2007

Evaluating the Conservation Security Program utilizing the perceptions and economics of producer participation: implications for land stewardship in Iowa agriculture

Denis Andrew Reich
Iowa State University

Evaluating the Conservation Security Program utilizing the perceptions and economics of producer participation: implications for land stewardship in Iowa agriculture

by

Denis Andrew Reich

A thesis submitted to the graduate faculty

in partial fulfillment of the requirements for the degree of

MASTER OF SCIENCE

Co-majors: Sustainable Agriculture; Economics

Program of Study Committee:
James Kliebenstein, Major and Co-major Professor
Michael Duffy
Francis Owusu
Robert Mazur

Iowa State University

Ames, Iowa

2007

This thesis is dedicated in loving memory to my father, Norman Denis Reich.

TABLE OF CONTENTS

ABSTRACT

Agriculture in the United States (US) has been the focus of a number of studies that address the link between on-farm agricultural practices and the degradation of natural resources. The mounting body of evidence that associates certain cropping and grazing practices with with soil and waterway damage points to a need for federal agricultural policy to provide improved conservation incentives for agricultural producers. This study focuses on the first two years of the Conservation Security Program (CSP) in Iowa, a watershed based conservation program introduced with the 2002 Federal Farm Act. This new "green payment" programt emphasizes "rewarding the best" stewards of natural resources and "attracting the rest" via reward payments and cost share incentives.

Previous studies of the CSP have been performed in a number of agricultural regions of the US including the Midwest corn belt. All have typically utilized only one research method such as interviews, focus groups, case studies or in-depth examinations of program spending. While collectively these studies have established the promise of the program as well as its limitations, this study provides a thorough examination of the CSP's implemnetation in Iowa, using an approach that combines a statisitically representative mail survey of producers in the state's first four CSP waterhseds with 13 in-depth interviews in a complimentary manner.

Results are consistent with the findings of other studies, suggesting that the CSP is rewarding the "status quo" of corn,and soybean crop production in the state with little incentive for producers who have not invested previously in stewardship to improve their standards of conservation. There appears to be little to distinguish among CSP enrollees as program participants were found to be relatively homogeneous, with many already receiving payments through other conservation programs. CSP payments were found to be unevenly distributed among producers, with some probably being over compensated for the costs of their conservation which threatens program compliance with World Trade Organization (WTO) "green box" rules.

Rewarding producers for practices already in place is not lost on long term stewards, as enrollment in traditional conservation programs has typically allocated the highest

payments to those practicing the least conservation. With the 2007 Farm Bill in mind, the effectiveness of the CSP at promoting and preserving natural resources could be greatly improved by capitalizing on the current period of high commodity prices by redirecting savings from Loan Deficiency and Counter-Cyclical payments into simplifying the CSP exclusively as a reward program for proven stewards. Additionally, conservation compliance for commodity programs should be improved and enforced so that the environemntal benefits of producers practicing "land stewardship" is not undermined by producers unwilling to maintain conservation minimums. Promoting the CSP exclusively as a reward program should provide the needed incentive for unproven land stewards to take advantage of cost-share programs such as the Environmental Quality Incentives Program (EQIP) to transition to higher levels of stewardship, increasing the overall acreage of conservation treatment in Iowa and reducing the total area of environmentally damaging practices.

1 INTRODUCTION

1.1 Study Description

This report is an analysis of the Conservation Security Program (CSP) in Iowa, evaluating program goals and its success at meeting these goals. The level of program adoption and the level of understanding of the program by Iowa agricultural producers are also provided. The CSP represents the first program of its kind for the Unites States (US) in that it rewards producers with annual payments for conservation practices implemented on working lands[1]. First implemented in Iowa in 2004, the program aims to reward farmers for their natural resource conservation efforts, sometimes referred to as "land stewardship" (Leopold, 1949; Berry, 1985).

Since its inception there have been a number of implementation setbacks and changes, the bulk due to funding appropriation setbacks. The program has been championed as a future alternative to the costly and increasingly controversial commodity farm programs that have come under both national and international scrutiny. With these two issues in mind, the primary focus of this study is as follows:

> *In Iowa has the CSP, a new program that represents a shift in US agricultural policy that has endured significant funding stress, (a) been effective at achieving its stated goals? And (b) had an early implementation experience that would be acceptable to both federal and international lawmakers?*

The study has used two methods for data collection and analysis:

1. A quantitative approach using a mail survey and regression modeling, and
2. A series of CSP producer interviews and case studies qualitatively comparing interviewed producers using a budgetary model.

---

[1] "Working lands" being land actively used for producing agricultural outputs.

The CSP was signed into law as part of the 2002 United States Farm Security and Rural Investment Act (Farm Bill) and has been described as "a voluntary program that provides financial and technical assistance to promote conservation and improvement of soil, water, air, energy, plant and animal life" (NRCS, 2004). The CSP has also been a departure from previous conservation programs such as the Conservation Reserve Program (CRP), which offers incentives for land retirement, and The Environmental Quality Incentives Program (EQIP), which offers cost share incentives to address specific environmental concerns on agricultural working lands. Though the CSP has struggled to fulfill many of the enactments from the original statute, the extent to which the original program statute attempts to address on-farm conservation is significant (Dobbs and Streff, 2005; Westra, 2005).

