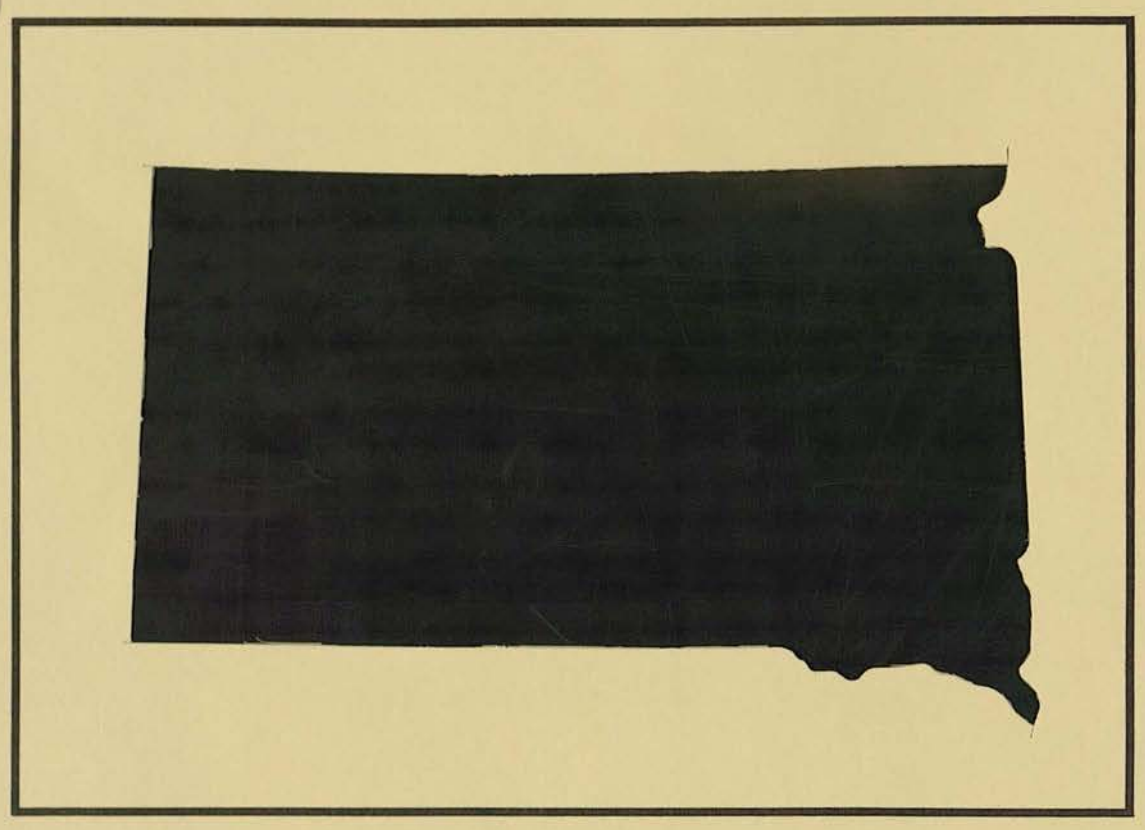

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FACTORS AFFECTING POST-CRP LAND USE INTENTIONS IN THE NORTHERN PLAINS*

by

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ABSTRACT

Post-CRP land use intentions of Conservation Reserve Program contract holders in South Dakota are examined. Results from logistic regression models indicate CRP crop base acres, farm commodity and conservation program provisions, and livestock/hay management are major factors affecting post-CRP land use plans.

INTRODUCTION

The 1985 Food Security Act authorized the U.S. Department of Agriculture (USDA) to contract with private landowners to place their highly erodible and other environmentally sensitive cropland into permanent vegetation for a 10-year period in exchange for an annual rental payment. This Conservation Reserve Program (CRP) has enrolled 36.4 million acres of cropland from 1986 - 1991.

Post-contract land use decisions of CRP contract holders will impact various crop and livestock commodity markets, farm-level cost and returns, and environmental (soil erosion, water quality, and wildlife habitat) quality. The greatest regional impacts will occur in the Great Plains states, where most CRP acres are located (Joyce, Mitchell, and Skold. 1991; Dicks et.al. 1994).

This report is focused on major factors affecting post-CRP land use intentions of contract holders. In this study post-contract CRP land use intentions are identified for CRP contract holders. An economic model that assesses the relative importance of economic, management, and public policy factors affecting post-CRP land use intentions is developed and estimated. This assessment is

important to: (1) individuals whose economic interests will be directly or indirectly affected by these land use decisions, and (2) interest groups that wish to influence CRP-related legislation.

