ASSESSMENT OF TWO CONSERVATION RESERVE PROGRAM OBJECTIVES IN NORTH DAKOTA

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Assessment of Two Conservation Reserve Program Objectives

in North Dakota

By

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The Supervisory Committee certifies that this paper complies with North Dakota State University's regulations and meets the accepted standards for the degree of

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ABSTRACT

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ASSESSMENT OF TWO CONSERVATION RESERVE PROGRAM OBJECTIVES IN NORTH DAKOTA

Major Advisor: Dr. F. Larry Leistritz

This study was undertaken to report performance of two objectives (curb production of surplus commodities and provide needed income support for farmers) of the Conservation Reserve Program. Secondary data from three existing data sets were used—a CRP participant survey from the spring of 1988 and two surveys done on the same group of farmers in the spring of 1985 and 1988.

Means of selected variables were compared between participants and non-participants. A significant difference (a = .05) was found between sign-up pools for intended use of land after the contract expires. Debt-to-asset ratios decreased from 1984 to 1987 for farmers that signed up and increased for farmers that did not. Further, non-participants had an increase in net farm income. Age was not significantly different between groups, and both groups decreased their off-farm employment from 1984 to 1987.

Future research should include non-participants for control, and conservation objectives should be included.
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J.S.
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CHAPTER I

INTRODUCTION

For the second time in 30 years the United States government has tried to protect erodible land and reduce surplus production by asking farmers to take land out of production for extended periods in return for annual payments. The first time was the Soil Bank Program of 1956, and the second the Conservation Reserve Program from the Food Security Act of 1985.

It is important for the Federal Government that the objectives of the program will have the intended effect. A measurement of program performance is therefore essential in order to see if administrative criteria have the intended effects. This study aims to measure program performance on two objectives--those of curbing production of surplus commodities and providing needed income support for farmers. It also contrasts the effects of CRP implementation in two contrasting areas of North Dakota.

Hypotheses are stated for each objective. Secondary data representing selected variables from three surveys are used to compare means between the two areas, between participant and non-participant, and from 1984 to 1987. By using this approach the study will use secondary data to identify performance in achieving the objectives and characteristics of participants. Finally, results give an indication of what should be emphasized in future research.
DEVELOPMENT/HISTORY BEHIND PROGRAMS AND EROSION

People started settling the western plains in the 1880s, about twenty years after the Homestead Act was passed in 1862.

"By 1890, 6 million people were living on the Great Plains, most who had come after 1886. Between 1880 and 1899, 104 million acres on the plains were plowed for crop production (U.S. Senate 1936). Wheat grown under dry land farming techniques has been the primary crop since the 1890's" (Laycock 1988).

According to Laycock (1988), additional marginal land was plowed following the needs created by World War I and the economic expansion that followed. It was also during this period that large-scale mechanization came to the wheat growing areas. All this plowing had a major effect on the severity of the dust storms during the Dust Bowl period. It was during these dust storms in the 1930s that the government started acting, and conservation practices were developed. The Soil Conservation Service was started, and many of the plowed lands were seeded to perennial grasses.

The Soil Bank program was enacted in the late 1950s, and allowed farmers to put any land into soil conserving uses and receive annual government payments. This program was not, therefore, aimed at conservation of marginal cropland, but was primarily an effort to reduce surplus production. The Soil Bank lasted until the late 1960s.
Triggered by the Russian wheat sale of 1972 which dramatically increased grain prices, the seventies and early eighties, with an inflationary period, encouraged farmers to expand.

Approximately 4.5 million acres of previously unbroken grassland have been plowed during the recent past in the central and northern Great Plains. The greatest amount of plowing has been in Montana with 1.8 million acres plowed between 1977 and 1982. Newly plowed land in North Dakota (849,000 acres), South Dakota (750,000 acres), and Colorado (572,000 acres) make up the bulk of the additional area plowed (Laycock and Lacey, 1984). Much of this was in land capability classes IVe, VI and VII which are highly erodible. (Laycock 1987).

According to Ogg (1988), one third of new corn and soybean land was so prone to erosion that it could not be in continuous crop production without sustaining damage, even with conservation measures. In the early eighties, as inflation became considerably lower real interest rates climbed, and land values plummeted, the farm crisis evolved. This, together with the erosion problems, created a political environment to help out farmers.

THE CONSERVATION RESERVE PROGRAM

The Conservation Reserve Program was established in the Food Security Act of 1985 under Title XII-Conservation (Pub.L. 99-198). The Conservation Reserve Program (CRP) provides for up to 45 million acres of highly erodible land to be planted to permanent cover. Farmers
can, between 1986 and 1990, bid land into a ten-year contract, in return for annual payments from the government. Some restrictions are imposed to dampen the effect on rural communities and to make sure it provides income support, without unduly subsidizing the wealthy. These restrictions are that no more than 25 percent of the cropland in any county can be placed under contract (unless the Secretary of Agriculture gives permission) and that annual payments to a contractor cannot exceed $50,000. The Government also provides half the costs of establishing a ground cover. Where practicable, at least one-eighth of the total CRP acreage should be devoted to trees.

The Objectives

"The legislation for the CRP was written with the expressed intent to "reduce wind and water erosion on marginal croplands that are eroding at excessive rates"(U.S.Senate, p.305). The CRP, however, has multiple objectives which include:

(1) reduce water and wind erosion,
(2) protect our long-term capability to produce food and fiber,
(3) reduce sedimentation,
(4) improve water quality,
(5) create better habitat for fish and wildlife through improved food and cover,
(6) curb production of surplus commodities, and
(7) provide needed income support for farmers. Thus, the objective of the CRP can be summarized as attempting to reduce, through monetary incentives, the environmental damages from excessive
soil erosion and the production of surplus commodities" (Dicks 1987a).

North Dakota is divided into five bidding pools that coincide with the state’s farmland (Figure 1). Pool 1 is the Missouri basin, which has very old soils. Pool 2 is the farmland just east of the Missouri River. Pools 3 and 4 are in the central part of the state where the north part is pool 3 with somewhat colder climate and less precipitation than pool 4. Finally, pool 5 is primarily the flat Red River Valley.

Figure 1. CRP Bidding Pools in North Dakota
The purpose of dividing the state into bidding pools is to create a more homogeneous bidding area. This way the Government hopes to retire land more evenly over geographic regions. For example, if the state was one bidding pool and all bids under the average bid were accepted, land in the Red River Valley would increase average bids because of the land's higher productivity. This would make most of the land in the western part of the state accepted because bids there would tend to be lower then the average bid in the state. Limiting the competition among acres of eligible land submitted, because of differences in production potential and rental rates, will tend to yield higher bids and thus support income for farmers more evenly.

About 2.8 million acres in the state are estimated to be eligible for CRP, and the total cropland that might eventually be accepted into CRP could exceed that figure because, if two-thirds or more of an established field is classified as highly erodible, the entire tract is eligible for the program (Leistritz 1986).

Eligibility Criteria

During a signup period (announced periodically by the Secretary of Agriculture) a farmer submits a bid to the local ASCS office, indicating the annual sum required to enroll the cropland. Eligible bids are then evaluated and accepted or rejected based on the bid price. According to U.S. Department of Agriculture (1986), eligible conservation practices are;" those practices specified in the conservation plan that meet all quantity and quality standards needed to establish permanent vegetative cover, including introduced or native species of grasses and
legumes, forest trees, permanent wildlife habitat, field windbreaks, and shallow water areas for wildlife that will provide adequate erosion control for the contract period". Only land that is highly erodible can be bid into the program, and eligibility criteria are:

1. Cropland in land capability class (LCC) VI, VII, and VIII; or
2. Cropland in LCC II, III, IV, or V having a predicted average annual soil loss greater than three times the soil loss tolerance (T); or land in LCC II, III, IV, or V having a predicted average annual soil loss of two or more times the T value and with a serious gully erosion problem (erosion criteria is two times T if trees are planted on the designated area); or
3. Cropland consisting of soils having both an erodibility index (EI) equal to or greater than 8 for either wind or water erosion; and an erosion rate, during the crop years 1981 through 1985, which is greater than that recommended by the Soil Conservation Service (SCS) Field Office Technical Guide (FOTG); or,
4. Cropland next to streams, lakes, and estuaries, regardless of annual soil loss, that is placed in a filter strip 66-99 feet in width (Rittall 1988).

NEED FOR STUDY

Program implementation is authorized through legislation. Rules do not always have the intended effect, and a different group than initially intended might sign up. It is therefore of importance that
program performance is assessed to assure the government that public money is being spent where intended. Secondly, it is of interest to evaluate program performance on a regular basis so that administrative criteria can be changed to better accommodate the objectives of the program.

OBJECTIVES

1. To assess program performance in pools 1 and 5 in North Dakota as to CRP objective #6
   -Curb production of surplus commodities.

