# Persistent and Immediate Effects of Land Retirement on Labor Market and Land Tenure: Evidence from Historical Conservation Reserve Program in the U.S.*

Aparna Howlader† Liqing Li‡

December 31, 2023

**Abstract**

Voluntary agricultural land retirement programs have received significant attention for their potential environmental benefits, but they may also impact local economies by reducing demand for farm labor. In this study, we examine the immediate and persistent impacts of land retirement on the labor market and land tenure by leveraging data from the historical Conservation Reserve Program (CRP), the first long-term land retirement program in the U.S. that was initiated in 1957 as part of the Set Aside Program. We constructed a new database using various historical sources and employed a difference-in-difference (DID) approach to identify the causal effects of the program. By comparing outcomes among counties with varying levels of program enrollment before and after the program, we estimate the impact of the historical CRP on the labor market and institutions over time. Our results suggest that the historical CRP had a significant and immediate impact on the local farm labor market, with high and medium CRP counties experiencing substantial reductions in hired agricultural labor and tenancy. Such impacts persist in some regions even after the program ended. We also explore the underlying mechanisms of varying degrees of impacts from the program with access to irrigation, race, and different initial tenancy structures. The results regarding labor market and tenancy impacts differ based on the agricultural and institutional characteristics specific to each region.

**Keywords:** Land Retirement, Agricultural Tenancy, Conservation Reserve Program
**JEL Codes:** N52, N92, Q15, Q18, Q57

*We express our gratitude to Jo Albers, Amy Ando, Eli Fenichel, and Bryan Leonard for their valuable comments. Additionally, this paper has derived substantial benefit from the insightful comments of participants at the AERE Annual Conference.

†Assistant Professor, Department of Business and Data Science, Chatham University
‡Assistant Professor, Department of Agricultural Economics, Texas A&M University

# 1 Introduction

Long-term agricultural land retirement programs, which aim to preserve land by converting active farmland into conservation areas, have gained significant attention from policymakers and stakeholders (Smith, 1995; Hellerstein, 2017). The major land retirement program in the U.S., the Conservation Reserve Program (CRP), currently covers approximately 20.5 million acres of land and has an annual budget of roughly 1.8 billion dollars as of the end of fiscal year 2021 (United States Department of Agriculture, 2023). Many developing countries and international organizations have also started advocating for increasing subsidies to encourage landowners to retire their land for environmental purposes (Jack, Kousky, and Sims, 2008; Jayachandran et al., 2017; and Hansen, 2007). Land retirement programs like the CRP can offer numerous environmental advantages. However, the transition from agricultural production to environmental conservation may negatively affect the local economy and institutions (Beck, Kraft, and Burde, 1999) by taking lands out of active production.

In this paper, we study the impacts of land retirement programs on the agricultural labor market and land tenure institutions, utilizing the first-ever long-term land retirement program in the U.S. The program was initially established in 1957 under the Set Aside Program to provide financial compensation to landowners for retiring environmentally sensitive land for 5 to 10 years (U.S. Dept. of Agriculture, 1957-1963; Farm Economics Research Division, 1958). Although the program was discontinued in the late 1960s due to a decade-long federal funding cut, it was later reintroduced in 1985 under the new farm bill (Bottum, 1957; Coppess, 2017; Hellerstein, 2017). To distinguish the two phases of the program, we refer to the CRP established in 1957 as the historical CRP and the CRP established in 1985 as the current CRP. This paper mainly focuses on studying the impacts of the historical CRP as it provides a unique opportunity to explore the persistent effects of land retirement.

While some previous qualitative research suggests that land retirement programs can harm the development of rural communities (Hyberg, Dicks, and Hebert, 1991; Martin et al., 1988; Mortensen et al., 1990; Siegel and Johnson, 1991), others find an

insignificant impact of such programs (Sullivan et al., 2004). Thus, it remains unclear what the consequences of land retirement programs are on both the agricultural and non-agricultural sectors, especially whether such impacts would persist in the long term due to data limitations. Furthermore, labor market effects may be translated into more persistent institutional effects, and that may also be of policy interest (Alston, 1981; Depew, Fishback, and Rhode, 2013). Whether such impacts on the labor market or land institutions persist in the long term after the program ends is understudied due to data limitations.

In addition, such land retirement programs can have an impact on land tenure since they may unevenly affect landowners and tenants. As government compensation policies mainly give financial assistance to the landowners, land retirement may have a more pronounced negative effect on tenants than agricultural landowners (Depew, Fishback, and Rhode, 2013). Removing land from active production and providing subsidies exclusively to landlords may result in the eviction of tenants from the land (Depew, Fishback, and Rhode, 2013), forcing them to either seek alternative employment or migrate in search of new opportunities. Existing literature that examines the economic impacts of land conservation often focuses on the agricultural labor market as a whole without distinguishing landowners and tenants (e.g., Sullivan et al., 2004). A close look at how such programs may affect the county-level percentage of tenants and the percentage of agricultural acreage operated by tenants can provide a complete picture of how the farm labor market responds to land retirement programs.

In this paper, we address three interdependent questions regarding the impacts of land retirement programs. First, we study the immediate and persistent effects of the historical CRP on the agricultural labor market utilizing spatial and temporal variations of the program enrollment. Specifically, we investigate how the historical CRP influenced local labor market conditions by analyzing changes in agricultural labor employment and farmland tenancy structure. Second, we explore how various regions may respond to the historical CRP differently based on their initial agricultural-related characteristics, such as irrigation infrastructure and tenancy structure. Third, we study how the non-agricultural

labor market may help adjust to implementing a land retirement program.

To answer these questions, we construct a unique database on historical land retirement from various sources. Initially, we digitized the historical CRP enrollment maps from USDA reports published in 1957 to create county-level historical CRP enrollment intensity data (Farm Economics Research Division, 1958; U.S. Dept. of Agriculture, 1957-1963).[1] Subsequently, we merged this geographic database with data on labor and agricultural characteristics from the county-level agricultural, population, and government census from the 1950s to 1970s (Haines, 2001). To examine the impact of the CRP, we first focus on agricultural tenancy. Due to the limited labor demand after the introduction of the historical CRP, landowners may reduce the number of tenants and decrease tenant acreage. These effects may also vary across tenant contracts, including sharecroppers, cash tenants, and other intermediate contracts. To supplement our analysis of the labor market response, we also examine the impacts on the number of hired workers who earn wages under temporary contracts. To examine the labor market adjustment, we study the effects on nonfarm labor jobs in different sectors: manufacturing, construction, transportation, and wholesale retailing.

As the historical CRP was a voluntary program, farmers self-selected to enroll. We use a difference-in-difference (DID) approach to causally identify the immediate and persistent impact of enrollment on labor market outcomes. We categorize counties into four groups (high, medium, low, and very low) based on their CRP enrollment in 1957 (Figure 2). We then compare the differences in labor outcomes among counties with different enrollment intensities before and after the program to estimate the effect of the historical CRP on the labor market over time. This empirical identification strategy can causally identify the impacts as the labor outcomes from the four groups of counties follow a parallel trend before the policy period starts.

Our findings suggest that the CRP immediately decreased farm tenancy and tenant acreage. Compared to counties with very low enrollment intensity, those with high and medium CRP enrollment witnessed significant reductions in hired labor and agricultural

[1]Figure 1 presents the map from historical reports on the CRP.

tenancy in the first decade after program initiation. Furthermore, following the initial shock, we observe that the land and labor markets become more stable over time. We also examine regional heterogeneity in the results, as historically, agricultural production and land institutions vary across regions in the U.S. We find that the effects are concentrated in the South and the Plains region. Southern and Plains states had the highest share of the CRP counties, so this result aligns with that initial distribution.

Next, we employ a heterogeneous treatment effect (HTE) analysis to understand this average treatment effect's underlying agricultural and demographic characteristics. We use an HTE model to study the varied impacts and mechanisms of the CRP effects, considering factors such as access to irrigation and tenancy institutions. Access to irrigation is identified as a substitute for land conservation, as water can enhance soil moisture, reducing the need for conservation practices. Results show that the Ogallala Aquifer's presence increased tenant-operated acreage. Additionally, we explore the impact of CRP across regions by studying the agricultural tenancy structure. We observe increased tenant-operated acreage in high cash tenant areas, particularly concentrated in the Southern states. [2]

This paper makes two major contributions to the existing literature. First, this paper examines the utilization of a historical Payment for Ecosystem Services (PES) program to shed light on the distribution of benefits arising from such programs. As a critical strategy for effectively allocating conservation budgets, PES compensates working landowners for their contributions to conservation efforts, and it has gained increasing recognition as an indispensable tool for preserving biodiversity (Blanco et al., 2023; Balmford et al., 2023; Jack, Kousky, and Sims, 2008; Jayachandran et al., 2017). While existing literature has shown the impacts of PES on landowners and environmental qualities, these studies did not consider the impacts on non-owner farm populations (Daniels et al., 2010;Zhang, Song, and Chen, 2018). Thus, these policies' overall general equilibrium impact and the equitable distribution of benefits across society remain subject to debate. The primary concern revolves around the fact that payments for these benefits tend to flow

[2]sharecroppers were more vulnerable compared to cash tenants (Depew, Fishback, and Rhode, 2013).

exclusively to landlords. Although withdrawing land from production may offer financial compensation and environmental improvements to landowners, these positive effects may not extend to tenants (Howlader, 2023b). In regions with high levels of tenancy, a contract established solely between the government and landowners could potentially leave tenants in a financially disadvantaged position. In this paper, we study how historical CRP had distributional effects across landownership and tenancy structure, which will help policymakers design better PES policies to induce people into conservation benefits.

Second, we provide empirical evidence of the immediate and persistent impacts of land retirement programs on the local agricultural labor market. Early works regarding the effects of land retirement often focus on the optimal design of such policies (e.g.,Floyd (1965)) in theory due to a lack of county-level datasets. More recent studies have explored the empirical implications of land retirement programs, including their economic effects on farmland values and environmental benefits. Some studies show that such programs can have economic impacts on farmland values. For instance, the current CRP is considered a least-cost land retirement mechanism, and land retirement can be capitalized into land values (Smith, 1995).[3] Importantly, early studies relied on state-level farmland acreage data due to the unavailability of county-level datasets at that time.

When it comes to the effects on labor market outcomes, only a few studies explore such effects from the land retirement program. For instance, China's sloping land conversion program pays more than 32 million households to plant trees on highly erodible cropland, resulting in significant land use change and transferring nonfarm labor employment (Bennett, 2008). Sullivan et al. (2004) focus on the first 15 years of the current CRP and find it would have a negligible effect on local employment. These studies often focus on the immediate impacts of the programs; whether the effects of land conversion programs persist in the next few decades remains unclear. We take advantage of the historical CRP

[3]Other studies have examined the historical perspective of how government programs affect crop acreage. For example, effective support prices are used to estimate the impacts of government programs on planted acreages of seven major crops, and the difference between acreage planted and acreage harvested is due to some environmental factors (Houck et al., 1976). Studies have also explored the impact of land retirement programs on environmental benefits. For instance, Babcock et al., 1997 show the optimum allocation of conservation benefits, while Feng et al., 2005 explains the interaction between working land and land retirement options as alternative investments to evaluate the cost-effectiveness of conservation programs.

established in the 1950s to identify both the short- and long-run impact of land retirement on the labor market. Understanding the persistent effects of historical land conservation can provide valuable information to government agencies and policymakers for future conservation and economic development decisions.

# 2 Background and Institutional Framework

## 2.1 Evolution of the CRP

Land conservation in the U.S. began in 1871 with Yellowstone National Park, initially focusing on natural beauty. It shifted to soil conservation in 1910, gaining momentum in the 1920s with Hugh Bennett's advocacy. The Dust Bowl in the 1930s intensified the need, leading to the USDA's comprehensive soil conservation plans (Howlader, 2023b). However, these post-Dust Bowl policies did not include long-term land retirement programs. Post-Dust Bowl land conservation policies only include financial and technical assistance for the farming landowners (Depew, Fishback, and Rhode, 2013; Howlader, 2023a; Howlader, 2023b). Land retirement has been introduced as a policy instrument for long-term conservation benefits in the Farm Bill of 1957 (U.S. Dept. of Agriculture, 1957-1963; Farm Economics Research Division, 1958). This historical CRP depended on the need for long-term planning to reduce erosion. The program is a continuation of the Soil Bank created by Congress and the Eisenhower Administration in 1956 to reduce surplus production through short and long-term acreage retirement programs (Bottum, 1957; Coppess, 2017; Hellerstein, 2017). In declaring the Soil Bank, Congress stated that "the production of excessive supplies of agricultural commodities depresses prices and income of farm families; constitutes improper land use and brings about soil erosion, depletion of soil fertility, and too rapid release of water from lands where it falls" (Agricultural Act of 1956, P.L. 84-540). Thus, Historical CRP had a two-folded mission: a) decrease agricultural supply to increase price, and b) increase soil quality. The historical CRP was discontinued in the late 1960s due to a decade-long federal funding cut.

The histogram depicted in Figure 3 shows that the historical CRP acreage experienced

a notable increase until 1960, after which it declined over time. It is noteworthy that the historical CRP concludes in the 1960s, and during this period, the maximum contract length peaked at 10 years. Leveraging this historical context, our empirical analysis in the subsequent sections aims to study the implications of these trends on both the labor market and the economy.