The first departure CSP makes from previous legislation such as the CRP is the program was the first conservation program legislated in a similar fashion to the commodity programs as an entitlement program, which for producers means those who qualify are guaranteed participation. Secondly, there is the manner in which the CSP addresses conservation on land currently being cropped and/or grazed also known as "working lands". While similar to EQIP by also providing incentives for new practices, the CSP is unique in providing producers with payments for practices already in place. Thirdly and perhaps most significantly, the CSP builds on the EQIP's precedent by applying the economics of a "green payment" to land active in the production of agricultural services.

In economic terms, "green payments" have been defined as "any payment to producers based on either specific actions taken to reduce non-point pollution or on the probable environmental results of such actions" (Horan et al, 1999); and more generally as a public payment to agricultural producers in return for a multifunctional service: that of providing "a range of agricultural, environmental and social goods side by side" (Batie and Lynch, 2005)

The phrase "reward the best and motivate the rest" is probably the most recognizable amongst CSP publications and attempts to summarize how the green payment concept is being applied within CSP at promoting conservation and stewardship practices. Rewarding of "the best" refers to the compensation of farmers who have already adopted conservation

practices at their own cost and initiative while attraction of "the rest" describes those producers that with some financial assistance would be willing to participate in such practices.

1.2 The CSP within Iowa

The CSP first became available in Iowa in 2004, the same year the program officially commenced. During this first year only 18 watersheds nationwide were activated to enroll eligible producers as part of an introductory pilot phase. Of these 18 watersheds, the East Nishnabotna watershed in southwestern Iowa participated. In 2005, the second year of the program, 202 more watersheds were added nationally while allowing producers in the original 18 watersheds a second chance to enroll. Iowa was able to add three more watersheds: the North Raccoon, in West-Central Iowa, as well as the Upper Wapsipinicon and Turkey watersheds in Northeastern Iowa[2].

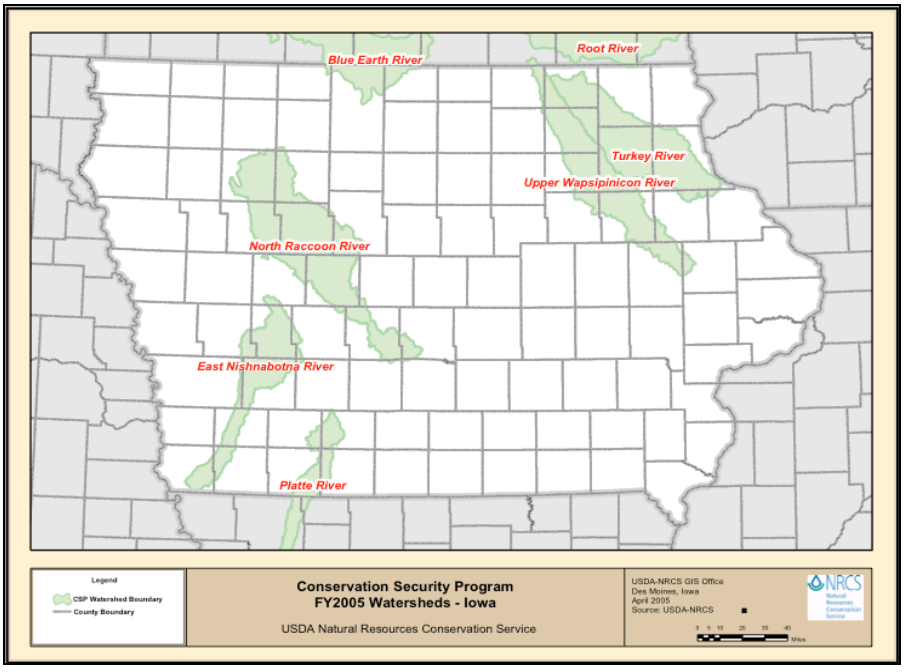


Figure 1.2A - Active (2005) Conservation Security Program watersheds in Iowa

[2] While the Platte River and Blue Earth watersheds and a very small part of the Root River watershed were available to some Iowa farmers, these watersheds were managed by Missouri and Minnesota NRCS respectively.

Iowa's participation in the CSP is slightly below average compared to other states if farm acres are accounted for. As presented in Table 1.2A, by area alone, Iowa has slightly more watersheds per square mile, but for farm acres, Iowa actually has about half the density of the national average and about three-quarters that of California, the most agriculturally productive state in the nation.

Table 1.2A – Participation in CSP by area for Iowa, California and nationally through to 2005

Region/ State	watersheds	Square Miles		Farm Acres	
		total	per watershed	total	per watershed
United States	220	3,537,441	16,079	1,017,030,357	4,622,865
Iowa	4	56,276	14,069	33,044,768	8,261,192
California	5	147,046	29,409	33,385,619	6,677,123

(Source: 2002 Census of Agriculture)

This report focuses on producers' experiences, understanding and awareness of the CSP within these four watersheds through to the end of the 2005 Financial Year.

1.2.1 East Nishnabotna Watershed

The East Nishnabotna watershed extends about 90 miles from just north of the Missouri border in Fremont County to the southern townships of Carroll County. It covers an area of 1,022 square miles or 653,765 acres. The farmland within the watershed is typically gently undulating with an average slope of 6.1 percent and clay rich soils that favor high soybeans yields. Grassland - both in public lands, set-aside acres and pasture - account for about 30 percent of the land area in the watershed, but has been dropping as crop acreage has been increasing (67 percent in 2000). The East Nishnabotna watershed was one of 18 watersheds nationwide that were part of the 2004 introductory pilot year for the CSP. Producers in the watershed were given the opportunity to sign-up in both 2004 and 2005.

