	64	133	0.15	0.15	0.15	0.15
	77	787	0.19	0.19	0.19	0.19
	90	167	0.35	0.35	0.35	0.35
	68	224	0.70	0.70	0.70	0.70
	70	196	0.77	0.77	0.77	0.77
	69	273	0.79	0.79	0.79	0.79
	74	497	0.98	0.98	0.98	0.98
	62	56	1.43	1.43	1.43	1.43
	84	1132	1.44	1.44	1.44	1.44
	82	1026	1.61	1.61	1.61	1.61
	65	122	2.46	2.46	2.46	2.46
	88	184	3.31	3.31	3.31	3.31
	87	170	3.34	3.34	3.34	3.34
	76	645	3.38	3.38	3.38	3.38
	79	345	4.59	4.59	4.59	4.59
MEDIAN	86	558	5.21	5.21	5.21	5.21
	48	11	5.99	5.99	5.99	5.99
	52	20	7.40	7.40	7.40	7.40
	56	14	7.42	7.42	7.42	7.42
	71	231	8.07	8.07	8.07	8.07
	51	21	8.23	8.23	8.23	8.23
	89	121	10.81	10.81	10.81	10.81
	55	30	11.77	11.77	11.77	11.77
	85	335	13.41	13.41	13.41	13.41
	57	55	18.18	18.18	18.18	18.18
	61	49	18.48	18.48	18.48	18.48
	80	574	19.41	19.41	19.41	19.41
	81	1041	21.82	21.82	21.82	21.82
	58	105	22.82	22.82	22.82	22.82
	63	73	25.99	25.99	25.99	25.99
	67	186	35.82	26.05	35.82	35.82
	78	1338	41.31	26.05	39.34	41.31
	83	873	46.22	26.05	39.34	46.22
	72	370	62.74	26.05	39.34	52.10
	Variance of non-zero loss costs		**213.45**	**86.86**	**147.55**	**186.82**
	Limited Losses		**1,868,357**	**1,334,169**	**1,695,240**	**1,828,989**
	Variance Reduction			**0.593**	**0.309**	**0.125**
	Loss Reduction			**0.286**	**0.093**	**0.021**
	Test Statistic			**2.074**	**3.332**	**5.920**