The historical CRP annual reports show that financial assistance for converting land to CRP primarily supported crops such as wheat, corn, cotton, tobacco, and rice. The contracted acreages for these crops were as follows: wheat - 12,783,192 acres, corn - 5,233,478 acres, cotton - 3,015,630 acres, rice - 242,017 acres, and tobacco - 79,701 acres. Notably, wheat alone accounted for nearly 60% of the total CRP area in 1957 (U.S. Dept. of Agriculture, 1957-1963; Farm Economics Research Division, 1958). CRP encompasses a total of 82,588 contracts in 1957.[4] CRP practices encompassed the establishment of permanent and temporary vegetative cover, tree or shrub cover, winter and summer vegetative cover, cover beneficial to wildlife, and water and marsh management, including the creation of dams, pits, and ponds to protect vegetative cover and promote fish habitat.[5]

In a survey conducted by the U.S. Department of Agriculture to understand the adoption constraints among CRP farmers, key motivations for participation included soil improvement, retirement planning, receipt of payments, avoidance of rental issues, pursuing full-time off-farm employment, and support for beginning farmers. Of the surveyed farmers, 14% expressed a desire for CRP to mitigate problems associated with farm renting, 10% aimed to work full-time off the farm, and 21% saw CRP as a means to facilitate retirement.[6] These motivations collectively reflect a significant influence of CRP participation on the agricultural labor market.

The CRP that was reintroduced in 1985 under the Farm Bill 1985 (referred to as the current CRP) allows farmers to temporarily retire their cropland by signing a 10 to 15-year contract. Applications submitted by landowners interested in enrolling their land parcels in the current CRP are subject to competitive bidding. Land parcels with a higher

[4]Data enclosed in Figure A1 in the Appendix
[5]Data enclosed in Figure A2 in the Appendix
[6]Data enclosed in Figure A3 in the Appendix

level of environmental benefits but a lower level of rent requested by the landlord would have a higher chance of enrollment. As the third wave of land retirement programs that began with the Agricultural Adjustment Act of 1933, followed by the Soil Bank Program of 1956 to 1972, the current CRP is the largest private-public partnership for conservation and habitat protection in the U.S., with an annual budget of nearly 2 billion (Ferris and Siikamäki, 2009). In 2023, 22 million acres of farmland were under CRP enrollment.

## 2.2 Agricultural Labor Market and Tenancy Structure

To see the effect of land retirement on the agricultural labor market, we mainly focus on the agricultural tenants. Tenancy has long played a significant role in the American agricultural production system, with a hierarchical structure commonly referred to as the tenant ladder (Cox, 1944). This ladder encompasses various levels, including sharecroppers, cash tenants, part owners, and full owners. Following the Civil War, the Southern United States witnessed a historical evolution of sharecroppers. A considerable portion of former slaves transitioned into the role of sharecroppers during this period. The fundamental concept behind sharecropping was that individuals in this arrangement received their income in the form of a share of the crops they cultivated. This practice emerged as a pivotal economic arrangement, especially in the post-Civil War South, where traditional plantation systems underwent significant transformations. Sharecropping allowed formerly enslaved people to continue working as farm tenants in others' land using their labor. In many cases, landowners provide capital and housing for their sharecroppers (Alston, 1981).

Alternatively, regions such as the Midwest and Great Plains have a higher dependence on cash tenants along with sharecropping contracts. Cash tenants typically possessed more financial resources. Unlike the sharecropping arrangement, where compensation came in the form of a share of the crops, cash tenants received their income in the form of monetary payment. The distinction between cash tenants and sharecroppers lies not only in the mode of compensation but also in the economic standing of the individuals involved. Cash tenants, being more financially secure, could afford to make cash payments

for using the land they cultivated. The relationship between landowners and cash tenants has usually been more formal. The growth of cash tenants across the U.S. may have a high correlation with higher absentee landlords.

Figure 4 illustrates the annual fluctuations in the percentage of tenants in the United States, indicating a sustained decline post-World War II. This study explores the potential impact of land retirement on shaping this downward trajectory.

Table 2 presents data from the agricultural census, revealing variations in agricultural contracts across different regions. In 1954, a higher proportion of sharecroppers was observed compared to cash tenants. Cash tenants are predominantly concentrated in the Atlantic and Western regions. In other regions, sharecroppers dominate, with some instances of intermediate contracts (a mix of cash tenancy and sharecropping).

# 3 Data Construction and Summary Statistics

We compiled a primary database by extracting information from various historical sources to assess the impact of the historical Conservation Reserve Program (CRP) on labor market outcomes. Our data sources include an archival database for CRP reports, agricultural and population census records, county data for the Ogalla aquifer, and county census government reports. The initial step involved digitizing the historical CRP enrollment maps in USDA annual reports published in the 1950s. This integration enabled the construction of county-level panel data, forming the basis for our empirical analysis.

## 3.1 Historical CRP Data

We obtain the historical CRP enrollment data by digitizing the historical CRP enrollment map from the USDA reports (Figure 1), which are available in the CRP annual reports published in 1959 by the USDA. In the enrollment map, counties are classified into four categories based on their historical CRP enrollment intensity. We define enrollment intensity as "very low" if the cumulative number of reserve acres within a county is not more than 0.9% of the total cropland in 1954. Similarly, we define the enrollment intensity

as "low" if county-level Reserve acres are between 1% to 4.9%, "Medium" if Reserve acres are 5% to 14.9%, and "High" if Reserve acres are 15% to 97.7%. The historical CRP enrollment map also includes counties with no CRP enrollment (no reserve acres in Figure 2). We drop these counties from our main sample because these counties are mainly metropolitan areas or areas with public conservation land (e.g., national parks), fundamentally different from other counties in our main sample.

The historical CRP enrollment exhibits regional variation. Counties with high CRP enrollment are concentrated in the South, Great Plains, and Midwest, as these regions have a substantial proportion of agricultural land. In contrast, Northeast and Western states have fewer CRP acres. Table 1 summarizes the number and percentage of counties in each enrollment category by region. High CRP areas are primarily concentrated in the Plains and Southern states. We also see that medium CRP areas are concentrated in the Midwestern and Southern states. Atlantic states and Western states mostly have lower CRP acreage.

Not only does variation exist in historical CRP enrollment intensity across regions, but differences in crop choices and institutional factors also exist in these regions. Such variations suggest that the response of the local labor market to farmland retirement may differ across regions. In our regression analysis, we explore regional disparities by considering these factors, examining how counties with distinct initial agriculture and demographic characteristics respond differently to the CRP regarding labor market outcomes.

## 3.2 Agricultural census

We integrate our newly constructed geographic database on historical CRP enrollment with labor and agricultural characteristics data from the agricultural census from the 1950s to the 1970s. This overlap results in creating county-level panel data focusing on farm labor and other related variables. Our primary outcome variables encompass agricultural tenancy, acreage under-tenants, and nonfarm labor allocation. Additionally, we incorporate county characteristics, such as average farm size and irrigation access, into

the analysis. Furthermore, we gather information on various types of tenancy structures, including sharecroppers, cash tenants, and other tenants.

A summary of agricultural data is presented in Table 3. In the pre-CRP period before 1957, we observe that the number of hired labor and the percentage of tenants were highest in areas with very low enrollment intensity. The average farm size was highest in the area with the highest CRP and lowest in the area with the lowest CRP. These summary statistics align with intuition, as the sustainability of a farm often depends on its size. Great Plains farms generally have larger sizes due to better soil quality compared to the Midwest and South, explaining the higher farm sizes in the high CRP areas. The areas with very low enrollment are designed to have the highest soil quality, automatically attracting more labor to the region. The number of hired labor decreases with the CRP enrollment intensity. The percentage of tenants decreases with CRP intensity. Additionally, the population density is highest in the lower CRP region. This is correlated with higher soil quality, which determines the lower CRP regions.

## 3.3 Population Census and County Government Census

We obtained county-level population data from the Population Census, providing information on the total population and racial characteristics. Additionally, we collected other available population data related to various activities from the county government census information. This serves as our primary source of information for different nonfarm jobs. Our nonfarm labor variables include manufacturing, transportation, construction, and wholesale jobs.

This information is presented in Table 4. We observe a decrease in the number of agricultural workers between 1952 and 1962. Construction labor increased during this period, similar to the trend seen in manufacturing. There is also an increase in transport and wholesale retail jobs.

### 3.4 Post-1985 CRP (Current CRP)

To complement our analysis of the historical CRP, we further investigate the spatial relationship between historical and current CRP enrollment. For the purpose of the analysis, we obtain county-level enrollment data on the current CRP, which started in 1985 from the Farm Security Administration. This Data provides information on the number of acres enrolled in the current CRP across years and counties from 1985 to 2020 (Hellerstein, 2017).

## 4 Empirical Method

### 4.1 Multinomial Logit Model

To initiate our empirical investigation, we employ a multinomial logit model to study the factors influencing historical enrollment in the CRP at the county level. The historical CRP enrollment is categorized into four groups: Very Low CRP, Low CRP, Medium CRP, and High CRP. The primary objective is to examine whether pre-CRP selection bias existed in the allotment process. Specifically, we regress the probability of CRP enrollment in any of these four categories on pre-CRP county-level agricultural and demographic characteristics.

The underlying heterogeneity in historical CRP enrollment can be modeled using a multinomial logit model. This model utilizes a linear predictor function $f(k, i)$ to predict the probability that observation $i$ has outcome $k$, represented as:

$$f(k, i) = \beta_{0,k} + \beta_{1,k}x_{1,i} + \beta_{2,k}x_{2,i} + \ldots + \beta_{M,k}x_{M,i},$$

where $\beta_{m,k}$ is a regression coefficient associated with the $m$-th explanatory variable and the $k$-th outcome. As discussed in the logistic regression literature, the regression coefficients and explanatory variables are typically grouped into vectors of size $M + 1$, leading to a more concise representation of the predictor function:

$$f(k, i) = \boldsymbol{\beta}_k \cdot \mathbf{x}_i,$$

where $\boldsymbol{\beta}_k$ is the set of regression coefficients associated with outcome $k$, and $\mathbf{x}_i$ (a row vector) is the set of explanatory variables associated with observation $i$.

The independent variables in this regression model include pre-CRP population density, the proportion of farmland in a county, the proportion of tenancy, various tenancy structures, and differences in farmers' racial backgrounds. This initial regression model explores the characteristics of CRP intensity and provides guidance for subsequent empirical models. The parameters of the multinomial logit regression are estimated through maximum-likelihood estimation, assuming a linear relationship between the outcome variable and the predictor variables.

The marginal effects are obtained by taking the partial derivative of the probability of each category with respect to a specific independent variable. For the $m$-th independent variable, the marginal effect for category $k$ is calculated as:

$$\text{Marginal Effect}_{m,k} = \frac{\partial P(Y = k \mid X)}{\partial X_m},$$

representing the change in the probability of category $k$ given a one-unit change in the $m$-th independent variable.

If the marginal effect is positive, it implies that an increase in the value of the independent variable leads to an increase in the probability of observing category $k$. Conversely, if the marginal effect is negative, it suggests that an increase in the value of the independent variable leads to a decrease in the probability of observing category $k$. The magnitude of the marginal effect indicates the strength of the effect, with larger magnitudes signifying a more substantial impact on the probability.

## 4.2 Long-difference Model

Next, we examine the historical CRP's causal impact on the local labor market. Randomly assigning land parcels to enroll in the CRP is the ideal solution to study its

causal impacts. However, self-selection bias exists because landowners voluntarily chose to enroll in the program. As a result, estimated impacts from a simple OLS regression can be biased due to simultaneity. Landowners may determine CRP enrollment acreage and labor allocation simultaneously. For instance, farmers may take hired agricultural labor out of production during a poor crop yield season and enroll more land under the CRP. To address these issues, we follow Hornbeck (2012) and compare the differences in labor outcomes among counties with different enrollment intensities before and after the program was implemented to estimate the causal effect of the historical CRP on the labor market over time. This approach is valid because labor outcomes from the four groups of counties followed a parallel trend before the policy period began (Hornbeck, 2012). The existence of the parallel trend is presented in Figure 4.

Outcome $Y_{ct}$ in county $c$ and year $t$ is differenced from its value in 1950. This difference is regressed on the CRP intensity categories (Low, Medium, High). The model shows as follows:

$$Y_{ct} - Y_{c1950} = \beta_1 Low_c + \beta_2 Medium_c + \beta_3 High_c + \alpha_s + \epsilon_{ct} \tag{1}$$

Where $Y_{ct}$ represents labor market outcomes in both farm and nonfarm labor activities in state $s$, county $c$, and year $t$. We mainly focus on the percentage of tenants, the percentage of acres cultivated by tenant farmers, the number of hired labor, total non-agricultural labor, and labor in manufacturing, construction, transport, and wholesale trade, depending on the availability of the dataset. The model investigates the immediate and persistent relationship between enrollment intensity and changes in labor market outcomes from the year 1959 to 1974, relative to the baseline year of 1950.

The variables $Low$, $Medium$, and $High$ are dummy variables that correspond to a county's CRP enrollment intensity status in the year 1957. As explained in Section 3.1, it comprises four levels: very low, low, medium, and high. In our main regression model, counties classified as having "very low" are designated as the baseline category and are omitted in the regression. The coefficients $\beta_1$, $\beta_2$, and $\beta_3$ capture the estimated impacts of the historical CRP for the low, medium, and high-intensity groups in comparison to

the omitted group. $\alpha_s$ represents state-fixed effects to control for any state-level policy variation. The regression model includes controls for initial county-level characteristics.

Having established the effects of the historical CRP on the labor market and land tenancy, we also investigate the persistent concentration of the program in both historical and current years. To accomplish this, we regress current CRP acres in various years on historical CRP enrollment. This analysis aims to qualitatively understand how the historical CRP can have a persistent local effect on current land use decisions. However, due to the nature of the problem, we do not claim any causality from this analysis.

