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# CC339 Multiple Peril Crop Insurance

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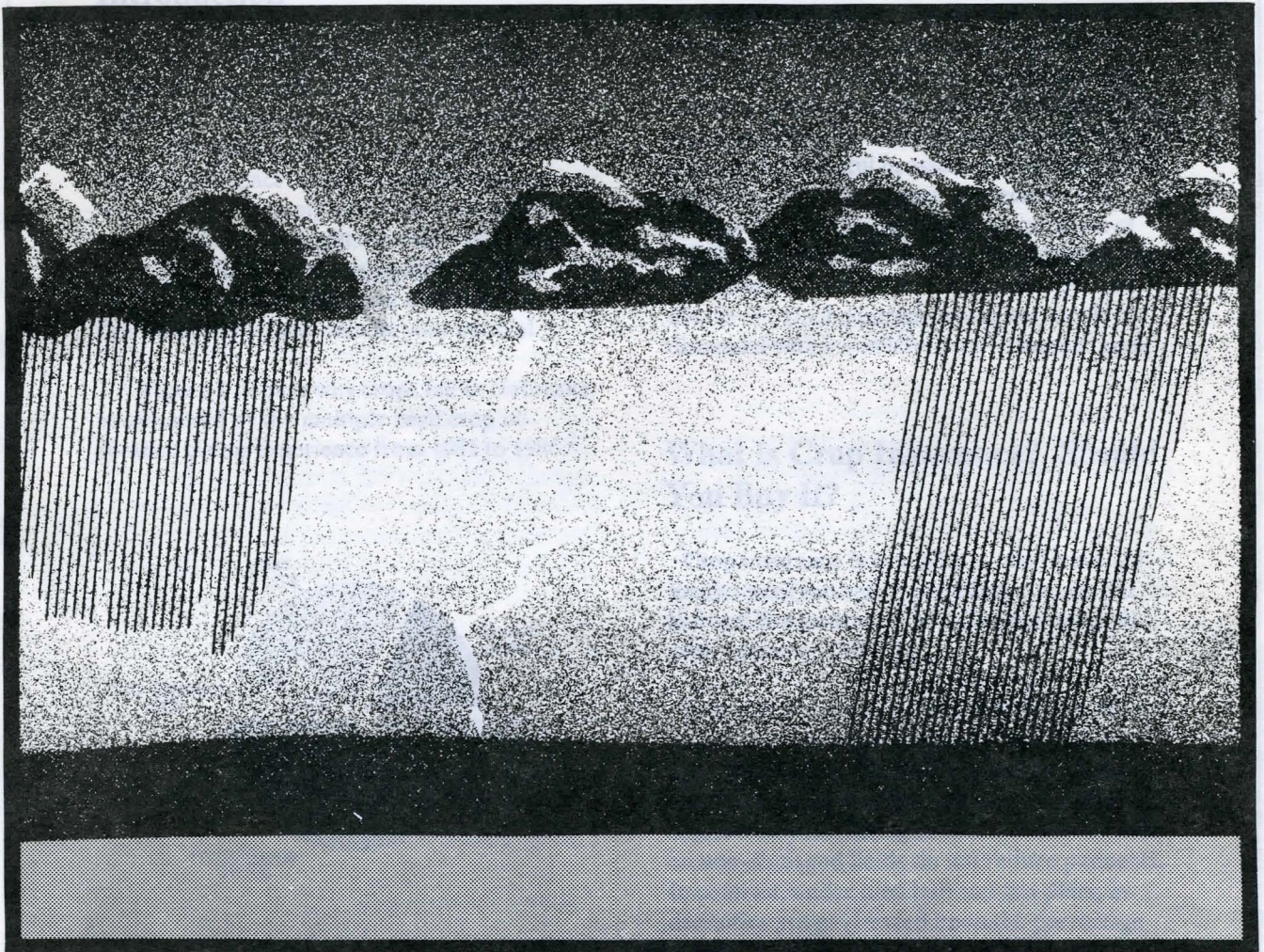
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# MULTIPLE PERIL CROP INSURANCE



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# MULTIPLE PERIL CROP INSURANCE:

## WHAT IS IT?

## SHOULD YOU BUY IT?

Doug Jose<sup>1</sup>

### Introduction

Do you remember the year you experienced severe drought or the hail storms that have hit your farm? Adverse events like this reduce your crop yields and/or quality, and can have a significant impact on your cash flow and net worth. Unfortunately, there are many adverse events including drought, excessive temperatures at pollination, excess moisture, flood, wind, frost, hail, disease, pest outbreaks, and fire which are largely outside your control.

Figure 1 depicts why crops fail in Nebraska, as measured by the multiple peril crop insurance claims experience from 1981 to 1986.<sup>2</sup>

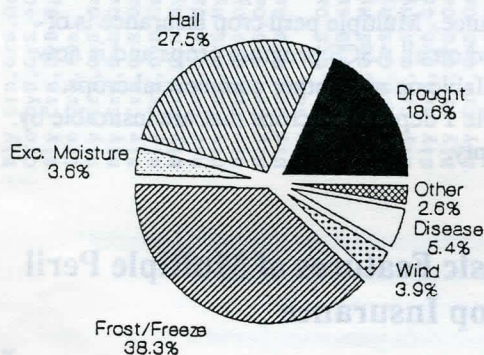


Figure 1. Why Wheat Crops Fail in Nebraska

Fortunately, there are strategies that you as a manager can use to reduce the impact of these adverse events. Examples of risk-reducing strategies might include diversification or growing more than one crop (don't put all your eggs in one basket); use of land tenure arrangements in which you share your risk with others, such as share rental arrangements; use of drought and disease resistant varieties and scheduling varieties to reduce risk; use of aggressive weed and pest control measures; and purchase of multiple peril and/or hail and fire crop insurance.

The purposes of this fact sheet are: (1) to describe the basic features of multiple peril crop insurance (MPCI), with emphasis on its role as a tool for reducing your financial risk; and (2) to describe a budgeting procedure that you may find useful in assessing whether you should buy crop insurance protection. Our focus will be on the impact of the purchase of MPCI on your farm's net cash flow and balance sheet should an adverse event arise. Specific details of MPCI contract provisions should be discussed with a qualified crop insurance agent.

## What is Crop Insurance? Should You Buy It?

Crop insurance is available in two forms: (1) limited peril insurance, including commercial hail and fire insurance; and (2) multiple peril crop insurance (MPCI).

Hail and fire crop insurance (H/FCI) is offered under two types of plans--spot and area. Spot (acre-by-acre) plans pay you for losses based on the percentage loss occurring due to hail/fire on your damaged acres. Normal yields on non-damaged fields do not reduce payments. In contrast, under area hail and fire plans, indemnities are paid based upon the percentage of yield loss due to hail/fire averaged across your insured unit.

