Estimating The Costs Of MPCI

Under The 1994 Crop Insurance Reform Act

Chad Hart and Darnell Smith

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Center for Agricultural and Rural Development
Iowa State University
Ames IA 50011

Chad Hart is a graduate research assistant and Darnell Smith is the managing director of FAPRI.

ABSTRACT

This study estimates the government costs of federal crop insurance under the framework of the Crop Insurance Reform Act of 1994. The history of federal crop insurance is outlined to examine how MPCI has evolved. The 1994 Act addressed two of the major problems of MPCI: low participation and additional disaster assistance. Total government costs for the FCIC and MPCI are estimated to be more than $2 billion, on average, from 1996 to 2003, with half of this amount being in the form of premium subsidies paid by the government.

ESTIMATING THE COSTS OF MPCI
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Under the Crop Insurance Reform Act of 1994, federal farm program provisions changed to make crop insurance mandatory for program participants (Black 1995). Farmers in the federal farm programs must insure any insurable crop that constitutes at least 10 percent of the farm's crop value (Harwood 1995). This rule change will greatly increase participation in federal crop insurance. Historically, participation in multiple peril crop insurance (MPCI) has never exceeded 45 percent of total eligible acres. This figure should shift to around 80 percent under the new guidelines.

The 1994 Act also increased the premium subsidies for MPCI and created a new catastrophic coverage level that farmers can purchase for only a $50 fee per crop. These program adjustments will radically affect the participation in and performance of MPCI. As Congress now explores options for the 1996 Farm Bill, federal crop insurance will come under the microscope. Questions have been raised about the size and role of federally subsidized farm insurance. Alternatives such as revenue assurance, revenue insurance, and a dual yield/revenue insurance program have been put forth. But how has the 1994 Act impacted MPCI? This study examines this issue by estimating the government costs of MPCI under the 1994 Act.

A Historical Review of FCIC and MPCI Performance[*]

In the midst of the Great Depression, the widespread droughts in 1934 and 1936 created the impetus for federal research into the idea of crop insurance. By 1937, the USDA had determined that they had sufficient wheat yield data to provide an actuarial basis for wheat yield insurance. With the passage of the Federal Crop Insurance Act of 1938, the Federal Crop Insurance Corporation (FCIC) was established and federally-sponsored crop insurance was born.

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[*] For a more detailed description of the history of crop insurance in America on which this brief summary is based, see Kramer 1988.

The crop insurance program began in 1939 with wheat as the only insurable crop. Farmers could choose to insure 50 or 75 percent of a "recorded or appraised average yield." In its first year, the FCIC paid $1.52 in indemnities for every $1.00 of premiums, resulting in a loss ratio (indemnities/premiums) of 1.52. Through the early 1940s, participation in the wheat yield insurance program grew steadily, though the program still remained rather small. But the insurance performance over this period did not improve. The original crop insurance plan was to be self-supporting, including administration and delivery costs, but it failed to be. In 1942, federal crop insurance expanded to cover cotton (Kramer 1988).

Due to the large losses in every year of the crop insurance program and the low levels of participation, Congress moved to effectively end federal crop insurance under the Agricultural Appropriations Act of 1944. However, later that year, an amendment added to the original 1938 Act revived federal crop insurance, expanded the crop coverage to wheat, cotton, and flax as insurable crops and corn, soybeans, barley, and "any other agricultural commodity" for which sufficient data could be obtained as experimental insurance crops. The amendment also allowed the FCIC to refuse to sell crop insurance in high risk areas and limited the offering of federal crop insurance to counties in which at least 50 farms or one-third of the farms that normally grow the insurable crop had applied for it. An experimental crop insurance program is constrained to fewer than 20 counties and up to 3 years of coverage (Kramer 1988).