# 5 Results

## 5.1 Results from the Multinomial Logit Model

We initiate our analysis by investigating the correlation between predetermined agricultural and demographic variables at the county level and historical placement decisions regarding CRP enrollment. Counties with diverse historical CRP enrollment intensities are categorized into four groups, as detailed in Section 3.1. The results of a multinomial logit model are presented in Table 5, utilizing county-level data on agricultural and demographic characteristics from 1954, before historical CRP enrollment, to elucidate the variations in CRP enrollment intensities. The model evaluates the influence of a one-unit change in independent variables on the logarithm of the odds, with other variables held constant. Table 5 presents the average marginal effects of various variables on the probability of being in each CRP group using the multinomial logit model.

In Column 1 of Table 5, it is evident that population density positively influences the adoption in the low CRP intensity areas but is negatively associated with the adoption in the high CRP intensity areas. In Column 2, the percentage of tenants exhibits a positive marginal effect on higher CRP adoption but a negative effect on lower CRP adoption, prompting an exploration of different tenant types to better understand this variation. The Census of Agriculture features four types of tenants: cash tenants (receive cash payments), sharecroppers (receive crop payments and have little to no decision-making power),

sharecash tenants (intermediate contracts between cash and crop), and other tenants (inclusive of various contractual arrangements).[7] In this regression model, we consider sharecroppers as our baseline category and use that as our omitted category. Results in Column 3 show that a high proportion of cash tenants in any county demonstrates a negative marginal effect on lower CRP adoption but a positive effect on higher CRP adoption compared to the proportion of sharecroppers in that county. This suggests that counties with more cash tenants compared to sharecroppers are more likely to be in high CRP areas, aligning with the concentration of high CRP regions in the Plains states, where cash tenants and intermediate contracts are the dominating institutions. Results in Column 4 reveal that other tenants are predominantly concentrated in Very Low CRP regions. Column 5 discusses results for the proportion of sharecash tenants, indicating a positive marginal effect on lower CRP adoption but a negative effect on higher CRP adoption compared to sharecroppers.

Results in Column 6 highlight that the average farm size has a small yet significant positive average marginal effect on the adoption of high CRP regions. This is attributed to larger farms in the Plains, driven by farm sustainability. However, the average farm size shows no significant effect on other CRP categories. In Column 7, the percentage of white farmers demonstrates an inconsistent relationship with CRP categories. A higher proportion of white farmers positively influences CRP adoption for Very Low and High CRP areas but negatively affects Medium and Low CRP areas.

These results provide insights into the relationship between CRP enrollment and labor market conditions, guiding our discussion in subsequent sections. Local labor demand can vary by land use and agricultural institutional characteristics. The labor market structure, including factors such as the percentage of cash tenants or sharecroppers in a county, may impact how the local labor market responds to land use changes resulting from CRP enrollment.

[7]Other tenants are not defined in the census. This may include different variations of contracts across the U.S.

## 5.2 Immediate and Long-Term Effects on the Labor Market

We employ Equation 1 to investigate the causal effects of the historical CRP on the agricultural labor market through three different county-level measurements: the tenant-cultivated acreage, the percentage of tenants, and the number of hired workers. These three measurements can provide a more complete picture of how agricultural labors are affected by the historical CRP.

The estimated impacts on tenant-cultivated acreage for the entire nation and by regions are presented in Table 6. The outcome variable is the change in the proportion of total farmland operated by tenants each year compared to the proportion in 1950.[8] After the introduction of CRP in 1957, tenant-cultivated acreage declined in High, Medium, and Low CRP areas related to changes in Very Low CRP areas. Panel A highlights the initial negative effects of the historical CRP on tenant acreage at the national level. Compared to counties with very low CRP enrollment, we observe a significant decrease in the proportion of tenant acreage in counties with high CRP enrollment from 1959 to 1969. However, starting from 1974, the effect is not visible, aligning with the defunding of the CRP policy in 1970, which allowed farmland to re-enter the production system after that period.

The effects in counties with lower enrollment intensities were less pronounced and faded faster than those observed in counties with high CRP enrollment. For instance, significant negative effects on the proportion of tenant-operated land were observed only for the first ten years of the program (as seen in the results for the years 1959 and 1964) in counties with medium CRP intensity. Moreover, the estimated effect in the low CRP counties was only negative and significant in the year 1964. In the low-intensity CRP areas compared to Very Low-intensity CRP areas, the proportion of land decreased insignificantly in 1959 but significantly decreased in 1964, with a magnitude of average treatment effect (ATE) of 0.67. Later, in 1974, the low CRP regions again started to gain tenant land. For medium CRP areas, the proportion of tenant-operated land decreased in 1959, with an average decrease magnitude of 0.66. In 1964, this average treatment effect

[8]The total farmland acres data are from the year 1950, before the program started.

decreased to 0.01. Later, in 1969, the average treatment effect remained negative but insignificant. The most robust results are observed in high CRP areas, where the initial reduction in tenant-operated land is 0.01. In 1964, this average treatment effect increased to 0.03; however, in 1969, the average treatment effect was again around .01. The relative decline of tenant-cultivated land is substantial and persistent across all CRP areas.

We also explore how this tenant-cultivated acreage in different regions responded to the historical CRP. For that purpose, we divide the U.S. into five regions following the division provided by the USDA: Western states, Plains states, Midwest states, Southern states, and Atlantic states.[9] Our discussion on regional analysis mainly focuses on the states in the South, Plains, and Midwest since most CRP enrollment is concentrated in these regions. Results for the Western and Atlantic States are available in the Appendix.

The results in Panel B reveal that the impacts in the South are consistent with what we observed in the nationwide analysis. However, the magnitude of the effects is generally larger compared to the findings in Panel A. Moreover, the negative and significant effects on the proportion of land operated by tenants persist even in the year 1974 in counties with high CRP enrollment and in the year 1969 in counties with medium CRP enrollment. Such results may suggest that it takes a longer period for counties in the South to make adjustments in the labor market compared to the national average level. Such results can be intuitive given the high dependency on tenants in Southern states (Alston, 1981). The magnitude of average treatment effects is generally higher than the entire nation. This result is intuitive given the higher dependency on share tenants in Southern states.

Panel C shows the pattern of results in the Plains aligns with the decreasing trends in tenant acreage observed in the entire nation. The results suggest that tenant acreage decreases with high CRP enrollment. Such effect not only is the largest in size among all regions but also remains visible until the year 1974. Moving to Panel D, the average

[9]the Western states include Arizona, California, Colorado, Hawaii, Idaho, Montana, Nevada, New Mexico, Oregon, Utah, Washington, and Wyoming; the Plain states include North Dakota, Oklahoma, South Dakota, Texas, Nebraska, Kansas; the Midwest states include Illinois, Indiana, Iowa, Michigan, Minnesota, Missouri, Ohio, and Wisconsin; the South states include Alabama, Arkansas, Florida, Georgia, Kentucky, Louisiana, Mississippi, South Carolina, Tennessee, Virginia, West Virginia, and North Carolina; and the Atlantic states include Connecticut, Delaware, Florida, Georgia, Maine, Maryland, Massachusetts, New Hampshire, New Jersey, New York, and Rhode Island.

treatment effect shows a distinct trend in the Midwest compared to the entire nation, as the proportion of tenant-operated acreage mainly increased during our study period. Such regional disparities in the Midwest may be linked to crop choices, as illustrated in Figure 6. Over the specified time period, soybean cultivation notably increased, with soybeans primarily concentrated in the Midwestern states of the USA. The data suggests that the rise in tenancy may be directly influenced by the expanding soybean plantation in the Midwest.

Merely demonstrating a decrease in the proportion of tenant acreage may not sufficiently illustrate the negative impacts that the historical CRP had on the tenants since it is possible that these tenants stayed in the agricultural production while managing fewer acres of land. To further explore the effects of the historical CRP, we examine its impact on the percentage of tenants, defined in the Census of Agriculture as the proportion of tenant operators divided by total farm operators.

The results displayed in Table 7, Panel A, reveal findings similar to those observed earlier. Compared to counties with very low CRP enrollment, there is a decline in the percentage of tenants across all three enrollment intensity groups nationwide. However, these impacts on the percentage of tenants were more enduring than effects on tenant acreage and persisted until 1974. This persistence may suggest that even though tenant acreage stabilizes in the long term, the percentage of tenants decreases as individual tenants may manage more acres of land due to mechanization (Perelman, 1973). Furthermore, results in Panels B to D highlight regional variations. The negative effects are more pronounced in the South. Considering the historically low job security for tenants in the agricultural sector, eviction of tenants from land due to retirement represents a relatively straightforward adaptation process in the South. As the government contracted only with landowners, the impact on tenants who did not own land was particularly severe, similar to the Dust Bowl period (Depew, Fishback, and Rhode, 2013). In the Midwest, there was a negative effect on the percentage of tenants during the program, but these negative effects diminished quickly after the program ended in late 1960. Although we observe negative effects on tenant acreage in counties with high CRP enrollment in the Plains, its

impact on the percentage of tenants is mostly insignificant in this region.

Next, to further understand the impacts of the historical CRP on the agricultural labor market, we incorporate an additional set of data: the number of hired workers. Unlike how tenants are involved in agricultural production, hired workers are typically wage earners under temporary contracts. The results displayed in Table 8 reveal negative and significant impacts of the historical CRP on the number of hired workers, both nationwide and by region. These effects mainly persist until the year 1974. The findings indicate that, compared to the effects on tenants, the program has more long-lasting effects on the number of contracted workers.

In summary, these three sets of results indicate a decline in tenants over time with increasing CRP intensity. We attribute this trend to the financial mechanism, where landlords were not obligated to retain tenants following the government subsidy for CRP. Additionally, we provide results that highlight regional differences and establish a connection with crop choices and agricultural institutions.

## 5.3 Heterogeneous Treatment Effect

To comprehend the underlying variation and mechanisms of the CRP's effects, we also generate a heterogeneous treatment effect analysis, considering factors such as access to irrigation, race, and different types of tenancy institutions.

First, increased access to irrigation can act as a substitute for land conservation efforts. This is because the availability of water can improve soil moisture, thereby diminishing the need for certain conservation practices (Opie, 2000). Table 9 presents these results using a heterogeneous treatment effect regression model, where we interact CRP intensity with the presence of the Ogallala Aquifer. In Panel A, we present results for the entire nation. We observe that the presence of the aquifer increased tenant-operated acreage in both medium and high CRP regions. The magnitude of the average treatment effects is highest in 1959 and 1964, with the results becoming non-significant after that period. Landowners may decide to take land out of CRP because of the access to the aquifer.

Subsequently, we conduct a similar analysis exclusively for the Plains states, as this region primarily features the aquifer. As anticipated, we find that the results are concentrated in the Plains. The aquifer increased tenant acreage even in the presence of CRP. Notably, the results are more pronounced in high and medium CRP regions compared to the lower CRP region, and they remain significant even in 1974.

Second, we examine how the initial agricultural tenancy structure would affect the labor market response to CRP enrollment. We construct a variable representing the ratio of cash tenants to sharecroppers. This variable exceeds 1 when there is a higher proportion of cash tenants compared to sharecroppers. Results show that with the increase in this ratio, there is an increase in tenant-operated acreage across all areas with different enrollment intensities. This is presented in Table 10. This outcome aligns with the intuitive expectation that sharecroppers were more susceptible to eviction compared to cash tenants (Depew, Fishback, and Rhode, 2013). Upon examining this regression across regions, it is not a surprise to see that the results are predominantly concentrated in the Southern states, where agricultural production heavily relies on tenants.

Third, we also study how the initial demographic characteristics may affect the labor market response to CRP enrollment. We construct a variable representing the ratio of white operators in the total operators. This proportion of white operators is used in the HTE analysis. The results presented in Table 11 show that the White farm operators are less likely to lose tenant land in the Southern and Plains states. This finding aligns with the literature on the racial agricultural farm decision-making process and indicates that white farm operators were less likely to be adversely affected by federal agricultural policies (Depew, 2013).[10]

## 5.4 The Effects on the Nonfarm Sector

As land is enrolled in the land retirement program, agricultural laborers may seek alternative employment opportunities. To gain insights into how farmers adapted to market-adjustable decisions following their enrollment in the historical CRP, we utilized

[10]More results, including Atlantic states, are included in the Appendix to save space.

County Government Census data from 1952 and 1962. This approach allowed us to examine the program's impacts on nonfarm job sectors. The outcome variables are the change in the proportion of workers in each job sector relative to the total nonfarm employment. Our analysis is limited to data from the years 1952 and 1962 due to data constraints; the necessary information on nonfarm employment across different job sectors is only directly comparable in the census data from these two years.

First, in Table 12, Panel A presents the nationwide results. From column 1, we observe a decrease in agricultural activities, as measured by the number of workers in all agriculture-related job sectors. It is worth noting that this variable differs slightly from the outcome variable, the number of hired workers, used in Table **??**, which specifically focuses on measuring the number of hired farm laborers using data from the Agriculture Census. Moving on to Columns (2) to (5), we show how the number of nonfarm jobs changes in response to CRP enrollment. The construction and wholesale trade sectors emerge as the primary alternative job sectors, reflecting where individuals are redirecting their efforts. This trend is understandable, given the limited presence of manufacturing and transport jobs in rural areas of the U.S. during the mid-20th century.

We further delve into regional differences to understand how these trends vary nationwide. Results in Panel B show an increase in nonfarm employment after CRP introduction is marginal in the Plains. There is an increase in manufacturing and wholesale trade jobs for the medium CRP regions, while for the high CRP regions, there is no observable significant increase in nonfarm jobs. Panel C displays the results for states in the Midwest, revealing a significant effect of the CRP. The Midwestern states experienced increased nonfarm employment after the introduction of CRP. This increase is particularly pronounced and significant for wholesale trade and construction jobs, with the highest magnitude observed in high CRP regions. Panel D provides results for the Southern states, indicating a small but significant increase in nonfarm employment after CRP introduction, primarily in construction jobs. The highest magnitude of results is observed in high CRP regions, with a slight increase in manufacturing jobs. Due to the data limitations, we only have information on nonfarm jobs for the years 1952 and 1962. Given

this constraint, we are unable to explore further implications across various CRP regions after the introduction of CRP over time.[11]

### 5.5 Correlation in Historical CRP and Current CRP Enrollment

Next, we investigate the influence of historical CRP participation on subsequent enrollment in the current CRP, introduced in the 1985 Farm Bill. The decision to enroll in the new CRP was based on the anticipated environmental benefits derived from the designated land parcels and the corresponding requested rental payments. Parcels offering higher environmental benefits were more likely to be enrolled. A general correlation is presented with OLS regression in Table 13. We regress current CRP areas on historical enrollment categories to understand the long-term correlation. Our findings indicate a sustained presence of the same geographic areas in new CRP contracts over the past five decades (Table 13), a pattern persisting even into 2010.