DATA SOURCES AND RESPONDENT / CRP CONTRACT CHARACTERISTICS

The study location is South Dakota, a Northern Plains state with 2.1 million acres of cropland enrolled in the Conservation Reserve Program - 10% of the State's cropland acres and 6% of CRP acres in the U.S. South Dakota ranks 5th in the number of enrolled CRP acres (after Texas, North Dakota, Kansas, and Montana).

The major data source is a 1993 CRP survey mailed to a random sample of 8.33% of South Dakota CRP contract holders and completed by 556 of 1133 persons contacted during March and April 1993. Management, socio-economic, and land use data from the 1993 CRP survey are combined with USDA CRP contract file data on physical and Federal program characteristics of their CRP contracts. Nearly 40% of respondents are enrolled in more than one CRP contract.

Land capability class (LCC) of CRP acres is an indicator of the relative ease of converting CRP acres to cropland and still meet conservation compliance. Nearly 64% of respondent CRP acres are in LCC 2 or 3 with moderate limitations for conversion to cropland. Another 23% of CRP acres are primarily Class 4 lands with very severe limitations for cropland use, and 13% of CRP acres (Class 5,6, or 7) should not be used as cropland.

Almost all respondents have some Federal crop program base acres on their CRP lands. Fifty eight percent of respondent CRP

acres (105.1 of 181.0 thousand acres) are crop base reduction acres. Forty percent of CRP base acres are wheat base acres and the remainder are oats, barley, corn and sorghum base acres.

Statistical analysis of CRP contracts held by respondents and nonrespondents indicated no significant differences ($p<=0.05$) in the mean level or distribution of CRP acres by regional location, land capability class, pre-contract erosion level, crop base acre reduction, or contract bid period, and other major characteristics. Based on similarity of CRP contract characteristics, we conclude that contracts held by sample respondents are representative of CRP contracts in South Dakota (Ghebremicael, 1994).

Farmers and ranchers will be the main decision makers on post-CRP land use in South Dakota. Nearly 67% are farm operators and the median age of respondents is 56 years, compared to 49 years for all SD farmers. Respondents owned or leased an average of 2007 acres of South Dakota farm/ranch land, including 326 acres of CRP lands, 680 acres of other cropland, and nearly 1000 acres of pasture land.

POST-CRP LAND USE INTENTIONS

A summary of post-CRP land use intentions of 556 respondents controlling 181,000 CRP acres indicates 52% of CRP acres will be converted to cropland, 29% of CRP acres will remain as grassland, and projected land use of 19% of CRP acres is uncertain. For the 496 respondents with specific intentions, 32% plan to convert all of their CRP lands to cropland, 28% plan to keep all CRP land as grassland, while 40% plan to use about three-fifths of their CRP acres for cropland and retain two-fifths of their CRP acres in

grassland. These land use intentions are indicated for the baseline assumption that CRP contracts will not be extended, renewed, or renegotiated by USDA.

There are some differences in CRP land use intentions by land capability class. Sixty nine percent of CRP acres intended for cropland use are in land capability classes 2 or 3, compared to 57% of CRP acres intended for grassland use. Thirty one percent of CRP acres intended for cropland use and 43% of CRP acres intended for grassland use are in land capability classes 4 - 7.

Respondents with post-CRP cropping intentions indicated a majority (51%) of these acres are expected to be planted to wheat, 16% are planned for corn, and 33% are planned for barley, oats, soybeans, and other crops. Nearly half of the 358 respondents with cropping intentions indicated plans to return most of their CRP acres to crop production to maintain their farm program crop base.

Two-thirds of respondents with post-CRP land use plans intend to keep some of their CRP acres in grass production. Most of these respondents, intend to use the grassland for livestock grazing and/or hay production. Nearly 45% plan to manage some of their grassland acres for improving wildlife habitat.

All respondents were asked to evaluate the suitability of their CRP lands for livestock grazing. Nearly 30% of the 536 respondents answering these questions indicated their CRP land is ready for grazing. Almost 65% of respondents said fences need to be built and 40% indicated existing fences need repair before their CRP lands would be suitable for livestock grazing. Nearly 48% stated that a livestock water source needs to be established, while

18% indicated an existing water source needs repair before their CRP lands would be suitable for livestock grazing.

Respondents' indicated that several economic and public policy factors will influence and may possibly CHANGE their post-CRP land use decisions from their current intentions. Respondents indicated the most important factors likely to influence their actual land use decisions are: (1) market prices of crops vs. livestock (62% stated this factor was very important), (2) expected costs of crop production on CRP lands (56%), and Federal crop program provisions (45%). Availability of cost-sharing programs for soil conservation compliance, promoting wildlife habitat, or making CRP lands suitable for livestock grazing were "very important" factors to 40%, 38% and 41% respectively of respondents.