2. To assess program performance in pools 1 and 5 in North Dakota as to CRP objective #7
   -Provide needed income support for farmers.

3. To describe economic changes for participants and non-participants in pools 1 and 5 resulting from implementing CRP.

   The conservation objectives, although important, are beyond the scope of this study. Since 39 out of 53 counties in North Dakota (73.5%) are farm dependent, the economic objectives are likely to have a greater short term impact for the population in rural areas.

   The two dissimilar pool groups are pool group 1 and 5, the Missouri basin and the Red River Valley. Using these pool groups makes it possible to measure effects in two very dissimilar areas. The Red
River Valley with its fertile soils and more urban sites is compared with the Missouri basin with more marginal land and less urban sites. Further, by using more than one pool to test the hypotheses, the study will give more general conclusions.

The Conservation Reserve Program is a national program, and objectives are supposed to be met nationally. Measuring program performance on two different pool groups will therefore give more detail, but will not tell if production of surplus commodities is curbed nationally. If production is reduced in North Dakota, it could still increase in Kansas. Analysis must therefore be designed to see how participants in North Dakota respond, and from that we can draw conclusions as to how administrative criteria are responded to in North Dakota and give us an indication of what might happen nationally.

*Curb production of surplus commodities.* Agricultural production today is supported to keep market shares and support income for farmers. As long as prices, because of regulation, remain above the free market price, there will be surplus production. Thus our assumption will be that reduction in any type of commodity production will be a contribution to curb surplus production. Yet a reduction is not very precise. A lower yield because of severe weather conditions cannot be credited CRP. Therefore, respondent's answers will be used as an indication of crop yields on land entered into CRP compared to land not entered.
Provide needed income support for farmers. There exists no definition on what is needed income support for farmers. For those who need income support the need is individual, and it is difficult to measure the certainty of annual CRP payments against uncertain future returns from farming. Analysis of this objective will therefore be based on answers from participants.

SCOPE OF STUDY

Data sets are available from three surveys—one done in the spring of 1985 and two in the spring of 1988. One survey was done on CRP participants throughout North Dakota. The other survey was done in March 1988 of 557 farm and ranch operators who had been previously contacted in 1985 and 1986. This study will use data from both the 1985 and 1988 surveys. This study is geographically limited to two pool groups in North Dakota.

ORGANIZATION OF STUDY

Chapter I provided an introduction to the research problem. Chapter II is a review of literature. Chapter III presents the data collecting procedures, the hypotheses to be tested, and the statistical processing. Results are discussed in Chapter IV. Chapter V contains results and conclusions of the study.
CHAPTER II

LITERATURE REVIEW

Literature about government programs like the Conservation Reserve is limited, simply because there have not been many programs like this. The Soil Bank Program, from the 1950s aimed at reducing surplus production through a set-aside program similar to CRP. The CRP program itself is so new that very little research has been done, and most of the literature is on implementing the program and possible implications.

THE SOIL BANK PROGRAM

On January 9, 1956 President Eisenhower addressed the Congress of the United States and stated the following.

"Of the many difficulties that aggravate the farm problem, mountainous surpluses overshadow everything else. . . . The plain fact is that wartime production incentives were too long continued . . . . We must stop encouraging the production of surpluses . . . . As we seek to go forward, we must not go back to old programs that have failed utterly to protect farm families" (Congressional Digest 1956).

The Soil Bank had a three point attack;

"First, future production of crops in greatest surplus must be adjusted both to the accumulated stocks and to the potential
markets. Second, producers of other crops and of livestock must be relieved of excessive production from acreage diverted from surplus crops. Third, lands poorly suited to tillage, now producing unneeded crops and subject to excessive wind and water erosion, must be returned from cultivation" (Congressional Digest 1956).

The Soil Bank would consist of two parts. One was a short-term acreage reserve program, and the other was a long-range attack called the conservation-reserve program. The Acreage Reserve would be for farmers to set aside land, and receive a cashable certificate. The objective of the acreage reserve being to shift 25 million acres from cropland to forage, trees, or water storage.

In the Conservation Reserve the government would pay a fair share of the costs of establishing a conservation use and provide annual payments. "The farmer, in turn, will agree that the acres put into this conservation reserve will be in addition to any land that he may put into the acreage reserve, and will represent a reduction in cropland cultivated" (Congressional Digest 1956).

LITERATURE ABOUT THE SOIL BANK

A number of publications from United States Department of Agriculture exist concerning the Soil Bank Program. As one would expect from the agency that implemented and supervises the program, a lot of the publications deal with statistical information. Some publications from a series such as the annual "Conservation Reserve Program of the Soil Bank, Statistical Summary" discuss changes in the
rules to make the program meet its expectations and listings of the
different signups, statewise numbers of amount of acres enrolled,
which type of production that were set aside, estimated reductions in
surplus production, rental payments, and effect on commodity prices.
Some publications also concern more demographic data like age,
income, farm-size, education, and marital status.

A study on the effects in selected counties in Maine done by
Christensen et al. (1960) found that "important differences between
farm owners participating in the Conservation Reserve and those not
participating may be noted. Participants average older, they have
owned their farms longer, a smaller proportion live on their farms, and
a higher proportion have jobs off their farms. . . . Participating farms
are smaller and have less cropland than nonparticipating farms. Fewer
had livestock enterprises, and fewer were commercial units than was
true in the case of non participating farms".

Another study by McArthur (1961) supports the findings from
Christensen et al. "For example, 35 percent of the participants who
placed whole farms in the conservation reserve were 65 years of age
and over compared with about 30 percent of the operators who placed
part of their farms in the program. Nearly half the participants in both
areas who placed all of their eligible land in the program resided off
their farms. The proportion was much less for participants with part
of their eligible lands in the program." As far as characteristics of
farms, the study found that participants averaged more total land, but
participants who placed the whole farm units in the program, averaged less total land. The survey did not indicate any substantial change in residence or employment.

Robinson (1966) made a comparison of planted and retired acreage in the U.S. and concluded that the government had succeeded in curbing production of surplus grains. If the government would have purchased and stored the amount of which land retirement caused, the cost would have been approximately the same. The saving in using the money according to Robinson is in the handling and storage cost. Despite the program's success Robinson also argues that the same amount of money could have been spent more efficiently if money would have been spent in those areas where; "land costs are low relative to the amount of grain produced per acre, so as to pay only for the cost of land kept out of production and not for other inputs as well" (Robinson 1966). To come up with this conclusion Robinson compared rent values converted to grain equivalents of land in different regions. To retire whole farms instead of marginal cropland would be more efficient because one would not have to pay for idle equipment and labor as you would retiring marginal land.

A follow-up study of Robinson was done by Wittlesey (1967) seeking to extend Robinson's analysis by providing more quantitative estimates of program costs. Whittlesey developed a linear programming model of inter-regional competition in wheat, feed grains, cotton, and soybeans. Production was allocated among 144 producing regions, and individual product demands were specified for
each of 311 spatially separated regions. Three different program models were run for mandatory or voluntary diversion. Whittlesey used average cost per acre for diverting land as a criteria and was able to conclude that a proportional acreage reduction on all farms and any program attempting to divert acres in highly productive areas will be much more expensive than programs which concentrate diversion in areas of least comparative advantage.

Barr et al. (1962) found that in general communities or states with 6.3 percent or less of the cropland enrolled in the program experienced an increase in the flow of money.

Few studies try to estimate or analyze impact on the rural communities, such as retail sales and off-farm employment. Fortunately there are some exceptions. Andrews et al. (1960) measured impact of the Soil Bank Program on the economy of a county in New Hampshire. The authors made high and low income models of the farms as they actually were and what they would have been without the program. They then presented an income flow model describing how a one dollar decline in farm production would flow through the county's economy, and what the total effect would be. " With the change in the income expenditure pattern anticipated with the program, agricultural dealers and providers of agricultural services to farmers would feel a decline in gross income. However, providers of consumer goods and services would benefit considerably by the shift of agricultural units into the Soil Bank" and further "if the low resource use model closely
fits the true resource structure, dealers who provide agricultural production goods and services would experience little reduction in gross income caused by the Soil Bank enrollment". The program did not, however, contribute a great deal towards the objective of reducing agricultural production, and the authors claim this is due to the fact that the Program attracted owners of unorganized units. Little change in the tax base was found, because so many towns have very low proportions of their tax bases in agricultural properties. It seems that the major impact from the Program is the change in expenditure patterns influencing different segments of the non-agricultural economy.