1.2.2 North Raccoon Watershed

The North Raccoon watershed extends about 100 miles from the confluence of the Des Moines and the Raccoon River at the Des Moines waterworks northwest to the southern townships of Palo Alto County. It covers an area of 5,544 square miles or 1,594,053 acres with significant portions on the edge of the flat and fertile Des Moines lobe. Pasture accounts for 13 percent of all land area with 80 percent used for cropland. The North Raccoon watershed contains parts of Dallas County, an area of rapid urban sprawl, subjecting all types of farmland to the pressures of urban development. The North Raccoon watershed was included as part of the state's 2005 CSP sign-up.

Being the watershed that contains some of the most productive agriculture in the state and a waterway that contributes to the municipal water supply of the state's largest urban population, the North Raccoon has been the focus of a number of studies that examine connections between agricultural land use and water quality. A comprehensive study by the US Geological Survey found weather, most notably flooding, was highly correlated with high nitrate events (greater than 10 parts per million) at the Des Moines Water Works (Schnoebelen et al, 1999); suggesting mineralized soil nitrogen was contributing significantly to nitrate levels in the river. A study with support from the Leopold Center for Sustainable Agriculture found that the combination of sub-surface tile drainage and annual cropping that left soil exposed for much of the year were the two biggest contributors to mineralization of soil nitrogen leading to high water nitrate levels in the river (Keeney and DeLuca, 1993). Modeling of increased use of set-aside acreage in the watershed by the Center for Agricultural and Rural Development at Iowa State University also suggested a lack of perennial grasses in the river's catchment area was hindering efforts to maintain nitrate levels that were consistently below the standard of 10 parts per million (Manoj et al, 2006).

1.2.3 Upper Wapsipinicon Watershed

The Upper Wapsipinicon watershed extends about 105 miles from Anamosa in Jones County into the southern tier of counties in Minnesota. It covers an area of 3,423 square miles or 984,086 acres. The farmland within the watershed is undulating to hilly. Cropland

accounts for 72 percent of land use and pasture for 17 percent. The watershed was introduced as part of the 2005 CSP sign-up.

1.2.4 Turkey Watershed

The Turkey watershed extends about 80 miles from the Wisconsin border in Clayton County to just south of the Minnesota border in Howard County, sharing its southwestern border with the Upper Wapsipinicon watershed. It covers an area of 3,779 square miles or 1,086,610 acres. The Turkey is in the hilly moraine region of the state and as a result has some distinct land-use differences. Cropland accounts for only 55 percent of land use, while pasture accounts for 25 percent and forested areas 16 percent. The Turkey watershed was included as part of the state's 2005 CSP sign-up.

1.3 Report Overview

The research for this report was conducted between February 2006 and February 2007. The primary data collection events were first a mail survey questionnaire conducted during March 2006 and then face-to-face interviews with CSP participating producers during the summer and early fall 2006.

The mail survey contained 36 questions on producers' general farming experiences, perceptions and demographic information in addition to experiences with the CSP. The survey respondent data was analyzed descriptively and quantitatively using a series of logit regressions. Producer interviews with CSP enrollees from the four CSP watersheds collected detailed information on the farm enterprise mix and operation. The interview data was then examined qualitatively using budget models with four of the farms being expanded into case studies. All research components were employed in a complimentary manner to help determine:

(a) How consistent has the CSP been at meeting its published goal, in particular how much success the program has had at "rewarding the best and attracting the rest" to "promote conservation" in Iowa.

(b) What the resulting impact has been on Iowa farmers, their level of program awareness, participation and understanding.

(c) What are the implications of the CSP for national and international[3] farm policy?

The ensuing chapters of the report will provide background on the CSP in more detail, expand on the specific goals of the study, the methodology of data collection and measurement, examine and analyze results and conclude with implications and recommendations for the CSP in the upcoming 2007 Farm Bill.

[3] For more detail on the trade legalities of domestic agricultural support see an explanation of the WTO's "amber box" and "blue box" rulings at http://www.wto.org/english/tratop_e/agric_e/agboxes_e.htm

2 BACKGROUND

2.1 History of the CSP

The concept of an agricultural farm program or green payment that focuses on and rewards working lands conservation has been applied outside of the United States for a number of years prior to the CSP appearing in the 2002 US Farm Bill. Europe is probably the region best known for examples of this kind; with some European Union (EU) countries having maintained political support for working lands' green payments to agricultural producers since the 1980s (Dobbs and Pretty, 2001).

The 1992 Common Agricultural Policy (CAP)[4] treaty of Rome saw mainstream EU policy collectively "green up". Apart from the replacement of many price support measures with a series of decoupled direct payments as a means to secure farmers' incomes, a new regulation[5] was introduced, requiring member states to introduce "agri-environmental" programs (Dobbs and Pretty, 2001). Since that time many EU countries have invested heavily in their own versions of working lands' green payment programs that include reward incentives; examples of which are the Countryside Stewardship Scheme (CSS) in England, the Organic transition schemes in Denmark and Austria and the Contrats Territoriales d'Exploitation (land management agreements or CTEs) in France (Dobbs and Pretty 2001).