Exhibit 7B

TEST STATISTICS FOR ALL MULTIPLES **1993 MINNESOTA SOYBEANS**

MULTIPLE	ACTUAL VARIANCE	NORMAL VARIANCE	% VAR. REDUCED	ACTUAL LOSSES	NORMAL LOSSES	% LOSS REDUCED	TEST STATISTIC
19.3	211.8149	191.1365	9.7625	238,353,170	229,712,094	3.6253	2.6929
19.2	211.8149	190.8559	9.8950	238,353,170	229,601,030	3.6719	2.6948
19.1	211.8149	190.5664	10.0316	238,353,170	229,482,038	3.7218	2.6953
19.0	211.8149	190.2737	10.1698	238,353,170	229,359,865	3.7731	2.6954
18.9	211.8149	189.9761	10.3103	238,353,170	229,235,171	3.8254	2.6952
18.8	211.8149	189.6724	10.4537	238,353,170	229,108,493	3.8786	2.6952
18.7	211.8149	189.3655	10.5986	238,353,170	228,981,300	3.9319	2.6955
18.6	211.8149	189.0529	10.7462	238,353,170	228,852,542	3.9859	2.6960
18.5	211.8149	188.7373	10.8951	238,353,170	228,722,103	4.0407	2.6964
18.4	211.8149	188.4185	11.0457	238,353,170	228,590,962	4.0957	2.6969
18.3	211.8149	188.0988	11.1966	238,353,170	228,458,408	4.1513	2.6971
18.2	211.8149	187.7765	11.3488	238,353,170	228,325,357	4.2071	2.6975
18.1	211.8149	187.4541	11.5010	238,353,170	228,191,033	4.2635	2.6976
18.0	211.8149	187.1305	11.6537	238,353,170	228,054,764	4.3207	2.6972
17.9	211.8149	186.8047	11.8076	238,353,170	227,915,943	4.3789	2.6965
17.8	211.8149	186.4760	11.9627	238,353,170	227,776,199	4.4375	2.6958
17.7	211.8149	186.1439	12.1195	238,353,170	227,636,303	4.4962	2.6955
17.6	211.8149	185.8095	12.2774	238,353,170	227,496,211	4.5550	2.6954
17.5	211.8149	185.4755	12.4351	238,353,170	227,355,897	4.6139	2.6952
17.4	211.8149	185.1408	12.5931	238,353,170	227,212,101	4.6742	2.6942
17.3	211.8149	184.8025	12.7528	238,353,170	227,068,061	4.7346	2.6935
17.2	211.8149	184.4610	12.9141	238,353,170	226,923,044	4.7955	2.6930
17.1	211.8149	184.1146	13.0776	238,353,170	226,775,187	4.8575	2.6923
17.0	211.8149	183.7609	13.2446	238,353,170	226,624,657	4.9206	2.6916
16.9	211.8149	183.3974	13.4162	238,353,170	226,469,458	4.9858	2.6909
16.8	211.8149	183.0246	13.5922	238,353,170	226,311,561	5.0520	2.6905
16.7	211.8149	182.6457	13.7711	238,353,170	226,153,136	5.1185	2.6905
16.6	211.8149	182.2642	13.9512	238,353,170	225,992,997	5.1857	2.6903
16.5	211.8149	181.8774	14.1338	238,353,170	225,827,806	5.2550	2.6896
16.4	211.8149	181.4780	14.3224	238,353,170	225,657,240	5.3265	2.6889

NATIONAL CROP INSURANCE SERVICES
CH510F
MINNESOTA SOYBEANS

1993
FALC ANALYSIS

BASED ON PERIOD 1948-1991

RATE YEAR	GROUP	CRD	LOCATION	LIABILITY	NORMAL LOSSES	NORMAL LOSS COSTS (CATASTROPHE REMOVED) LOC	9TWP	25TWP	CTY	CRD	FALC	FALC (WITH CATASTROPHE)
			043 FARIBAULT									
1993	011	80	101N 024W	9,563,497	1,111,590	11.62	11.08	9.85	9.66	7.70	10.21	10.93
1993	011	80	101N 025W	16,561,343	1,300,599	7.85	10.49	9.64	9.66	7.70	9.59	10.27
1993	011	80	101N 026W	12,988,682	1,101,977	8.48	9.66	9.94	9.66	7.70	9.75	10.44
1993	011	80	101N 027W	9,019,172	877,991	9.73	9.69	10.16	9.66	7.70	10.05	10.76
1993	011	80	101N 028W	12,740,136	1,146,023	9.00	10.26	9.85	9.66	7.70	9.83	10.53
1993	011	80	102N 024W	9,932,217	1,203,010	12.11	10.04	9.96	9.66	7.70	10.19	10.91
1993	011	80	102N 025W	15,087,464	2,214,799	14.68	9.94	9.66	9.66	7.70	10.20	10.92
1993	011	80	102N 026W	14,796,310	1,351,013	9.13	9.50	9.66	9.66	7.70	9.58	10.26
1993	011	80	102N 027W	10,561,707	784,427	7.43	9.83	9.63	9.66	7.70	9.44	10.11
1993	011	80	102N 028W	13,992,899	1,921,161	13.73	10.34	9.44	9.66	7.70	10.00	10.71
1993	011	80	103N 024W	11,833,624	783,674	6.62	10.48	10.29	9.66	7.70	9.95	10.66
1993	011	80	103N 025W	14,200,817	1,174,070	8.27	10.13	9.89	9.66	7.70	9.76	10.45
1993	011	80	103N 026W	15,771,457	1,754,943	11.13	9.01	9.75	9.66	7.70	9.78	10.47
1993	011	80	103N 027W	8,240,148	578,737	7.02	9.30	9.20	9.66	7.70	9.00	9.64
1993	011	80	103N 028W	9,342,278	1,043,508	11.17	9.90	8.69	9.66	7.70	9.12	9.77
1993	011	80	104N 024W	14,202,029	2,077,986	14.63	10.95	9.74	9.66	7.70	10.41	11.15