ECONOMETRIC MODELING OF FACTORS INFLUENCING POST-CRP LAND USE DECISIONS

In economic modeling, rational decisions on land use alternatives are usually based on expected profitability of each alternative, subject to risk preferences and other constraints imposed by the decision maker, by available technology, and by the legal environment. In this study, expected profits of post-CRP land use alternatives were not directly estimated. However, explanatory variables are selected on the basis that they are related to increasing (decreasing) revenues (costs) or are related to respondent preferences concerning land use alternatives.

The logistic regression procedure is used to predict the likelihood of respondents returning their CRP land to cropland or

grassland, after contract expiration. Logistic regression analysis is often used to investigate the relationship between the response probability and the explanatory variables. The response, Y, is a binary (0,1) variable representing the land use decision.
Let X denote a vector of explanatory variables and p=pr(Y=1/X) is the response probability to be modeled. The linear logistic model has the form: Logit (p)=ln(p/(1-p)) = a + b'X, where 'a' is the intercept parameter and 'b' is the vector of slope parameters (Gujarati, 1988, McCullagh and Nelder, 1989).

The dependent (response) variable is the post-CRP land use decision. The two models estimated are the cropland use decision and the grassland use decision. Explanatory variables included in each model are respondent demographic and management factors, CRP land characteristics, and respondent assessment of the relative importance of economic policy factors in their decision process.

Demographic variables of principal occupation, education and age level are included in both land use models because these factors influence many types of economic decisions. Gross farm income and major source of farm income are included because income source and business size are often related to costs of added crop or livestock production. If crop (livestock) income is the major source, the expected post-CRP decision is cropland (grassland).

Physical characteristics of CRP lands are often related to relative profitability of each land use decision. For example, CRP land in land capability classes (LCC) 1 - 3 may be more likely to convert to crop production, while CRP land in LCC 4 - 7 may remain in grass production due to severe limitations and rising costs

associated with cropland conversion. As predicted erosion level (EROSION) increases, conservation compliance costs should increase and respondents may be less likely to convert CRP land to cropland.

Past or present management practices can greatly influence land use decisions. For example, a higher proportion of CRP crop base acres are expected to be positively related to a cropland use decision. Suitability of CRP lands for grazing and ownership/use of haying equipment are expected to be positively related to a grassland use decision.

Respondent assessment of the relative importance of market prices, crop production costs, Federal commodity programs, and various cost-sharing programs are also expected to be related to their post-CRP land use decision. For example, if farm program benefits are perceived as very important to the success of their farm business, then these respondents may decide to recrop their CRP lands to continue receiving farm program payments.

A stepwise logistic regression procedure (PROC LOGISTIC in SAS/STAT, Version 6) was used to empirically estimate the coefficients of each decision model. The data set used are the 427 (417) South Dakota CRP survey respondents providing all data to estimate the cropland (grassland) decision model. The stepwise model results, variable names and definitions are shown in Table 1. A 0.10 probability level cutoff was used for entering and exiting variables and maximum likelihood estimation procedures were used.

The stepwise model for the cropland use decision includes a statistically significant intercept term and six explanatory variables. Coefficients of all explanatory variables, except Cost-

Share Crop, had the expected positive sign. Thus respondents with a greater number of CRP acres, with a higher percentage of CRP acres in land capability classes 1-3, with a greater proportion of CRP crop base acres, and respondents indicating Federal farm programs and crop production costs are important decision criteria are more likely to have post-CRP cropland use intentions. The negative coefficient for Cost-Share Crop indicates respondents perceiving conservation cost-sharing as important decision criteria are less likely to convert CRP acres to cropland.

The stepwise model for the grassland use decision includes an intercept term and five explanatory variables: respondent age, suitability of CRP land for grazing, ownership of hay harvesting equipment, and respondent assessment of the relative importance of crop/livestock market prices and cost-sharing livestock-related improvements in the land use decision process. The coefficients for Grazing, HayEquip, and Cost-Share Lvstk have the expected positive signs, while the coefficients for Age and MktPrice have the expected negative signs (Table 1).

Empirical results indicating increased respondent age is negatively related to a grassland use decision, while increased number of CRP acres is positively related to a cropland use decision are consistent with results reported in a study of post-CRP land use intentions in New Mexico (Skaggs, Kirksey, and Harper. 1994). All other demographic and farm business size variables are not included as statistically significant explanatory variables in either land use decision model.