The enduring impact of historical CRP participation on contemporary enrollment decisions can be related to various factors. Areas with historically inferior soil quality may not have substantially improved due to climate, topography, and human activities. Consequently, these land parcels may consistently enroll in the CRP across multiple decades. Institutional factors may also contribute to these persistent effects. Landowners with previous experience in farmland retirement programs and familiarity with the enrollment procedures may be more inclined to re-enroll their land in such initiatives. This can potentially result in an inequitable allocation of funding within the CRP. A more in-depth analysis is necessary to discern the mechanisms underpinning these enduring effects of historical CRP participation.

## 6 Conclusion

Private land retirement programs represent a crucial and widely adopted conservation tool, contributing significantly to the farmland conservation budget in the United States

[11] In this historical county government census database, we do not have information on tourism.

and globally (United States Department of Agriculture, 2023). In this paper, we compile unique archival data on historical land retirement in the U.S. and study the immediate and enduring impacts of the historical CRP on the labor market and agricultural institutions. The comprehensive historical context provided in this study offers valuable insights into the persistent effects and economic adjustments resulting from land conversions, providing guidance for designing cost-effective conservation practices in the future.

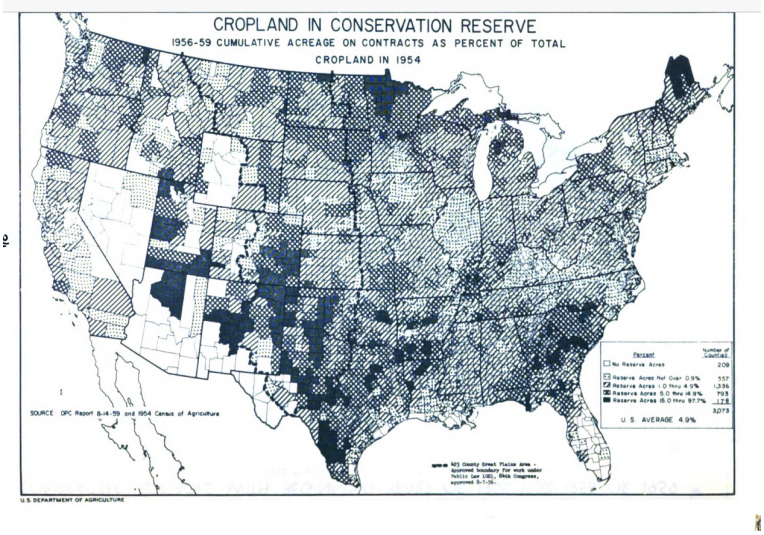
Specifically, our investigation explores whether the historical CRP induces changes in local labor market conditions by influencing agricultural labor employment, tenancy, and farm hired labor. Overall, our study highlights the immediate and lasting effects of the program on the local economy, revealing that tenants experience negative impacts due to the program, particularly in the Southern and Plains states. Additionally, our results demonstrate strong regional heterogeneity in the effects of different agricultural and demographic characteristics of the counties. These findings are crucial for designing new CRP and other conservation retirement programs more equitably. Our study contributes to understanding the agricultural labor market and institutional responses to land retirement policies. The findings provide insights into the mechanisms governing the magnitude and composition of agricultural labor market responses under conservation policies, particularly for non-landowner farm operators.

However, this paper has multiple limitations. Firstly, we lack individual farm or landowner-level data to study complementarity among land-use choices. Having individual CRP enrollment data across space and time would be crucial for studying changes in land-use decisions and labor market choices made by landowners. Secondly, while we demonstrate a correlation between current and past CRP across space, a more in-depth analysis requires detailed data. Understanding the spatial concentration of CRP can inform better policy design for future land retirement programs, particularly as it indicates that marginal land may not be improving even if it has been under CRP for an extended period. Thirdly, linking commercial market pressure and land conservation may be crucial for policy design. Detailed data access to different crop choices and land retirement could be instrumental in this regard. Policymakers may also require information on nonfarm

job allocation to understand alternative occupations. These ideas could be explored in future research.

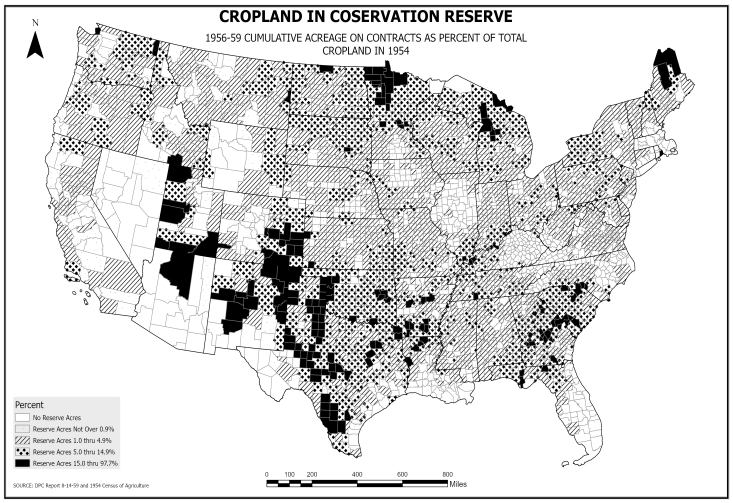
# 7 Figures

Figure (1) Historical CRP Intensity Map



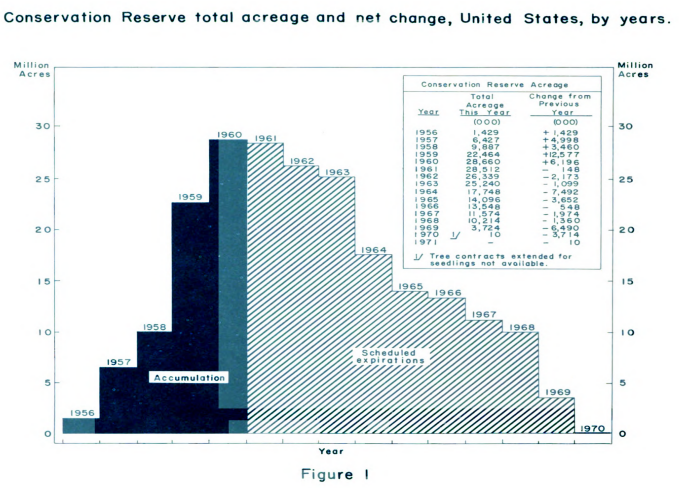

Note: This map is extracted using data from USDA annual reports on CRP intensity across counties in the USA (U.S. Dept. of Agriculture, 1957-1963; Farm Economics Research Division, 1958). It illustrates the extent of CRP enrollment as a percentage of the total cropland area in 1954.

Figure (2) Historical CRP Intensity Map - Digitized



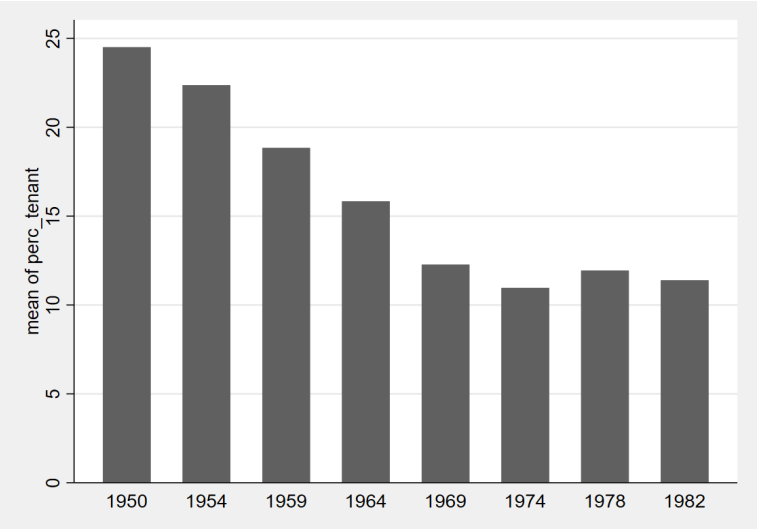

Note: This map is digitized based on the illustration in Figure 1 (U.S. Dept. of Agriculture, 1957-1963; Farm Economics Research Division, 1958). We utilized ArcGIS to generate the map and extract data on CRP intensity at the county level.

Figure (3) Historical CRP Histograms



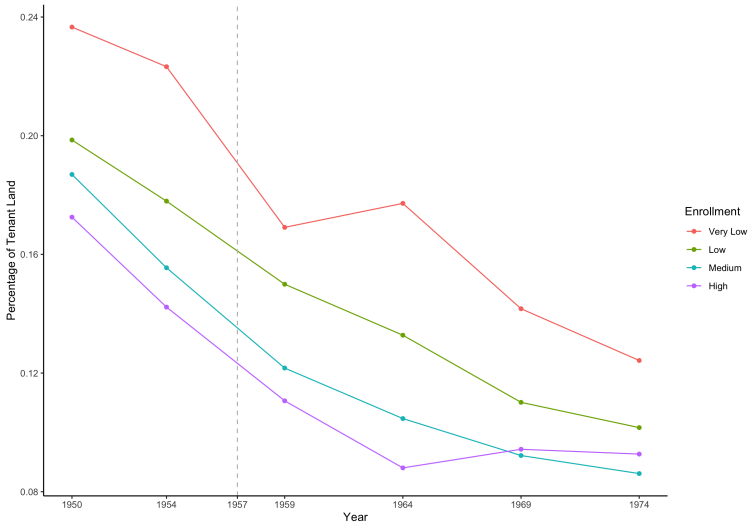

Note: This graph illustrates the histogram of CRP acreage by year throughout the 1950s. It is evident that CRP acreage peaked in 1960. The data for this graph is extracted from the historical CRP report published by the USDA (U.S. Dept. of Agriculture, 1957-1963; Farm Economics Research Division, 1958).

Figure (4) USA Percentage of Tenants by Year



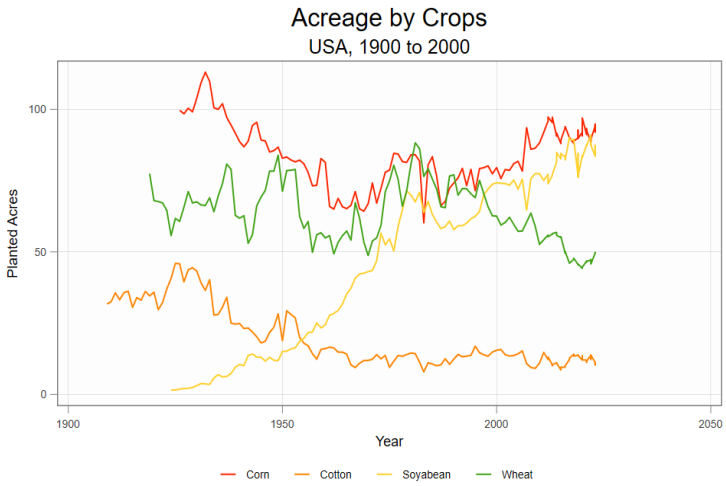

Note: This graph is created from the information in the USDA Census of Agriculture (Haines, 2001).

Figure (5) Proportion of tenant land by year




Note: This graph is created from the information in the USDA Census of Agriculture.

Figure (6) Crop Acreage Data




Note: This graph is generated using data from the USDA-NASS database. We extracted annual data on crop planted areas for the entire USA and created a time series graph based on that information.

# 8 Tables

Table (1) The Number and Percentage of Counties by Enrollment Intensity and Region

| | **Atlantic** | | |
|---|---|---|---|
| CRP Type | Number of Counties | Percent | Cum. |
| Very Low | 39 | 19.7 | 19.7 |
| Low | 100 | 50.51 | 70.2 |
| Medium | 53 | 26.77 | 96.97 |
| High | 6 | 3.03 | 100 |
| Total | 198 | 100 | |
| | **Midwest** | | |
| CRP Type | Number of Counties | Percent | Cum. |
| Very Low | 140 | 17.59 | 17.59 |
| Low | 421 | 52.89 | 70.48 |
| Medium | 211 | 26.51 | 96.98 |
| High | 24 | 3.02 | 100 |
| Total | 796 | 100 | |
| | **Plains** | | |
| CRP Type | Number of Counties | Percent | Cum. |
| Very Low | 57 | 9.03 | 9.03 |
| Low | 228 | 36.13 | 45.17 |
| Medium | 278 | 44.06 | 89.22 |
| High | 68 | 10.78 | 100 |
| Total | 631 | 100 | |
| | **South** | | |
| CRP Type | Number of Counties | Percent | Cum. |
| Very Low | 200 | 22.08 | 22.08 |
| Low | 401 | 44.26 | 66.34 |
| Medium | 250 | 27.59 | 93.93 |
| High | 55 | 6.07 | 100 |
| Total | 906 | 100 | |
| | **Western** | | |
| CRP Type | Number of Counties | Percent | Cum. |
| Very Low | 70 | 21.41 | 21.41 |
| Low | 151 | 46.18 | 67.58 |
| Medium | 72 | 22.02 | 89.6 |
| High | 34 | 10.4 | 100 |
| Total | 327 | 100 | |

Note: This data is extracted from Figure 1. We count the number of counties across different regions based on USDA categories.