The US has not been without "agri-environmental" policy, examples such as the Sodbuster[6] and Conservation Compliance[7] provisions as well as land set-aside programs such as the CRP and working lands cost-sharing programs such as EQIP have been in effect for some time. What has been lacking is a working lands green payment program that creates

---

[4] The Common Agricultural Policy (CAP) treaties of the EU are akin to the US Farm Bills, where EU member countries for the purpose of maintaining an affordable food supply and a stake in world food and fiber trade ratify periodic reforms.

[5] EU CAP regulation 2078/92, 1992 Treaty of Rome.

[6] The Sodbuster provision severely limits previously unploughed land from being brought into crop production.

[7] Conservation Compliance requires farmers who wish to participate in USDA price support programs comply with conservation plans for all "highly erodible" land.

incentives for producers to adopt higher levels of conservation based on reward payments received. Such a program was first publicly discussed within the United States under the heading of a "green support program" in 1994. Introduced with the primary goal of appeasing dissatisfaction with the existing commodity programs in both the domestic and international trade arenas (Lynch, 1994), the concept gradually gathered momentum and political support until it became the CSP in the 2002 Farm Bill. When the Senate Agriculture Committee first drafted the program in 1999, to be included in the ensuing Farm Bill, there was strong emphasis on three governing strategies, each of a green payment nature: (SWCS, 2007):

1. Rewarding farmers and ranchers for conservation standards that may already be in place on the farm,

2. Payments should be indexed with conservation performance and the impact on natural resources rather than the cost to implement them, and

3. The use of entitlement funding, where the program budget is not restricted by an annual cap but rather by the number of eligible producers and the level of their participation.

While signed into law as a comprehensive program it has struggled for undivided political support since inception and at a more elementary level for sufficient funds (Harkin, 2004). Twice since 2004, the program's allocation has been tapped and diverted to emergency relief financing outside of agriculture (Heller et al., 2005; GAO, 2006). The Congressional Budget Office initially estimated that about $1 billion dollars per year would be required to fully fund CSP at the national level. However the program was capped at $41.4 million in 2004, $202 million in 2005 and $259 million in 2006 (Heller et al., 2005; GAO, 2006). While measures have been implemented to utilize the remaining funding in an effective manner, the CSP is now only a shadow of what the original bill prescribed.

Two of the more controversial measures have been the reduction in the area of eligibility from all US states and protectorates to select watersheds as well as replacing continuous open enrollment with 3-month enrollment periods every eight years (Hoefner, 2004). While other more localized rule revision issues have perhaps justified the

extended watershed-by-watershed "pilot" introductions, eligible producers within CSP watersheds being denied the opportunity to upgrade their contracts or even the option to sign up altogether is becoming more prevalent. The result has been an increasing level of uncertainty regarding the program; especially since funds for commodity programs have remained uncapped while CSP has seen increased payment limitations (Hoefner, 2003). The next Farm Bill (2007), which is being currently debated, will do much to determine the fate of CSP.

2.2 Structure of the CSP[8]

Throughout the numerous NRCS publications and web pages covering the CSP, the program goals or mission appear as variations on a theme rather than as a clearly defined mission statement. Central to this theme is the desire to "preserve" and "promote" natural resources in a "sustainable" manner. These concepts are also summarized with the catch-all expression: "land stewardship".

The program separates participants into three tiers: tier 1, tier 2 and tier 3. The proportion of farmland that meets basic conservation standards for soil and water determines eligibility for tiers 1 and 2. Producers satisfying these basic program requirements for *part* of their farm are eligible for tier 1. If *all* of their land complies they are eligible for tier 2. If a participant excels at conservation i.e. demonstrates conservation of soil, water and all other resources of local concern on all of their farmland they become eligible for the top tier, tier 3 (see table 2.2A). An appealing aspect of CSP for some farmers has been that once enrolled, contracts are annually reviewed and if new conservation practices warrant, then a producer is eligible for a contract increase to the next tier level with no penalty to any previous or intended payments. It is not unrealistic, as a number of the farmers in this study have shown, that a producer can start from a 5-year tier 1 contract and quickly graduate to a 10-year tier 3 contract.

[8] Most of the CSP detail in this section is available from fact sheets on the NRCS CSP web page: http://www.nrcs.usda.gov/programs/csp

Table 2.2A - The tier payment structure of the CSP

Tier Number	Percent of the Farm Enrolled	Conservation Requirements		Contract Length	Base Contract† Maximum Annual Payment
		Soil and Water	All Other Resources of Concern*		
1	<100%	✓		5 yrs	$20,000
2	100%	✓		5 to 10yrs§	$35,000
3	100%	✓	✓	5 to 10yrs	$45,000

* Refers to the local county's National Resource Conservation Service (NRCS) Field Office Technical Guide (FOTG) listing: "Resources of concern". (Source: NRCS, 2005)

† Each producer is only eligible for one CSP contract. The contracted individual must share in the risk and profits of crop and livestock production on the farm.

§ Only one CSP contract in Iowa at the tier 2 or 3 level elected for a contract length of less than 10 years (Source Iowa NRCS, 2007).

Each CSP contract is divided into four sub-payment areas:

1. An annual stewardship component for the existing base level conservation treatment
2. An annual existing practice component for the maintenance of existing conservation practices.
3. An enhancement component for exceptional conservation effort and additional conservation practices or activities that provide increased resource benefits beyond the prescribed level.
4. A one-time new practice component for additional practices specified on the "watershed needed list"; at 65% cost share for beginning and limited resource farmers, 50% cost share for all other farmers.

