Agricultural Economics Report No. 61

November 1968

Effect of All-Risk Crop Insurance on Farm Firm Survival

CARL E. OLSON,
LEROY W. SCHAFFNER
AND
DENNIS L. POWELL

Department of Agricultural Economics
Agricultural Experiment Station
North Dakota State University
Fargo, North Dakota

TABLE OF CONTENTS

LIST OF TABLES

SUMMARY

Income from farming in the Great Plains is extremely variable from year to year, primarily because of variation in weather and price. Farmers in North Dakota and the Great Plains use several methods of protecting against yearly income instability, including stored grain and feed, cash reserves, stocks and bonds, reducing operating and living expenses, off-farm jobs, credit reserves, and crop insurance.

This study has been concerned with Federal "all-risk" Crop Insurance as offered by the Federal Crop Insurance Corperation as a means of reducing risk. The objectives were:

1. To determine the effects of participation in the Federal Crop Insurance program on the level of income each year and over a period of years.
2. To determine the effects of "all-risk" crop insurance on stabilizing farm income for a given year and over a period of years.

Budget analysis was the major analytical tool employed to answer the above objectives. A typical county was selected from each of the three risk areas in the state. The counties selected were Morton in the high-risk area, McHenry in the medium-risk area, and Traill in the low-risk area.

The data on each individual farm, obtained from the United States Department of Agriculture, Statistical Reporting Service, showed farm size, number of acres in each crop (wheat, barley, oats, and flax), and total production. Average yield per acre for each crop was derived from these data.

Farm size did not affect the average yield per acre of crops used in this study. Since yields were assumed not to be affected by farm size, a typical size farm was selected in each county and the net income determined for each farm.

The gross farm income for a typical farm was obtained by using the actual production records for each crop. The production costs were subtracted from the gross income to get net income from crops. The net income from cattle was added to the net income from crops to get the net farm income.

To determine if there were significant differences in net farm income, all farms were budgeted with and without "all-risk" crop insurance.

The results of the statistical techniques for all-risk areas used in this study indicate that Federal Crop Insurance did not affect average net farm income over a 10-year period. However, "all-risk" crop insurance did appear to reduce the chances of very low incomes in bad years, which may be very important for farm firm survival. In poor crop years, "all-risk" crop insurance does increase net farm income, but in average or better crop years, it appears that the insurance lowers incomes by the cost of the premium.

EFFECT OF ALL-RISK CROP INSURANCE ON FARM FIRM SURVIVAL

Carl E. Olson, LeRoy W. Schaffner, and Dennis L. Powell*

Farm firm survival from year to year is necessary for a farm family to achieve its long-run goals. If the farm firm does not survive in the short run, the long-run goals will not be met. Farming is a business that requires large amounts of capital, most of it provided by the farm operator; and failure of the farm business can cause a farm family to lose its life's savings. Income variability and the general level of income can and do have an effect upon the survival and/or growth of a farm firm. Unstable income creates a situation where the farm operator does not know if he will be able to cover his costs and thus enable the firm to survive.

The Problem

The cause of unstable income is twofold, variable yields and variable prices, neither of which can be controlled by the individual farmer. Variable yields are largely caused by the result of weather conditions, and variable prices are largely caused by market conditions.

Past governmental agricultural programs have been aimed at stabilizing farm incomes through price support programs. In general, the program establishes a price floor below which the price of a commodity is not likely to fall for a given time period. With such price support

---

*Carl E. Olson and LeRoy W. Schaffner are Assistant Professors and Dennis L. Powell is a former graduate assistant in the Department of Agricultural Economics, North Dakota State University. The authors wish to thank Herman Delvo for reviewing the manuscript.

programs, the minimum price a farm operator may receive for his products is set, and income variability from price variation is minimized, particularly in a downward direction.

Weather conditions, particularly precipitation, are the major causes of yield variations and crop failures in North Dakota and other Great Plains areas, which in turn result in instability of income. There are several strategies that farmers can use to protect themselves against risk of crop failure and/or unstable income.

An adequate discussion of the risks faced by farmers logically must begin with a definition of risk and what strategies are available to farmers to reduce risk. Risk refers to variability or outcomes which are measurable in a quantitative manner. For example, hail risks may be measured by the experience from past years in which a certain area may be completely hailed out one year in ten and in two of the ten years partial crop losses will occur due to hail.

Farmers may use one or more of the following strategies as precautions against risk in agriculture:

1. Diversification.
2. Flexibility in farm organization and production methods.
3. Reserves, both monetary and physical.
4. Contracts for prices of products sold or bought.
5. Insurance.