Exhibit 9

1993 MINNESOTA GRAINS

REDISTRIBUTION FACTORS

(1) CRD	(2) TOTAL LOSSES	(3) LIMITED LOSSES	(4) CATASTROPHE LOSSES	(5) UNLIMITED FACTOR	(6) LEVEL 1 FACTOR[a)]	(7) LEVEL 2 LOSSES[b)]
10	35,201,057	33,488,591	1,712,466	1.051	1.051	0
20	435,734	430,702	5,032	1.012	1.012	0
30	0	0	0	1.000	1.000	0
40	21,035,626	20,196,211	839,415	1.042	1.042	0
50	13,090,093	12,449,736	640,357	1.051	1.051	0
60	957,318	892,114	65,204	1.073	1.073	0
70	13,917,098	12,944,887	972,211	1.075	1.075	0
80	30,421,459	23,950,154	6,471,305	1.270	1.197	1,746,671
90	11,816,147	11,131,421	684,726	1.062	1.061	0
STATE	126,874,532	115,483,816	11,390,716	1.099		1,746,671

[a)]Column (5) limited to a maximum of 1.197

[b)]Column (3) x [Column (5) - Column (6)]

Exhibit 10

ANTICIPATED LOSS RATIO SCHEDULE

RATE	ALR : % FALC	% EXPENSES AND PROFIT
Under $0.99	50 %	50 %
1.00 - 1.99	52	48
2.00 - 2.99	53	47
3.00 - 3.99	54	46
4.00 - 4.99	55	45
5.00 - 5.99	56	44
6.00 - 6.99	57	43
7.00 - 7.99	58	42
8.00 - 8.99	59	41
9.00 - 9.99	60	40
10.00 - 10.99	61	39
11.00 - 11.99	62	38
12.00 - 12.99	63	37
13.00 - 13.99	64	36
14.00 - 14.99	65	35
15.00 - 15.99	66	34
16.00 - 16.99	67	33
17.00 - 17.99	68	32
18.00 - 18.99	69	31
19.00 and Over	70	30

CHIAA CROP-HAIL POLICY

The Name of Company

This policy is signed by the President and Secretary of the company. One of our authorized representatives must also countersign the policy before it is valid.

(Signature)	(Signature)
Secretary	President

YOUR CROP-HAIL INSURANCE POLICY

Quick Reference

Your Crop-Hail policy is composed of four parts:

1) Part I —Consists of your APPLICATION OR DECLARATION PAGE for this insurance which contains the schedule of insurance, description and location of crops insured, and binder provisions.

2) Part II —The SPECIAL PROVISIONS and ENDORSEMENTS, if any, tailor the coverage to meet the needs of the crops grown within your state and to conform to the laws and regulations of the state.

3) Part III —The following GENERAL PROVISIONS are the same for all policies written in the United States.

4) Part IV —EXPLANATION OF POLICY TERMS.

IMPORTANT: This Quick Reference is not part of the Crop-Hail Policy and does not provide coverage. Refer to the Crop-Hail Policy itself for the actual contractual provisions.

PLEASE READ THE CROP-HAIL POLICY CAREFULLY

EXPLANATION OF POLICY TERMS

Throughout this policy "you" and "your" refer to the "named insured" shown in the Application or Declarations, and "we", "us" and "our" refer to the Company providing this insurance. In addition, certain words and phrases are defined as follows:

1. "**Insured**" means you.