Table (2) Different Types of Tenants

| | (1) Atlantic mean | (2) Midwest mean | (3) Plains mean | (4) South mean | (5) Western mean | (6) Very Low mean | (7) Low mean | (8) Medium mean | (9) High mean |
|---|---|---|---|---|---|---|---|---|---|
| Percent tenant (1950) | 8.591878 | 20.85817 | 30.01157 | 31.31199 | 13.58563 | 26.32327 | 23.08464 | 25.15787 | 26.73583 |
| Cash tenant | .3748167 | .2143012 | .1823368 | .1736758 | .307941 | .1883921 | .2129275 | .2322647 | .2386205 |
| Sharecash | .031992 | .1903344 | .2451961 | .0187622 | .0836048 | .1551104 | .1287732 | .1132017 | .0685084 |
| Sharecropper | .1663266 | .4175304 | .4162375 | .2795061 | .4212079 | .3409397 | .3678693 | .3419583 | .3866214 |
| Other tenant | .3773427 | .1778341 | .1185975 | .199355 | .1872463 | .1799291 | .1892011 | .1873941 | .1802042 |
| Observations | 197 | 796 | 631 | 909 | 327 | 507 | 1302 | 864 | 187 |

Note: This data is extracted from the Census of Agriculture in 1954. The distribution of different types of tenants across different regions is presented.

Table (3) Pre-CRP Basic Characteristics (1954)

| | All | Very Low | Low | Medium | High |
|---|---|---|---|---|---|
| Number of Hired Labor | 753.00 | 940.19 | 776.83 | 666.05 | 481.35 |
| | (635.30) | (895.57) | (605.91) | (485.20) | (388.07) |
| Average Farmsize | 427.67 | 346.36 | 363.73 | 430.16 | 1,079.24 |
| | (1,194.92) | (1,131.26) | (765.81) | (1,363.04) | (2,290.50) |
| Percent of Tenant | 22.37 | 25.51 | 21.33 | 21.88 | 23.31 |
| | (15.87) | (17.99) | (15.38) | (15.31) | (14.52) |
| Total Population | 45210.41 | 58792.85 | 51860.66 | 33259.78 | 16186.43 |
| | (1.5e+05) | (1.4e+05) | (2.0e+05) | (72343.79) | (18432.96) |
| Total White | 40531.05 | 53799.69 | 46457.27 | 29432.87 | 13527.61 |
| | (1.4e+05) | (1.3e+05) | (1.8e+05) | (66352.07) | (16230.17) |

Note: This data is extracted from the Census of Agriculture in 1954. Pre-CRP basic characteristics across different CRP intensities are presented.

Table (4) Change in non-agricultural labor sector

| | (1) | (2) |
|---|---|---|
| | 1952 | 1962 |
| Workers employed in Agri | 6551.3 | 4010.6 |
| | (124497.3) | (76597.6) |
| Workers employed in Construction | 3273.0 | 3595.4 |
| | (62552.1) | (69015.0) |
| Workers employed in Manufacturing | 13868.4 | 16501.0 |
| | (267398.3) | (318892.7) |
| Workers employed in Transport | 4156.3 | 4200.5 |
| | (79786.3) | (80959.9) |
| Workers employed in Wholesale | 10035.7 | 11111.1 |
| | (192512.2) | (213801.9) |
| Observations | 3153 | 3184 |

mean coefficients; sd in parentheses

$^{*}$ $p < 0.05$, $^{**}$ $p < 0.01$, $^{***}$ $p < 0.001$

Note: This data is extracted from the Census of Government from the ICPSR. Changes in non-agricultural labor are presented.

Table (5) Average Marginal Effects from Multinomial Logit Model

| | (1) Population Density | Percent of Tenant | Cash Tenant | Other Tenant | Sharecash Tenant | Average Farmsize | White Operators |
|---|---|---|---|---|---|---|---|
| Very Low CRP_predict | 0.146*** | 0.00426*** | -0.0861 | 0.236*** | 0.0375 | -0.00000670 | 0.431*** |
| | (5.48) | (5.59) | (-1.78) | (3.74) | (0.83) | (-0.68) | (5.83) |
| Low CRP_predict | 0.356*** | -0.00605*** | -0.175** | -0.166* | 0.224*** | -0.00000975 | -0.315*** |
| | (5.52) | (-6.20) | (-2.92) | (-1.98) | (3.40) | (-0.88) | (-3.79) |
| Medium CRP_predict | 0.0898 | 0.000400 | 0.213*** | -0.0361 | -0.0000298 | 0.00000918 | -0.196** |
| | (1.50) | (0.45) | (3.94) | (-0.46) | (-0.00) | (1.03) | (-2.70) |
| High CRP_predict | -0.592*** | 0.00139** | 0.0479 | -0.0344 | -0.261*** | 0.00000727** | 0.0790* |
| | (-4.83) | (3.07) | (1.81) | (-0.84) | (-5.31) | (2.84) | (2.14) |
| r2 | | | | | | | |
| chi2 | | | | | | | |
| p | | | | | | | |

$t$ statistics in parentheses

* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

Note: Multinomial Logit Regression models are used to general average marginal effects of individual variables to understand the probability of the CRP adoption.

Table (6) The Effects of the Historical CRP on Tenant Acreage

| | Panel A: Nation | | | |
|---|---|---|---|---|
| | (1) | (2) | (3) | (4) |
| | 1959 | 1964 | 1969 | 1974 |
| Low | 0.00212 | -0.00673** | 0.000338 | 0.00859** |
| | (0.00261) | (0.00288) | (0.00375) | (0.00404) |
| Medium | -0.00663** | -0.0164*** | -0.00460 | 0.00569 |
| | (0.00291) | (0.00321) | (0.00418) | (0.00451) |
| High | -0.0113*** | -0.0303*** | -0.0147** | -0.00370 |
| | (0.00436) | (0.00482) | (0.00627) | (0.00676) |
| $N$ | 2856 | 2856 | 2850 | 2849 |
| | Panel B: South | | | |
| | (1) | (2) | (3) | (4) |
| | 1959 | 1964 | 1969 | 1974 |
| Low | -0.0108*** | -0.00843* | 0.000495 | 0.00769 |
| | (0.00381) | (0.00504) | (0.00593) | (0.00650) |
| Medium | -0.0316*** | -0.0316*** | -0.0189*** | -0.00832 |
| | (0.00440) | (0.00582) | (0.00684) | (0.00750) |
| High | -0.0473*** | -0.0606*** | -0.0434*** | -0.0289*** |
| | (0.00657) | (0.00869) | (0.0102) | (0.0112) |
| $N$ | 906 | 905 | 905 | 905 |
| | Panel C: Plains | | | |
| | (1) | (2) | (3) | (4) |
| | 1959 | 1964 | 1969 | 1974 |
| Low | -0.00246 | 0.0000622 | -0.0118 | -0.00515 |
| | (0.00780) | (0.00866) | (0.0122) | (0.0126) |
| Medium | -0.0139* | -0.0110 | -0.0205 | -0.0163 |
| | (0.00797) | (0.00886) | (0.0125) | (0.0129) |
| High | -0.0111 | -0.0266** | -0.0458*** | -0.0363** |
| | (0.01000) | (0.0111) | (0.0157) | (0.0161) |
| $N$ | 631 | 631 | 631 | 631 |
| | Panel D: Midwest | | | |
| | (1) | (2) | (3) | (4) |
| | 1959 | 1964 | 1969 | 1974 |
| Low | 0.0242*** | -0.0141*** | -0.00428 | 0.00867 |
| | (0.00475) | (0.00378) | (0.00479) | (0.00565) |
| Medium | 0.0260*** | -0.0189*** | 0.00124 | 0.0173*** |
| | (0.00562) | (0.00448) | (0.00567) | (0.00668) |
| High | 0.0234** | -0.0124 | 0.0267** | 0.0405*** |
| | (0.0110) | (0.00878) | (0.0111) | (0.0131) |
| $N$ | 796 | 796 | 795 | 795 |

Standard errors in parentheses

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Note: The results are estimated using Equation 1. Each regression equation incorporates controls, such as average farm size, proportion of land in farming, percent of cropland, and population density. State fixed effects are also included in all regressions.

Table (7) The Effects of the Historical CRP on Percent of Tenant

| | Panel A: Nation | | | |
|---|---|---|---|---|
| | (1) | (2) | (3) | (4) |
| | 1959 | 1964 | 1969 | 1974 |
| Low | -0.773*** | -1.170*** | -0.140 | 0.504 |
| | (0.241) | (0.320) | (0.430) | (0.460) |
| Medium | -2.306*** | -3.131*** | -1.992*** | -1.011** |
| | (0.269) | (0.357) | (0.480) | (0.513) |
| High | -2.490*** | -4.147*** | -3.095*** | -2.056*** |
| | (0.404) | (0.536) | (0.720) | (0.771) |
| $N$ | 2858 | 2861 | 2855 | 2855 |
| | Panel B: South | | | |
| | (1) | (2) | (3) | (4) |
| | 1959 | 1964 | 1969 | 1974 |
| Low | -0.856* | -1.803*** | 0.00241 | 0.624 |
| | (0.463) | (0.650) | (0.887) | (0.967) |
| Medium | -3.787*** | -6.325*** | -4.299*** | -2.918*** |
| | (0.535) | (0.753) | (1.027) | (1.119) |
| High | -4.432*** | -8.460*** | -6.085*** | -4.337*** |
| | (0.799) | (1.125) | (1.536) | (1.673) |
| $N$ | 905 | 908 | 908 | 908 |
| | Panel C: Plains | | | |
| | (1) | (2) | (3) | (4) |
| | 1959 | 1964 | 1969 | 1974 |
| Low | 0.185 | -0.0578 | -0.770 | -0.251 |
| | (0.736) | (0.863) | (0.987) | (1.031) |
| Medium | -0.552 | -0.610 | -1.067 | -0.185 |
| | (0.752) | (0.882) | (1.009) | (1.054) |
| High | -0.428 | -1.765 | -3.239** | -2.144 |
| | (0.943) | (1.106) | (1.265) | (1.322) |
| $N$ | 631 | 631 | 631 | 631 |
| | Panel D: Midwest | | | |
| | (1) | (2) | (3) | (4) |
| | 1959 | 1964 | 1969 | 1974 |
| Low | -1.102*** | -1.217*** | -0.207 | 0.854* |
| | (0.231) | (0.325) | (0.444) | (0.505) |
| Medium | -1.846*** | -1.724*** | 0.173 | 1.289** |
| | (0.274) | (0.385) | (0.526) | (0.598) |
| High | -1.263** | -0.851 | 2.463** | 3.855*** |
| | (0.536) | (0.754) | (1.032) | (1.173) |
| $N$ | 795 | 796 | 795 | 795 |

Standard errors in parentheses

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Note: The results are estimated using Equation 1. Each regression equation incorporates controls, such as average farm size, proportion of land in farming, percent of cropland, and population density. State fixed effects are also included in all regressions.

Table (8) The Effects of the Historical CRP on Number of hired workers

| | Panel A: Nation | | | |
|---|---|---|---|---|
| | (1) | (2) | (3) | (4) |
| | 1959 | 1964 | 1969 | 1974 |
| Low | -0.00121 | -0.00183*** | -0.00179** | -0.00126 |
| | (0.00143) | (0.000637) | (0.000695) | (0.000893) |
| Medium | -0.00288* | -0.00482*** | -0.00457*** | -0.00397*** |
| | (0.00159) | (0.000710) | (0.000776) | (0.000997) |
| High | -0.000948 | -0.00864*** | -0.00752*** | -0.00815*** |
| | (0.00238) | (0.00106) | (0.00116) | (0.00150) |
| $N$ | 2856 | 2857 | 2855 | 2855 |
| | Panel B: South | | | |
| | (1) | (2) | (3) | (4) |
| | 1959 | 1964 | 1969 | 1974 |
| Low | 0.00382* | -0.000719 | -0.00113 | 0.00146 |
| | (0.00223) | (0.00104) | (0.00112) | (0.00129) |
| Medium | 0.00202 | -0.00422*** | -0.00441*** | -0.000147 |
| | (0.00257) | (0.00120) | (0.00130) | (0.00149) |
| High | 0.000811 | -0.00475*** | -0.00404** | -0.000586 |
| | (0.00384) | (0.00179) | (0.00194) | (0.00223) |
| $N$ | 906 | 905 | 908 | 908 |
| | Panel C: Plains | | | |
| Low | -0.00677 | -0.00316 | -0.00278 | -0.00475* |
| | (0.00496) | (0.00207) | (0.00217) | (0.00284) |
| Medium | -0.00745 | -0.00617*** | -0.00549** | -0.00769*** |
| | (0.00507) | (0.00212) | (0.00221) | (0.00291) |
| High | -0.00106 | -0.0124*** | -0.0115*** | -0.0160*** |
| | (0.00636) | (0.00266) | (0.00278) | (0.00365) |
| $N$ | 631 | 631 | 631 | 631 |
| | Panel C: Midwest | | | |
| | (1) | (2) | (3) | (4) |
| | 1959 | 1964 | 1969 | 1974 |
| Low | -0.00298 | -0.00172* | -0.00168 | -0.00218 |
| | (0.00183) | (0.000964) | (0.00109) | (0.00147) |
| Medium | -0.00397* | -0.00228** | -0.00253** | -0.00350** |
| | (0.00217) | (0.00114) | (0.00129) | (0.00174) |
| High | -0.0131*** | -0.00903*** | -0.00770*** | -0.00952*** |
| | (0.00425) | (0.00224) | (0.00252) | (0.00342) |
| $N$ | 795 | 796 | 795 | 795 |

Standard errors in parentheses

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Note: The results are estimated using Equation 1. Each regression equation incorporates controls, such as average farm size, proportion of land in farming, percent of cropland, and population density. State-year fixed effects are also included in all regressions.