By 1947, corn and tobacco had progressed from experimental to regular status. Also, in 1947, the FCIC finally experienced a year in which total premiums exceeded total indemnities. However, from 1939 to 1947, the FCIC had incurred a net loss of $73 million. County coverage was reduced from 2,500 to 375 and the minimum number of applying farms needed to secure federal crop insurance for a county was increased in a effort to reduce the excess indemnities. During the 1950s, MPCI performed on an actuarially sound basis while experimenting with several new crops and innovations such as multiple-crop contracts. Soybeans and barley joined the regular insurable crops list. By 1956, coverage had rebounded to 948 counties and 24 crops, some as experimental crops or included in multiple-crop contracts (Kramer 1988).

The success of MPCI in the 1950s led into its decline during the 1960s. The FCIC moved aggressively to increase coverage across the country through lower premium rates, partially based upon previous successes. Federal crop insurance performance steadily deteriorated as indemnities rose at a greater rate than premiums. By 1970, this trend pressured

the FCIC to eliminate some experimental programs, increase premium rates for cotton, and make several adjustments to soybean policies (Kramer 1988).

Agriculture's safety net was enlarged by the Agriculture and Consumer Protection Act of 1973. This act created the disaster payment programs of the 1970s and 1980s. More than $3 billion was distributed in the form of disaster payments from 1974 to 1980. Many thought this form of "free crop insurance" undermined the FCIC effort. Thus, with the passage of the Federal Crop Insurance Act of 1980, federal crop insurance became the main form of disaster assistance. The 1980 Act also removed the bounds on the expansion of MPCI coverage by crop and county and provided premium subsidies to spur participation in the insurance program. To limit the impact of these changes on private crop insurers, rule changes were made so that farmers who insured against hail or fire with a private company could remove these provisions from their federal crop insurance policy and pay only 70 to 85 percent of their normal premium. Also, the delivery of MPCI was adjusted so private insurance companies could actively market and service any MPCI contract through master marketer or reinsurance plans (Kramer 1988). Private insurers could market MPCI previously, but only in limited areas (Goodwin and Smith 1994). The 1980 Act specified that all administration and delivery costs were to be paid by the federal government (Glauber, Harwood, and Skees 1993).

Many had urged the FCIC to "individualize" crop insurance policies in order to increase participation and reduce adverse selection problems. In 1985, the FCIC switched the farmer's average yield formulation to rely upon his/her Actual Production History (APH) in which the insurable yield is based upon the farmer's historical yields, instead of county average yields (Kramer 1988; Goodwin and Smith 1994). Loss ratios for MPCI continued to rise above what had been expected. Under the Food, Agriculture, Conservation, and Trade Act of 1990, Congress set guidelines for the FCIC to increase premiums to an actuarially sound level, but not by more than 20 percent per year (Glauber, Harwood, and Skees 1993). Over the period 1980-90, government outlays for MPCI exceeded $9.2 billion, indemnities were over $7.2 billion, and farmer-paid premiums only added up to $3.8 billion. Only 17 percent of the acres eligible for MPCI enrolled, on average, over the 1980s (Goodwin 1994).

Overall, from 1939 to 1994, the FCIC paid more in indemnities than it received in premiums in 33 out of the 56 years (Goodwin and Smith 1994). Since the 1980 Act, indemnities exceeded premiums 12 out of 14 years with an average loss ratio of 1.41. Thus, the performance

of the FCIC and MPCI has been unfavorable at best. The program resulted in significant budget outlays, yet failed to cover a vast majority of farmers.

The Current Structure of Federal Crop Insurance

Significant changes have occurred in federal crop insurance due to the Crop Insurance Reform Act of 1994. Farmers who wish to be eligible for price and income support payments, through federal farm programs, must enroll in a crop insurance plan. A basic catastrophic coverage (50 percent of the yield guarantee at 60 percent of the price election) is available to farmers for a $50 fee per crop with total fees possibly faced by a farmer capped at $600. There are more options to choose from in the percentages of yield guarantees and price elections covered. Premium subsidies have been increased. Also, the 1994 Act brought *ad hoc* disaster aid "on-budget," meaning spending cuts would have to be made elsewhere in the federal budget to free money for disaster aid. Before this, *ad hoc* disaster assistance was "off-budget" (Harwood 1995).