2. "**Schedule of Insurance**" is the list of crops, locations, and amounts of insurance for which you have made application.

3. "**Harvest**": the act or process of gathering in a crop.

4. "**Replant**": to reseed or transplant due to the condition of the original crop.

5. "**Feasible to Replant**" means that the remaining growing season is considered sufficient for a crop to reach maturity.

6. "**Insured Crop**" means a crop described in the Schedule of Insurance for which a specific amount of insurance and premium charge has been indicated.

7. "**CHIAA**": Crop-Hail Insurance Actuarial Association.

8. "**Unit of Insurance**": Throughout this policy the acre is the unit of insurance. This means that the limit of insurance applying to loss on any acre may not exceed the limit per acre in the Schedule of Insurance.

   This also means to the extent a crop is insured for less than its value you are self insured. As an example of how this works, assume a crop is worth $100 per acre and you insured it for only $50 per acre; assume also that there has been a yield reduction of 40% due to hail. If there is no Excess Over Loss or Deductible applying, the amount payable is 40% of $50 per acre (or $20.00 per acre), whereas the actual amount of the loss is 40% of $100 (or $40.00 per acre), and you are thus self insured for the difference of $20.00 per acre.

9. "**Crop Yield**" means the production per acre that the insured crop would reasonably be expected to produce at harvest. The production per acre is usually expressed in terms of bushels, pounds, tonnage, etc.

OPTIONAL COMPANY INFORMATION

AGREEMENT TO INSURE: We will provide the insurance described in this policy in return for the premium and compliance with all applicable provisions.

1. COVERAGE.
We cover the crops specified at the locations described in the schedule of insurance.

We do not cover crops that have been damaged by hail prior to signing the application.

2. INSURANCE PERIOD.
The insurance is in effect from the time the crop is clearly visible above the ground until the crop is harvested, except as follows:

a. No coverage is in effect until 12:01 a.m. following the date you signed the application.

b. For some crops there is an additional waiting period if shown in the Special Provisions or in a special crop endorsment.

c. Coverage expires on the dates shown in the Special Provisions or special crop endorsement.

d. *Increase of Existing Insurance*
Insurance added to this policy becomes effective at 12:01 a.m. following the date of the revised Schedule of Insurance or as otherwise provided in the Special Provisions or special crop endorsement.

e. *Decrease of Existing Insurance*
Reduction or cancellation of insurance will be effective at 12:01 a.m. of the date requested.

3. DUTIES AFTER LOSS.
a. *Your Duties Are:*
In case of a probable loss to crops insured under this policy you must:

(1) Give written notice to us within 10 days after the occurrence.

(2) Preserve in each damaged field of insured crop samples of the remaining damaged crop for our examination.

(3) Allow us to examine the damaged crop as often as we reasonably require.

(4) Upon our request provide a complete harvesting and marketing record of each insured crop.

(5) Upon our request submit to examination under oath.

(6) Sign a Withdrawal of Claim when our inspection of the crop determines there is no payable loss under the terms of this policy.

(7) Within 60 days after your loss, unless we extend such time in writing, submit to us a signed statement in proof of loss declaring your loss and interest in the crop.

b. *Our Duties Are:*

(1) Adjust all losses.

(2) Pay the loss within 30 days after we reach agreement with you, entry of a final judgment, or the filing of any appraisal award with us.

c. *Adjustment Procedures.*
We recognize and apply the Loss Adjustment Procedures used by the Crop Insurance Industry.

d. *Deferred Adjustment.*
At times it may be necessary for us to defer the adjustment of a covered loss until the actual loss can be determined. We will not pay for reduction of yield resulting from your failure to care for the crop during the deferral period.

4. LOSS PAYMENT.
a. The amount payable per acre will be the limit of insurance applying on the date of the loss multiplied by the percentage the crop yield is reduced because of the loss. However, the amount payable may not exceed the actual cash value of the portion of the crop destroyed by perils insured against.

b. If a crop loss is also covered by other insurance, we will pay only the proportion of the loss that our limit of insurance bears to the total amount of insurance, except that no Federal Crop Insurance policy or Multiple Peril Crop Insurance policy will be prorated with this policy.