Another noteworthy study was done by Loftsgard et al. (1961) measuring the effects of the Soil Bank on Ransom County in North Dakota. Besides giving a description of participants, income changes, and the community as a whole, the publication uses a multiplier analysis of income changes and related impacts. Loftsgard et al. measured profits and volumes of production before and after the Program, instead of estimating them. They then used a weighted aggregate figure for the sales margin (15%) and determined the multiplier to be 1.176. Findings were, "at an annual wage rate of $5000, the total reduction in income of $25,097 could mean that five less people are employed in the Lisbon community" (population of 2093 in 1960). The study did not include any detailed analysis of sociological implications.
CRP LITERATURE

The Conservation Reserve Program from the Food Security Act of 1985 has been under close surveillance since the very beginning. The program itself is very similar to the Soil Bank. However, the farm sector is not. Agriculture has experienced a tremendous increase in efficiency, and the eighties has, with higher real interest rates and low commodity prices, made it hard for farmers to survive. So this time it may be even more important to see what will happen in rural communities that may already be stressed. Is there high or low participation? Does the program meet its objectives?

As with the Soil Bank, the United States Department of Agriculture has kept a close surveillance on the implications and development of the program. Most of this is statistical information from the different signup periods.

Studies concerning the efficiency of the CRP have been published. These deal with how well CRP meets its objectives, retires the most erodible land, and what implications for the rural societies might be. Most studies find suboptimal solutions, and suggest changes in administrative criteria to become more efficient.

Reichelderfer et al. (1988) used eligibility, maximum bid level accepted, and pool size as control variables and simulated program performance for a 40 million acre reserve. Evidence from the study suggests suboptimal implementation in 1986. However, the authors recognized the interdependence between control variables, which makes it hard to get the optimal criteria set.
Dicks et al. (1987b) discuss the eligibility criteria, and how they influence the objectives of CRP. Discussed are (1) Which land should be eligible? (2) How large should bid pools be?, and (3) Which bid selection criteria should be chosen. No conclusion was drawn.

Dicks et al. (1988) in a later publication stated "to determine the effects of the CRP on local economies, the impact must be traced from the reduction in crop production (direct impacts) through the reduction in the associated agricultural input and processing industries (indirect impacts), to the goods and services providing support to these agricultural industries (induced impacts)". The authors use a computer-based system, IMPLAN, which utilizes input-output analysis procedures capable of estimating the interindustry economic impacts. Further, three separate stages of CRP final demand shocks were imposed on the model. The first stage reflected enrollment as of July, 1987. The second reflected the impacts after all establishment activities have ended and rental payments for all 45 million acres are received. Finally, the third stage, also called the post-CRP period, contains two separate economic shocks. First when rental payments are removed, and second what will happen if half of the participating land would go back to commercial hay and pasture production". (Dicks et al. 1988) found that in all three stages of final demand shocks, economic activity would be reduced by the CRP. "In stage1 agricultural production, total gross output, total income, and employment decrease as cropland is retired from production, rental payments are made to participants, and cover crops established. In the next stage, economic activity declines in all sectors". Further " Some increases in economic
activity can be expected after the contracts expire and the retired land
goes into haying and grazing, but the level of activity will not recover
to pre-program levels".

Martin et al. (1988) used an IMPLAN input-output model to analyze
the impacts of CRP on three rural counties in Oregon. A survey was
conducted among representative firms, and for the Input-Output model,

"A secondary data input/output model was utilized to estimate the
impacts of changes in production spending income generated through
marketing services, and changes in economic activity associated
with consumer oriented spending resulting from government
transfer payments under CRP".

For use in the input-output model the authors surveyed representative
farmers. A typical budget was then developed to represent the
expenditure patterns for wheat production in each of the three
counties. They used total income coefficients from the inverse of the
transactions matrix to find total income generated. Martin et al.(1988)
found that "On a relative basis, however, it would indicate that areas
with comparatively productive land, albeit highly erosion prone, are
more likely to be adversely affected by the CRP program". The findings
from this study were based on the assumptions that participants in the
CRP program stayed and spent their CRP transfer payments in their own
counties. It was further assumed that the county was able to provide
the new services due to the change in consumer spending patterns, and
any effects of this structural change were beyond the scope of the
study.
A recent study by Mortensen et al. (1988) on characteristics of participants in North Dakota tends to support Martin et al., because only 3.5 percent of the participants said they were either going to retire out of state or spend CRP money on leisure activities out of state. By far the majority (54.6 percent) of the participants would use their CRP transfer payments on living expenses.
CHAPTER III

METHOD

This chapter describes the data, the hypothesis testing procedure, and the hypotheses.

THE DATA

Data were available from three surveys (Mortensen et al. 1988, Leholm et al.1985, and Leistritz et al.1989), and the U.S. Census of Agriculture.

Survey of CRP Participants

A mail survey of participating CRP landowners was conducted in the spring of 1988, using a six-page questionnaire. Over 7,000 landowner names and addresses were obtained and randomized by pool group using a computerized routine. From these 7000 nearly 3,000 questionnaires (approximately 40 percent of the total) were sent to CRP landowners in all 53 North Dakota counties. After follow-up mailings to non-respondents, 1,289 usable surveys remained. This is a response rate of about 44 percent. Response rates were quite similar for each of the state's five pool groups (Mortensen et al. 1988).
Survey of Farm and Ranch Operators 1985, 1986, and 1988

The initial farm and ranch operators survey was conducted in March and April 1985 using telephone interviews. All respondents had to (1) be less than 65 years old, (2) consider farming to be their primary occupation, and (3) sold at least $2500 of farm products in 1984. Initially 1206 farm operators were contacted, and 933 completed the survey. In 1986 a follow-up survey of the 933 farmers and ranchers was conducted. Similar questions were asked. "Of these 759 responded, 99 refused to participate, 18 had ceased to operate a farm or ranch, 4 were deceased, and 53 could not be contacted" (Leistritz et al.1987).

In the March 1988 survey Leistritz et al. attempted to contact all 759 producers who had responded in 1986. Of this group, 557 provided complete information, 107 refused to participate, 2 had retired, 38 had ceased to operate a farm or ranch, 7 were deceased, and 51 could not be contacted. The data base for this report is constituted from the 557 who were still farming and who had complete useable questionnaires.

Responses from these three surveys were compared with each other and with data from the 1982 Census of Agriculture to determine representativeness. According to Leistritz et al. (1989), the distribution of farms by state planning region compares quite closely with both the 1985 survey and the 1982 census count. Age distributions were also quite similar between the three surveys and the census except for a slightly smaller percentage of operators under age 25.
CRP participants' data are arranged by pool group. The farm and ranch operators' survey is arranged by state planning region and will therefore have to be arranged to pool group 1 and 5. Since State Planning Regions and Pool groups both use county borders, data can be rearranged.

HYPOTHESIS TESTING

Given the data set and the objectives of this study, there exist few methodological alternatives. To compare means between two sample distributions for significant differences lies with the hypothesis testing. A number of test-statistics exist for both parametric and non-parametric statistics. The choice is made according to the kind of data available. This study has three different data sets--the CRP participant's survey, which is an independent study, and the farm survey from 1985 and 1988 which also is an independent study but where the samples across years are related. For a number of variables, especially when we compare participants and non-participants, we have unequal sample sizes. For unequal sample sizes a TUKEY option is preferred and will be used for this study (SAS Institute Inc.1985). This will be explained later in this chapter.

The Hypothesis Testing Procedure

In dealing with hypothesis testing we wish to determine if there is significant evidence to reject or accept the null hypothesis (H₀). This is done by computing a value, and then seeing if this value is
greater than the absolute number of the critical value for two sided
tests; one sided tests deal with one side of the distribution, in other
words greater than or smaller than the critical value. The critical
value of the test statistic is, according to Daniel (1978), the value that
is so extreme that the probability of getting it or a more extreme
value, when $H_0$ is true, is equal to $\alpha$ (the chosen significance level).
When we reject the null hypothesis, we accept the alternative
hypothesis as true. This can be done because the null and alternative
hypotheses are stated in such a way that they are mutually exclusive
and complementary. The statistical procedures follow these steps;

1. State the null and alternate hypotheses.
2. Specify the significance level and test statistic.
3. Determine a decision rule.
4. Obtain sample data, calculate the necessary statistics, and make
   a decision based upon these results.

The objective of this study is to assess program performance.
Given the data set available it seems best that we not state specific
hypotheses. This would (1) limit some of the observations and
conclusions we can draw from our data. At the same time it is
recognized that to incorporate all the existing data as to test them as
hypotheses is beyond the scope of this study, and (2) the hypotheses
would have to be fitted to the data and not the other way around as it
should be.

The procedure to be followed here is an extraction of selected
variables so that two objectives can be assessed. The data will then be
reported as to if they are significant or not as we would with an ordinary hypothesis testing but without specifying the null hypothesis. This method justifies the statistical procedures since hypotheses are stated after the data are collected.

For the objectives (a) Curb production of surplus commodities and (b) Provide needed income support for farmers, hypotheses are stated and significance levels reported. Finally a comparison between the two pools is made.

**Curb Production of Surplus Commodities.**

- Do participants plan to put land back into production after 10 years?