Table 1. Fees and premium subsidies for MPCI

Coverage Level	Processing Fee (paid by the farmer)	Government Premium Subsidy
(% of yield guarantee/ % of price election)	(dollars)	(% of the premium)
50/60	50	100
65/100	10	41.7
75/100	10	23.5

Source: Black 1995.

Table 1 presents the fee and premium subsidy structure for federal crop insurance under the 1994 Act. Previously, premium subsidies had been set at up to 30 percent of the premium (Harwood 1995). Thus, the 1994 Act has brought about a major change in premium subsidies.

These changes in federal farm policy included in the 1994 Act target two of the largest concerns about federal crop insurance: the low participation rate and the need for *ad hoc* disaster assistance (Harwood 1995). By requiring farmers who participate in federal farm programs to purchase some form of crop insurance, the crop insurance participation rate will rise

substantially. Also, since most farmers will now have crop insurance, the likelihood of needing *ad hoc* disaster relief is decreased. The catastrophic coverage and increased premium subsidies should also inspire more farmers to enroll in federal crop insurance. By bringing *ad hoc* disaster relief "on-budget," Congress will be forced to make hard choices in spending cuts to provide such assistance, thus making it less likely.

The Empirical Data and Underlying Assumptions

Eight crops (barley, corn, oats, rice, sorghum, soybeans, upland cotton, and wheat) are examined in this study. Historical 1981-94 state-level data on net insured acres, total premiums, government subsidies of premiums, losses paid, price election, and protection in force (the product of the price election, yield guarantee, and net insured acres, i.e., the maximum possible loss) are provided by the FCIC through Rain and Hail Insurance Services. From these figures, historical loss ratios, per acre premiums, and yield guarantees are calculated. Projected 1995-2003 state-level figures for planted acres, complying base acres, farm program participation, yield, and farm price are computed from regional figures from the FAPRI baseline with variable weather.

It is assumed that yield insurance is mandatory for farm program participants, as under the Crop Insurance Reform Act of 1994, and that nonparticipants in the farm program will employ yield insurance at the crop's 1982-94 average MPCI participation rate. The percentage of complying base acres planted to the program crop is assumed to be the same as in 1994. Projected net insured acres equal the sum of farm program planted acres and non-program planted acres with MPCI. Since soybeans is not a farm program crop but is often planted by farmers who participate in the federal farm program, the yield insurance participation rate for soybeans is taken to be the same as the participation rate for corn.

The price election is computed as the sum of the farm price and the 1981-94 average difference between the price election and the farm price. The yield guarantee is set at 65 percent of the 10-year average yield; thus, we have assumed 65 percent yield insurance, which has been the most popular MPCI package over the 1980s and early 1990s (GAO 1991). The government subsidy of the premium covers 41.7 percent of the premium. This rate is the 1995 premium subsidy rate for 65 percent yield insurance (Black 1995).

Due to data limitations and the drive in the early 1990s to bring federal yield insurance to better actuarial performance, we only use historical loss ratios (HLRs) over the previous 10 years to update premium rates. The per acre premium updating structure is given by:

$$
\text{Premium}_{t+1} = \begin{cases}
0.95 * \text{Premium}_t & \text{if} & & \text{HLR}_{t+1} < 0.70 \\
\text{Premium}_t & \text{if} & 0.70 \leq \text{HLR}_{t+1} < 1.11 \\
1.05 * \text{Premium}_t & \text{if} & 1.11 \leq \text{HLR}_{t+1} < 1.25 \\
1.10 * \text{Premium}_t & \text{if} & 1.25 \leq \text{HLR}_{t+1} < 1.75 \\
1.125 * \text{Premium}_t & \text{if} & 1.75 \leq \text{HLR}_{t+1} < 2.05 \\
1.15 * \text{Premium}_t & \text{if} & 2.05 \leq \text{HLR}_{t+1} < 2.51 \\
1.20 * \text{Premium}_t & \text{if} & 2.51 \leq \text{HLR}_{t+1}
\end{cases} .
$$