Examination of nationwide CSP contracts has shown that the enhancement component has so far received the largest proportion of the funds (see Table 2.2B). It is not clear whether the original statute intended the enhancement component to be weighted so heavily, but it is clear little was done to reduce it when the program hit appropriations difficulties in the way that the existing practice payments or new practice cost share incentives were reduced. The enhancement component is calculated at a "variable rate" with payment amounts declining over the length of the contract, making it unique to the other three payments (See Figure 2.2A). Since producers can add new enhancements as older

enhanced payments begin to taper, there is an incentive to continually improve the level of on-farm conservation for the life of a CSP contract. It is possible that administrators were reluctant to interfere with this incentive when deciding not to reduce the enhanced component in line with some of the other payment decreases. NRCS personnel have indicated that for 2008, in the interests of " greater transparency," a new method of calculating enhanced payments will be introduced (Howard, 2007).

Table 2.2B – Total nationwide CSP payments by payment type, fiscal year 2005.

Payment Type	Payments	Percent of total payments
Stewardship	$27,428,071	15%
Existing Practice	$6,864,218	4%
New Practice	$119,777	<1%
Enhancement	$142,972,322	81%
TOTAL	**$177,384,387**	**100%**

(Source: GAO analysis of NRCS ProTracts data, October 2005)

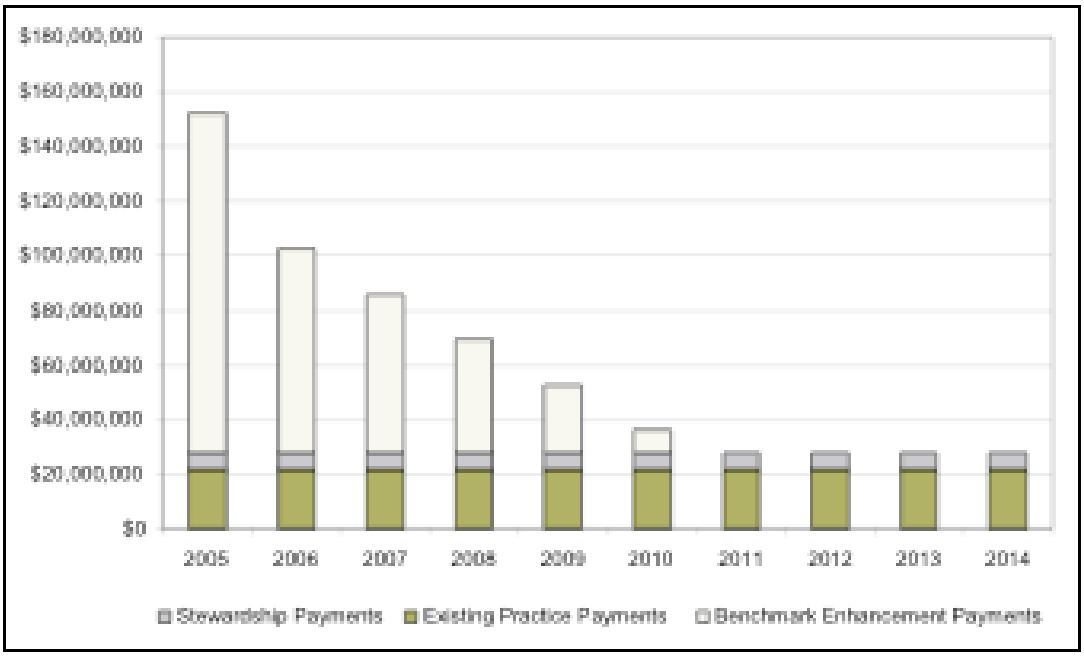


Figure 2.2A – Trend in CSP payments, by type over the life of 2005 contracts. (Source: SWCS analysis of NRCS ProTracts data, February 2007)

The eligibility for enhancements is governed by the following conditions:

- The improvement of a significant resource of concern to a condition that exceeds the requirements for the participant's contract tier.
- An improvement in a priority local resource condition, as determined by NRCS, such as water quality or wildlife abundance.
- Participation in an on-farm conservation research, demonstration, or pilot project.
- Cooperation with other producers to implement watershed or regional resource conservation plans that involve at least 75 percent of the producers in the targeted area.
- Implementation of assessment or evaluation activities relating to conservation practices included in the participant's contract, such as drilling water monitoring wells.

Table 2.2C - CSP contract approved payment amounts in Iowa and nationally for 2005

FY 05	Iowa	National
Tier 1	$8,286,054	$42,156,596
Tier 2	$2,436,982	$53,975,701
Tier 3	$1,526,999	$49,577,930
TOTAL	$12,159,035	$124,770,554†
	n=1,886*	n=14,516
Tier 1 average	$5,561	$5,390
	n=1,490 (79% of 1886)	n=7,821 (54% of 14,516)
Tier 2 average	$9,458	$13,360
	n=64 (14% of 1886)	n=4,040 (28% of 12,787)
Tier 3 average	$11,069	$18,673
	n=47 (7% of 1886)	n=2,655 (18% of 12,787)

(Source: NRCS ProTracts database, 2007)

*NRCS had records for only 1,886 of 2252 successful applicants receiving payments in Iowa in 2005.

† This amount is different from the total in Table 2.2B. The primary sources for these amounts were different and were likely compiled at different times.