- Are participants in pool 5 more likely to put land back into production than those in pool 1?

- Is CRP land planted with trees less than one-eight of total CRP land?

- Are crop yields among participants on land enrolled in CRP lower than from cropland not in CRP?

**Provide Needed Income Support for Farmers**

- Is debt to asset ratio of participants higher than for non-participants?
• Is net farm income lower for participants than for non-participants?

• Is gross farm income lower for participants than for non-participants?

• Have debt to asset ratios declined relative to 1984 for farmers that signed up in CRP?

• Has net farm income increased relative to 1984 for farmers that signed up in CRP?

• Has gross farm income increased relative to 1984 for farmers that signed up in CRP?

**A Comparison Between Pools**

Characterize the implementation of CRP in pools 1 and 5 as to:

• Net farm income
• Debt to asset ratios
• Off-farm income
• Gross farm income
• Off-farm employment
• Age of participants and non-participants
Significance Levels

The selection of a significance level is dependent on the types of error that can be made. There are two types of errors. Type I error is to reject $H_0$ when $H_0$ is true, and Type II error is to accept $H_0$ when $H_0$ is false (Table 1).

Now a decision rule should be chosen such that the probability of getting a computed value greater than or smaller than the critical value when $H_0$ is true is equal to the significance level. For example, a significant level at 5 percent would mean a 95 percent probability that the computed value is smaller than the critical value (absolute number). Traditionally $\alpha = 0.1, 0.05$ or 0.01 is chosen.
TABLE 1. TYPE I AND TYPE II ERROR IN HYPOTHESIS TESTING

<table>
<thead>
<tr>
<th>Verdict</th>
<th>State of the World</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>$H_0$ is true</td>
<td>$H_a$ is true</td>
</tr>
<tr>
<td>Reject $H_0$</td>
<td>Type I error</td>
<td>Correct</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Decision</td>
</tr>
<tr>
<td>Do not reject $H_0$</td>
<td>Correct</td>
<td>Type II error</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Decision</td>
</tr>
</tbody>
</table>

The choice of a significant level depends on the situation. For business statistics, where large amounts of money are directly involved one might want to choose $\alpha=0.01$. In other words, choose to be 99 percent sure, due to the expense of a failure. For the CRP program most of the money is already spent in retiring the land. To measure opinions about it does therefore not require a significance level of 0.01. First, the result will not have a monetary effect. The testing is done to gain knowledge. Second, people's opinions vary, and will change. Therefore it is hard to claim a significance level of 99 percent.

Another thing to be considered when choosing a significance level is the trade off between type I and type II errors. Decreasing the probability of one type of error will increase the probability of the other type of error. Figure 2 shows two distributions, and if $H_0$ is correct, according to Kmenta (1986), then $X_\text{H}$ follows distribution 1. Therefore the probability of type I error is given by the chosen level of significance (black area). A type II error occurs when $x$ falls to the
left of $X_H$. If $\mu_0$ were not the true mean, the only other possibility is that the true mean is $\mu_A$. The probability of making a type II error is given by the dotted area.

![Distribution Diagram](image)

**Figure 2.** Trade-off Between Type I and Type II Error

Source: (Kmenta 1986)

Other publications (Leistritz et al. 1989) have reported if data were statistically significant to the 1 percent and 5 percent levels but did not make a decision rule prior to reporting. For this paper 5 percent and 10 percent will be chosen as significance levels that will be reported.

**Test Statistic**

When comparing means between participants and non-participants, two different group sizes are compared (there are more non-participants than participants). In order to compare means of unequal samples a Tukey option is preferred to the traditional $t$-statistic. This method was developed independently by Tukey in 1953 and Kramer in 1956 as a modified test for unequal sample sizes. According to SAS Institute Inc. (1985), the test aims to control the maximum experimentwise error rate under any complete or partial null
hypothesis. Two means are considered significantly different by the Tukey-Kramer criterion if;

$$\frac{|y_i - y_j|}{\sqrt{s(1/n_i + 1/n_j)/2}} \geq q(\alpha;k,v)$$

where

- $y_i$ = mean of $n_1, n_2, \ldots, n_i$ observations
- $y_j$ = mean of $n_1, n_2, \ldots, n_j$ observations
- $s$ = pooled standard deviation for samples
- $n_i$ = number of $i$ observations
- $n_j$ = number of $j$ observations
- $q(\alpha;k,v)$ = the alpha level critical value of a studentized range distribution of $k$ independent normal random variables with $v$ degrees of freedom.

For equal cell sizes, Tukey's method rejects the null hypothesis of equal population means if;

$$|y_i - y_j| \geq q(\alpha;k,v)s/\sqrt{n}$$

where

- $\sqrt{n}$ = square root of the number of observations

Results will therefore be reported and commented on with above specified significance levels.
CHAPTER IV

RESULTS

This chapter presents the results of the comparisons made between participants/non-participants, pools, and years. Results are presented in the same order the hypotheses were stated. Each hypothesis was tested at five and 10 percent significance levels. Each test has, if necessary, a brief description of which variables were compared with a remark to the outcome.

CURB PRODUCTION OF SURPLUS COMMODITIES

This section reports on the objective curb production of surplus commodities. Future plans, acres planted with trees, and crop yields are covered.

Plans After Contract Expires

To measure intended use of cropland when the contract period expired, data from the CRP participants survey were used. Questions asked were; *What do you intend to do with your CRP land after 10 years?* From this, two answers clearly indicated willingness to put land back into production. These answers were (Q17a7) *Turn it into cropland and farm it myself* and (Q17A8) *Turn it into cropland and rent it to someone else.* Three answers clearly indicated continued preservation. These were (Q17A1) *Keep it with a permanent ground*
cover, (Q17A4) Grow trees on it, and (Q17A6) Lease it for recreational uses such as hunting.

Of 132 farmers in pool 1, one farmer intends to grow trees on the CRP land, one intends to lease it for recreational uses such as hunting, and 35 farmers intend to keep it with permanent ground cover (26.5 percent). For those who plan to put land back into production, 24 farmers said they were going to turn it into cropland and farm it themselves, and 26 said they were going to turn it into cropland and sell it to someone else (19.6 percent).

For pool 5 the numbers show the same tendency. Of 182 farmers one intends to grow trees on the CRP land, 16 plan to keep it with a permanent ground cover (8.8 percent), and six plan to lease it for recreational uses. For those who plan to put land back into production, 53 plan to turn it into cropland and farm it themselves, and 60 said they were going to turn it into cropland and sell it to someone else (33 percent).

There was a significant difference ($\alpha = .05$) between the pools as to if they intend to keep CRP land with permanent cover, with pool one having the most farmers planning to keep it. When it came to growing trees and using the land for recreational purposes, there was no significant difference between the pool groups. For farmers that planned to put the CRP land back into production and either farm it themselves or sell it there was a significant difference ($\alpha = .05$). In both cases pool 5 had the the most extreme value (8.8 and 33 percent) indicating the most willingness to turn land back into production. This may be because of the fertile soil in the Red River Valley with
sugarbeets and other specialized crop production. Land values and production possibilities are higher in the Red River Valley than in the southwestern part of the state, where the land is more marginal, and the difference between hayland and cropland is not as considerable. These findings support suggestions that more marginal land is retired in pool 1.

**CRP Land Planted With Trees**

A ratio of CRP land planted with trees relative to total CRP land was calculated. For pool 1, 4.1 percent of the CRP land was planted with trees. The same ratio for pool 5 was slightly higher at 5.3 percent. There was no significant difference between the pools. The national goal is that 12.5 percent of the CRP land be planted with trees. The national goal may be achieved even if North Dakota is not planting enough land with trees.

**CURB PRODUCTION OF SURPLUS COMMODITIES**

**Crop Yields for Land Enrolled in CRP and Land Not Enrolled**

In pool 1 land entered in CRP yielded an average of 10 percent less than land not entered. For pool 5 the corresponding number was 11 percent. There was no significant difference between the two pools.