The C index of rank correlation, which assumes a value between 0 and 1, is used for assessing the predictive ability of a model. The closer the C index value is to 1.0 the better the predictive ability. The stepwise cropland model has a C index value of 0.726, while the stepwise grassland model has a C index of 0.727. Based on the -2 LOG likelihood statistics and chi-square tests for covariates for both models, the combined effect of all explanatory variables are significantly different from zero ($p = 0.0001$).

CONCLUSIONS AND IMPLICATIONS

Results from this South Dakota study indicate CRP contract holders plan to return a majority of CRP acres to cropland upon contract expiration. Their post-CRP land use decisions will be be primarily influenced by economic, management, and public policy factors prevailing at the time their contracts expire. These results are generally consistent with those reported in other Northern Plains states and with results from a national survey (NCT-163 Proceedings, 1994; Nowak, Schnepf, and Barnes, 1991).

The grassland use decision is closely related to prevalence of livestock and hay enterprises on their farm/ranch and potential for cost-sharing livestock related improvements on their CRP land. Many respondents have made the necessary improvements (fencing, water sources etc.) on their CRP lands for livestock use or plan to increase hay production. However, other respondents indicate cost-sharing livestock related improvements on their CRP land would influence their land use decision.

The cropland use decision is closely related to the extent of CRP crop base acres and farm program benefits. Respondents are clearly indicating that Federal farm program incentives will have a substantial impact on their decision, if their enrolled CRP lands have a relatively large crop base. Public policy modifications that change incentives for using CRP crop base acres could alter many post-CRP land use decisions.

Expected costs of converting CRP land to cropland and ease of conservation compliance appear to be factors influencing post-CRP cropland intentions. An increased proportion of CRP acres in land capability classes (LCC) 1-3 are positively associated with post-CRP cropland use intentions. In general, CRP acres in LCC 1-3 are likely to have greater ease of conservation compliance and lower costs in converting to a cropland use, than CRP acres in LCC 4 - 7.

Finally, the logistic regression models in this study could be refined by joint consideration of the major land use alternatives in one model. Another useful extension would be applying this model to a regional / national CRP survey data set. This would provide information on the consistency and diversity of factors influencing post-CRP land use decisions across the United States.

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Table 1. Stepwise Logistic Regression Model Results for Post-CRP Land Use Decision.

A. Cropland Decision Model

Variable	Parameter Estimate	Standard Error	Wald Chi-Square	Probability Significance Level	Odds Ratio
Intercept	-1.682	0.474	12.59	0.0004	0.186
CRP Acres	0.0011	0.0005	5.50	0.019	1.001
PctAcre 1-3	0.006	0.0026	5.41	0.020	1.006
PctBase	0.011	0.005	4.28	0.038	1.011
FedSupport	0.345	0.108	10.30	0.0013	1.412
Cost-Share Crop	-0.226	0.113	4.04	0.044	0.798
CropCost	0.291	0.109	7.06	0.008	1.338

N = 427 C-Index = 0.726
-2 Log L = 440.03 for intercept and covariates
ChiSquare for covariates = 68.87 with 6 D.F. (p = 0.0001)

B. Grassland Decision Model

Variable	Parameter Estimate	Standard Error	Wald Chi-Square	Probability Significance Level	Odds Ratio
Intercept	0.753	0.628	1.43	0.231	2.12
Age	-0.017	0.008	3.82	0.051	0.983
Grazing	1.41	0.30	22.10	0.0001	4.09
HayEquip	0.603	0.239	6.37	0.012	1.828
MktPrice	-0.229	0.093	6.07	0.014	0.795
Cost-Share Lvstk	0.359	0.085	17.95	0.0001	1.432

N = 417 C-Index = 0.727
-2 Log L = 462.35 for intercept and covariates
Chi-Square for covariate = 62.781 with 5 D.F. (p = 0.0001)

Source: 1993 South Dakota CRP Survey

Definitions of Explanatory Variables:

Cropland Decision Model:

CRP Acres = Number of CRP acres
Pct Acres 1-3 = Percent of CRP acres in land capability class 1-3
Pct Base = Percent of CRP acres with crop base
FedSupport = Relative importance of Federal price/income supports (1 to 5); =1 not important, =5 very important
Cost-Share Crop = Relative importance of conservation cost sharing programs (1 to 5); =1 not important, =5 very important
CropCost = Relative importance of crop production costs (1 to 5); =1 not important, =5 very important

Grassland Decision Model:

Age = Respondent age in years
Grazing = 1 if CRP land is suitable for grazing, = 0 otherwise
HayEquip = 1 if respondent has hay harvesting equipment, = 0 otherwise
MktPrice = Relative importance of crop/livestock market prices (1 to 5) = 1 not important, = 5 very important
Cost-Share Lvstk = Relative importance of cost-sharing programs for livestock improvements (1 to 5) = 1 not important, = 5 very important