In 2004, 380 Iowa producers or 0.4 percent of producers in Iowa enrolled in the CSP, in 2005 1,872 or 2.1 percent of statewide producers enrolled and during the 2006 signup an additional 156 producers or 0.2 percent enrolled in the CSP statewide. The current (2007) total of producers enrolled in the CSP in Iowa is 2370 or 2.6 percent of all producers statewide, which accounts for 38 producers who since enrolling have elected to cancel their contracts[9].

In 2005 Iowa had a total of 2,252 total producers or 2.5 percent of 90,655 producers statewide enrolled in the program, compared to 12,787 producers or 0.6 percent of all producers nation-wide (NRCS, 2007). Iowa enrollees accounted for over $12 million in contract payments in 2005, 9.7 percent of the $145,710,226 spent nationwide on contracts for that year. A breakdown of the CSP contract payments in Iowa and nationally is displayed in Table 2.2C.

2.3 Administering the CSP as a Green Payment.

Despite the issues with securing adequate finances for the CSP, there is much to suggest that simply restoring the program to full funding will not correct all of the problems that have surfaced in the inaugural years of the program. While the idea of a nationwide green payment program such as CSP is economically appealing, its application can be cumbersome.

Firstly, it is hard to quantify the level of individual responsibility for a communal problem when the cost of environmental damage to society is not necessarily correlated with the cost of its repair (Horan et al, 1999). The "environment" has the ability to absorb human interferences such as pollution up to a threshold level, once crossed its ability to self-regulate and regenerate and perhaps most importantly to absorb more pollution tends to deteriorate exponentially (Carson, 1962; Daily, 1997). Hence the benefit of one acre of on-farm conservation does not simply cancel out another's lack of. Such quantification is instead dependent on the proportion of total farms cooperating with conservation efforts, how non

[9] Thanks to Mr. Tom O'Connor, Iowa CSP Coordinator, NRCS, for help with these figures.

co-operators are hindering efforts and the prior level of environmental damage. Put most simply "the farm is the unit of conservation, but *not* the unit of environmental improvement" (Batie and Lynch, 2005).

Secondly there is the challenge of implementing a green payment program across variable geography, soils and climate, which the CSP is attempting (eventually) to do as a nationwide program. The notion that conservation practices should be compensated equally without contextualizing their application has come under some scrutiny.

A good example within Iowa is "no-till," where the farmer drills the crop seed directly into the residue from the previous year's crop. Conservation tillage, minimum tillage or reduced tillage also adhere to this principle of reducing soil disturbance and maintaining residue cover. No-till practices inhibit soil surface nitrogen mineralization and are well rewarded by the CSP across the entire state, while more conventional tillage practices offer less opportunity for reward under the program and are sometimes reason for a program penalty. Yet there is some debate that conventional tillage practices if employed correctly can reduce nutrient leaching at no expense to organic matter while no-till can potentially promote nutrient leaching through sub-surface tile drainage (Gassman, et al, 2006).

Thirdly, there is the larger question of whether the program is singling out a certain combination of practices or certain brand of producer for higher or lower degrees of compensation. This is not necessarily a good or bad thing but does provide information as to which type of producer the program might be targeting.

Lastly and perhaps the biggest challenge for a "green payment" program such as CSP is when the incentives for improved stewardship provided by the program are overshadowed by other government incentives such as the commodity programs. The commodity programs are a production incentive, while CSP is an incentive to improve on-farm conservation. Hence, if a farmer is making upwards of 40 dollars per acre from commodity payments and yet averages less than half that amount in CSP payments then the incentive provided by the CSP to pursue additional conservation practices is likely to be adversely affected.

2.4 Literature Review: This Research in Context

Six notable evaluations of the CSP that have incorporated producer economics along with CSP rule revision analysis and farmers' feedback have been completed and published. Two studies were ex-ante in nature, using computer based modeling to gauge the potential impact of the CSP on certain areas of the Midwest corn-belt, while the remaining four studies are evaluations of the program's progress during its first years of implementation.

Of the two predictive studies the earlier involved an examination of agriculture's multifunctionality in two Minnesota watersheds, one a low relief "warmwater" watershed and the other a hilly "coolwater" watershed (Boody et al, 2005). While much of this study does not pertain directly to CSP, a number of follow-up publications have resulted detailing the likely environmental and economic impact of increased CSP and CRP use within these watersheds (Vondracek, Zimmerman and Westra, 2003; Westra, Vondracek and Zimmerman, 2004; Westra, 2005). The ADAPT[10] model employed to predict environmental and economic impacts on these watersheds suggested that farmers within these watersheds would have the opportunity cost of less production through conservation increases offset by CSP and CRP payments. Environmentally the "coolwater" watershed would be better off with a significant reduction in the number of lethal events for the watershed's fish population while predictions for the other "warmwater" watershed indicated no significant improvement. The implications of these results are that a nationwide practice-based program such as CSP will struggle with inconsistent environmental results due to varying ecological and agricultural characteristics across watersheds.

The second ex-ante study modeled CSP's influence on crop mix diversity in the South Dakotan Corn Belt (Dobbs and Streff, 2005). Research included modeling a representative 1000-acre farm for likely changes in per acre returns based on a series of crop rotations of varying diversity, both conventional and organic. Payment amounts used in this model were from the time period prior to CSP funding being cut in 2004, and were significantly higher than the current payment structure. Results from the 1000-acre farm

[10] Agricultural Drainage And Pesticide Transport (ADAPT) model.

model suggest that under the original payment structure farmers would have been compensated by CSP for any income forgone with the inclusion of hay or a small grain crop into a traditional corn and soybean rotation.