MPCI guarantees a minimum average yield per acre for the insured crop for the insured unit, with the minimum determined by the deductible you choose. If your average yield (adjusted for quality) for the insured unit falls below the level specified in your insurance policy, the insurance company agrees to pay you the difference. The guarantees are based on commonly accepted standards for good quality grain. To calculate an actual yield for insurance purposes harvested yields are adjusted for quality factors such as grade, kernel quality and moisture level.

Crop insurance may be attractive to you because:

1. It represents an opportunity to substitute a known cost (annual premiums) for unpredictable and irregular yield losses, particularly catastrophic losses. You can transfer a portion of your yield risk.
2. It stabilizes your farm's cash flow, thereby making you a lower risk borrower. This may improve access to and terms for borrowed money.
3. It may provide the financial liquidity needed to remain in farming for another year in the event of a significant crop yield loss.
4. It may increase the attractiveness of cash forward contracts and hedging using futures since your risk of not being able to perform in accordance with the contract is reduced.

Major factors which influence your MPCl purchase decision include:

1. Your family's financial capacity to withstand a significant crop yield loss; that is, your family's capacity to self-insure.
2. Your family's willingness to take risk; that is, your family's attitude toward the trade off between greater profit vs. lower risk.
3. The probability that the yield will fall below your insured coverage.

4. The expected benefits of the insurance due to risk reduction versus the annual premium cost.

The purchase of multiple peril crop insurance may simultaneously increase your long-run average net profit per year as well as reducing your downside risk. If the purchase of multiple peril crop insurance significantly reduces your probability of bankruptcy over the next decade, your long-run average net profit per year (and, net worth accumulation) can increase with the purchase of MPCl.

## Development of the Multiple Peril Crop Insurance Program

The federal government (USDA), and to a limited extent, the private industry have sponsored some form of multiple peril crop insurance since 1938. However, until recently MPCl was available for only a few crops in a limited number of counties. The goal of the Crop Insurance Act of 1980 was to make crop insurance available to growers of major crops as a replacement for the USDA's low-yield disaster program. The Farm Bill of 1985 takes that goal a step further. Beginning with crops harvested in 1987, if MPCl is available in your county you will not be eligible for emergency low-interest loans unless you purchase crop insurance. Multiple peril crop insurance is offered on all ASCS program crops and is now available on most other commercial crops. Table 1 depicts the crops that are insurable by county.

## Basic Features of Multiple Peril Crop Insurance

### How Is It Marketed?

Crop insurance is marketed by local crop insurance agents who, in most cases, sell crop insurance along with other lines of insurance.

## CROP INSURANCE PROGRAMS IN NEBRASKA COUNTIES BEGINNING IN 1987

CODE	COUNTY	WINTER CROPS	SPRING CROPS	CODE	COUNTY	WINTER CROPS	SPRING CROPS
001	Adams	Wht	Crn, GrS, HyS, Oat, Pop, Soy	099	Kearney	Wht	Crn, GrS, HyS, *Oat, Pop, Soy
003	Antelope	Rye, Wht	Bly, Crn, GrS, Oat, Pop, Soy	101	Keith	Wht	Bly, Crn, DyB, GrS, Oat, Soy, SuB
005	Arthur		Crn, DyB, GrS, *Oat	103	Keya Paha	Wht	Bly, Crn, GrS, Oat
007	Banner	Wht	Bly, Crn, DyB, GrS, Oat, Pot, SuB	105	Kimball	Wht	Bly, Crn, DyB, GrS, Oat, Pot
009	Blaine	Wht	Crn, GrS, *Oat	107	Knox	Wht	Bly, Crn, GrS, Oat, Soy
011	Boone	Wht	Bly, Crn, GrS, Oat, Pop, Soy	109	Lancaster	Wht	Bly, Crn, GrS, HyS, Oat, Pop, Soy
013	Box Butte	Wht	Bly, Crn, DyB, GrS, Oat, Pot, SuB	111	Lincoln	Wht	Bly, Crn, DyB, GrS, Oat, Pop, Soy
015	Boyd	Wht	Bly, Crn, GrS, Oat, Soy	113	Logan	Wht	Bly, Crn, DyB, GrS, *Oat
017	Brown	Wht	Bly, Crn, DyB, GrS, Oat, Pop, Soy	115	Loup	Wht	Crn, GrS, Oat, Pop, Soy
019	Buffalo	Wht	Bly, Crn, GrS, HyS, Oat, Pop, Soy	117	McPherson	Wht	Crn, DyB, GrS, *Oat
021	Burt	Wht	Bly, Crn, GrS, HyS, Oat, Soy	119	Madison	Wht	Bly, Crn, GrS, HyS, Oat, Pop, Soy
023	Butler	Wht	Bly, Crn, GrS, HyS, Oat, Pop, Soy	121	Merrick	Wht	Bly, Crn, GrS, HyS, Oat, Pop, Soy
025	Cass	Wht	Bly, Crn, GrS, Oat, Soy	123	Morrill	Wht	Bly, Crn, DyB, GrS, *Oat, Pot, SuB
027	Cedar	Wht	Bly, Crn, GrS, Oat, Soy	125	Nance	Wht	Bly, Crn, GrS, HyS, Oat, Pop, Soy
029	Chase	Wht	Bly, Crn, DyB, GrS, *Oat, Pot, Pop, Soy, SuB	127	Nemaha	Wht	Crn, GrS, HyS, Oat, Soy
031	Cherry	Wht	Bly, Crn, GrS, Oat	129	Nuckolls	Wht	Bly, Crn, GrS, HyS, Oat, Soy
033	Cheyenne	Wht	Bly, Crn, DyB, GrS, Oat, SuB	131	Otoe	Wht	*Bly, Crn, GrS, Oat, Soy
035	Clay	Wht	Bly, Crn, GrS, HyS, Oat, Pop, Soy	133	Pawnee	Wht	Bly, Crn, GrS, Oat, Soy
037	Colfax	Wht	Bly, Crn, GrS, HyS, Oat, Soy	135	Perkins	Wht	Bly, Crn, DyB, GrS, *Oat, Pot, Soy, SuB
039	Cuming	Wht	Bly, Crn, GrS, HyS, Oat, Soy	137	Phelps	Wht	*Bly, Crn, GrS, HyS, *Oat, Soy
041	Custer	Wht	Bly, Crn, DyB, GrS, Oat, Soy	139	Pierce	Wht	Bly, Crn, GrS, HyS, Oat, Pop, Soy
043	Dakota	Wht	Bly, Crn, GrS, Oat, Pop, Soy	141	Platte	Wht	Bly, Crn, GrS, Oat, Soy
045	Dawes	Wht	Bly, Crn, GrS, Oat	143	Polk	Wht	*Bly, Crn, GrS, Oat, Soy
047	Dawson	Wht	Bly, Crn, GrS, HyS, Pop, *Oat, Soy	145	Red Willow	Wht	Bly, Crn, DyB, GrS, *Oat, Soy
049	Deuel	Wht	Bly, Crn, DyB, GrS, Oat, SuB	147	Richardson	Wht	Bly, Crn, GrS, Oat, Soy
051	Dixon	Wht	Bly, Crn, GrS, Oat, Soy	149	Rock	Wht	Bly, Crn, DyB, GrS, *Oat, Pop, Soy
053	Dodge	Wht	Bly, Crn, GrS, HyS, Oat, Soy	151	Saline	Wht	Bly, Crn, GrS, HyS, Oat, Soy
055	Douglas	Wht	Bly, Crn, GrS, HyS, Oat, Soy	153	Sarpy	Wht	Bly, Crn, GrS, Oat, Soy
057	Dundy	Wht	Bly, Crn, DyB, GrS, *Oat, Soy	155	Saunders	Wht	Bly, Crn, GrS, HyS, Oat, Pop, Soy
059	Fillmore	Wht	Crn, GrS, HyS, Oat, Soy	157	Scott Bluff	Wht	Bly, Crn, DyB, GrS, *Oat, Pot, SuB
061	Franklin	Wht	Bly, Crn, GrS, Oat, Soy	159	Seward	Wht	Bly, Crn, GrS, HyS, Oat, Soy
063	Frontier	Wht	Bly, Crn, GrS, Oat, Soy	161	Sheridan	Rye, Wht	Bly, Crn, DyB, GrS, Oat
065	Furnas	Wht	*Bly, Crn, GrS, *Oat, Soy	163	Sherman	Wht	Bly, Crn, GrS, Oat, Soy
067	Gage	Wht	Bly, Crn, GrS, Oat, Soy	165	Sioux	Wht	Bly, Crn, DyB, GrS, Oat, SuB
069	Garden	Wht	Bly, Crn, DyB, GrS, *Oat	167	Stanton	Wht	Bly, Crn, GrS, HyS, Oat, Soy
071	Garfield	Wht	Bly, Crn, GrS, *Oat, Soy	169	Thayer	Wht	Crn, GrS, HyS, Oat, Pop, Soy
073	Gosper	Wht	*Bly, Crn, GrS, *Oat, Soy	171	Thomas		Crn, GrS, *Oat
075	Grant		Crn	173	Thurston	Wht	Bly, Crn, GrS, Oat, Soy
077	Greeley	Wht	Bly, Crn, GrS, Oat, Pop, Soy	175	Valley	Wht	Bly, Crn, GrS, Oat, Pop, Soy
079	Hall	Wht	Crn, GrS, HyS, *Oat, Pop, Soy	177	Washington	Wht	Bly, Crn, GrS, Oat, Soy
081	Hamilton	Wht	Crn, GrS, HyS, Oat, Soy	179	Wayne	Wht	Bly, Crn, GrS, Oat, Soy
083	Harlan	Wht	Bly, Crn, GrS, *Oat, Soy	181	Webster	Wht	Bly, Crn, GrS, Oat, Soy
085	Hayes	Wht	Bly, Crn, DyB, GrS, *Oat, Soy	183	Wheeler	Wht	Crn, GrS, Oat, Pop, Soy
087	Hitchcock	Wht	Bly, Crn, DyB, GrS, *Oat, Soy	185	York	Wht	Bly, Crn, GrS, Oat, Soy
089	Holt	Wht	Bly, Crn, GrS, HyS, Oat, Pop, Soy				
091	Hooker		Crn				
093	Howard	Wht	Bly, Crn, GrS, HyS, Oat, Pop, Soy				
095	Jefferson	Wht	Bly, Crn, GrS, Oat, Soy				
097	Johnson	Wht	Bly, Crn, GrS, HyS, Oat, Soy				