5. REDUCTION OF INSURANCE.
The limit of insurance applying to each acre of insured crop will be reduced:

a. By the gross percentage of loss determined for each loss.

b. By the same percentage as each acre of crop is harvested.

6. APPRAISAL.
If you and we fail to agree on the percentage the yield is reduced because of the loss, the following procedure will be used:

a. One of us will demand in writing that the percentage of yield reduction be set by appraisal.

b. Each of us will select a competent appraiser and notify the other of the appraiser's identity within 10 days after receipt of the written demand.

c. The two appraisers will then select a competent, impartial umpire. If the two appraisers are unable to agree upon an umpire within 10 days, you or we can ask a judge of a court of record in the state in which the insured crop is grown to select an umpire.

d. The appraisers will then set the percentage of yield reduction. If the appraisers submit a written report of an agreement to us, the amount agreed upon will be the percentage of yield reduction.

e. If the appraisers fail to agree within a reasonable time, they will submit their difference to the umpire. Written agreement signed by any two of these three will set the percentage of yield reduction.

Each appraiser will be paid by the party selecting that appraiser. Other expenses of the appraisal and compensation of the umpire will be paid equally by you and us.

We will not be held to have waived any of our rights by any act relating to appraisal.

7. LIBERALIZATION.
If we adopt any revision which would broaden the coverage under this policy without additional premium, the broadened coverage will apply.

8. VARIATION IN ACREAGE IN CASE OF LOSS.
When the actual acreage of a crop differs from the number of acres stated by item in the Schedule of Insurance:

a. A revised Schedule of Insurance per acre will be obtained by dividing the limit of insurance by the actual acreage at the location for such item.

b. The total insurance per acre on your insured interest will not exceed the value of the crop at the time of loss.

9. WAIVER OR CHANGE OF POLICY PROVISIONS.
A waiver or change of any provision must be in writing and approved by us. Our request for an appraisal or examination will not waive any of our rights.

10. ASSIGNMENT OF INTEREST.
You may not assign your interest in this policy without our written consent.

11. ASSIGNMENT OF INDEMNITY.
You may assign to another party your right to an indemnity for the crop year only on our form and with our approval. The assignee will have the right to submit the loss notices and forms required by the policy.

12. CONCEALMENT OR FRAUD.
We do not provide coverage for any insured who has intentionally concealed or misrepresented any material fact or circumstance relating to this insurance, either before or after a loss.

13. CANCELLATION OF POLICY. (Except as provided in Special Provisions)
a. *By You:*
If you cancel or reduce coverage prior to inception of the insurance period we will refund your paid premium for the amount of insurance cancelled. If you cancel or reduce coverage during the insurance period we will not refund any premium.

b. *By Us:*
We may cancel all or any part of the insurance provided by us at any time by notifying you at least 10 days before the date and hour cancellation takes effect. Notices of cancellation may be delivered or mailed to you at your mailing address shown in the declarations. Proof of mailing will be sufficient proof of notice.

If we cancel all or any part of this policy, we will return the premium paid for the amount of insurance per acre on the portion cancelled.
(State law exceptions to the 10 days notice of cancellation, if any, are contained in the Special Provisions.)

14. EXCLUSIONS.
We do not cover:

a. Loss from any peril not insured against, even though the loss may have occurred in conjunction with a peril insured against.

b. Loss of any portion of a crop recoverable by harvesting equipment.

c. Loss due to your neglect or failure to harvest mature crops.

d. Injury or damage to the vegetative or flowering portion of any plant, tree or shrub, except to the extent that the injury results in a reduction of yield of that crop.

e. Any loss that has been contributed to by nuclear reaction, radiation, or radioactive contamination, all whether controlled or uncontrolled or however caused, or any consequence of any of these.