The strategy of primary concern in this study is the "all-risk" crop insurance program offered by the Federal Crop Insurance Corporation. Federal "all-risk" Crop Insurance has been available in certain areas in the United States since 1939.

The program has been expanded since then to include about 1,300 counties. Each year more counties are added and coverages are adjusted to better fit the needs of a given area.

Background of Federal Crop Insurance

The Federal Crop Insurance Act was first written in 1938 and revised in 1947. The Act created the Federal Crop Insurance Corporation. FCIC provides a means by which farmers can reduce the financial impact of crop failures. Federal Crop Insurance is "all-risk" insurance which covers unavoidable losses from natural hazards. Farmers take the insurance for stated levels of crop production. Both the quantity and quality of the crop may be specified in the contract.

The Act limits coverage to a maximum of not more than 75 per cent of the average yield of any crop on the insured farm. If this level of coverage represents more protection than the investment in the crop for the general area, the coverage is reduced to more nearly reflect the actual investment in the crop. In recent years coverage has been based on area-average yields rather than on individual farm yield because information for individual farms has not been available. The FCIC is set up so that the premiums charged will cover the indemnities except for administration costs which are paid by the Federal government.

Objectives

This study is concerned with the effects of all-risk crop insurance on the stability and level of farmers' incomes. Specific objectives are:

1. To determine the effects of Federal Crop Insurance on stabilizing farm income for a given year and over a period of years.

2. To determine the effects of participation in the Federal Crop Insurance program on the level of income each year and over a period of years.

Methodology

The methodology used to determine the effect of "all-risk" crop insurance upon farm firm survival was budget analysis done for typical farms in each of three "risk-areas" of North Dakota. Data used in the budgets were obtained from the Statistical Reporting Service, United States Department of Agriculture, for North Dakota. To determine the effect of all-risk crop insurance upon the level and stability of net farm income, each farm was budgeted with and without the insurance. Statistical tests were employed to determine if there were significant differences in the level of income with and without all-risk crop insurance.

Risk Areas

North Dakota has three prevalent areas of crop variability: the western dry area, the central intermediate rainfall area, and the eastern humid area.

Delvo,[1] using an aggregate index of risk, delineated the state into three areas with homogenous risk and crop production (Figure 1).

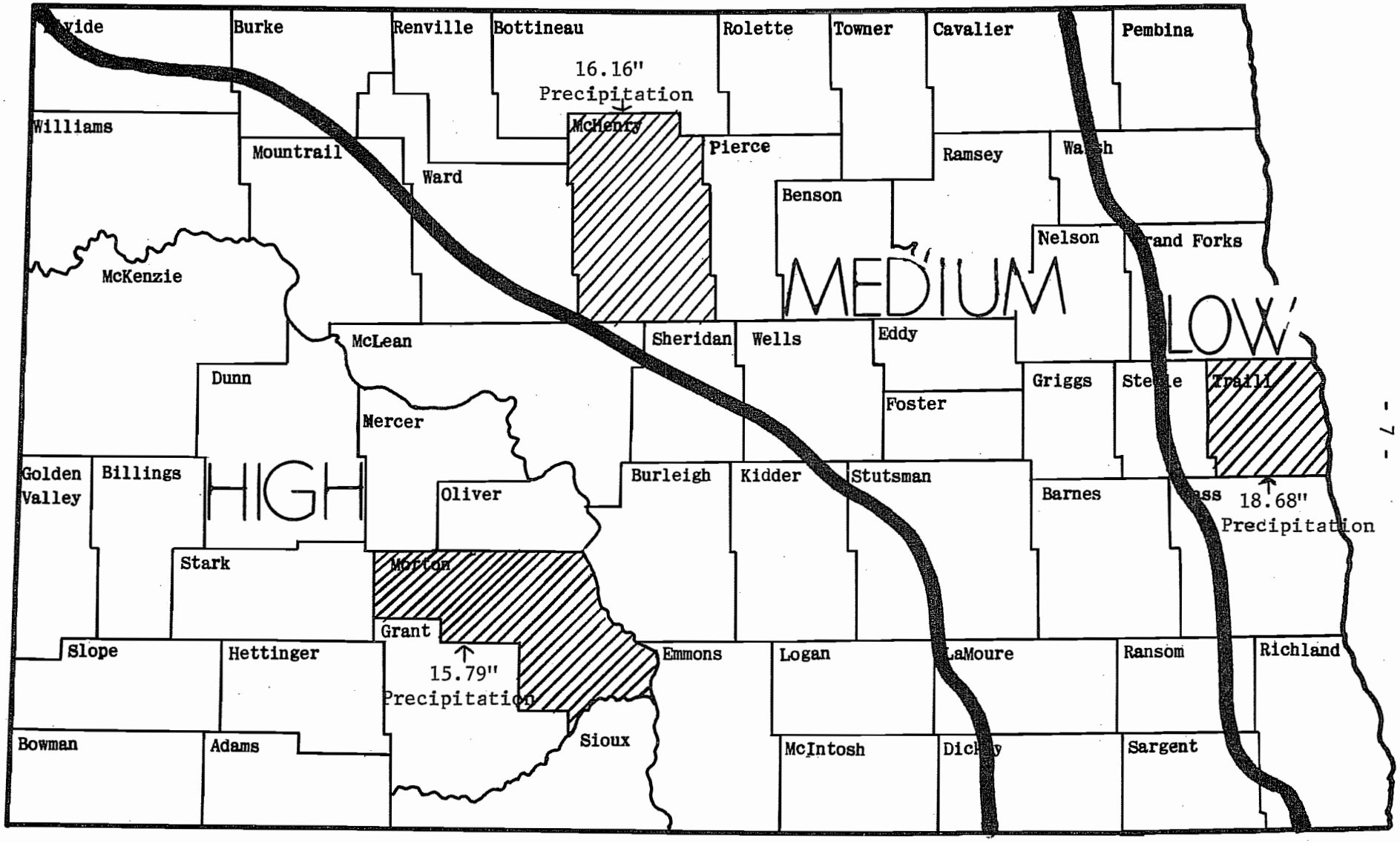
1. Low risk-high yield.