Thus, the premium structure follows the restriction, under the 1990 Farm Bill, that the FCIC can make premiums actuarially sound by raising rates, but not by more than 20 percent per year (Glauber, Harwood, and Skees 1993). Administration costs for the FCIC are set at $100 million per year. Delivery costs, reimbursements to private insurance companies, and processing fees paid by farmers are not included in this analysis.

Yields are assumed to be normally distributed across a state. The mean yield is given by the state-level actual yield. The standard deviation for yields is set at a multiple of the state-level yield standard deviation given by county-level yields. To simulate farm-level yield variability and to adequately capture past yield insurance performance, the multiplier is set so actual and simulated yield insurance performance are equivalent over the 1982-89 period. To parallel the weather pattern underlying the FAPRI projections, the yield variability over the 1980s is used in the projection period (1996-2003). The rice yield variability is also weighted by the average growth in yields over the projection period versus over the 1980s. Yields are also taken to be non-negative. Thus, yields have a truncated normal distribution across a state in this analysis. The percentage of acres with losses is computed as the probability of being below the yield guarantee given the yield distribution. The average yield of acres with losses is computed as the mean of the distribution given by the yield distribution when truncated from below at zero and above at the yield guarantee.

MPCI Cost and Premium Estimates

The effects of increased participation in MPCI and higher premium rates due to a need for actuarially better performance can be seen in Table 2. MPCI participation jumps from an average of 24 percent from 1982 to 1994 to 86.5 percent for 1996 to 2003. Per acre total premiums increase for every crop. Soybean has the smallest increase, while cotton, rice, and oat per acre total premiums nearly double in size. Per acre farmer premiums also increase for every crop, inspite of the larger premium subsidies. Again, soybean has the smallest increase at $0.03 more per acre and cotton has the largest increase at more than $8 per acre, on average. Overall, per acre total premiums increase by $3.83 and per acre farmer premiums increase by $1.37.

Table 2. Average 1982-94 and 1996-2003 insured acres and per acre premiums

| Crop | 1996-2003 Average | | | | 1982-94 Average | | | |
	Eligible Acres	Net Insured Acres	Per Acre Total Premium	Per Acre Farmer Premium	Eligible Acres	Net Insured Acres	Per Acre Total Premium	Per Acre Farmer Premium
	(mill.)	(mill.)	($/acre)	($/acre)	(mill.)	(mill.)	($/acre)	($/acre)
Barley	5.44	4.43	8.01	4.67	5.79	2.42	4.87	3.41
Corn	80.83	65.53	11.23	6.55	74.42	17.04	8.63	6.04
Cotton	12.68	12.08	36.24	21.13	10.05	3.06	18.37	12.86
Oats	4.88	1.57	7.53	4.39	9.51	0.71	4.07	2.85
Rice	3.50	3.49	15.59	9.09	2.80	0.37	7.55	5.28
Sorghum	11.32	7.92	11.41	6.65	13.08	2.45	6.47	4.53
Soybeans	63.09	50.34	9.13	5.32	60.71	12.83	7.56	5.29
Wheat	74.11	75.94	8.38	4.88	73.80	21.99	5.02	3.51
Total	255.85	221.30	11.12	6.48	250.16	60.87	7.29	5.11

The actuarial performance of MPCI is given in Table 3. With the higher participation and premiums, average total premiums rise from $444 million in 1982-94 to $2.46 billion in 1996-2003, a nearly sixfold increase. Average total indemnities move from $620 million in 1982-94 to $2.99 billion in 1996-2003, a fivefold increase. Since premiums increase more than indemnities, the overall loss ratio for MPCI improves from 1.40 to 1.21. Loss ratio improvements are seen in all of the crops, except corn.