Table (9) How irrigation affects the impacts of the Historical CRP on Tenant Acreage

| | Panel A: Nation | | | |
|---|---|---|---|---|
| | (1) | (2) | (3) | (4) |
| | 1959 | 1964 | 1969 | 1974 |
| Aquifer | 0.0316*** | 0.0113 | 0.0409*** | 0.0385*** |
| | (0.00839) | (0.00934) | (0.0122) | (0.0132) |
| Low | 0.00141 | -0.00876*** | -0.000796 | 0.00781* |
| | (0.00271) | (0.00301) | (0.00394) | (0.00426) |
| Medium | -0.00861*** | -0.0200*** | -0.00589 | 0.00476 |
| | (0.00302) | (0.00336) | (0.00439) | (0.00474) |
| High | -0.0198*** | -0.0397*** | -0.0188*** | -0.00935 |
| | (0.00473) | (0.00527) | (0.00688) | (0.00744) |
| Aquifer#Low | 0.00102 | 0.0143 | 0.00300 | 0.000716 |
| | (0.00813) | (0.00905) | (0.0118) | (0.0128) |
| Aquifer#Medium | 0.0169* | 0.0317*** | 0.0103 | 0.00754 |
| | (0.00885) | (0.00985) | (0.0129) | (0.0139) |
| Aquifer#High | 0.0212* | 0.0361*** | -0.00180 | 0.00552 |
| | (0.0111) | (0.0123) | (0.0161) | (0.0174) |
| *N* | 2856 | 2856 | 2850 | 2849 |
| | Panel B: Plains | | | |
| | (1) | (2) | (3) | (4) |
| | 1959 | 1964 | 1969 | 1974 |
| Aquifer | -0.00468 | -0.00738 | 0.00887 | -0.00215 |
| | (0.0155) | (0.0174) | (0.0246) | (0.0254) |
| Low | -0.0308** | -0.0255* | -0.0486** | -0.0366* |
| | (0.0127) | (0.0143) | (0.0202) | (0.0209) |
| Medium | -0.0408*** | -0.0365*** | -0.0474** | -0.0475** |
| | (0.0121) | (0.0136) | (0.0192) | (0.0199) |
| High | -0.0512*** | -0.0691*** | -0.0902*** | -0.0857*** |
| | (0.0145) | (0.0163) | (0.0231) | (0.0238) |
| Aquifer#Low | 0.0383** | 0.0346* | 0.0497** | 0.0418 |
| | (0.0157) | (0.0177) | (0.0250) | (0.0258) |
| Aquifer#Medium | 0.0492*** | 0.0467*** | 0.0461* | 0.0582** |
| | (0.0159) | (0.0180) | (0.0254) | (0.0262) |
| Aquifer#High | 0.0557*** | 0.0628*** | 0.0549* | 0.0694** |
| | (0.0193) | (0.0217) | (0.0307) | (0.0317) |
| *N* | 631 | 631 | 631 | 631 |

Standard errors in parentheses

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Note: Aquifer is a dummy variable that equals one if a county has access to Ogalla Aquifer and 0 otherwise. Each regression equation incorporates controls, such as average farm size, proportion of land in farming, percent of cropland, and population density. State-year fixed effects are also included in all regressions.

Table (10) Different Tenancy Contract Effect on Tenants' Acreage

| | Nation | | | |
|---|---|---|---|---|
| | (1) | (2) | (3) | (4) |
| | 1959 | 1964 | 1969 | 1974 |
| ratio | -0.000479 | -0.000201 | -0.000407 | -0.00183*** |
| | (0.000384) | (0.000414) | (0.000551) | (0.000594) |
| Low | -0.000471 | -0.0106*** | -0.00441 | 0.00120 |
| | (0.00277) | (0.00299) | (0.00396) | (0.00427) |
| Medium | -0.00835*** | -0.0197*** | -0.00631 | 0.00239 |
| | (0.00307) | (0.00332) | (0.00439) | (0.00473) |
| High | -0.0200*** | -0.0298*** | -0.0115 | -0.00455 |
| | (0.00493) | (0.00531) | (0.00704) | (0.00758) |
| Low#Ratio | 0.00123** | 0.00142** | 0.00178** | 0.00311*** |
| | (0.000520) | (0.000561) | (0.000742) | (0.000799) |
| Medium#Ratio | 0.000775 | 0.00167*** | 0.000624 | 0.00124 |
| | (0.000536) | (0.000578) | (0.000765) | (0.000824) |
| High#Ratio | 0.00680*** | 0.000636 | -0.00223 | 0.000335 |
| | (0.00159) | (0.00171) | (0.00227) | (0.00244) |
| *N* | 2790 | 2790 | 2787 | 2786 |
| | South | | | |
| | (1) | (2) | (3) | (4) |
| | 1959 | 1964 | 1969 | 1974 |
| ratio | -0.00185*** | -0.00172*** | -0.00164** | -0.00386*** |
| | (0.000463) | (0.000578) | (0.000726) | (0.000786) |
| Low | -0.0159*** | -0.0163*** | -0.00669 | -0.00369 |
| | (0.00395) | (0.00494) | (0.00620) | (0.00672) |
| Medium | -0.0376*** | -0.0403*** | -0.0244*** | -0.0174** |
| | (0.00450) | (0.00563) | (0.00706) | (0.00765) |
| High | -0.0521*** | -0.0594*** | -0.0440*** | -0.0344*** |
| | (0.00756) | (0.00944) | (0.0119) | (0.0128) |
| Low#ratio | 0.00330*** | 0.00466*** | 0.00447*** | 0.00657*** |
| | (0.000863) | (0.00108) | (0.00135) | (0.00147) |
| Medium#ratio | 0.00403*** | 0.00614*** | 0.00356*** | 0.00579*** |
| | (0.000830) | (0.00104) | (0.00130) | (0.00141) |
| High#ratio | 0.00392 | 0.000687 | 0.000570 | 0.00393 |
| | (0.00306) | (0.00382) | (0.00479) | (0.00519) |
| *N* | 899 | 898 | 899 | 899 |
| | Midwest | | | |
| | (1) | (2) | (3) | (4) |
| | 1959 | 1964 | 1969 | 1974 |
| ratio | 0.000491 | 0.00194** | -0.000977 | -0.00231* |
| | (0.00121) | (0.000926) | (0.00117) | (0.00136) |
| Low | 0.0242*** | -0.0139*** | -0.00875* | 0.00283 |
| | (0.00502) | (0.00385) | (0.00485) | (0.00566) |
| Medium | 0.0284*** | -0.0154*** | 0.00296 | 0.0202*** |
| | (0.00599) | (0.00460) | (0.00578) | (0.00676) |
| High | 0.0286** | 0.00333 | 0.0494*** | 0.0633*** |
| | (0.0140) | (0.0107) | (0.0135) | (0.0158) |
| Low#ratio | 0.000308 | 0.00116 | 0.00593*** | 0.00712*** |
| | (0.00145) | (0.00111) | (0.00140) | (0.00163) |
| Medium#ratio | -0.00118 | -0.000479 | 0.00206 | 0.00208 |
| | (0.00144) | (0.00110) | (0.00139) | (0.00162) |
| High#ratio | -0.00249 | -0.00340 | -0.00503 | -0.00647 |
| | (0.00589) | (0.00452) | (0.00569) | (0.00665) |
| *N* | 775 | 775 | 774 | 774 |
| | Plains | | | |
| | (1) | (2) | (3) | (4) |
| | 1959 | 1964 | 1969 | 1974 |
| ratio | 0.000837 | 0.000650 | 0.00156 | -0.00415 |
| | (0.00357) | (0.00400) | (0.00561) | (0.00577) |
| Low | -0.00310 | 0.000306 | -0.0120 | -0.00962 |
| | (0.00841) | (0.00943) | (0.0132) | (0.0136) |
| Medium | -0.0123 | -0.00926 | -0.0147 | -0.0143 |
| | (0.00864) | (0.00970) | (0.0136) | (0.0140) |
| High | -0.0205* | -0.0229* | -0.0354** | -0.0361** |
| | (0.0110) | (0.0123) | (0.0173) | (0.0178) |
| Low#ratio | 0.000656 | -0.00126 | -0.00107 | 0.00523 |
| | (0.00377) | (0.00422) | (0.00593) | (0.00610) |
| Medium#ratio | -0.00149 | -0.00139 | -0.00435 | 0.0000781 |
| | (0.00361) | (0.00405) | (0.00569) | (0.00585) |
| High#ratio | 0.00735* | -0.00269 | -0.00843 | -0.00119 |
| | (0.00418) | (0.00469) | (0.00658) | (0.00677) |
| *N* | 628 | 628 | 628 | 628 |

Standard errors in parentheses

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Note: The variable ratio is defined as the percent of cash tenant over the percent of share croppers in a county. Each regression equation incorporates controls, such as average farm size, proportion of land in farming, percent of cropland, and population density. State-year fixed effects are also included in all regressions.

Table (11) Racial Differences on Tenants' Acreage

| | (1) | (2) | (3) | (4) |
|---|---|---|---|---|
| | 1959 | 1964 | 1969 | 1974 |
| White | 0.0387** | 0.0899*** | 0.181*** | 0.196*** |
| | (0.0178) | (0.0197) | (0.0256) | (0.0276) |
| Low | 0.00236 | 0.0548*** | 0.133*** | 0.171*** |
| | (0.0179) | (0.0198) | (0.0257) | (0.0277) |
| Medium | -0.0306 | 0.0276 | 0.106*** | 0.138*** |
| | (0.0187) | (0.0207) | (0.0269) | (0.0290) |
| High | -0.102*** | -0.0845*** | 0.0342 | 0.0763* |
| | (0.0261) | (0.0288) | (0.0375) | (0.0404) |
| Low#White | 0.000358 | -0.0647*** | -0.140*** | -0.171*** |
| | (0.0188) | (0.0208) | (0.0270) | (0.0292) |
| Medium#White | 0.0277 | -0.0451** | -0.115*** | -0.138*** |
| | (0.0197) | (0.0218) | (0.0284) | (0.0306) |
| High#White | 0.101*** | 0.0637** | -0.0470 | -0.0806* |
| | (0.0280) | (0.0310) | (0.0403) | (0.0435) |
| *N* | 2856 | 2856 | 2850 | 2849 |
| | | Panel C: Midwest | | |
| White | -0.0359 | 0.354** | 0.0338 | 0.132 |
| | (0.224) | (0.178) | (0.226) | (0.266) |
| Low | 0.0419 | 0.175 | 0.0928 | 0.295 |
| | (0.255) | (0.202) | (0.257) | (0.303) |
| Medium | 0.201 | 0.0982 | -0.250 | -0.00317 |
| | (0.259) | (0.205) | (0.261) | (0.308) |
| High | -2.256 | -2.170 | -2.669 | -5.421 |
| | (3.602) | (2.851) | (3.628) | (4.279) |
| Low#White | -0.0183 | -0.189 | -0.0969 | -0.287 |
| | (0.256) | (0.203) | (0.258) | (0.304) |
| Medium#White | -0.177 | -0.116 | 0.254 | 0.0210 |
| | (0.260) | (0.206) | (0.262) | (0.309) |
| High#White | 2.281 | 2.161 | 2.699 | 5.468 |
| | (3.607) | (2.855) | (3.632) | (4.284) |
| *N* | 796 | 796 | 795 | 795 |
| | | Panel D: Plains | | |
| White | 0.00607 | -0.0257 | 0.0657 | 0.00303 |
| | (0.0870) | (0.0972) | (0.137) | (0.142) |
| Low | -0.131 | -0.0971 | -0.180 | -0.107 |
| | (0.0925) | (0.103) | (0.145) | (0.151) |
| Medium | -0.0983 | -0.110 | -0.174 | -0.175 |
| | (0.0892) | (0.0997) | (0.140) | (0.145) |
| High | -0.401*** | -0.479*** | -0.455** | -0.510*** |
| | (0.119) | (0.133) | (0.187) | (0.194) |
| Low#White | 0.132 | 0.100 | 0.172 | 0.105 |
| | (0.0955) | (0.107) | (0.150) | (0.156) |
| Medium#White | 0.0856 | 0.101 | 0.156 | 0.162 |
| | (0.0925) | (0.103) | (0.145) | (0.151) |
| High#White | 0.401*** | 0.467*** | 0.418** | 0.487** |
| | (0.123) | (0.138) | (0.194) | (0.201) |
| *N* | 631 | 631 | 631 | 631 |
| | | Panel D: South | | |
| White | -0.224 | -0.136 | -0.643** | -0.533 |
| | (0.176) | (0.205) | (0.305) | (0.358) |
| Low | -0.208 | -0.121 | -0.661** | -0.545 |
| | (0.182) | (0.212) | (0.315) | (0.369) |
| Medium | -0.274 | -0.203 | -0.782** | -0.673* |
| | (0.183) | (0.214) | (0.318) | (0.372) |
| High | -0.281 | -0.113 | -0.762** | -0.616 |
| | (0.218) | (0.254) | (0.377) | (0.442) |
| Low#White | 0.212 | 0.126 | 0.680** | 0.569 |
| | (0.185) | (0.215) | (0.320) | (0.375) |
| Medium#White | 0.287 | 0.224 | 0.818** | 0.718* |
| | (0.186) | (0.216) | (0.321) | (0.377) |
| High#White | 0.277 | 0.108 | 0.785** | 0.641 |
| | (0.220) | (0.257) | (0.382) | (0.447) |
| *N* | 327 | 327 | 325 | 324 |

Standard errors in parentheses

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Note: We construct a ratio for proportion of white operators (white farm operators/total farm operators) and use HTE regression model. Each regression equation incorporates controls, such as average farm size, proportion of land in farming, percent of cropland, and population density. State-year fixed effects are also included in all regressions.