2. Medium risk-medium yield.

3. High risk-high yield.

---

[1]Delvo, Herman W., An Economic Appraisal of All-Risk Crop Insurance in North Dakota, Unpublished M. S. Thesis, North Dakota State University, Fargo, North Dakota, 1965.



Counties used in analysis.

Figure 1. Low, Medium and High-Risk Areas in North Dakota Showing the Three Study Counties.

One county from each risk area was chosen to represent that area in the analysis. The particular counties were selected because of their representativeness to the entire area. Morton County was selected in the high-risk area, McHenry in the medium, and Traill in the low-risk area.

McHenry County

McHenry County is in north central North Dakota. The county is primarily agricultural with no large industrial or population centers. The largest town and also the county seat is Towner. The average size farm in the county is 775 acres.

The county is included in the Drift Prairie physiographic area.[2] The general slope of the Drift Prairie is to the south and east. Stream systems are poorly developed and the runoff goes into the numerous closed depressions where it evaporates or goes to a groundwater table. The basin of Glacial Lake Souris covers about half of McHenry County. Lake sediments in this area are mostly sandy loams and loamy sands. Sandhill areas in central and northeast McHenry County mark areas of most active post-glacial wind reworking of the sands.

The climate of McHenry County is subhumid, with long winters and summers characterized by warm, windy days with 14 to 16 hours of sunshine. The nights are generally cool. The long-term mean temperature is 38.8 degrees and the long-term mean annual precipitation is 16.16 inches.

---

[2]Omodt, H. W.; Johnsgard, G. A.; Patterson, D. D.; and Olson, O. P., The Major Soils of North Dakota, Bulletin No. 472, Department of Soils, Agricultural Experiment Station, North Dakota State University, Fargo, North Dakota, January, 1968, pp. 3 and 4.

McHenry County lies on the western edge of a climatic zone, which has a group of important black soils. The climatic conditions of the region have favored a heavy grass vegetation. There is sufficient moisture to permit large quantities of organic matter to accumulate in the surface soil. This surface soil has an average depth of 12 inches. At depths greater than 12 inches, the color of the soil becomes increasingly lighter. Twenty inches below the surface the color becomes a light olive gray. The group of soils characterized by this profile includes the various soil types in the Barnes and Pierce series.

Morton County

Morton County is representative of the southwestern part of North Dakota.[3] The average size farm in the county is 967 acres.

The county lies in what is known as the Missouri Plateau. Glacial ice once covered the entire county. The land is rolling with about 42 per cent of the farmland used for crops. All of the county drains into the Missouri River. The valley floor ranges in width from one-eighth of a mile to three miles.