Data from the farm survey, done in the spring of 1988, also provides some information on average per acre wheat yield on main farm units. For pool 1, farmers that participate in CRP report an average per acre wheat yield of 26.8 bushels. Farmers that did not
participate reported 26.6 bushels (Figure 3). There is no significant
difference between participants and non-participants in pool 1.
Looking at pool 5, participants reported an average per acre wheat yield
of 37.9 bushels. Farmers that did not participate reported 41.2 bushels
(Figure 3). There was no significant difference. Comparing
participants' and non-participants' yields between pools reveals a
significant difference at the 5 percent level for both groups with pool
5 being higher in both cases. From this it is realistic to conclude that
the Red River Valley is a better farm district than the Missouri Basin
when it comes to crop yields. The reason there is a difference among
participants and non-participants in the CRP participant survey but not
in the farm survey is probably because the CRP participant survey
reported yields on the CRP land. The farm survey reports average
yields on the farm, and not on the CRP land itself. The two different
results therefore show no dispute between the two surveys. However,
it is possible to say something about farmers signing up. Since there is
no significant difference in average farm yields but an average of 10.5
percent less yield from the CRP land, it is therefore likely that the low
productivity land on the farm is entered into CRP, but it is not farmers
that do worse on an average that sign up. Poor farming, in other words,
is not the reason for signing up in CRP.
Figure 3. Average Per Acre Wheat Yields for Participants and Non-participants in Pool 1 and Pool 5 in North Dakota

PROVIDE NEEDED INCOME SUPPORT FOR FARMERS

Needed income support is a very vague statement, because it is individual for each farmer and very hard to measure. To generalize, debt-to-asset ratios, net farm income, and gross farm income are estimated. This is because a debt-to-asset ratio usually is used as a measure of economic stress. The higher the ratio, the more stress. A very high ratio is not sustainable over a long period if you are dependent on farm income only. Net farm income is also a generally accepted measure of how well you are off from your farm operation. Finally, gross farm income can say something about the size of your operation. Changes in debt-to-asset ratios, net cash farm income, and
gross farm income from the 1985 survey to the 1988 survey are compared within pools and participation as to give a measure of improved or a worsened situation. Summary data for these comparisons are provided in Table 2.

**Debt-to-Asset Ratios for Participants and Non-participants.**

For pool 1 the debt-to-asset ratio among participants was 41.5 percent per January 1st. 1988. For non-participants this ratio was 43.4 percent. There was no significant difference between participants and non-participants. For pool 5 the debt-to-asset ratio among participants was per January 1st. 1988 40.3 percent and for non-participants 40.8 percent. This is even closer, and no significant difference was found. There was no significant difference across pools comparing participants to each other and non-participants to each other. Looking at the CRP participant survey, the average debt-to-asset ratio in pool 1 for the same time period is 25.7 percent and for pool 5 24.9 percent. There is no significant difference between pools here either. However there is an apparent difference between the two surveys. This may be explained by the fact that the farm survey's number of observations is smaller when it comes to farmers that submitted land to the CRP program, whereas for the CRP participant survey, it included older farmers and retired farmers. The surveys tend to support each other comparing debt-to-asset ratios across pool groups in the fact that there is no significant difference.
Net Farm Income for Participants and Non-participants.

Average net cash farm income in 1987 among participants in pool 1 is reported to be $13,413. For non-participants this value is $18,990. There is no significant difference between participants and non-participants. In pool 5 the average net cash farm income in 1987 among participants is reported to be $22,480, for non-participants this value is reported to be $35,495. There is no significant difference between participants and non-participants. Comparing across pools reveals no significant difference in net cash farm income among participants. However there is a significant difference at the 5 percent level when comparing non-participants across pools, with the farmers in pool 5 having the highest value. When comparing findings to the CRP participant survey, the average net cash farm income for pool 1 is $15,242 and for pool 5 $18,312. There is no significant difference between these values. Findings from the two different surveys show close values, and one can therefore say they tend to support each other. Further they disclose that net cash farm income is on an average higher in pool 5. This may be due to better farm conditions and better ability to grow different crops in the Red River Valley. An example here can be sugarbeets that give a higher profit margin per acre, and that are grown primarily in the Red River Valley. It is also interesting that non-participants have higher net farm income. This was not significant. Remembering that average per acre yields were not significantly different among participants and non-participants either makes it hard to claim that non-participants had a higher return per eligible acre and therefore submitted higher bids to enter land into CRP.
Gross Farm Income for Participants and Non-participants

Gross farm income says something about the size of operation and is therefore of interest.

In 1987 gross farm income for participants in pool 1 was $94,024 and for non-participants $93,580. There was no significant difference between the two groups. Participants in pool 5 had an average gross farm income of $160,112 in 1987, and non-participants had $175,989. There was no significant difference between the two groups. Pool 5 shows the same trend as for net farm income where non-participants have the higher values. Comparing gross farm income for 1987 across pools discloses a significant difference at the 5 percent level for both participants and non-participants, with pool 5 having the higher values. In other words, gross farm income shows more significant differences across pools than does net farm income. When comparing with the CRP participant survey, a significant difference in gross farm income across pools at the 10 percent level is found.

Debt-to-Asset Ratios for Participants and Non-participants Across Years.

The farm survey makes it possible to trace farmers and information about them back to before they entered land into CRP. Therefore something can be said about how time has treated the farmers that signed up and those who did not.

The Tukey test shows no significant reduction in debt-to-asset ratios across years. For pool 1 the average debt-to-asset ratio for
farmers that signed up was 46.4 percent per January 1985. By January 1988 this ratio was reduced to 41.6 percent (Figure 4). For pool 5 the debt-to-asset ratio per January 1st 1985 was 40.5 percent and per January 1st 1988 40.4 percent (Figure 4) which is about the same. Data for non-participants show no significant difference between the same time period. For pool 1 non-participants had a ratio per January 1st 1985 of 35.4 percent which by January 1st 1988 increased to 43.4 percent. In pool 5 the ratios were respectively 33.5 and 40.8 percent.

None of these results are significant, but it is interesting to note the tendency for participants to have a relative "improvement" to the non-participants over these 3 years. If that is true, it should be an indicator that the CRP Program has indeed improved the economic situation for those who signed up. It is also interesting to look at debt and assets separately, to see if the changes in debt-to-asset ratios are due to changes in debt or in assets. These numbers are displayed in Table 2. However no revealing trends stand out. In pool 1 participants and non-participants reduced both debt and assets. For pool 5 participants increased both debt and assets, while non-participants reduced their debt and assets.
Figure 4. Debt-to-Asset Ratios for Participants and Non-participants for Pools 1 and 5 in 1984 and 1987 in North Dakota

Net Farm Income for Participants and Non-participants Across Years.

Participants in pool 1 had an average net cash farm income in 1984 of $17,077. By 1987 it had decreased to $13,413 (Figure 5). However there is no significant decrease over these 3 years. For pool 5 the situation is different; farmers here had an average net farm income of $20,279 in 1984, and by 1987 it had increased to $22,480 (Figure 5). There was no significant increase. Non-participants in pool 1 had an average net cash farm income in 1984 of $7,329. By 1987 it had increased to $18,990 (Figure 5). This is a significant difference at the 5 percent level. Non participants in pool 5 show the same tendency as participants in this pool. The average net cash farm income in 1984...
was $24,367, and by 1987 this had increased to $35,495 (Figure 5). This is significant to the 10 percent level. Trends to be found from net farm incomes are for non-participants.

![Graph showing net farm income for participants and non-participants across years and pools in North Dakota](image)

Figure 5. Net Farm Income for Participants and Non-participants Across Years and Pools in North Dakota

**Gross Farm Income for Participants and Non-participants Across Years**

In 1984 participants in pool 1 had an average gross farm income of $107,588, and by 1987 this had decreased to $94,024 (Figure 6). This is not however a significant decrease. For non-participants in the same pool the average gross farm income in 1984 was $75,327, and by 1987 this had increased to $93,580 (Figure 6). This was not a significant increase either. In pool 5 participants had an average
gross farm income of $154,338 in 1984, and by 1987 this had increased to $160,112 (Figure 6). This is not a significant increase. Non-participants had in 1984 an average gross farm income of $145,013 which by 1987 had increased to $175,989 (Figure 6). This is no significant increase.

Participants in pool 1 are the only group that actually had a decrease in gross farm income, which is the same result as for net farm income. One is therefore tempted to say that farmers that have had a negative development in the last three years have submitted lower bids and therefore been accepted. A negative progression may give each individual farmer a more pessimistic view of the future which has led him to participation. It seems like an overall trend that non-participants have done better economically. This may also be the reason they have not signed up (perhaps their bids have been too high to be accepted).
Employment Status

Many factors decide the employment status of a person. It is not only a function of the need and desire to work off-farm but also the availability of off-farm employment. This study reports on selected variables and compares them among pools and participation. Only data from respondents that answered both in 1985 and 1988 was used in order to avoid errors caused by different sample sizes in the two years.
Participants in pool 1 averaged 30 percent in their answers for 1984 and for 1987 this was reduced to 22 percent. This is not a significant difference, but indicates that few farmers had off-farm jobs and that there has not been any change. When we look at pool 5, the numbers were 21 percent for both 1984 and 1987. For non-participants in pool 1 the average in 1984 was 30 percent and for 1987 22 percent which shows a small decline in off-farm employment. This is not significantly different. For pool 5 the numbers are respectively 27 and 22 percent.