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## KEY TO CROP ABBREVIATIONS:

Bly/Barley, DyB/Dry Beans, GrS/Grain Sorghum, HyS/Hybrid Seed, Oat/Oats, Pop/Popcorn, Pot/Potatoes, Rye/Rye, Soy/Soybeans, SuB/Sugar Beets, Wht/Wheat.

\*No rate published, consult your crop insurance agent.

TABLE 1.

MULTIPLE PERIL CROP INSURANCE

Nebraska

The objective of these agents is to provide a full range of insurance protection from crop insurance to farm/home owners' policies to meet farmers' risk management needs.

If the farmer's yield risks are general, the agent would likely recommend the multiple peril coverage which provides protection on most crops against practically all unavoidable causes of loss. If the primary risk is hail/fire damage, then the agent would likely recommend commercial hail/fire crop insurance (H/FCI). It is also becoming common to develop a blend of multiple peril and commercial hail and fire protection into a comprehensive package to both reduce the deductible that is required in MPCFI and expand the range of peril of H/FCI.

H/FCI can provide acre by acre coverage for a given crop with protection up to the "Actual Cash Value" of the crop (e.g., 35 bu. x \$2.50 = \$87.50 Actual Cash Value). This protection can usually be purchased anytime during the growing season with a 24-48 hour delay of insurance going into effect.

#### What Causes of Yield Losses are Covered?

MPCFI on most crops covers unavoidable production losses caused by:

1. Drought
2. Excessive moisture
3. Hail
4. Wind
5. Frost/freeze
6. Tornado
7. Lightning
8. Flood
9. Insect infestation
10. Plant disease
11. Excessive temperature during pollination
12. Wildlife damage
13. Fire
14. Earthquake

MPCFI does not cover losses resulting from:

1. Poor farming practices
2. Low commodity prices (e.g., crop was not

harvested because it was not worth harvesting)

#### 3. Theft

4. Specified perils which are excluded in a limited number of policies.

There are specific restrictions on some crops based upon acceptable farming practices. For example, in most instances potatoes cannot be insured if potatoes were grown in the previous two years. There are restrictions on planting dates for many crops. However, in many instances, reduced coverage can be obtained for the base premium if late planting occurs. See a qualified crop insurance agent for details.

#### How Much Coverage Can be Purchased?

There are two decisions that determine the amount of coverage: (1) the level of coverage (i.e., the amount of deductible); and, (2) the price at which yield losses are converted to cash.

Your insurance yield is based on your actual production history (APH) which is an estimate of your 10-year average yield on the insurance unit. APH provides coverage based upon your proven performance record, not county averages.

**Level of Coverage.** You have the option of insuring at one of three coverage levels:

1. 75% of your insurance yield (i.e., 25% deductible)
2. 65% of your insurance yield (i.e., 35% deductible)
3. 50% of your insurance yield (i.e., 50% deductible)

MPCFI payments are made if yields fall below your insurance guarantee.

**Your yield guarantee per acre is equal to:**

*Insurance yield x coverage purchased (i.e., 50%, 65%, or 75%)*

For example, if your insurance yield is 35 bushels of wheat per planted acre and you purchase 65% coverage (35% deductible), your yield guarantee would be:

$$35 \text{ bu./acre} \times 0.65 = 22.8 \text{ bu./planted acre.}$$

#### Commodity Indemnity Price Elections.

You must select a commodity indemnity price from the **three elections available**. This sets the price at which losses will be paid. For example, the 1988 low, medium, and high price elections for wheat are \$2.00, \$2.25 and \$2.60, respectively.