Of the four program evaluations, two are of a regional nature and the more recent are nationwide assessments. The first evaluation was a collaboration between academics, policy experts, and farmers representing the Maryland Center for Agro-Ecology assessing the success of the CSP within Maryland (Heller et al., 2005); the second was performed by The Tufts University's Friedman School of Nutrition Science and Policy assessing the impact of CSP in the New England States (Lundgren et al., 2006). Of the nationwide assessments, The US Senate Appropriations Committee on USDA management of CSP (GAO, 2006) completed a comprehensive study of the program's performance especially regarding cases of overlap with other conservation programs; the last being a recent assessment of the program nationwide by the Soil and Water Conservation Society (SWCS, 2007). All studies suggested the program showed significant promise but also hit upon the potential problems some of which have already been described in the previous section "2.3 Administering the CSP as a Green Payment". The common theme being that in its current form CSP is at risk of sinking the vast majority of its funds into "rewarding the best" stewards, those with conservation practices in place prior to the CSP, with little impact being made on the larger population of "the rest," those whose current lack of conservation practices is hindering stewardship efforts of the "best" (SWCS, 2007).

Recent Leopold Center funded studies have examined the early stages of the CSP within the Midwest: "The Conservation Security Program: An assessment of farmer's experience with program implementation" (Bruckner, 2006) is an assessment of program effectiveness based on the Center for Rural Affairs conservation hotline comments and follow-up interviews with farmers and ranchers; "Leveraging Linkages" (Gesieke, 2006) is an examination of how non-government organizations and watershed leaders can work more effectively with government agency staff to improve CSP implementation. Both of these studies highlighted that if the program is to avoid losing support among producers, inconsistencies and ambiguities within the program rule structure need to be addressed,

funding needs to be restored, and administrative support for local NRCS staff must increase especially as more farmers come online with the program.

In addition to the research on CSP within the US, Dobbs and Pretty have conducted a notable examination of the agri-environmental programs introduced in the United Kingdom (UK) (Dobbs and Pretty, 2001). The report carefully examines all stewardship-based programs implemented within the UK starting with the Environmentally Sensitive Areas (ESA) scheme that commenced in 1986, preceding the 1992 Common Agricultural Policy (CAP) reforms. The implications of this report's findings for US agriculture and the CSP are that mainstream producers and their farms have never been successfully accommodated when attempting to induce large improvements in agricultural stewardship. This applies especially to improvements sustained beyond the point at which program funding begins to wane. In the short-term this suggests that investment in agricultural conservation must itself be substantial and innovative if US policy makers are to expect long-term measurable improvement in the natural resource health and ecological services of agricultural lands (Dobbs and Pretty, 2001; Swinton et al, 2006) and move beyond simply rewarding the "status quo" levels of conservation that existed prior to CSP (SWCS, 2007).

2.4.1 Research Objectives

A recurring theme amongst all studies and commentaries of the program is the unavoidable complexity that a green payment program such as CSP faces when attempting to improve working lands conservation at the national or even state level. The source of most of this complexity is not new to agricultural policy makers who are forever faced with the opposing interests of what is economically feasible and what is politically feasible. The economics of CSP: how to attach dollar values to ecological services and correlate these with particular conservation practices across 220 watersheds, has so far proved challenging enough for program administrators without even including the rocky road the program has traveled in Congress (Dobbs, 2006).

To avoid unnecessary overlap between all of these projects and the research included within this report, this study will focus on a number of issues that have received less attention.

The objectives for this study are to:

(a) Determine the consistency that the CSP has demonstrated at meeting its published goals, in particular how much success the program has had at "rewarding the best and attracting the rest" to "promote conservation" in Iowa.

(b) Establish the resulting impact of the CSP on Iowa farmers and their level of program understanding.

(c) Describe the implications of the CSP for national and international[11] farm policy.

A number of key research questions will be employed as the underlying approach to meeting these objectives (see Table 2.4A):

1. What characteristics define Iowa producers who are aware of and enroll in the CSP and the patterns of participation for enrolled producers?
2. How consistent is the CSP at compensating Iowa producers for their conservation efforts?
3. How does the CSP fare as an incentive to continually improve conservation efforts among participating producers?
4. How does the CSP compare as an incentive to commodity program payments?
5. How do producers perceive compensation and incentives provided by the program?
6. Are contract amounts proportionate with the practiced level of conservation or are certain approaches to conservation better rewarded than others?
7. Are CSP payments likely to be contributing to farm income or only covering costs of conservation?

[11] For more detail on the trade legalities of domestic agricultural support see an explanation of the WTO's "amber box" and "blue box" rulings at http://www.wto.org/english/tratop_e/agric_e/agboxes_e.htm

Table 2.4A - Study objectives with underlying approaches.