**Gross Earnings from all Nonfarm Employment**

To control the employment indications we can take a look at gross farm earnings from all nonfarm employment for the farm family themselves. For pool 1 the participants reported off-farm earnings of $7,052 in 1984. This decreased to $4,629 in 1987 (Figure 7), which is no significant difference. For pool 5 participants reported off-farm earnings of $8,423 in 1984 which had increased to $16,453 by 1987 (Figure 7). This is not a significant increase. For non-participants in pool 1 off-farm earnings of $11,028 were reported for 1984 and $20,899 for 1987 (Figure 7). This is a significant increase at the 5 percent level. For pool 5 the same numbers are respectively $5,272 and $15,107 (Figure 7), which is a significant increase at the 5 percent level.

With one of the objectives of CRP being to provide needed income support for farmers one is likely to think that participants would have the higher increase in earnings either from farm or from off-farm
work. This because it is natural to assume that land entered into CRP should give better per acre payments than the local rent price. Further, by freeing labor from farm work participants are inclined to undertake other activities such as off-farm employment or more intensive farming on remaining acres. One might therefore say that the results are surprising when non-participants had the only significant increase in off-farm earnings. Comparing these results to the CRP participants survey reveals that respondents reported off-farm earnings that in 1987 in pool 1 were $9,789 and for pool 5 $6,205. These show consistency with the farm survey numbers, and we should therefore accept the fact that non-participants have higher off-farm earnings, and have increased their off-farm earnings significantly since 1984. One is therefore inclined to say that the CRP program is not taken advantage of by farmers who really do not need it. At the same time, for farmers who sign up CRP does not significantly improve their situation. Another set of information that might be interesting is the spouses' off-farm earnings. From the CRP participant survey pool 1 an average off-farm earnings from the spouse of $13,667 was reported, and for pool 5 $15,166. There was no significant difference between the pools. However one might note that the number of observations in pool 1 is 3 versus 22 in pool 5 indicating that by far more spouses in pool 5 work off-farm. It is therefore reasonable to assume that the availability of off-farm work is more important as a decision factor and economic aid, than participation in the CRP program is.
Figure 7. Gross Farm Earnings from all Nonfarm Employment for Participants and Non-participants Across Pools in North Dakota

Age of Participants and Non-participants

With the data already presented it is hard to find any economic difference between participants and non-participants and therefore a definite economic reason for signing up in the CRP program. Demographic data ought therefore to be looked at. The age of the different groups and participants may be of interest.

For participants in pool 1 the average age in 1987 was 47 years and for non-participants 52.5. For pool 5 the average age for participants and non-participants was 47.6 and 50.4 respectively.
There is no significant difference between the groups. The CRP participant survey, however, discloses the average age to be 57.2 years. One should however remember that the farm survey was restricted to (1) Farmers under 65 years of age, (2) considered farming to be their primary occupation, and (3) sold at least $2,500 of farm products in 1984. The farm survey showed to be very representative but may because of this give a younger average age relative to the CRP participants survey.
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<th>VARIABLES</th>
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<th></th>
<th>POOL 5</th>
<th></th>
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<td>26.5 (182)</td>
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<td></td>
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<td>Grow trees %</td>
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<td>4.8 (8)</td>
<td>NA</td>
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<td></td>
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<tr>
<td>Average wheat yields (bu/acre)</td>
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<td>26.8 (11)</td>
<td>NA</td>
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<td></td>
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<td>Debt ($)</td>
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<td>16237 (17)</td>
<td>13594</td>
<td>13350 (17)</td>
</tr>
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<td></td>
<td></td>
<td></td>
<td>9</td>
<td>9 (108)</td>
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<tr>
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<td></td>
<td></td>
<td>(103)</td>
<td>(103)</td>
</tr>
<tr>
<td>Assets ($)</td>
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<td>50031 (17)</td>
<td>38920</td>
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<td>3</td>
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<td>(97)</td>
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<td>40.8</td>
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<td>19890</td>
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Note: Numbers in parenthesis are number of observations. Values for "Keep permanent cover", "Turn to cropland and farm", and "Grow trees" are taken from the CRP participant survey.
CHAPTER V

SUMMARY AND CONCLUSIONS

This study was undertaken to measure CRP program performance in North Dakota, and is limited to see if objective (6) and (7) (*Curb production of surplus commodities, and Provide needed income support for farmers*) have affected participants in the way they were intended to. To do this farmers that signed up in the program, and those that did not sign up are compared to look for differences. Three existing data sets are utilized to measure the program’s performance. One is a CRP participant survey from the spring of 1988. The two others are farm surveys done in the spring of 1985 and 1988 on the same group of farmers. Relevant variables were selected and means compared between (1) participants and non-participants within each pool, (2) participants across pools, (3) non-participants across pools (control group for the participants), and (4) participants and non-participants across years for each pool.

The reason for doing this is based on three grounds. (1) It is important to regularly measure program performance as to give feedback for future corrections. (2) To do more research on the CRP program it is necessary to first see what we have in existing data, to find existing patterns among participants, what to concentrate future research on, or both. (3) Finally, the scope of this study is limited to existing data sets, and thus only two objectives from the program.
RESULTS AND CONCLUSION

Results and conclusions will be presented in the same order as we stated the hypotheses, with an evaluation of objective 6 (curb surplus production) first, then an evaluation of objective 7 (provide needed income support for farmers), and finally a comparison of pools.

Curb Production of Surplus Commodities

Of all the data tested, the most consistent significant differences were on the "production side" of the CRP program. There was a significant difference (α = .05) between the two pools when it came to intended use of the CRP land after the contract expires. More participants in pool 1 wanted to keep the land under permanent cover than did participants in pool 5. At the same time more participants in pool 5 intend to put land back into production. This is a very clear statement, and is probably due to the more marginal land in pool 1. It is again supported by the fact that both participants and non-participants in pool 5 had significantly higher yields. In other words, the alternative value of the land in pool 1 is not as great as in pool 5, where there are higher yields and more specialized crop-production. These findings support the intention of retiring less productive land into CRP. This happens where the land is generally more marginal and the options fewer. There was no significant difference between average wheat yields for participants and non-participants indicating that it is not individual farms that do worse which sign up in CRP. The deciding factor is the alternative value of the land. The CRP
participant survey (Mortensen et al. 1988) supports this fact because land entered into CRP yielded on an average 10 and 11.1 percent less than the rest of the cropland on the farm in pool 1 and 5 respectively.

Hopefully, the ten year contract period will have an effect past the ten years, so land will be retired permanently. The short term effects are therefore obvious for the ten sign up years. Further, all the land is not signed up instantly. Contracts will be signed until the 45 million acres are signed or until 1990, and they will expire respectively. The major impact on production will therefore occur between when the last acre is signed up and the first acre is turned back into production. In addition there is storage capacity for several years of some commodities such as grains. These could have an eroding effect. It is therefore important, for the CRP to be successful, that land is kept under cover also after the contracts expire. In more marginal production areas we have already established the intention of participants to keep it out of production.

The best way to be sure that land is retired for more than 10 years is to look at how many acres were planted with trees. The national goal was 12.5 percent. In pool 1 4.1 percent of the acres were planted with trees and in pool 5 5.3 percent. This is far from the national goal. Some other states may have a high enough percentage of acres with trees to increase the national average. Two other facts, however, support the conclusion that not enough tree-acres are planted. First is the fact that North Dakota is one of the states with the highest sign up in acres and would therefore weigh more nationally. Secondly, farmers answered in the CRP survey done by Mortensen et al (1988)
that they would have planted more trees if the cost sharing was higher. In other words, it seems that planting trees has been a little too expensive to be attractive enough.

Macroeconomic policies have a great impact on agriculture, and if prices for some crops increase like they did for wheat in 1972, land may be turned back into production again. Studies have shown that the macroeconomic policies have a greater impact on agriculture than do farm programs. One should therefore take advantage of the reduced production and farming by decreasing other support programs as well. In other words use the CRP period as an opportunity to look at some other programs.

Even though farmers in more marginal areas plan to keep CRP land under permanent cover, this does not tell anything directly about production of surplus commodities. For that one needs to know what kind of crops that were grown on CRP land, and more about where farmers intend to keep land covered.

Provide Needed Income Support for Farmers

Debt-to-asset ratios, net farm income, and gross farm income were chosen as indicators of farmers' economic situation. There is no specification in the Food Security Act on what needed income support is. Income support could be any positive contribution to income. For CRP to have an effect, annual payments should provide a better alternative than it is to farm the land. This can be achieved in two ways, either by better annual payments than from alternative crops or local cash rent. There is also needed income support in the certainty of
CRP payments compared with farming the land. This certainty may enable the participants to continue farming.

No debt-to-asset ratios showed significant differences. However debt-to-asset ratios for participants in both pools showed a decrease from 1984 to 1987. For non-participants the debt-to-asset ratio had increased in the same time period in both pools. Two things make this consistent trend interesting. Apparently, participants have managed their farms better. Secondly, participants in both pools in 1984 had a higher debt-to-asset ratio than did non-participants in the respective pools. In 1987 non-participants had higher debt-to-asset ratios than did participants in their respective pools. These trends also indicate that CRP has had some positive effect for those who signed up. No consistency could be found as to if it was due to either debt or assets that the ratios had changed.