#### How are Indemnity Payments Calculated?

If your average yield (adjusted for quality) is greater than your yield guarantee, no indemnity is paid. If your average yield per acre is less than your yield guarantee, the indemnity paid is equal to:

$$(\text{Yield guarantee} - \text{average yield for insured unit}) \times \text{indemnity price.}$$

For example, using our previous case example, if your yield was 10 bu./planted acre your indemnity payment would be:

$$(22.8 \text{ bu./acre yield guarantee} - 10.0 \text{ bu./acre realized yield}) \times \$2.60/\text{bu. indemnity price} = \$33.28/\text{planted acre.}$$

Indemnity payments are taxable income.

#### What Does Multiple Peril Crop Insurance Cost?

Premium rates are based on your historical yields and the loss history for the county in which you farm. The premium rate, as a percent of the dollar value of protection, varies with your 10 year average yield level. Table 2, for example depicts the premium rate structure for wheat for Banner County in the Nebraska Panhandle.

You have the option of buying MPCl with or

without hail and fire coverage. However if you choose to opt out of the hail and fire insurance component of MPCl, an equivalent dollar amount of hail and fire coverage must be purchased as a separate hail and fire policy.

Premiums are generally due around the normal harvest period and if not paid within 30 days of billing, interest may be charged for late payment. Premium payments are a tax deductible expense.

To encourage broader participation, Congress authorized a **30 percent subsidy** for premiums at the 50 percent and 65 percent coverage levels which is included in the quoted rates. However, if you choose 75 percent coverage, you must pay the full additional premium cost over the 65 percent level which decreases the effective subsidy rate. You also benefit from the federal government paying all of the administrative costs to operate the program. These two subsidies reduce your premium cost by about 50%.

Your premium/acre is calculated as follows:

$$\text{Yield guarantee} \times \text{indemnity price selected} \times \text{premium rate.}$$

For example, if we use our case example yield guarantee of 22.8 bu./acre, an indemnity price of \$2.60/bu., and a premium rate of 5.2% the premium is:

$$22.8 \text{ bu./acre} \times \$2.60/\text{bu.} \times 0.052 = \$3.08/\text{acre}$$

The 5.2% premium rate is based upon 65% coverage. The rate is circled in Table 2.

#### Do I Have To Insure All of My Crop?

If you purchase MPCl for a particular crop, all of that crop you are raising in the same county must be insured. It is not possible to just insure the portion of a crop that is most susceptible to loss. However, each crop is insured separately, so you may insure one crop without having to insure a second crop produced in the same county. A qualified crop

Table 2 MULTIPLE PERIL CROP INSURANCE COUNTY COVERAGE AND RATE TABLE

State: Nebraska	County: Banner	
Crop: Wheat	Practice: Summerfallow	
Approved Insurance	Subsidized Premium Rates	
Yield (Bu.)	With Hail and Fire Protection (%)	
	Without Hail and Fire Protection(%)	
	COVERAGE LEVEL 1 (50%)	
14 & Below	12.7	8.9
15 - 18	10.6	7.4
19 - 22	7.8	5.5
23 - 26	6.2	4.3
27 - 30	5.0	3.5
31 - 34	4.3	3.0
35 - 38	3.8	2.7
39 - 42	3.4	2.4
43 & Above	3.2	2.2
	COVERAGE LEVEL 2 (65%)	
14 & Below	17.6	12.6
15 - 18	14.6	10.2
19 - 22	10.9	7.6
23 - 26	8.5	6.0
27 - 30	7.0	4.9
31 - 34	6.0	4.1
35 - 38	5.2	3.6
39 - 42	4.6	3.2
43 & Above	4.3	3.0
	COVERAGE LEVEL 3 (75%)	
14 & Below	32.2	26.2
15 - 18	26.8	20.8
19 - 22	19.8	13.9
23 - 26	15.5	10.9
27 - 30	12.8	9.0
31 - 34	10.9	7.6
35 - 38	9.5	6.6
39 - 42	8.5	5.9
43 & Above	8.0	5.6

Note: The premium per acre is calculated as follows:

Insurance yield x coverage level x indemnity price selected x premium rate.

insurance agent can define the insurable units for the land you farm.

Claims are paid by farm unit. A single farm (located in one county) represents one unit. If you crop-share rent a second farm, the rented acreage constitutes a second unit. Providing proper records are maintained, you may qualify for more than one unit if your land is located in separate sections.

#### When Must MPCl Be Purchased?

MPCI must be purchased by the date specified as the end of the sales period. In Nebraska the closing date for winter crops is September 30 and for spring crops it is April 15.

## Analysis of the MPCl Purchase Decision

To help you analyze whether to purchase MPCl, two worksheets have been developed. The first worksheet helps you identify and quantify your downside yield risks. The second worksheet helps you project your net cash flow with and without MPCl coverage for alternative yields, including a typical year scenario and a low yield year scenario. It also permits examination of alternative coverage (deductible) levels.

#### Analyzing Historical Yields

Consideration of historical yields and the assessment of the downside risks help you determine the risks you face and the alternative yields you might consider in the cash flow analysis. All factors or risks which have the

potential of reducing yields need to be considered. Even though the prospect of a flood may not be very significant, for example, it may wash out the total crop on a portion of your farm when it happens.

To make our discussion more concrete, we will use a case farm example. The crop under consideration is wheat, and the farmer's ASCS program acreage is 900 acres.

The farmer's wheat yields per planted acre for the last seven years are as follows:

Year	Yield bu./acre
1986	37
1985	34
1984	44
1983	31
1982	40
1981	28
1980	15

A good indicator of your long-run average yield can be obtained by calculating an "olympic" average. If you have 7 to 12 years of yield data, throw out the lowest and highest yields, and calculate the average for the rest. For this farm, the lowest yield was 15 bushels per acre in 1980, a year of serious drought, and the highest yield was 44 bushels per acre in 1984.

When the high and low values are thrown out, the yields remaining average 34 bushels per acre.

The farmer has given considerable thought to the probability of alternative yield levels, based on his own experience and that of his neighbors. Figure 2 depicts his 1988 estimates for wheat using a bar graph of probabilities. The heights of the bars for each yield range indicate **the relative likelihood of that yield occurring**. For example, the most likely yield range is 35 to 40 bushels per acre.

An additional way to look at this information is to consider the chances of a yield below some specified level. This is the concept of cumulative probabilities. For example, the probability of a yield below 20 bushels per acre is 10% as indicated by the line labeled CP (for cumulative probability). This approach helps identify the chances of a yield less than some critical level such as the yield required to meet cash flow obligations.