Morton County has a large acreage of hilly and stump land--Bainville-Morton, Bainville-Rhoades, and Flasher-Vebar soil associations. These soil associations are found in the eastern, central, and southern parts of the county and are used principally for pasture. The soils used

---

[3]Edwards, M. J. and Ableiter, J. K., Soil Survey of Morton County, North Dakota, United States Department of Agriculture, Government Printing Office, Washington, D. C., 1951.

for crops are the dark brown soils of semi-arid grassland. These loams and clay loam soils are nearly level to gently rolling, with a thick dark brown surface layer and associated soils with claypan subsoil or steeply sloping soils with a thin surface layer. Soil associations in Morton County used principally for cropland include the Agar-Williams-Zahl, the Morton, and the Morton-Rhoades.

The climate of Morton County is semi-arid and continental. It has long-severe winters and short, warm summers. The mean long-term annual average temperature is 42.5 degrees. Most of the precipitation falls in the early part of the summer. The mean average rainfall is 15.79 inches. Much of the rainfall comes as thundershowers, causing soil erosion and damage to young crops. Severe local hailstorms frequently accompany the thundershowers, ruining crops.

Traill County

Traill County lies in eastern North Dakota along the Minnesota border, half way between the Canadian and South Dakota borders. Hillsboro is the county seat.

The county has three topographic regions--the Edinburg Moraine region, the delta of the glacial Elk River, and the Lake Plain region occupied by Lake Agassiz. Glacial till covers all but a small part in the southwestern part of the county where the land is rolling to hilly, with sloughs and depressions. The delta of the glacial Elk River occupies the northwestern two-thirds of the county, where the land is level to sloping. The area formerly covered by the glacial Lake Agassiz is in

the southeastern and eastern parts of the county and is level to undulating in topography. The soils are mostly dark colored deposits of silt and clay.

The climate of Traill County is subhumid, with long winters and short, cool summers. The county lies in the east central region of North Dakota. The average mean temperature is 40.7 degrees. The mean average rainfall is 18.68 inches per year. Hail occasionally injures crops, but ordinarily the percentage of the planted area suffering from hail damage is small.

Typical Farms for Budget Analysis

Loftsgard and Ullrich made a study of farm characteristics for North Dakota.[4] One of the characteristics included in the study was distribution of farms by size. The size of the typical farm in this study was determined by the size group in which the largest number of farms were found.

The per cent of cropland for the farm size was taken from Selected Characteristics of North Dakota Farms.[5] This figure multiplied by the total number of acres in each farm gives the number of acres in cropland. A percentage of cropland is also given for the acres in wheat

---

[4]Loftsgard, Laurel D. and Ullrich, Erwin O., Jr., Farm Characteristics for North Dakota by Economic Area, Agricultural Economics Report No. 23, North Dakota State University, Fargo, North Dakota, June, 1962.

[5]Krenz, Ronald D., Selected Characteristics of North Dakota Farms, Agricultural Economics Report No. 38, North Dakota State University, Fargo, North Dakota, February, 1965.

and barley. The remainder of the acres was divided among oats, flax, and summerfallow. Basic enterprises included in the farm budgets for the three counties are shown in Table 1.

TABLE 1. ACRES OF EACH CROP GROWN ON TYPICAL FARMS USED IN THE ANALYSIS

Crop	McHenry County	Morton County	Traill County
		acres	
Wheat	180	166	90
Barley	150	60	100
Oats	100	40	40
Flax	---	---	80
Cattle	---	30[a] cows	---
Total Crop Acres	430	266	310

[a]Figured on the basis that 28 calves are born each year.

A flax enterprise was not considered in Morton and McHenry counties because only a small percentage of the farms included it in their rotation. Cattle were used in Morton County, however, because it is typical of the farms in that area. Table 2 shows prices and value of the calves sold in Morton County. The calves were assumed to be sold at 400 pounds in November of each year. Using cattle in Morton County may tend to have a stabilizing effect on net income.

The typical farms in each county were budgeted for 10 years, using the enterprises given in Table 1, the prices given in Table 2, and the costs given in Table 3.

The same number of farms was used in each county for each of the 10 years: Morton--30, McHenry--35, and Traill--38. These are the number of farms that grew all the crops used in the study each of the 10 years (wheat, barley, oats, and flax in Traill County only).

Gross income was found by multiplying the actual crop yield for each year on the farms used in the analysis by the acres of each crop times the price received each year. Added together, they give the gross income from crops on each farm. In Morton County gross value of cattle sold also is included in gross farm income.