15. ABANDONMENT OF CROP.
We will not accept abandonment to us of any interest in any crop.

16. SUIT AGAINST US.
You cannot bring suit or action against us unless you have complied with all of the policy provisions.

If you do enter suit against us you must do so within 12 months of the occurrence causing loss or damage.
(State law exceptions to the 12 months limitation, if any, are contained in the Special Provisions.)

17. CONFORMITY TO STATUTES.
If any terms of this policy are in conflict with statutes of the state in which this policy is issued the policy will conform to such statutes.

18. SUBROGATION (Recovery of loss from a third party.)
Because you may be able to recover all or a part of your loss from someone other than us, you must do all you can to preserve any such rights. If we pay you for your loss then your right of recovery will belong to us. If we recover more than we paid you plus our expenses, the excess will be paid to you.

SPECIAL PROVISIONS

Oklahoma

1. PERILS INSURED AGAINST.
We insure for direct loss to crops described in the Schedule of Insurance caused by:

a. *Hail*

b. *Fire and Lightning*
We cover loss by fire and lightning before harvest and while crop is still in the harvester.

c. *Transit Coverage (Except Cotton)*
While the harvested crop is being transported to the first place of storage not to exceed 50 miles, this policy is extended to cover loss caused by:

(1) Fire and Lightning
(2) Windstorm
(3) Collision
(4) Overturn
(5) Collapse of bridges, docks and culverts

However, *Transit Coverage* is excess over any other valid and collectible insurance.

FIRST PLACE OF STORAGE means any drying apparatus, drying bins or storage facility of any kind.

d. *Fire Department Service Charge*
We will pay up to $250 for your obligation assumed by contract or agreement for fire department charges incurred when the fire department is called to save or protect the unharvested crop.

No Excess Over Loss or Deductible will apply to Fire, Lightning and Transit Coverage or Fire Department Service Charge.

2. MINIMUM LOSS.
We will not cover any loss until the percentage of yield reduction per acre equals 5% or more of the crop, nor any loss in addition to a paid loss until such additional reduction in yield equals 5% or more of the original crop.

3. CATASTROPHE LOSS AWARD.
When a loss exceeds 70% on any acre of the insured crop an additional amount of one-half of the percent of loss that is in excess of 70% will be paid. However:

a. the total amount payable per acre will not exceed the amount of insurance applying at the time of loss;

b. this award will not be paid if the loss is subject to any Excess Over Loss or Deductible provision which does not disappear at or less than 70% loss.

4. CANNING BEANS AND CANNING PEAS.
Insurance on canning beans and canning peas will expire 60 days after the crop is clearly visible above the ground.

5. CORN AND SORGHUM.
On corn grown for seed purposes, and on popcorn or sweet corn, the amount of any loss will be determined in the same manner as for ordinary field corn. On sorghum crops grown for seed purposes, the amount of any loss will be determined in the same manner as for ordinary field sorghum.

6. COTTON.
We do not cover cotton bolls immature at the time of a killing frost or freeze.

7. HAY, FORAGE AND GRASS CROPS.
a. For hay, forage or other crops harvested more than once each growing season, the limit of insurance per acre provided for each cutting or harvest will be determined by dividing the total insurance per acre by the number of cuttings or harvests.
b. If your schedule of insurance specifies a limit of insurance per acre for each cutting or harvest, Section (a) will not apply.
c. When hay and grass crops grown for seed are insured:

(1) The insurance will apply only to the cutting to be harvested for seed.
(2) Until the seed is set, a maximum of 25% of the insurance per acre stated in the Schedule of Insurance will apply.

8. REPLANTING DESTROYED CROPS.
When any acre of crop has been damaged by hail to the extent that replanting is necessary, and replanting to the same or a substitute crop is feasible under the growing conditions where such crop is grown, we will reimburse you for your actual expense of replanting not to exceed the following percentage of the limit of insurance applying to each acre of the insured crop, whether the crop is replanted or not.