You can also use this approach to determine the chances of a yield less than the guarantee such as the 22.8 bu. in the above example. The farmer's estimate, based upon Figure 2, is 14%.

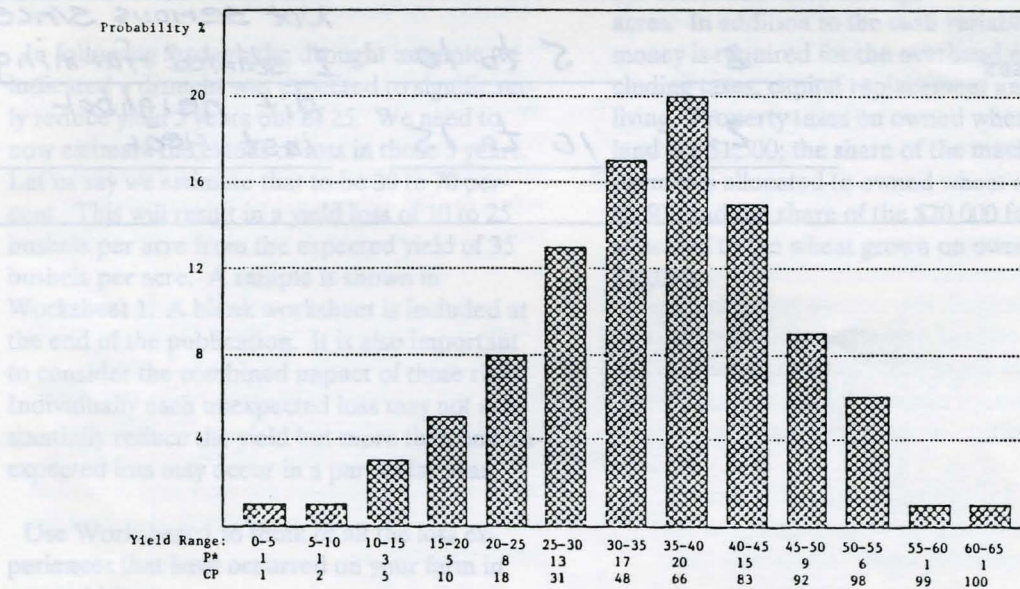


Fig. 2 Yield Probabilities for Wheat to be Harvested in 1988 (bu./acre)

\* P = probability of each yield range

# WORKSHEET 1

## EVALUATION OF SOURCES OF RISKS

Crop: Wheat

Source	Chance of Loss No. of Years Out of 25	Extent of Loss Use Index of 0-100 To Specify Range	Comments (e.g., Type of Loss; Experiences You or Your Neighbor Have Had)
1. Drought	<u>5</u>	<u>30 to 70</u>	<u>North 1/4 more susceptible</u>
2. Excess moisture	<u>3</u>	<u>10 to 20</u>	
3. High temp. at poll.			
4. Flood			
5. Wind	<u>4</u>	<u>10 to 15</u>	
6. Hail	<u>10</u>	<u>10 to 70</u>	<u>Some almost every year on home place</u>
7. Frost	<u>8</u>	<u>10 to 25</u>	
8. Insect	<u>3</u>	<u>5 to 10</u>	<u>Grasshoppers in '85</u>
9. Diseases	<u>2</u>	<u>5 to 10</u>	<u>Not serious since I started farming</u>
10. Fire	<u>2</u>	<u>10 to 15</u>	<u>Hit neighbor last year</u>

An important managerial goal is to achieve the **financial liquidity** needed to stay in business. Knowing the chances of the yield being less than that needed to generate this level of liquidity, provides the basis for assessing the family's capacity to bear yield risks.

### Downside Yield Risk

Historical yields help identify the range in possible yields and the average yield you might expect. Worksheet 1 can be used to help further evaluate the potential downside risks. It is designed to help identify and evaluate factors which result in yield losses.

We begin by assessing the chance in terms of the number of years out of 25 that a loss will occur due to each source of risk. For example, you might think drought will reduce expected yield 5 years out of 25. Next, we assess the potential severity of the loss. Specifically, what is the extent of loss in the event it occurs? We suggest you use an index of 0 to 100 or a percentage to rate the potential loss where 100 would indicate a complete loss. It would also be helpful to use a range of expectations rather than a single number to estimate your perception of the risks you face. This assessment can be used to compare your risks to the deductible levels in MPCl.

In following through the drought example we indicated a drought was expected to significantly reduce yield 5 years out of 25. We need to now estimate the extent of loss in those 5 years. Let us say we estimate that to be 30 to 70 percent. This will result in a yield loss of 10 to 25 bushels per acre from the expected yield of 35 bushels per acre. A sample is shown in Worksheet 1. A blank worksheet is included at the end of the publication. It is also important to consider the combined impact of these risks. Individually each unexpected loss may not substantially reduce the yield but more than one unexpected loss may occur in a particular year.

Use Worksheet 1 to think of all the loss experiences that have occurred on your farm in recent history.

The consideration of historical yields and the assessment of the downside risks helps you determine the risks you face and the alternative yields you might consider in the cash flow analysis.

### Cash Flow Projection

The case farm includes 1800 acres, 1160 of which is owned and 640 is rented. It is cropped on a wheat - fallow rotation. It is also has a cow-calf enterprise.

The farmer plans to participate in the USDA's wheat program. Assume, for discussion purposes, that participation is at the 27.5% level. Thus, he anticipates planting 652.5 of the 900 acres to wheat with 247.5 acres being set-aside in the Acreage Conservation Reserve (ACR). There will be 159.5 acres of set aside and 580 acres of fallow.

He projects his pre-harvest cash expenses at \$32.62/acre and harvest cash expenses at \$.24 per bu. for normal yields and \$.35 bu. for low yields<sup>3</sup>. The expenses for fallow and set aside acres are projected at \$5 per acre.

The farmer is considering the purchase of MPCl on his owned acreage. That's 420.5 acres. In addition to the cash variable expenses, money is required for the overhead expenses including taxes, capital replacement and family living. Property taxes on owned wheat acreage land are \$1,500; the share of the machinery loan payments allocated to owned wheat acreage is \$8,500 and the share of the \$20,000 family living allocated to the wheat grown on owned land is \$10,000.

From a cash flow view, the requirements, exclusive of debt service on land, are:

Cash Variable Expenses on 420.5 owned wheat acrs.

Wheat production expense on owned cropland @ 32.62/acre	\$13,717
Wheat drying & hauling expense 14,717 bu @ \$.24/bu	3,532
Set aside and fallow @ 5/acre	<u>3,698</u>
Total	\$20,947

Overhead and Fixed Expenses

Property taxes	\$1,500
Machinery debt payment	8,500
Family living (labor)	10,000
Other fixed cash requirements	<u>5,000</u>
Total	\$25,000

**TOTAL CASH REQUIRED**  
(excluding debt service on land) \$45,947

Revenues are provided by sales and government payments. For budgeting purposes, a harvest equivalent sale price of loan of \$1.93 is used. That is \$2.20/bu. loan price less \$.27/bu. for storage. Total sales on 420.5 acres of wheat are projected at \$28,405. Deficiency payments are estimated at \$2.10/bu., and are based on a program base yield of 32 bu./acre. That is a revenue of \$67.20/acre, or \$28,258. This analysis is for the owned land portion of the operation only. Any cash surplus from the rented land portion could be used to help debt on owned land.