To find answers to the two objectives of the study, each farm was budgeted with and without Federal Crop Insurance. Budgeting with premium reductions[6] is done by adding the premium reduction the farmer has coming to his gross farm income for that year. Indemnity payments to farmers whose average yield for the insured crop is below a yield set by the FCIC also are added to the gross income of each farm.[7]

Costs for each crop and county were determined from cost and return data published by the North Dakota Extension Service.[8] The total

---

[6]If a farmer has Federal Crop Insurance for a three-year period and he does not collect an indemnity, the next year he will receive a 5 per cent reduction in the premium. He can receive a 5 per cent per year reduction in premiums for each year without an indemnity past the three-year period, up to a maximum of 25 per cent.

[7]Coverage tables were obtained from the state FCIC office for the three study counties. Those tables are summarized in Appendix Tables.

[8]Loftsgard, Laurel D. and Sobering, Fred D., Crop Costs and Returns, North Dakota Economic Areas 1, 3A, and 4, Circulars FM-63-1, 4, and 7, Cooperative Extension Service and Agricultural Experiment Station, North Dakota State University, Fargo, North Dakota, March, 1963.

cost per farm for each county is shown in Table 3. This figure includes all costs except land charge and family living.

Net income was determined by subtracting the total cost per farm, given in Table 3, from the gross income.

In order to show the effects of Federal Crop Insurance on farm income, the yield of each crop was examined and the insurance indemnity was determined for each farm (Table 4). This was added to the net income, and the cost of the insurance, as determined from the FCIC rate sheets, was subtracted from the net income. This was done for each county and crop. It was not possible to follow the same farm through the 10 selected years. Thus, the yields were randomly selected to represent a single farm. Using this technique, each farm could be followed through to determine the premium decrease that could be expected. When there was a premium decrease earned due to yield above the level set by FCIC, they were added back into the net income. Having the net income with and without Federal Crop Insurance, a statistical analysis can be made to give some insight to the results of this study.

TABLE 2. PRICE, WEIGHT, COST, GROSS AND NET VALUE OF CATTLE ENTERPRISE, MORTON COUNTY[a]

Year	Price 100/lb.	Weight (cwt)	Gross Value	Cost	Net Value
1955	$16.50	4.00	$1,848.00	$2,100.00	$ -252.00
1956	15.00	4.00	1,680.00	2,100.00	-420.00
1957	20.00	4.00	2,240.00	2,100.00	140.00

- continued -

TABLE 2. PRICE, WEIGHT, COST, GROSS AND NET VALUE OF CATTLE ENTERPRISE, MORTON COUNTY[a] (continued)

Year	Price 100/lb.	Weight (cwt)	Gross Value	Cost	Net Value
1958	$27.70	4.00	$3,102.40	$2,100.00	$1,002.40
1959	27.20	4.00	3,046.40	2,100.00	946.40
1960	22.00	4.00	2,464.00	2,100.00	364.00
1961	24.60	4.00	2,755.20	2,100.00	665.20
1962	28.00	4.00	3,136.00	2,100.00	1,036.00
1963	25.60	4.00	2,867.20	2,100.00	767.20
1964	21.10	4.00	2,251.20	2,100.00	151.20

[a]There are 30 head of cows figured at a cost of $70 a cow or $2,100 total cost.

TABLE 3. COST OF PRODUCTION MINUS LAND CHARGES AND LIVING EXPENSES FOR THE THREE COUNTIES

Crop	McHenry County	Morton County	Traill County
Wheat	$2,961.00	$2,108.70	$1,881.00
Barley	1,852.50	618.00	1,620.00
Oats	1,160.00	382.00	600.00
Flax	---	---	1,156.00
Cattle	---	2,100.00	---
Total	5,973.50	5,208.70	5,326.00

Source: Loftsgard, Laurel D. and Sobering, Fred D., Crop Costs and Returns, North Dakota Economic Areas 1, 3A, and 4, Circulars FM-63-1, 4, and 7, Cooperative Extension Service and Agricultural Experiment Station, North Dakota State University, Fargo, North Dakota, March, 1963.

TABLE 4. COST OF INSURANCE PER FARM IN THE THREE STUDY COUNTIES BY YEAR

Year	McHenry County	Morton County	Traill County
1955	$235.80	$253.98	$163.60
1956	219.60	235.72	242.70[c]
1957	239.40	258.96	249.00
1958	238.68	259.58	248.00
1959	238.68	259.58	248.00
1960	238.68	259.58	248.00
1961	251.24	278.88	300.00
1962	251.24	278.88	336.00[c]
1963	270.00	428.60[b]	332.00
1964	465.00[a]	428.60	332.00

Source: Rates and coverage tables as supplied by the state FCIC.