Cotton:
Basic Form 10%
DXS10 Form 8%
XS20IP Form 7%
Other crops, all forms 20%

The limit of insurance will be reduced by the amount of the replanting award. The insurance will continue on the replanted crop if of like kind; if not of like kind, the insurance will transfer to the substitute crop at the appropriate premium upon approval by us.

9. EXPIRATION OF INSURANCE.

Coverage ceases at 12:01 a.m. on the following dates of the current year:

	Hail coverage:	Fire, Lightning and Transit coverage:
Barley		
Cimarron, Texas, and Beaver Counties	July 25	July 25
All other counties	July 15	July 15
Corn	October 15	December 15
Cotton	December 15	December 15
Combine maize	November 15	December 15
Milo maize	November 15	December 15
Oats		
Cimarron, Texas, and Beaver Counties	July 25	July 25
All other counties	July 15	July 15
Rye		
Cimarron, Texas, and Beaver Counties	July 25	July 25
All other counties	July 15	July 15
Sorghum crops	November 15	December 15
Soybeans	November 15	November 15
Wheat		
Cimarron, Texas and Beaver Counties	July 25	July 25
All other counties	July 15	July 15
All crops not specified	October 15	October 15

OPTIONAL PROVISIONS

Your application and rate of premium determine whether your coverage will be amended by one of the following optional provisions.

EXCESS OVER 10% LOSS—DISAPPEARING AT 50%—PROVISION—(SYMBOL: DXS10)

We will not cover any loss until the percentage of yield reduction per acre exceeds 10%. The percentage per acre then payable will be the percent in excess of 10%, multiplied by 1.25. Once the percent of yield reduction equals or exceeds 50% this provision will no longer apply. The payable percentage may not exceed 100%.

When the percentage of yield reduction once exceeds 10%, thereafter the "Minimum Loss" provision will apply to any subsequent loss(es).

EXCESS OVER 20% LOSS—INCREASING PAYMENT PROVISION (SYMBOL: XS20IP)

We do not cover any loss until the reduction in yield per acre exceeds 20%; the percentage per acre then payable will be the percent in excess of 20%, multiplied by 1.25. The payable percentage may not exceed 100%.

When the percentage of yield reduction once exceeds 20%, thereafter the "Minimum Loss" provision will apply to any subsequent loss(es).

REPORT ON BIAS IN FALC DETERMINATION

Since the new crop hail rating method was implemented in 1990, there have been questions about how well this system works. One area of concern is whether there is any bias introduced by the Final Average Loss Cost (FALC) mix and the Catastrophe procedure.

In the new Catastrophe procedure, losses in excess of a specified amount are removed from local experience and gathered into State and Crop Reporting District loss pools. The remaining losses are called "normal" losses. The initial estimate of the FALC for each location is based on a weighted average of location normal loss costs and normal loss costs from surrounding areas. It should not consistently over- or under-estimate local normal loss costs. Normal "implied" losses are defined for each location as

NORMAL IMPLIED LOSS = FALC (w/o catastrophe) x LIABILITY.

If there is no consistent bias in the FALC calculation, then the total implied losses for the state should not deviate significantly from statewide normal losses.

After the initial FALC estimates are computed, the catastrophic losses are redistributed by means of factors applied to the FALC. The FALC with catastrophe should not consistently over- or under-estimate local loss costs. Total implied losses are calculated as

TOTAL IMPLIED LOSS = FALC (w/catastrophe) x LIABILITY,

Total implied losses for the state should not deviate significantly from statewide total losses.

Table 1 lists several of the township rated states for which a rate analysis or FALC analysis has been done using the new rating methods. Also listed is the amount by which total implied losses deviated from total losses and the percent by which implied losses deviated from normal and total losses.