Estimated revenue totals \$56,663. Given cash variable expenses and overhead cash flow commitment of \$45,947, the dollars remaining for debt service on land and other machinery replacement net out at \$10,716--for typical yields. That's \$25.48/acre planted. This analysis is for the owned portion of the operation only.

Worksheet 2 provides an organizational framework and step-by-step calculations for cash flow projections under alternative yield

scenarios. The objective of the cash flow projection is to **evaluate the economic consequences of the downside risk protection provided by MPCI**, and to help you evaluate whether you have **adequate cash and credit reserves** to meet a cash flow shortfall--should it occur.

The example depicted in Worksheet 2 assumes 65% coverage and a \$2.60/bu. indemnity price. The 65% coverage was chosen because it provides significant downside protection, with a yield guarantee of 22.8 bu./acre. The \$2.60 indemnity price was chosen because it's in the range of the projected net sale price received including deficiency payment. Line 11 includes the cash expenses for the cropped acres and the cash expenses for the fallow and set aside acres allocated on a per acre basis to the production acres.

The worksheet shows the net cash flow for the typical year without insurance of \$25.48/acre, the same figure calculated above. In the disaster year the net cash flow is -\$17.81/acre. A blank worksheet is provided at the end of this publication.

## Comparison of Coverage Levels

Usually, the next step in the budgeting process is to evaluate the performance of alternative coverage levels, particularly in the shortfalls--should they occur. Which coverage level should you purchase? We begin by calculating the premiums per acre, as depicted in Figure 3. As noted earlier, the premium per acre goes up much more rapidly between 65% and 75% versus 50% and 65% coverage.

Next, the downside risk "protection" provided by MPCI is evaluated. Figures 4, 5, and 6 depict the impacts of the 50%, 65%, and 75% coverage levels respectively, on the downside risk protection provided, and the trade-off between annual premiums per acre and downside protection. The \$2.60 price election is used for these comparisons.

WORKSHEET 2

ANALYSIS OF PER ACRE NET CASH FLOW

Crop: wheat  
 Situation: Nebraska Panhandle  
Case Farm

	Typical Year		Disaster Year	
	With Insurance	Without Insurance	With Insurance	Without Insurance
Projected Crop Sales and Other Cash Inflows:				
1. Enter yield/planted acre	35	35	10	10
2. Enter expected market price of crop at harvest time	\$ 1.93	\$ 1.93	\$ 1.93	\$ 1.93
3. Expected sales: Line 1 x Line 2	\$ 67.55	\$ 67.55	\$ 19.30	\$ 19.30
4. Enter other receipts (deficiency pmt., straw, etc.)	\$ 67.20	\$ 67.20	\$ 67.20	\$ 67.20
5. Total receipts: Line 3 + Line 4	\$ 134.75	\$ 134.75	\$ 86.50	\$ 86.50
MPCI Premium				
6. Enter insurance yield	35	XXX	35	XXX
7. Enter level of coverage (0.50, 0.65 or 0.75)	.65	XXX	.65	XXX
8. Enter premium rate for the desired level of coverage	5.2%	XXX	5.2%	XXX
9. Enter crop price election	\$ 2.60	\$ XXX	\$ 2.60	\$ XXX
10. Insurance premium: Line 6 x Line 7 x Line 8 x Line 9	\$ 3.08	\$ XXX	\$ 3.08	\$ XXX
Projected Crop Cash Requirements				
11. Enter preharvest cash operating expense (32.62 + 8.74)	\$ 41.36	\$ 41.36	\$ 41.36	\$ 41.36
12. Enter harvest cash expense for yield on line 1	\$ 8.46	\$ 8.46	\$ 3.50	\$ 3.50
13. Enter debt service, family living, and other fixed cash requirements (except land)	\$ 59.45	\$ 59.45	\$ 59.45	\$ 59.45
14. Total cash requirements: Line 11 + Line 12 + Line 13	\$ 102.97	\$ 102.97	\$ 104.31	\$ 104.31
Projected MPCI Payment Received				
15. Enter Line 6 x Line 7	22.75	XXX	22.75	XXX
16. Enter Line 15 - Line 1 (enter a zero if answer is a negative number)	0	XXX	12.75	XXX
17. Insurance payment received: Line 16 x Line 9	0	XXX	33.15	XXX
NET CASH FLOW: Line 5 - Line 10 - Line 14 + Line 17	\$ 22.40	\$ 25.48	\$ 12.26	\$ -17.81