[a]Barley added in 1964, wheat only in other years.

[b]Oats added in 1963, wheat only in other years.

[c]Barley added in 1956, Oats added in 1962, wheat and flax all other years.

RESULTS

High-Risk Area--Morton County

Levels of Income

To determine if there is a significant difference in the level of farmers' net income with and without Federal Crop Insurance over time, Student's "t" test[8] was used. The calculated "t" values[9] were checked against table values at the 95 per cent confidence limit. The results of the tests ("t" = 0.01) indicate that the difference in the average incomes was not significantly different from zero. Thus, the Federal Crop Insurance program has had little, if any, effect on the level of income over time in Morton County.

Average income in Morton County for each year, shown in Table 5, was larger without Federal Crop Insurance in all years except 1959 and 1961. Both 1959 and 1961 were years of generally poor crops. In 1959, 20 of the 30 farms budgeted in the county had a yield sufficiently low to collect Federal Crop Insurance indemnity payments and in 1961, 24 of the 30 farms received an indemnity payment.

---

[8]Hoel, Paul G., Elementary Statistics, John Wiley & Sons, Inc., New York, 1960, pp. 22 and 116.

[9]Calculated $t = \frac{\bar{y}_1 - \bar{y}^2}{s_{\bar{y}_1 - \bar{y}^2}}$ where $s^2_{\bar{y}_1 - y^2} = \frac{s_1^2}{n_1} + \frac{s_2^2}{n_2}$

and n_1 = number of observations with Federal Crop Insurance

n_2 = number of observations without Federal Crop Insurance

s_1^2 = variance of income with Federal Crop Insurance

s_2^2 = variance of income without Federal Crop Insurance

Stability of Income

The ranges in net income, a measure of stability, for Morton County show an increase in the low net incomes with Federal Crop Insurance, but also show that the largest income in the sample is always larger without Federal Crop Insurance. The lowest net income of the farmers used in the budgeting analysis for Morton County was lower without Federal Crop Insurance in all years except 1958 and 1962, exceptionally good crop years. The average range of net income for all 10 years also shows that the lowest level of income is increased with the use of Federal Crop Insurance.

The standard deviation of net income, another measure of stability, was used to determine the effects of Federal Crop Insurance on stability of the farmers' net income.

The average net income with Federal Crop Insurance does not vary as much from year to year as average net income without Federal Crop Insurance. Table 5 shows the standard deviation with and without Federal Crop Insurance for the 10 years used in the budgeting analysis.

The average standard deviation of all 10 years is $278.79 smaller with the use of Federal Crop Insurance. The largest difference in standard deviations occurred in 1961, when it was $813.50. The smallest difference was in 1958, when it was $1.06. When all years were grouped together, the standard deviation was $353.14 smaller with the use of Federal Crop Insurance.

The implications of the above data are that farmers in high-risk areas can increase the stability of their incomes by using Federal Crop Insurance.

TABLE 5. AVERAGE, RANGE, AND STANDARD DEVIATION OF NET INCOME BY YEAR FOR MORTON COUNTY WITH AND WITHOUT FEDERAL CROP INSURANCE

Year	Average		Range				Standard Deviation	
			With		Without			
	With	Without	Low	High	Low	High	With	Without
1955	$ 3,422.52	$ 3,583.10	$ 382.40	$ 7,678.38	$-1,617.90	$ 7,932.36	$2,057.64	$2,231.20
1956	1,748.07	1,852.32	-1,763.56	6,273.58	-3,111.48	6,509.30	1,926.16	2,142.17
1957	3,321.09	3,449.69	-415.76	9,323.95	-2,457.56	9,582.91	2,465.30	2,702.62
1958	4,877.51	5,126.28	1,100.61	11,142.90	1,360.19	11,389.50	2,645.14	2,644.08
1959	350.26	-398.37	-451.17	9,304.54	-2,195.13	9,538.26	1,745.73	2,203.45
1960	2,313.95	2,470.79	-829.99	7,834.25	-2,854.06	8,082.25	2,213.80	2,382.01
1961	-103.09	-1,015.84	-686.38	2,337.95	-2,731.50	2,616.83	728.30	1,541.80
1962	12,361.06	12,636.62	138.82	20,454.74	318.10	20,733.62	3,601.50	3,613.18
1963	5,053.48	5,106.78	895.68	10,075.90	-2,574.73	10,504.50	2,890.36	3,525.71
1964	4,110.39	4,479.73	771.79	9,938.30	503.19	10,324.04	2,229.60	2,305.20
All Years Comb.			-1,763.56	20,454.74	-3,111.48	20,733.62	4,055.83	4,409.96
10-Year Ave.	3,745.52	3,729.11	-703.50	9,436.45	-1,536.09	9,721.36	2,250.35	2,529.14