Net farm income showed more significant results than did debt-to-asset ratios. In both pools non-participants increased their net farm income from 1984 to 1987 (5 percent level in pool 1 and 10 percent level in pool 5). They also tend to have higher income levels in both pools. Participants did not show a significant increase. Further, participants in pool 1 were the only group that had a decrease in net farm income from 1984 to 1987.

Gross farm income showed the same pattern as net farm income. In pool 5 participants and non-participants had higher gross farm incomes than in pool 1. This was significant at the 5 percent level and
is a clear indicator that pool 5 is a better farming area. It also supports earlier conclusions about the alternative value of the land.

Overall, it seems like CRP payments have improved the economic stability for farmers that signed up, but farmers that did not sign up significantly improved their income. It is hard to make a clear statement about what is an obvious conclusion. One is inclined to say that farmers that are not improving their farm situation are more likely to sign up in CRP, and get their needed income there. Farmers that are improving their situation are not as likely to sign up because they think they may be better off on their own.

**Comparison Across Pools**

The comparison across pools included more demographic data and off-farm work. A major finding here was that non-participants in both pools had a significant increase in off-farm earnings from 1984 to 1987. Gross non-farm earnings increased also for participants, but not nearly as much. This supports our conclusion that farmers that chose not to sign up in the CRP are improving their farm situation overall relative to those who sign up.

Employment status did not show any significant differences. However, all groups had a decrease in off-farm employment from 1984 to 1987. Reasons that all groups decreased can be reduced job opportunities. Agriculture as an industry improves efficiency on a yearly basis. Unless a person expands his farming operation, labor should be released. With an exception for participants in pool 5 all groups reduced total acres farmed from 1984 to 1987. This was not
significant. However, since there was no increase in acres farmed, there is no reason that farmers would reduce off-farm employment for an expanding farm operation. It is therefore realistic to conclude that it is not increased farm operations that is the main reason for the reduction.

Again, this could be due to the fact that there are less job opportunities, and few new jobs are being conceived. If this is true, it shows that "real life" matters more than any agricultural program does. If there were plenty of off-farm jobs, there would perhaps not be any need for income support from a CRP program. Again it appears that CRP provides a transition period for a lot of people to see if they can find alternative uses for their labor or their land.

Gross earnings from non-farm employment increased significantly for non-participants from 1984 to 1987 for both pools. For participants it also increased but not significantly. Obviously fewer people worked off-farm in 1987 than in 1984, but they made a lot more in 1987. Better off-farm income should be an incentive to reduce farm activity, but as for net cash farm income non-participants made more progress over the years. Conclusions to be drawn from this may therefore be that for net cash farm income, that non-participants are "on a roll" and do not see the need to sign up in CRP.

Since no clear trends could be found in the economic characteristics as to whether a farmer would sign up or not, a demographic characteristic such as age would be interesting to look at.
Comparing means among participants and non-participants yielded no significant difference, however. This is interesting in a way that it kills the myth about the CRP participant being far over average age, and ready to retire anyway. We should keep in mind that the CRP participant survey had a higher average age among participants than did the farm survey. In addition the farm survey only surveyed farmers that were 65 years or younger in 1985. This may distort the view. On the other hand we should remember that the farm survey showed to be a very representative sample as far as age distribution was concerned apart from the fact that farmer under 25 years of age were under-represented. One is therefore inclined to believe the farm survey, and say that there is no significant difference in age between participants and non-participants.

From the variables in this study one is likely to conclude that it is not the economic factors that separate a farmer that signs up in CRP from a farmer that does not. Given that one is also likely to conclude that other objectives or criteria make a difference. These criteria can be how much eligible land a farmer has on his farm, and what kind of crops he can grow on his farm. This should be pursued in another study. A typical farmer is an average North Dakota farmer whose perception of a future in agriculture is not the most optimistic. Further he has eligible land he can sign up, and bid price is higher than from long-run average yield and local cash rent. To sum up the following statements can be made;
There are no typical participants or non-participants within each pool.

Participants in marginal areas tend to say "keep it under permanent cover"

Participants in productive areas tend to say "turn it back to cropland after contract expires.

Not enough trees are planted.

Participants seem to have managed their economy better from 1984 to 1987.

It looks as if a farmer's perception of agriculture's future has something to say. Farmers that are not improving their operation are more likely to sign up.

Is it possible, from this, to conclude whether CRP met its objectives or not? Yes, it retires more marginal land (probably because of eligibility criteria) and because of that curbs production of surplus commodities. Further it provides income support. (Whether it is needed or not is hard to say). The question to be asked is then, is it the right way to do it. In other words, are there any other ways the same or less amount of money could have been spent and better results achieved?
NEED FOR FURTHER STUDY

This study has revealed some information about participants, non-participants, and CRP. The government will spend a lot of money to retire up to 45 million acres nationwide, hoping that it will have an effect far beyond the 10-year contract of the CRP. It is therefore of importance that assessments of program performance are undertaken. Further it is necessary that this be done at regular intervals to see effects over time. Findings from this study reveal that follow-ups are necessary. Non-participants should be included as a control group. It is also interesting to know if it is part-time farmers, landowners or family farmers that enter land into CRP. Finally this study has revealed the importance of the eligibility criteria. How much eligible land does each farmer have, and what portion of it is submitted to CRP is of importance to understand the effects of CRP.
LITERATURE CITED


Mortensen, Timothy L., F. Larry Leistritz, Jay A. Leitch, and Brenda L. Ekstrom, 1988. A Baseline Analysis of Participants in the Conservation Reserve Program in North Dakota. Department of Agricultural Economics, North Dakota State University. Agricultural Economics Miscellaneous Report No. 120.


APPENDIX A

Key to Selected Variables
Variables listed in this appendix are taken from three surveys. The CRP participant survey, and the two farm surveys. They were selected from each survey as to provide information on the two objectives measured in this study. Not all may be discussed or used in the publication, but are statistically tested, and may be included in ratios.

KEY TO SELECTED VARIABLES; CRP SURVEY

Q1C Total enrolled CRP acres in North Dakota
Q3 My CRP land yielded. ( % less, same, more)
Q10GEARN Respondent 1987 gross employment earnings; off-farm
Q10HEARN Spouse's 1987 gross employment earnings; off-farm
Q16A Did you plant any trees of shrubs on your CRP land?
Q16AC How many acres of trees planted.

What do you presently intend to do with your CRP land after 10 years

Q17A1 Keep it with a permanent ground cover.
Q17A2 Use it myself for pastureland
Q17A3 Rent it to someone else for pastureland
Q17A4 Grow trees on it
Q17A5 Sell it
Q17A6 Lease it for recreational uses such as hunting
Q17A7 Turn it into cropland and farm it myself
Q17A8 Turn it into cropland and rent it to someone else
Q17A9 Other
Q17A10  Don't know

Current Employment status
Q20A  Full time job/Part time job
Q20B  Part time/2nd part time

Financial Characteristics
Q25  Gross farm income
Q26  Net cash farm income
Q27  Farm and personal assets
Q28  Total debt against farm and personal assets
DBTASR  Debt to Asset ratio  \((Q28/Q27)*100\)
HDBTASR  High debt to asset ratio (for farmers over 40%)
TREEACR  Acres of CRP land planted with trees  \((Q16AC/Q1C)*100\)

KEY TO SELECTED VARIABLES; FARM SURVEY 1985 AND 1988

DTAR85  Debt to asset ratio in 1985  \((Q37/Q35)*100\)
DTAR88  Debt to asset ratio in 1988  \((B15/B14)*100\)
ASSET85  Value of farm and personal assets as of Jan.85  \((Q35)\)
DEBT85  Total debt on farm and personal asset Jan.85  \((Q37)\)
NFI85  Net cash farm income in 1984  \((Q43)\)
YEILD88  Average per acre wheat yield on main farm unit  \((B4)\)
CRP88  Has any of your land been entered into CRP  \((B5A)\)
ASSET88  Value of farm and personal assets as of Jan 88  \((B14)\)
DEBT88  Total debt on farm and personal asset Jan 88  \((B15)\)
NCFI88  Net cash farm income in 1987 (B17)
SOFE88  Spouse plan to look for off-farm employment? (B13A)
SWOF88  Spouse work in an off-farm job in 1987?
HWOF88  Hours per week you would like to work off-farm (B13B)
KOO88   What kind of occupation would you be interested in (B13E)
TACO88  How many total acres did you own in 1987 (B2A)
TACRE88 Total acres in your operation last year (B2D)
PACRE88 Total acres enrolled in CRP (B5C)
TACRE85 Total acres in your operation in 1984 (Q3A)
TACO85  How many total acres did you own in 1984 (Q3B)
TAIC85  Total acres in cropland in 1984 incl. hayland (Q4C)
EOFE85  Family's earnings from off-farm employment 1984 (Q44)
AGER85  Age of respondent spring 85 (Q14A)
OFJN85  In 1984 did you work in an off-farm job NO (Q21A)
OFJY85  In 1984 did you work in an off-farm job YES (Q21A)
OFJN88  In 1987 did you work in an off-farm job NO (B8A)
OFJY88  In 1987 did you work in an off-farm job YES (B8A)
OFJ85   In 1984 did you work in an off-farm job? (Q21A)
OFJ88   In 1987 did you work in an off-farm job? (B8A)
EARN88  Your gross earnings from all non farm employment in 1987
         Exclude costum farm work. If married exclude spouse's
         earnings (B8F)
EARN88  Your (Spouse) gross earnings from all non farm employment
         in 1987 Exclude costum farm work. If married exclude
         spouse's earnings (B12F)
GFI85   What was your gross farm income (including government
payments and custom work performed for others, but excluding hunting and oil or gas lease income) in 1984