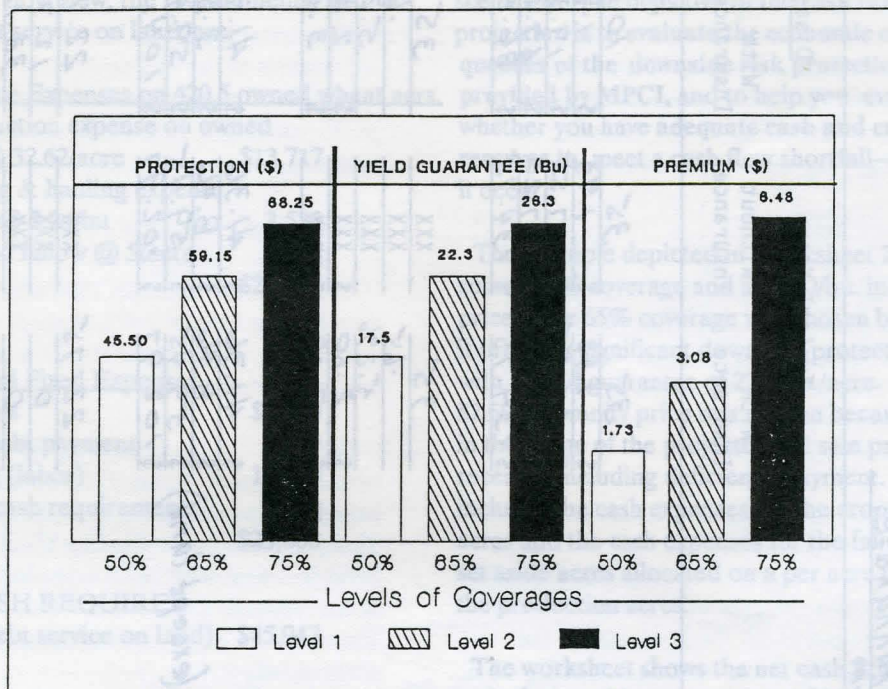


Fig 3. Protection, Guarantee, Premium/acre vs. Coverage

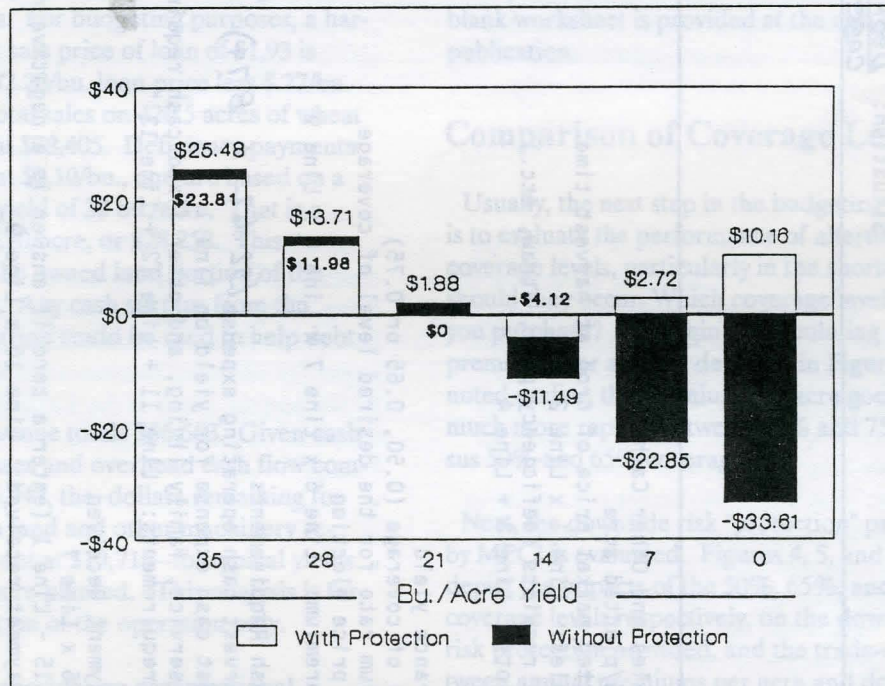


Fig 4. Net cash flow with and without MPCl protection for 50% coverage level

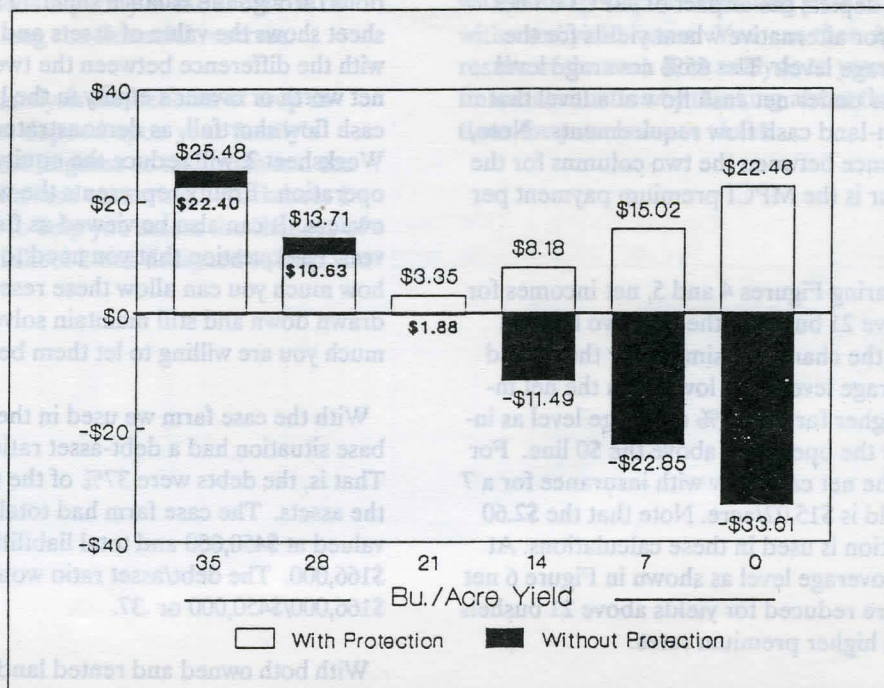


Fig 5. Net cash flow with and without MPC protection for 65% coverage level

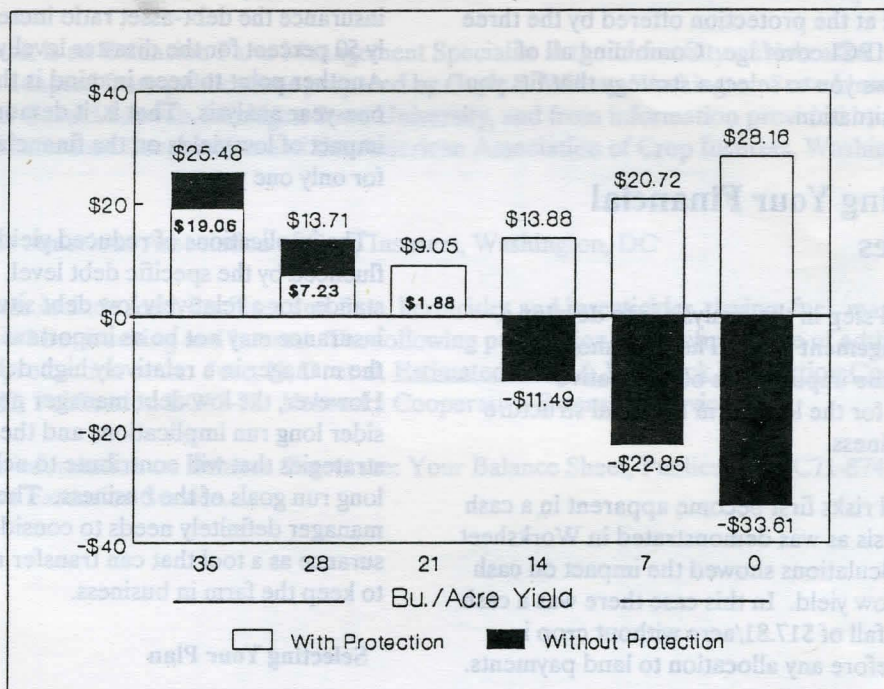


Fig 6. Net cash flow with and without MPC protection for 75% coverage level

Figure 5 depicts the impact of MPCl on net cash flow for alternative wheat yields for the 65% coverage level. The 65% coverage level puts a floor under net cash flow at a level that covers non-land cash flow requirements. Note, the difference between the two columns for the typical year is the MPCl premium payment per acre.

In comparing Figures 4 and 5, net incomes for yields above 21 bushels (the first two bars on the left of the chart) are similar for the 50 and 65% coverage levels. At low yields the net income is higher for the 65% coverage level as indicated by the open bars above the \$0 line. For example the net cash flow with insurance for a 7 bushel yield is \$15.02/acre. Note that the \$2.60 price election is used in these calculations. At the 75% coverage level as shown in Figure 6 net incomes are reduced for yields above 21 bushels due to the higher premium rates.