Table (12) The Effects of the Historical CRP on Employment by Sector, 1962-1952

| | Panel A: Nation | | | | |
|---|---|---|---|---|---|
| | (1) | (2) | (3) | (4) | (5) |
| | Agri | Construction | Manufacturing | Transport | WholesaleTrade |
| Low | -0.00296 | 0.00102 | -0.00223 | -0.000189 | 0.00279** |
| | (0.00362) | (0.00131) | (0.00253) | (0.000913) | (0.00136) |
| Medium | -0.0142*** | 0.00371** | -0.000624 | 0.000894 | 0.00551*** |
| | (0.00404) | (0.00146) | (0.00282) | (0.00102) | (0.00151) |
| High | -0.0250*** | 0.00231 | 0.00505 | 0.00155 | 0.00758*** |
| | (0.00603) | (0.00218) | (0.00421) | (0.00152) | (0.00226) |
| $N$ | 2865 | 2865 | 2864 | 2865 | 2865 |
| | Panel B: Plains | | | | |
| | (1) | (2) | (3) | (4) | (5) |
| | Agri | Construction | Manufacturing | Transport | WholesaleTrade |
| Low | -0.0127 | 0.00142 | 0.00684 | -0.00196 | 0.00510 |
| | (0.00947) | (0.00399) | (0.00467) | (0.00251) | (0.00407) |
| Medium | -0.0227** | 0.00346 | 0.00885* | 0.00158 | 0.00764* |
| | (0.00967) | (0.00407) | (0.00477) | (0.00256) | (0.00415) |
| High | -0.0106 | -0.00138 | -0.00203 | 0.00141 | 0.00737 |
| | (0.0119) | (0.00502) | (0.00588) | (0.00316) | (0.00512) |
| $N$ | 631 | 631 | 630 | 631 | 631 |
| | Panel C: Midwest | | | | |
| | (1) | (2) | (3) | (4) | (5) |
| | Agri | Construction | Manufacturing | Transport | WholesaleTrade |
| Low | -0.00347 | 0.00147 | -0.00380 | 0.00224 | 0.00552** |
| | (0.00581) | (0.00128) | (0.00478) | (0.00171) | (0.00215) |
| Medium | -0.0180*** | 0.00519*** | -0.00326 | 0.00290 | 0.0111*** |
| | (0.00657) | (0.00145) | (0.00541) | (0.00194) | (0.00243) |
| High | -0.0436*** | 0.0141*** | -0.00728 | 0.0109*** | 0.0133*** |
| | (0.0131) | (0.00289) | (0.0108) | (0.00387) | (0.00486) |
| $N$ | 796 | 796 | 796 | 796 | 796 |
| | Panel D: South | | | | |
| | (1) | (2) | (3) | (4) | (5) |
| | Agri | Construction | Manufacturing | Transport | WholesaleTrade |
| Low | 0.00226 | 0.00135 | -0.00414 | 0.00127 | -0.00161 |
| | (0.00711) | (0.00202) | (0.00508) | (0.00129) | (0.00217) |
| Medium | -0.00693 | 0.00621*** | -0.00361 | -0.0000285 | -0.00312 |
| | (0.00814) | (0.00231) | (0.00582) | (0.00148) | (0.00248) |
| High | -0.0467*** | 0.00750** | 0.0213** | 0.00101 | -0.000822 |
| | (0.0122) | (0.00347) | (0.00872) | (0.00221) | (0.00372) |
| $N$ | 909 | 909 | 909 | 909 | 909 |

Standard errors in parentheses

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$



Note: We construct employment data from county census database. State fixed effects are also included in all regressions.

Table (13) Persistent Effects on current CRP acre changes by decades

| | (1) 1990-2000 | (2) 2000-2010 | (3) 2010-2020 |
|---|---|---|---|
| Very Low | 1376.7* | 3954.0*** | 2681.8*** |
| | (745.4) | (590.2) | (961.6) |
| Low | 27.41 | 3264.2*** | 2948.0*** |
| | (678.3) | (537.1) | (875.0) |
| Medium | -95.00 | 2219.8*** | 1864.7** |
| | (667.6) | (528.6) | (861.2) |
| $N$ | 2864 | 2864 | 2864 |

Standard errors in parentheses

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Note: Current CRP data is extracted from the USDA website. OLS regression model is used to understand persistent spatial effect of historical CRP on current CRP areas.

# References


Alston, Lee J (1981). "Tenure choice in southern agriculture, 1930–1960". *Explorations in Economic History* 18.3, pp. 211–232.

Babcock, Bruce A, PG Lakshminarayan, JunJie Wu, and David Zilberman (1997). "Targeting tools for the purchase of environmental amenities". *Land economics*, pp. 325–339.

Balmford, Ben, Joseph Collins, Brett Day, Luke Lindsay, and James Peacock (2023). "Pricing rules for PES auctions: Evidence from a natural experiment". *Journal of Environmental Economics and Management* 122, p. 102889.

Beck, RJ, SE Kraft, and JH Burde (1999). "Is the conversion of land from agricultural production to a bioreserve boon or bane for economic development? The Cache River Bioreserve as a case study". *Journal of soil and water conservation* 54.1, pp. 394–401.

Bennett, Michael T (2008). "China's sloping land conversion program: Institutional innovation or business as usual?" *Ecological economics* 65.4, pp. 699–711.

Blanco, Esther, Lina Moros, Alexander Pfaff, Ivo Steimanis, Maria Alejandra Velez, and Björn Vollan (2023). "No crowding out among those terminated from an ongoing PES program in Colombia". *Journal of Environmental Economics and Management* 120, p. 102826.

Bottum, J Carroll (1957). "Impact of the Acreage Reserve on resource adjustments in agriculture". *Journal of Farm Economics* 39.5, pp. 1134–1144.

Coppess, Jonathan (2017). "Historical background on the Conservation Reserve Program". *farmdoc daily* 7.82.

Cox, Lawanda Fenlason (1944). "Tenancy in the United States, 1865-1900: A Consideration of the Validity of the Agricultural Ladder Hypothesis". *Agricultural History* 18.3, pp. 97–105.

Daniels, Amy E, Kenneth Bagstad, Valerie Esposito, Azur Moulaert, and Carlos Manuel Rodriguez (2010). "Understanding the impacts of Costa Rica's PES: Are we asking the right questions?" *Ecological economics* 69.11, pp. 2116–2126.

Depew, Briggs, Price V Fishback, and Paul W Rhode (2013). "New deal or no deal in the Cotton South: The effect of the AAA on the agricultural labor structure". *Explorations in Economic History* 50.4, pp. 466–486.

Farm Economics Research Division (1958). *The Conservation Reserve Program of the Soil Bank: Effects in Selected Areas, 1957*. Agriculture Information Bulletin 185. Agricultural Research Service, U.S. Dept. of Agriculture.

Feng, Hongli, Catherine L Kling, Lyubov A Kurkalova, Silvia Secchi, and Philip W Gassman (2005). "The Conservation Reserve Program in the presence of a working land alternative: implications for environmental quality, program participation, and income transfer". *American Journal of Agricultural Economics* 87.5, pp. 1231–1238.

Ferris, Jeffrey and Juha Siikamäki (2009). "Conservation reserve program and wetland reserve program: Primary land retirement programs for promoting farmland conservation". *RFF Backgrounder, Resources for the Future*.

Floyd, John E (1965). "The effects of farm price supports on the returns to land and labor in agriculture". *Journal of Political Economy* 73.2, pp. 148–158.

Haines, Michael R (2001). "Historical demographic, economic and social data: The united states, 1790-1970". *Department of Economics. Colgate University, Computer File*.

Hansen, LeRoy (2007). "Conservation reserve program: Environmental benefits update". *Agricultural and Resource Economics Review* 36.2, pp. 267–280.

Hellerstein, Daniel M (2017). "The US Conservation Reserve Program: The evolution of an enrollment mechanism". *Land Use Policy* 63, pp. 601–610.

Hornbeck, Richard (2012). "The enduring impact of the American Dust Bowl: Short- and long-run adjustments to environmental catastrophe". *The American Economic Review* 102.4, pp. 1477–1507.

Houck, James P, Martin E Abel, Mary E Ryan, Paul W Gallagher, Robert G Hoffman, JB Penn, et al. (1976). *Analyzing the impact of government programs on crop acreage*. USDA Washington DC.

Howlader, Aparna (2023a). "Determinants and consequences of large-scale tree plantation projects: Evidence from the Great Plains Shelterbelt Project". *Land Use Policy* 132,

p. 106785. ISSN: 0264-8377. DOI: https://doi.org/10.1016/j.landusepol.2023.106785. URL: https://www.sciencedirect.com/science/article/pii/S026483772300251X.

Howlader, Aparna (2023b). "Environmental Recovery after the Dust Bowl: Implication of Land Policies in the Great Plains". *Journal of the Association of Environmental and Resource Economists* 0.ja, null. DOI: 10.1086/726154. eprint: https://doi.org/10.1086/726154. URL: https://doi.org/10.1086/726154.

Hyberg, Bengt T, Michael R Dicks, and Thomas Hebert (1991). "Economic impacts of the conservation reserve program on rural economies". *The Review of Regional Studies* 21.1, p. 91.

Jack, B Kelsey, Carolyn Kousky, and Katharine RE Sims (2008). "Designing payments for ecosystem services: Lessons from previous experience with incentive-based mechanisms". *Proceedings of the National Academy of Sciences* 105.28, pp. 9465–9470.

Jayachandran, Seema, Joost de Laat, Eric F. Lambin, Charlotte Y. Stanton, Robin Audy, and Nancy E. Thomas (2017). "Cash for carbon: A randomized trial of payments for ecosystem services to reduce deforestation". *Science* 357.6348, pp. 267–273. ISSN: 0036-8075. DOI: 10.1126/science.aan0568. eprint: http://science.sciencemag.org/content/357/6348/267.full.pdf. URL: http://science.sciencemag.org/content/357/6348/267.

Martin, Michael, Hans Radtke, Bart Eleveld, and S Dianne Nofziger (1988). "The impacts of the conservation reserve program on rural communities: the case of three Oregon counties". *Western Journal of Agricultural Economics*, pp. 225–232.

Mortensen, Timothy L, F Larry Leistritz, Jay A Leitch, Randal C Coon, and Brenda L Ekstrom (1990). "Socioeconomic impact of the conservation reserve program in North Dakota". *Society & Natural Resources* 3.1, pp. 53–61.

Opie, John (2000). *Ogallala: Water for a dry land*. U of Nebraska Press.

Perelman, Michael (1973). "Mechanization and the Division of Labor in Agriculture". *American Journal of Agricultural Economics* 55.3, pp. 523–526.

Siegel, Paul B and Thomas G Johnson (1991). "Break-even analysis of the conservation reserve program: the Virginia case". *Land Economics* 67.4, pp. 447–461.

Smith, Rodney BW (1995). "The conservation reserve program as a least-cost land retirement mechanism". *American Journal of Agricultural Economics* 77.1, pp. 93–105.

Sullivan, Patrick, Daniel Hellerstein, Leroy Hansen, Robert Johansson, Steven Koenig, Ruben N Lubowski, William D McBride, David A McGranahan, Michael J Roberts, Stephen J Vogel, et al. (2004). "The conservation reserve program: economic implications for rural America".

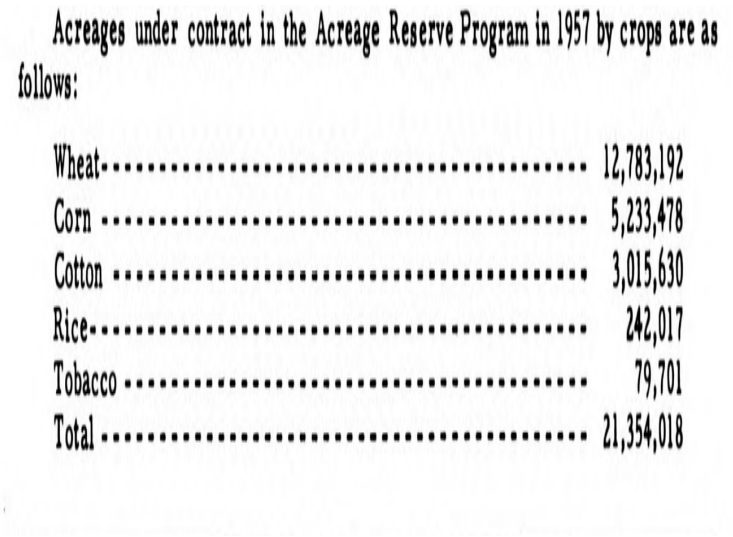
United States Department of Agriculture (2023). *Conservation Reserve Program*. Accessed on: May 1, 2023. URL: https://www.fsa.usda.gov/programs-and-services/conservation-programs/conservation-reserve-program/index.

U.S. Dept. of Agriculture (1957-1963). *Conservation Reserve Program of the Soil Bank*. Washington, D.C.: U.S. Dept. of Agriculture, Commodity Stabilization Service and Agricultural Conservation Program Service.

Zhang, Qi, Conghe Song, and Xiaodong Chen (2018). "Effects of China's payment for ecosystem services programs on cropland abandonment: A case study in Tiantangzhai Township, Anhui, China". *Land use policy* 73, pp. 239–248.