GFI88  What was your gross farm income (including government payments and custom work performed for others, but excluding hunting and oil or gas lease income) in 1987

EOFE88  (B8F + B12F)
APPENDIX B

Literature Search
An extensive literature search was done for this study. Future researchers may find it useful. All search procedures are described.

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CONSERVATION RESERVE PROGRAM

PUBLICATIONS


Conservation Reserve Program (includes six signup results).
Conservation and Environmental Protection Division. (05/31/88). 9p.


Landowners making additions to cropland in 1975-77 differed little from all owners of farm and ranch land. They were predominantly white, male and lived in the counties where their land was located. About 89 percent owned their land as sole proprietors or in husband-wife ownership. Over 50 percent owned all the land they operated. Of the owners reporting additions to cropland, 50 percent were 35-54 years of age and 40 percent reported more than a high school education. Over 40 percent also reported their occupation as closely allied to farming.


Conceptual economic welfare impacts of cropland diversion for conservation and environmental improvement (e.g., Conservation Reserve Program, CRP) are identified. The analysis demonstrates the possible incongruities between government cost effects and the program's social benefits and costs. Partial estimates for a hypothetical cropland diversion program reveal that annual
program benefits probably fall short of annual costs. However, some important program effects could not be valued. Several design improvements are discussed which may enhance the net benefit potential of the CRP or other programs.


In fiscal year 1987, 126,421 farms enrolled 13.8 million acres in the Conservation Reserve Program (CRP), 779,000 acres of which were planted to trees, Enrollment per contract averaged 109.2 acres out of an average of 350.7 total acres. Cost-share per treated acre was $38,- for a total of $505 million. Soil erosion rates declined on average of 22 tons per acre annually on enrolled cropland. The CRP, enhanced in December 1985 as part of the 1985 Food Security Act, is a tool for protecting the Nation's most highly erodible and fragile croplands. The CRP's primary goal is to establish a reserve of 40-45 million acres by 1990 to assist owners and operators of highly erodible cropland in conserving and improving the soil and water resources of their farms and ranches. Producers with highly erodible croplands were given three opportunities to enroll acreage in the program in calendar year 1986 and two opportunities in calendar year 1987. This report summarizes the accomplishments of the CRP for fiscal years 1986 and 1987.


The Conservation Reserve Program (CRP) of the 1985 Food Security Act is designed to retire "highly erodible" cropland from production. The CRP has multiple objectives, including reduced onsite and offsite environmental damages, supply control, and farm income maintenance. Another major conservation measure in the Act, the Highly Erodible Land Conservation (HEL) Subtitle, is designed to prevent farmers from receiving commodity program benefits if conservation plans are not implemented on their "highly
erodible " lands. The definition(s) of "highly erodible" used for the CRP and HEL measures may be consistent with their objectives but inconsistent between measures. Or the definitions may be consistent between programs but inconsistent with program objectives. This paper presents an in-depth discussion of using popular definitions of highly erodible and the impact on the consistency between programs and between programs and objectives.


The impact of the CRP on 5 industrial sectors were investigated at national, regional, and local levels using an input/output model. The results indicate that the agricultural production sector is most affected, followed by the agricultural inputs sector. The incomes in the agricultural production sector and the agricultural inputs sectors in areas dependent on agricultural production were found to decline up to 7 times the national rate.


Controlling erosion on the Nation's most erodible cropland and reducing the acreage of surplus crops depends more on how the Conservation Reserve Program is implemented than on the actual number of acres enrolled in the program. Choices must be made on how enrollment acreage is selected: choosing a definition of which lands are eligible, choosing the acreage allotment any given area (region, state, or substate) may seek to enroll, and choosing the most desirable cropland characteristics. How these three choices interact will determine the levels of erosion reduction, surplus reduction, and program cost.


The economic and employment links between agriculture and the industries supplying its inputs and marketing its output determine how a change in the agricultural sector will affect the rest of the economy. These links can work differently for large economic shocks or policy changes than for small ones. For example, minor changes in farm programs (such as temporarily reducing commodity acreage or production to limit Government stock accumulation) have little effect on employment and income in the rest of the economy. But substantial changes in farm programs (such as large, permanent acreage reductions to significantly raise farm commodity process) affect the entire economy by forcing cutbacks in industries linked to agricultural production.


The Conservation Reserve Program (CRP) has substantially influenced the nature of agriculture in parts of the United States, including the western Great Plains. It has a potential for even greater influence in future years, depending upon policy and funding. Many of these impacts are still unknown. However, the long term outlook for land use and management under the CRP is positive for those operators who survive the short term perturbations.


Ogg, Clayton W. 1987. The Conservation Title of the Food Security Act of 1985. Challenge of a Multiple-Objective Program, Resources and

Discretionary environmental provisions could add to the Conservation Reserve Program's (CRP) objectives but would complicate the program. Nationally consistent criteria for designation fields contributing to salinity and selenium pollution, groundwater declines, loss of wetland habitat, or groundwater pollution are not yet available. Particularly being for the CRP would be groundwater problems, since the main cropland contributors generally have not yet been identified, and such croplands may be widely dispersed. In spite of these challenges, enrollment of marginal acres contributing to several environmental problems offers economic advantages, especially if States take action to foster enrollment in watersheds actually subject of pollution.


A survey of Michigan CES County Extension Directors, ASCS County Executive Directors, and SCS District Conservationists.


Socioeconomic Impacts of Farm Failure. North Dakota State University, Agricultural Experiment Station, Department of Agricultural Economics, Project ND01378, pp.7.


GOVERNMENT DOCUMENTS


**JOURNAL ARTICLES**


Performance of the Conservation Reserve Program (CRP) in meeting the political preferences of its administrators is highly sensitive to the choice of eligibility, bid solicitation, and bid selection criteria used in making program implementation decisions. Decisions made in the first year of CRP implementation led to suboptimal results; net government cost could have been reduced while simultaneously increasing the extent to which erosion and supply control objectives were met. Simulation of the outcomes for fully enrolled reserve under alternative implementation schemes indicates that future performance can be improved by manipulation key control variables to directly target preferences.

SOIL BANK

PUBLICATIONS


GOVERNMENT DOCUMENTS


Conservation Reserve of Soil Bank, B1 series 1960-72 A82.82 ;12.


Conservation Reserve Program, B1 series 1970-72 A82.82 ; 912-914.


U.S. Dept. of Agriculture, Off. of Inf., Soil Bank Program: How it Operates, How it Will Help Farmers, 18p... tabs, processed '56 Washington D.C.
JOURNAL ARTICLES


Another 50,000 Farmers Polled on Benson, Soil Bank, Politics, Farm Mangt. Vol.5. No.4. p. 24-25. April.


**SEARCH PROCEDURES**

1. Literature given to me from within the Department of Agricultural Economics.
2. A search on the library system (North Dakota State University) was conducted. The following words were searched on:
   TE SYS CONSERVATION RESERVE,
   TE SYS SOIL BANK,
   TE SYS SOIL CONSERVATION,
   AND AGRICULTURE,
   AND PROGRAM,
   TE SYS CONSERVATION PROGRAM.

3. A search for journal articles was done on AGRICOLA at NDSU library. This provided information of articles from 1984 to August 1988.

4. All titles of articles from Journal of Farm Economics from 1956 and up until today's American Journal of Agricultural Economics were searched in the department's library.

5. Index of Economic Journals from 1954 - 1970 was read through under topics Agriculture (most found under production control) and Natural resources management.


8. The Agricultural Index starting September 1954 ending Vol 74 October 1988, searching under soil conservation, soil bank and from 1985 also under United States Department of Agriculture.

9. Western Journal of Ag.Econ from volume 1 No.1 June 1977 and up to date.


11. North Central Journal of Agricultural Economics from Vol.1 No.1 and up to date.