In previous sections we discussed yield risks and cash flow projections. You also made an assessment of your risk situation. In this section we looked at the protection offered by the three levels of MPCl coverage. Combining all of these allows you to select a strategy that fits you and your situation.

## Analyzing Your Financial Reserves

The final step in the analysis is to **develop a risk management plan**. The plan should be based on the implications of alternative strategies for the long term financial structure of the business.

Potential risks first become apparent in a cash flow analysis as was demonstrated in Worksheet 2. The calculations showed the impact on cash flow of a low yield. In this case there was a cash flow shortfall of \$17.81/acre without crop insurance before any allocation to land payments.

In reviewing risk management strategies, it is helpful to trace the impact of cash flow varia-

tions through the balance sheet. The balance sheet shows the value of assets and liabilities with the difference between the two being the net worth or owner's equity in the business<sup>4</sup>. A cash flow shortfall, as demonstrated in Worksheet 2, will reduce the equity in the operation. Equity represents the wealth of the owners. It can also be viewed as **financial reserves**. The question that you need to answer is how much you can allow these reserves to be drawn down and still maintain solvency or how much you are willing to let them be reduced.

With the case farm we used in the analysis, the base situation had a debt-asset ratio of 37%. That is, the debts were 37% of the total value of the assets. The case farm had total assets valued at \$450,000 and total liabilities of \$166,000. The debt/asset ratio would be  $\$166,000/\$450,000$  or .37.

With both owned and rented land included in the analysis, the percent debt was held at about 37% with crop insurance as the yield decreased below the expected 35 bu./acre. Without crop insurance the debt-asset ratio increased to nearly 50 percent for the disaster level yield. Another point to keep in mind is that this is a one-year analysis. That is, it demonstrates the impact of low yields on the financial reserves for only one year.

The implications of reduced yields are influenced by the specific debt level. For instance, for a relatively low debt situation, crop insurance may not be as important as it is for the manager in a relatively high debt situation. However, the low debt manager needs to consider long run implications and the risk strategies that will contribute to achieving the long run goals of the business. The high debt manager definitely needs to consider crop insurance as a tool that can transfer risk and help to keep the farm in business.

### Selecting Your Plan

The graphic presentations demonstrate the ability of crop insurance to help stabilize cash

flow and provide liquidity in the short run to preserve the long run financial reserves.

In the final analysis the benefits of crop insurance to you depend upon **your family's capacity and willingness** to take risks and the **probability of a loss occurring**. Worksheet 1 was designed to help you assess the chances of a loss and Worksheet 2 was designed to help you

with the first step in evaluating your capacity to withstand yield losses. You can then apply the results of the cash flow analysis to your specific financial situation by thinking about the **implications for your balance sheet**.

## Credits

<sup>1</sup>H. Doug Jose, is an Extension Farm Management Specialist at the University of Nebraska. This publication is adapted from publications prepared by Gayle S. Willett, Washington State University, J. Roy Black and Gerald Schwab, Michigan State University, and from information provided by the Federal Crop Insurance Corporation and the American Association of Crop Insurers, Washington, DC.

<sup>2</sup> Source: The American Association of Crop Insurers, Washington, DC

<sup>3</sup> Expenditures include seed, fertilizer and lime, herbicides and insecticides, drying, fuel, machinery repairs, custom hire, trucking and interest. The following publication is a useful source of additional information on production costs: Jose, H. D. et al, Estimated Crop & Livestock Production Costs, Nebraska, 1987, Publication EC87-72. Nebraska Cooperative Extension Service.

<sup>4</sup> For further information on Balance Sheets see: Your Balance Sheet, Publication EC71-874, Nebraska Cooperative Extension Service.

# WORKSHEET 1

## EVALUATION OF SOURCES OF RISKS

Crop: \_\_\_\_\_

Source	Chance of Loss No. of Years Out of 25	Extent of Loss Use Index of 0-100 To Specify Range	Comments (e.g., Type of Loss; Experiences You or Your Neighbor Have Had)
1. Drought	_____	_____	_____
2. Excess moisture	_____	_____	_____
3. High temp. at poll.	_____	_____	_____
4. Flood	_____	_____	_____
5. Wind	_____	_____	_____
6. Hail	_____	_____	_____
7. Frost	_____	_____	_____
8. Insect	_____	_____	_____
9. Diseases	_____	_____	_____
10. Fire	_____	_____	_____

# WORKSHEET 2

## ANALYSIS OF PER ACRE NET CASH FLOW

Crop: \_\_\_\_\_  
 Situation: \_\_\_\_\_

	Typical Year		Disaster Year	
	With Insurance	Without Insurance	With Insurance	Without Insurance
<b>Projected Crop Sales and Other Cash Inflows:</b>				
1. Enter yield/planted acre	_____	_____	_____	_____
2. Enter expected market price of crop at harvest time	\$ _____	\$ _____	\$ _____	\$ _____
3. Expected sales: Line 1 x Line 2	\$ _____	\$ _____	\$ _____	\$ _____
4. Enter other receipts (deficiency pmt., straw, etc.)	\$ _____	\$ _____	\$ _____	\$ _____
5. Total receipts: Line 3 + Line 4	\$ _____	\$ _____	\$ _____	\$ _____
<b>MPCI Premium</b>				
6. Enter insurance yield	_____	XXX	_____	XXX
7. Enter level of coverage (0.50, 0.65 or 0.75)	_____	XXX	_____	XXX
8. Enter premium rate for the desired level of coverage	_____	XXX	_____	XXX
9. Enter crop price election	\$ _____	\$ XXX	\$ _____	\$ XXX
10. Insurance premium: Line 6 x Line 7 x Line 8 x Line 9	\$ _____	\$ XXX	\$ _____	\$ XXX
<b>Projected Crop Cash Requirements</b>				
11. Enter preharvest cash operating expense	\$ _____	\$ _____	\$ _____	\$ _____
12. Enter harvest cash expense for yield on line 1	\$ _____	\$ _____	\$ _____	\$ _____
13. Enter debt service, family living, and other fixed cash requirements	\$ _____	\$ _____	\$ _____	\$ _____
14. Total cash requirements: Line 11 + Line 12 + Line 13	\$ _____	\$ _____	\$ _____	\$ _____
<b>Projected MPCI Payment Received</b>				
15. Enter Line 6 x Line 7	_____	XXX	_____	XXX
16. Enter Line 15 - Line 1 (enter a zero if answer is a negative number)	_____	XXX	_____	XXX
17. Insurance payment received: Line 16 x Line 9	_____	XXX	_____	XXX
<b>NET CASH FLOW: Line 5 - Line 10 - Line 14 + Line 17</b>	\$ _____	\$ _____	\$ _____	\$ _____