Deviations from normal losses are quite small in each case. It is clear that the FALC mix does not consistently inflate or deflate losses. That the deviations from total losses don't differ much from the deviations from normal losses would indicate that the catastrophe loading procedure does not create any bias.

Areas with low liability have a different FALC mix than do areas with adequate liability. To examine the effects of the change in FALC mix, townships were separated by amount of liability. Tables 2 and 3 are examples of the results from this analysis. The amount of deviation from actual losses in the low liability areas varied considerably by crop and state. In some cases, implied losses in low liability areas differed quite a bit from actual losses. However, because the losses in these areas are so small, they have little impact overall.

DEVIATIONS OF IMPLIED LOSSES FROM ACTUAL LOSSES

RATE ANALYSIS YEAR	STATE	CROP	DEV. FROM TOTAL LOSSES	% DEV. FROM TOTAL LOSSES	% DEV. FROM NORMAL LOSSES
1990	IDAHO	BARLEY	($248,865)	-1.0%	-1.0%
1990	IDAHO	PEAS	($178,230)	-2.0%	-2.1%
1990	IDAHO	POTATOES	($48,036)	-0.4%	-0.4%
1990	IDAHO	WHEAT	($711,612)	-2.5%	-2.5%
1991	ILLINOIS	CORN	$526,560	0.7%	0.7%
1991	ILLINOIS	SOYBEANS	$859,841	0.6%	0.5%
1990	IOWA	CORN	$637,725	0.3%	0.3%
1990	IOWA	SOYBEANS	$2,432,748	0.5%	0.5%
1990	KANSAS	CORN	$46,746	0.1%	0.1%
1990	KANSAS	WHEAT	$590,628	0.3%	0.3%
1990	MINNESOTA	GRAINS	$51,511	0.0%	0.1%
1990	MINNESOTA	SOYBEANS	$2,691,539	1.3%	1.3%
1991	MONTANA	BARLEY	($132,994)	-0.4%	-0.3%
1991	MONTANA	WHEAT	($139,851)	-0.1%	-0.1%
1990	NEBRASKA	GRAINS	($363,953)	-0.1%	-0.1%
1990	N. DAKOTA	WHEAT	$783,800	0.3%	0.3%
1990	OKLAHOMA	WHEAT	$324,816	0.5%	0.5%
1991	OREGON	GRAINS	$17,994	0.2%	0.2%
1990	S. DAKOTA	CORN	$308,176	0.7%	0.7%
1990	S. DAKOTA	WHEAT	($369,777)	-0.4%	-0.4%
1991	WASHINGTON	TREE FRUIT	$21,032	0.1%	0.2%
1991	WASHINGTON	WHEAT	($459,228)	-3.4%	-3.3%

TABLE 1.

TABLE 2. 1990 IDAHO BARLEY

LIABILITY	NORMAL LOSSES	IMPLIED NORMAL LOSSES	% DEVIATION FROM NORMAL
LOW	163,047	245,595	0.3
NORMAL	24,744,793	24,415,535	-1.3
TOTALS	24,907,840	24,661,130	-1.0

LIABILITY	TOTAL LOSSES	IMPLIED TOTAL LOSSES	% DEVIATION FROM TOTAL
LOW	163,047	251,392	0.3
NORMAL	25,594,542	25,257,332	-1.3
TOTALS	25,757,589	25,508,724	-1.0

TABLE 3. 1990 IDAHO PEAS

LIABILITY	NORMAL LOSSES	IMPLIED NORMAL LOSSES	% DEVIATION FROM NORMAL
LOW	119,084	149,211	0.4
NORMAL	8,074,647	7,875,001	-2.4
TOTALS	8,193,731	8,024,212	-2.1

LIABILITY	TOTAL LOSSES	IMPLIED TOTAL LOSSES	% DEVIATION FROM TOTAL
LOW	119,084	155,991	0.4
NORMAL	8,654,480	8,439,343	-2.5
TOTALS	8,773,564	8,595,334	-2.0