Table 3. Average 1982-94 and 1996-2003 total premiums, total indemnities, and loss ratios

Crop	1996-2003 Average			1982-94 Average		
	Total Premiums	Total Indemnities	Loss Ratio	Total Premiums	Total Indemnities	Loss Ratio
	($ mill.)	($ mill.)		($ mill.)	($ mill.)	
Barley	35.47	56.78	1.60	14.77	20.86	1.77
Corn	736.09	912.56	1.24	147.07	163.89	1.11
Cotton	437.69	475.82	1.09	56.21	87.12	1.55
Oats	11.86	16.06	1.35	2.91	4.66	1.60
Rice	54.40	72.50	1.33	2.82	7.98	2.83
Sorghum	90.37	114.34	1.27	15.82	25.06	1.58
Soybeans	459.35	567.00	1.23	97.02	136.76	1.41
Wheat	636.14	772.78	1.21	110.38	174.12	1.58
Total	2461.37	2987.84	1.21	444.00	620.44	1.40

Table 4. Comparison of 1996-2003 average premiums with 1994 premiums

Crop	State	1996-2003 Average Per Acre Premiums		1994 Per Acre Premiums	
		Total	Farmer	Total	Farmer
		($/acre)	($/acre)	($/acre)	($/acre)
Corn	Illinois	11.67	6.80	9.80	6.86
Corn	Iowa	9.32	5.44	8.56	5.99
Cotton	Arkansas	42.00	24.49	14.57	10.20
Cotton	North Carolina	16.05	9.36	17.67	12.37
Rice	Arkansas	18.45	10.76	8.82	6.17
Rice	California	5.67	3.30	7.46	5.22
Rice	Texas	8.58	5.00	7.55	5.29
Soybeans	Arkansas	20.30	11.84	10.84	7.59
Soybeans	Illinois	7.16	4.17	6.05	4.24
Soybeans	Iowa	4.93	2.88	5.32	3.72
Wheat	Kansas	7.06	4.12	4.80	3.36
Wheat	North Dakota	6.40	3.73	4.62	3.23

State-level impacts differ greatly due to the diverse yield distributions and past MPCI performance in the states. Table 4 compares the average 1996-2003 per acre premiums to the 1994 per acre premiums. For state-crop combinations where MPCI had performed well in the past, such as North Carolina cotton, California rice, and Iowa soybeans, both per acre total and farmer premiums fall. Other state-crop combinations, such as Texas rice, Illinois soybeans, and Illinois and Iowa corn, have per acre total premiums rising; but per acre farmer premiums

decrease due to the larger premium subsidies. For state-crop combinations where MPCI had performed poorly in the past, the goal of actuarial soundness drives both sets of premiums up. In some cases, such as Arkansas cotton, rice, and soybeans, per acre premiums are two to three times the 1994 levels.

Table 5. 1996-2003 average federal crop insurance government costs and its components

Crop	Excess Losses	Government Subsidies of Premiums	Total Government Costs
	($ mill.)	($ mill.)	($ mill.)
Barley	21.32	14.79	39.41
Corn	176.46	306.95	737.03
Cotton	38.13	182.51	294.75
Oats	4.20	4.95	10.06
Rice	18.10	22.68	43.31
Sorghum	23.96	37.69	73.41
Soybeans	107.65	191.55	389.12
Wheat	136.64	265.27	464.85
Total	526.47	1026.39	2051.95

Table 5 displays average 1996-2003 average government costs for the FCIC and MPCI. Excess losses, i.e., indemnities over and above premiums, add up to more than $500 million with nearly 80 percent of this coming from corn, wheat, and soybeans. From 1982 to 1994, government subsidies of MPCI premiums averaged $112 million. With the increased participation in MPCI and the higher premium subsidies, this figure leaps to over $1 billion for 1996 to 2003, making this category one-half of the average total government outlays for the FCIC and MPCI. Average 1996-2003 total government costs for federal crop insurance is $2 billion. These costs vary greatly from year to year. Under the weather pattern used here, total government costs ranged from just over $1 billion in 1996 to $4 billion in 2002. Thus, the expanded crop insurance program may create significant budgeting problems in the future.