TABLE 6. AVERAGE, RANGE, AND STANDARD DEVIATION OF NET INCOME BY YEAR FOR MCHENRY COUNTY WITH AND WITHOUT FEDERAL CROP INSURANCE

Year	Average		Range				Standard Deviation	
			With		Without			
	With	Without	Low	High	Low	High	With	Without
1955	$ 4,325.42	$ 4,561.22	$ 1,148.20	$10,447.20	$ 1,384.00	$10,683.00	$2,188.66	$2,188.67
1956	3,155.54	3,344.29	-864.59	10,893.69	-1,595.39	11,113.29	2,689.77	2,738.29
1957	1,987.19	2,065.87	-2,558.16	7,162.49	-3,392.82	7,401.89	2,136.14	2,360.72
1958	1,957.37	1,912.94	-4,473.20	9,997.38	-6,065.25	10,224.13	3,886.58	4,233.58
1959	528.62	589.03	-3,908.93	8,028.92	-5,588.70	8,243.73	3,151.42	3,368.07
1960	2,695.24	2,886.39	-2,096.25	8,721.40	-2,788.17	8,924.28	2,805.11	2,850.84
1961	-2,929.68	-3,421.04	-4,295.29	1,762.75	-6,422.00	1,963.74	1,366.56	1,950.21
1962	13,327.28	13,564.52	4,594.00	22,680.50	4,807.55	22,931.74	5,830.82	5,835.45
1963	6,250.80	6,493.80	-875.63	13,555.00	-997.13	13,798.00	3,321.63	3,345.83
1964	5,271.12	5,595.65	-632.43	9,816.75	-3,059.43	10,165.50	2,741.01	2,990.74
All Years Comb.			-4,473.20	22,680.50	-6,422.00	22,931.74	5,147.94	5,359.94
10-Year Ave.	3,656.90	3,759.27	-2,315.03	10,306.61	-3,333.24	10,544.93	3,011.77	3,186.24

Medium-Risk Area--McHenry County

Levels of Income

The Student "t" test[10] on farmers' net income (Table 6) used in Morton County was also used in McHenry County with basically the same results. When the calculated "t" values ("t" = -0.053) were checked against the table values at the 95 per cent level, the difference in the average income with or without Federal Crop Insurance was not statistically significant.

McHenry County has a higher average net income or level of income without Federal Crop Insurance in all years except 1958 and 1962. The average net income for all 10 years was higher without Federal Crop Insurance, but as stated above, was not significantly higher. Table 6 shows the average net income for each year and the total average of all years for McHenry County. The level of income in 1958 with Federal Crop Insurance was only slightly higher than without Federal Crop Insurance, and the opposite was true in 1959. The crops in 1958 were generally above average yield; but evidently there were some large losses in McHenry County, probably due to hail. In 1959 eight McHenry County farmers were paid an indemnity by the FCIC. This was considered a relatively poor crop year, but the losses were not as severe as in 1958. In 1961, another poor crop year, Federal Crop Insurance raised the level of net income by approximately $500.

---

[10]Hoel, op. cit.

Stability of Income

The range of net income for McHenry County is lower for farms budgeted with Federal Crop Insurance than those budgeted without. In all years the low income for the farms with Federal Crop Insurance was higher than the low income for the farms without Federal Crop Insurance.

The standard deviation (Table 6) is used in determining the effects of Federal Crop Insurance on the stability of net income to farmers. In every year the standard deviation with Federal Crop Insurance was smaller than the standard deviation without Federal Crop Insurance.

The average difference in standard deviation for the 10-year period was very small, $174.47, with the largest difference being $583.65. This shows that in each year there was less income variability with Federal Crop Insurance than without the insurance.

Over the 10-year period Federal Crop Insurance did not stabilize net farm income in McHenry County; the average standard deviation was small. However, looking at the standard deviation from year to year, the farmers' net income can vary to a great degree and Federal Crop Insurance would stabilize it.

Low-Risk Area--Traill County

Levels of Income

In Traill County, as in Morton and McHenry counties, the Student "t" test (calculated "t" = -0.071) showed no difference in the average incomes with or without insurance over the 10-year period.