# 9 Appendix

Figure (A1) Historical CRP

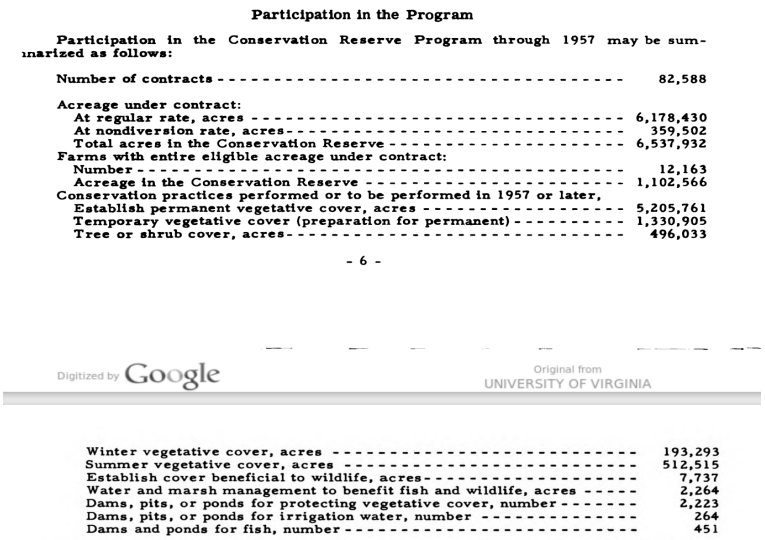


Acreages under contract in the Acreage Reserve Program in 1957 by crops are as follows:

| | |
|---|---|
| Wheat | 12,783,192 |
| Corn | 5,233,478 |
| Cotton | 3,015,630 |
| Rice | 242,017 |
| Tobacco | 79,701 |
| Total | 21,354,018 |

Note: This table is extracted from the historical CRP report published by the USDA(U.S. Dept. of Agriculture, 1957-1963; Farm Economics Research Division, 1958).

Figure (A2) Historical CRP



**Participation in the Program**

Participation in the Conservation Reserve Program through 1957 may be summarized as follows:

| | |
|---|---|
| Number of contracts | 82,588 |
| Acreage under contract: | |
| At regular rate, acres | 6,178,430 |
| At nondiversion rate, acres | 359,502 |
| Total acres in the Conservation Reserve | 6,537,932 |
| Farms with entire eligible acreage under contract: | |
| Number | 12,163 |
| Acreage in the Conservation Reserve | 1,102,566 |
| Conservation practices performed or to be performed in 1957 or later, | |
| Establish permanent vegetative cover, acres | 5,205,761 |
| Temporary vegetative cover (preparation for permanent) | 1,330,905 |
| Tree or shrub cover, acres | 496,033 |

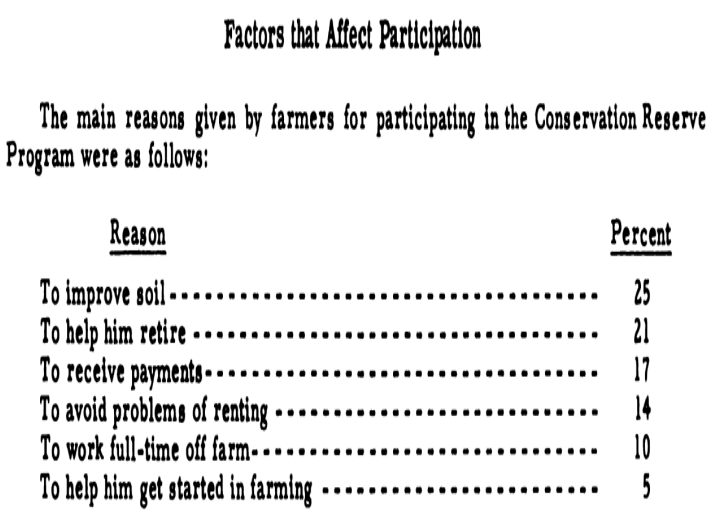
- 6 -



| | |
|---|---|
| Winter vegetative cover, acres | 193,293 |
| Summer vegetative cover, acres | 512,515 |
| Establish cover beneficial to wildlife, acres | 7,737 |
| Water and marsh management to benefit fish and wildlife, acres | 2,264 |
| Dams, pits, or ponds for protecting vegetative cover, number | 2,223 |
| Dams, pits, or ponds for irrigation water, number | 264 |
| Dams and ponds for fish, number | 451 |

Note: This table is extracted from the historical CRP report published by the USDA (U.S. Dept. of Agriculture, 1957-1963; Farm Economics Research Division, 1958).

Figure (A3) Historical CRP



**Factors that Affect Participation**

The main reasons given by farmers for participating in the Conservation Reserve Program were as follows:

| Reason | Percent |
|---|---|
| To improve soil | 25 |
| To help him retire | 21 |
| To receive payments | 17 |
| To avoid problems of renting | 14 |
| To work full-time off farm | 10 |
| To help him get started in farming | 5 |

Note: This table is extracted from the historical CRP report published by the USDA (U.S. Dept. of Agriculture, 1957-1963; Farm Economics Research Division, 1958).

Table (A1) The Effects of the Historical CRP on Tenant Acreage (Atlantic and Western)

| | Atlantic | | | |
|---|---|---|---|---|
| | (1) | (2) | (3) | (4) |
| | 1959 | 1964 | 1969 | 1974 |
| Low | 0.00977 | 0.00867 | 0.0241* | 0.0206 |
| | (0.00812) | (0.00933) | (0.0145) | (0.0131) |
| Medium | 0.00745 | 0.0127 | 0.0179 | 0.0135 |
| | (0.00987) | (0.0113) | (0.0176) | (0.0159) |
| High | -0.00687 | -0.0106 | 0.0346 | 0.00444 |
| | (0.0176) | (0.0203) | (0.0315) | (0.0285) |
| avg_farmsize_1950 | 0.0000210** | 0.0000639*** | 0.0000666*** | -0.00000305 |
| | (0.00000980) | (0.0000113) | (0.0000175) | (0.0000158) |
| landonfarm | 0.000219 | 0.000144 | 0.000684* | 0.00136*** |
| | (0.000219) | (0.000251) | (0.000392) | (0.000355) |
| percent_cropland | -0.0997*** | -0.113*** | -0.221*** | -0.271*** |
| | (0.0374) | (0.0429) | (0.0670) | (0.0607) |
| pop_density | 0.00161 | 0.00191 | 0.0512*** | 0.0498*** |
| | (0.00137) | (0.00157) | (0.0141) | (0.0128) |
| *N* | 196 | 197 | 194 | 194 |
| | Western | | | |
| | (1) | (2) | (3) | (4) |
| | 1959 | 1964 | 1969 | 1974 |
| Low | 0.00153 | 0.00379 | 0.00911 | 0.0156 |
| | (0.00564) | (0.00656) | (0.00986) | (0.0115) |
| Medium | 0.0103 | 0.0175** | 0.0254** | 0.0353** |
| | (0.00674) | (0.00784) | (0.0118) | (0.0137) |
| High | -0.00701 | -0.00576 | 0.0155 | 0.0198 |
| | (0.00903) | (0.0105) | (0.0158) | (0.0184) |
| *N* | 327 | 327 | 325 | 324 |

Standard errors in parentheses

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Table (A2) The Effects of the Historical CRP on Tenant Percent (Atlantic and Western)

| | Atlantic | | | |
|---|---|---|---|---|
| | (1) | (2) | (3) | (4) |
| | 1959 | 1964 | 1969 | 1974 |
| Low | 0.470 | 0.319 | 2.120* | 1.934 |
| | (0.739) | (0.877) | (1.225) | (1.226) |
| Medium | -0.385 | 0.0140 | 1.032 | 1.147 |
| | (0.898) | (1.054) | (1.475) | (1.477) |
| High | -1.549 | -2.220 | -0.316 | 1.980 |
| | (1.604) | (1.905) | (2.661) | (2.664) |
| $N$ | 197 | 199 | 196 | 196 |
| | Western | | | |
| | (1) | (2) | (3) | (4) |
| | 1959 | 1964 | 1969 | 1974 |
| Low | -0.102 | 0.334 | 0.588 | 0.825 |
| | (0.467) | (0.545) | (0.685) | (0.749) |
| Medium | 0.242 | 0.449 | 0.581 | 1.230 |
| | (0.558) | (0.651) | (0.817) | (0.894) |
| High | -1.927** | -0.886 | -0.614 | -1.438 |
| | (0.759) | (0.873) | (1.095) | (1.198) |
| $N$ | 326 | 327 | 325 | 325 |

Standard errors in parentheses

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Table (A3) The Effects of the Historical CRP on the Number of Hired Labor (Atlantic and Western)

| | Atlantic | | | |
|---|---|---|---|---|
| | (1) | (2) | (3) | (4) |
| | 1959 | 1964 | 1969 | 1974 |
| Low | -0.00493 | -0.00305** | -0.00168 | -0.00131 |
| | (0.00330) | (0.00147) | (0.00155) | (0.00199) |
| Medium | -0.0118*** | -0.00391** | -0.00331* | -0.00382 |
| | (0.00401) | (0.00179) | (0.00186) | (0.00240) |
| High | -0.0111 | -0.00734** | -0.00568* | -0.00730* |
| | (0.00717) | (0.00320) | (0.00336) | (0.00432) |
| $N$ | 197 | 198 | 196 | 196 |
| | Western | | | |
| | (1) | (2) | (3) | (4) |
| | 1959 | 1964 | 1969 | 1974 |
| Low | -0.00740** | -0.000927 | -0.00110 | -0.00247 |
| | (0.00332) | (0.00163) | (0.00166) | (0.00216) |
| Medium | -0.0153*** | -0.00507*** | -0.00357* | -0.00574** |
| | (0.00397) | (0.00194) | (0.00198) | (0.00258) |
| High | -0.0198*** | -0.00807*** | -0.00619** | -0.00858** |
| | (0.00532) | (0.00260) | (0.00265) | (0.00346) |
| $N$ | 327 | 327 | 325 | 325 |

Standard errors in parentheses

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Table (A4) The Effects of the Historical CRP on Tenant Acreage - Long difference without control

| | Nation | | | |
|---|---|---|---|---|
| | (1) | (2) | (3) | (4) |
| | 1959 | 1964 | 1969 | 1974 |
| Low | 0.00288 | -0.00512* | 0.00325 | 0.0122*** |
| | (0.00265) | (0.00304) | (0.00411) | (0.00453) |
| Medium | -0.00482 | -0.0125*** | 0.00231 | 0.0144*** |
| | (0.00295) | (0.00338) | (0.00457) | (0.00505) |
| High | -0.00730* | -0.0228*** | -0.00146 | 0.0126* |
| | (0.00441) | (0.00504) | (0.00682) | (0.00754) |
| *N* | 2857 | 2856 | 2850 | 2849 |
| | Atlantic | | | |
| | (1) | (2) | (3) | (4) |
| | 1959 | 1964 | 1969 | 1974 |
| Low | 0.00564 | 0.00516 | 0.0142 | 0.00540 |
| | (0.00798) | (0.0102) | (0.0154) | (0.0136) |
| Medium | -0.00615 | -0.00642 | -0.0117 | -0.0160 |
| | (0.00883) | (0.0114) | (0.0173) | (0.0153) |
| High | -0.0171 | -0.0249 | 0.00346 | -0.0328 |
| | (0.0176) | (0.0221) | (0.0336) | (0.0295) |
| *N* | 197 | 197 | 194 | 194 |
| | Midwest | | | |
| | (1) | (2) | (3) | (4) |
| | 1959 | 1964 | 1969 | 1974 |
| Low | 0.0246*** | -0.0111*** | 0.00363 | 0.0210*** |
| | (0.00476) | (0.00418) | (0.00564) | (0.00683) |
| Medium | 0.0331*** | -0.000707 | 0.0334*** | 0.0609*** |
| | (0.00538) | (0.00473) | (0.00638) | (0.00772) |
| High | 0.0364*** | 0.0188** | 0.0799*** | 0.111*** |
| | (0.0108) | (0.00946) | (0.0128) | (0.0155) |
| *N* | 796 | 796 | 795 | 795 |
| | Plains | | | |
| | (1) | (2) | (3) | (4) |
| | 1959 | 1964 | 1969 | 1974 |
| Low | -0.00320 | 0.00381 | -0.00161 | 0.00835 |
| | (0.00818) | (0.00921) | (0.0136) | (0.0145) |
| Medium | -0.0177** | -0.0102 | -0.0134 | -0.00630 |
| | (0.00835) | (0.00940) | (0.0138) | (0.0148) |
| High | -0.00112 | -0.00764 | -0.0109 | 0.00468 |
| | (0.0103) | (0.0116) | (0.0171) | (0.0182) |
| *N* | 631 | 631 | 631 | 631 |
| | South | | | |
| | (1) | (2) | (3) | (4) |
| | 1959 | 1964 | 1969 | 1974 |
| Low | -0.0107** | -0.00855 | 0.000702 | 0.00755 |
| | (0.00425) | (0.00576) | (0.00693) | (0.00758) |
| Medium | -0.0330*** | -0.0348*** | -0.0225*** | -0.0134 |
| | (0.00486) | (0.00658) | (0.00791) | (0.00866) |
| High | -0.0475*** | -0.0627*** | -0.0464*** | -0.0336*** |
| | (0.00728) | (0.00985) | (0.0118) | (0.0130) |
| *N* | 906 | 905 | 905 | 905 |
| | Western | | | |
| | (1) | (2) | (3) | (4) |
| | 1959 | 1964 | 1969 | 1974 |
| Low | 0.00376 | 0.00675 | 0.0144 | 0.0193 |
| | (0.00564) | (0.00658) | (0.0101) | (0.0119) |
| Medium | 0.0134** | 0.0203*** | 0.0301** | 0.0358** |
| | (0.00669) | (0.00781) | (0.0120) | (0.0141) |
| High | -0.00511 | -0.00384 | 0.0184 | 0.0184 |
| | (0.00907) | (0.0106) | (0.0163) | (0.0192) |
| *N* | 327 | 327 | 325 | 324 |

Standard errors in parentheses

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$