Summary and Concluding Remarks

This paper examines the past, present, and future of federal crop insurance. Though federal crop insurance has mainly been an "experimental" program for much of its life, its role has been greatly expanded since the Crop Insurance Act of 1980. With the crop insurance

participation provisions in federal farm programs in place, a vast majority of the nation's farmers will be covered by MPCI. Increasing budgetary pressure will force the FCIC to make more forceful attempts to bring MPCI to a more acceptable actuarial performance level. The 1996 Farm Bill will set the structure of agriculture's safety net for the 21st century. MPCI will be compared to several other safety net options, such as revenue assurance and a dual yield/revenue insurance program.

Under the various assumptions employed in this study, the government costs and premiums of MPCI are estimated for 1996 to 2003. In comparing the projected 1996-2003 averages to 1982-94 averages, MPCI participation leaps from 24 to 86.5 percent of eligible acres; per acre premiums rise across the board; total premiums increase nearly sixfold; total indemnities increase fivefold; and the overall loss ratio falls from 1.40 to 1.21. Thus, MPCI's actuarial performance improves.

In looking at the various state-level impacts, we find that the increased participation, higher premium subsidies, and stepped-up actuarial performance have very different effects depending on the state and the crop. For some state-crop combinations, both total and farmer per acre premiums decline in the projection period. Other state-crop combinations encounter higher total per acre premiums, but lower farmer per acre premiums due to the increased subsidies. Still other state-crop combinations, where MPCI has performed poorly, face significantly higher premiums.

In total, average 1996-2003 government costs for the FCIC and MPCI are over $2 billion. Half of this amount originates from the government subsidies of the crop insurance premiums. The total government costs also varies a great deal from year to year. Under this projection, costs ranged from $1 to $4 billion. Thus, when the 1996 Farm Bill debate focuses on agriculture's safety net, the questions become: (1) Does the increased participation in and expected improved performance of MPCI justify the substantial budgetary allocation? (2) Can the agriculture budget handle such a wide ranging cost for a program? and (3) Is there another package that can provide farmers the stability they need at a lower cost?.

REFERENCES

Black, Roy. "The Marriage of Multiple-Peril Crop Insurance and Disaster Aid: What Does It Mean for You?" *Michigan Farm News*. February 15, 1995.

Glauber, Joseph W., Joy L. Harwood, and Jerry R. Skees. *An Alternative for Reducing Federal Crop Insurance Program Losses*. USDA-ERS Report AER-668. May 1993.

Goodwin, Barry K. "Premium rate determination in the Federal Crop Insurance program: What do averages have to say about risk?" *Journal of Agricultural and Resource Economics* 19(1994):382-395.

Goodwin, Barry K. and Vincent H. Smith. "The Economics of U.S. Agricultural Insurance and Disaster Relief Policies." Conference Paper for Future Directions in Agricultural Policy. American Enterprise Institute. November 3-4, 1994.

Harwood, Joy L. "Crop Insurance Update." Presented at the American Agricultural Economics Association meetings. Indianapolis, Indiana. August 7, 1995.

Kramer, Randall A. "Federal Crop Insurance: 1938-1986." *Multiple Peril Crop Insurance: A Collection of Empirical Studies*. Edited by Harry P. Mapp. Southern Cooperative Series Bulletin No. 334. May 1988. pp. 1-25.

United States General Accounting Office. *Crop Insurance: Inaccurate FCIC Price Forecasts Increase Program Costs*. GAO/PEMD-92-4. December 1991.