Traill County, in the low-risk area, had a higher level of income in all years except 1957 without Federal Crop Insurance. In 1957 net income with Federal Crop Insurance is only $15.52 greater than net income without Federal Crop Insurance. Table 7 shows the average net income for each year with and without Federal Crop Insurance. In 1957 there were 17 farms that collected indemnities in Traill County. This is by far the most that was collected in any given year, indicating that 1957 was a poor crop year compared to other years.

Stability of Income

The range in net income shows that the lowest net income is raised by using Federal Crop Insurance in seven of the ten years (Table 7). The average low income with and without Federal Crop Insurance for the 10 years is higher with Federal Crop Insurance. The level of income to the low income farms in a given year for all years is greatly improved by the use of Federal Crop Insurance. This is done at the expense of the high income farm. The level of income is higher without Federal Crop Insurance, but the low income is raised by using Federal Crop Insurance in Traill County.

There was much less variation in income measured by standard deviation in Traill County than in Morton and McHenry counties. The average difference over the 10-year period was $129.64 and the largest in any one year was $281.71. Table 7 shows that in every year the standard deviation of net income in Traill County was smaller with Federal Crop Insurance than without, as it also was when all 10 years were combined.

TABLE 7. AVERAGE, RANGE, AND STANDARD DEVIATION OF NET INCOME BY YEAR FOR TRAILL COUNTY WITH AND WITHOUT FEDERAL CROP INSURANCE

Year	Average		Range				Standard Deviation	
			With		Without			
	With	Without	Low	High	Low	High	With	Without
1955	$ 2,020.32	$2,058.38	$-1,240.62	$ 7,852.76	$-1,480.27	$ 8,016.36	$2,260.41	$2,366.42
1956	4,678.88	4,747.26	829.35	9,810.93	-475.95	10,053.63	2,220.19	2,448.59
1957	3,744.34	3,728.82	919.00	6,356.38	-232.00	6,495.38	1,405.90	1,491.31
1958	5,645.54	5,697.84	-107.52	10,624.80	-1,259.52	10,872.80	2,461.00	2,742.71
1959	3,723.38	3,866.54	-860.17	8,117.64	-1,703.97	8,365.64	2,217.36	2,354.74
1960	4,567.71	4,789.59	-9.15	9,340.94	75.65	9,564.14	2,290.97	2,300.36
1961	5,103.61	5,253.93	1,195.32	12,746.00	694.11	13,046.00	2,493.28	2,640.34
1962	6,075.18	6,258.97	1,239.52	12,177.95	939.92	12,513.94	2,552.00	2,709.71
1963	4,641.04	4,918.34	1,925.35	10,243.20	1,984.00	10,542.00	1,806.24	1,833.70
1964	3,400.38	3,477.91	577.20	8,267.20	799.57	8,599.20	1,058.98	1,694.79
All Years Comb.			-1,240.62	12,746.00	-1,703.97	13,046.00	2,412.39	2,548.05
10-Year Ave.	4,360.04	4,479.76	446.83	9,553.78	-65.85	9,807.01	2,128.63	2,258.27

Farmers in Traill County can decrease the variability of their income with the use of Federal Crop Insurance.

The farmers' level of income in Traill County over the 10-year period will be statistically the same and there is very little difference in the stability of income with or without Federal Crop Insurance. However, it would not make any difference if a farmer took out Federal Crop Insurance or not; over the 10-year period he would end up with the same income. The net income is stabilized to a small degree with Federal Crop Insurance from year to year.

Conclusions

The results of the statistical techniques for all-risk areas used in this study indicate that Federal Crop Insurance did not increase average net farm income over a 10-year period. However, Federal Crop Insurance did appear to reduce the chances of very low incomes in bad years, which may be very important for farm firm survival. In poor crop years Federal Crop Insurance does increase net farm income, but in average or better crop years it appears that the insurance lowers incomes by the cost of the premium.

The results of the study indicate that Federal Crop Insurance can be very important in aiding farm firm survival by reducing the probability of low net farm income in good crop years as well as in poor crop years. In a business with high capital requirements, such as farming, it may be very important for the farm firm to attempt to guarantee itself with an income that will enable it to maintain its capital position.

Such a strategy is particularly important in the short run for beginning operators. If a farm firm cannot survive in the short run, it cannot achieve its long-run objectives. Federal all-risk crop insurance appears to be a good device for assuring short-run farm firm survival.

If the farm firm is in a position to survive in the short run by means other than insurance, then Federal Crop Insurance may not be desirable. The study has shown that Federal Crop Insurance does not increase net farm income over time. In fact, it lowers net farm income, as the insurance is an added cost to the business.