Objective:	Description	Approach:	Question
(a)	Determine the consistency CSP has demonstrated at meeting its published goal, in particular how much success the program has had at "rewarding the best and attracting the rest" to "promote conservation" in Iowa.	1.	What characteristics define Iowa producers who are aware of and enroll in the CSP and the patterns of participation for enrolled producers?
		2.	How consistent is the CSP at compensating Iowa producers for their conservation efforts?
(b)	Establish the resulting impact of CSP on Iowa farmers and their understanding of the program.	3.	How does CSP fare as an incentive to continually improve conservation efforts among participating producers?
		4.	How does CSP compare as an incentive to commodity programs?
		5.	How do producers perceive compensation and incentives provided by the program?
(c)	Describe the implications of CSP for national and international farm policy.	6.	Are contract amounts proportionate with the practiced level of conservation or are certain approaches to conservation better rewarded than others?
		7.	Are CSP payments likely to be contributing to farm income or only covering costs of conservation.

2.5 The CSP with High Commodity Prices

The data for this study was collected between March and November of 2006. As the end of the 2006 calendar year approached, the average market price for corn grain in Iowa was closing in quickly on $3.00 per bushel. This is after a number of years where corn prices had struggled to stay at or above $2.00 per bushel. By the time this report is completed there is a high probability of Iowa producers living in a world where a bushel of yellow-number-two corn is worth over $3.75 at elevators around the state.

Created largely by the boom in bio-fuels this upheaval in Iowa agriculture creates a whole new set of variables that are beyond the scope of this study to explore. Even so it is worth remembering that with the rapid expansion of the ethanol and bio-diesel industries, the incentives to practice conservation are destined to be diluted, especially if programs promoting on-farm conservation like the CSP, do not adjust accordingly.

3 METHODOLOGY

3.1 CSP Goal Definitions

As already outlined, the green payment nature of the CSP provides both economic and political challenges for policy makers and program administrators. Additionally the spectrum of beliefs and opinions that exist regarding what constitutes natural resource conservation is wide and varied making the choice of instrument or instruments for evaluating the program important.

The first research question of evaluating the CSP in Iowa is a test of how the program has been received by Iowa producers and to what extent program goals have been met. As previously discussed there is an element of subjectivity surrounding the nature of the CSP's mission; value judgments are required to define terms such as "sustainability" and "stewardship". If greater clarity is to be achieved regarding this mission, then the multi-faceted nature of CSP's purpose must be explored.

The CSP functions at a number of different levels. Firstly there is the CSP contract, of which the binding elements describe the social benefits a farmer will provide through conservation practices and his/her compensation level with public funds. The broader knowledge of how CSP contracts work provides the financial incentive for farmers to enroll for financial reward of existing conservation practices or compensation for soon to be implemented practices, or a combination of both.

Secondly there is the larger and less immediate effect of environmental improvement through the successful implementation of multiple CSP contracts. Farming communities begin to reap the benefits of conservation practices such as cleaner waterways and reduced soil loss, providing additional incentive for producers as community members, to adopt higher levels of conservation. It is when producers' incentives to practice conservation shift beyond the purely financial that they arguably become examples of "land stewardship" apart from mere conservation practitioners (Leopold, 1949; Berry, 1985).

Thirdly there is the most advanced objective that may lay partly outside of the scope of CSP in its present existence, the larger aim of the green payment, "multifunctionality". As already defined, multifunctionality within agriculture requires a number of goods, both public and private to be made simultaneously available (Batie, et al., 2005). This is likely hard to achieve without the reintegration of agriculture into the psyche of the modern consumer, who are on average apathetic about agricultural policy (Batie, et al., 2005).

Hence to reduce any uncertainty that might arise, CSP goals will be defined (in order of action) for the purposes of this study as follows (also see table 3.1A):

1. CSP contract: Reward agricultural producers for, and attract them to, NRCS endorsed conservation practices with financial incentives.

2. CSP mission: To promote "land stewardship" (ongoing preservation of natural resources such as soil, water, air, energy and wildlife habitat) amongst all agricultural producers.

3. Green payment mission: To enhance the "multifunctionality" (adjacently providing agricultural, environmental and social services) of rural areas.

Table 3.1A – CSP goals as defined for this study.

Conservation Security Program Goal:	**1. CSP Contract:** Individual producer conservation improvements.	**2. CSP Mission:** Promote "Land Stewardship"	**3. Green Payment Mission:** Enhance rural "Multifunctionality"
Incentive:	Financial Personal Beliefs	Improved image in local community. Local community membership.	Improved image in broader community. Broader community membership.
Mechanism:	"Reward the best and attract the rest."	Reduced risk and stigma through increased adoption of conservation practices.	Sharing costs and benefits of increased conservation with consumer/customer and urban communities.
Outputs:	Improved quality of natural resources for agricultural use. Potentially some off farm benefits.	Improved quality of natural resources beyond agricultural use. i.e. waterways clean for recreational use. Increased numbers of "Land Stewards."	Producers provide an array of adjacent products: agricultural, environmental and social. Consumer participation. "Land Stewardship" shared among all stakeholders.

Exploring both demographic trends and individual program incentives is a challenge that does not lend itself well to only one brand of research. Population-based comparisons are at the other end of the research spectrum from the case study analysis of CSP payments and their influence on farm decision making. Hence there was a clear need to branch out from the well-trodden qualitative route of interviews and case study analysis to include a quantitative component that allows for more specific generalizations about the larger population of producers within CSP watersheds.

By including the exploration of CSP participation at both the population and individual level, a more comprehensive insight into the program and its impact becomes achievable. If findings match between a population-based analysis and individual case studies then there is a reinforcement of both. If they suggest different outcomes then the possibility of over-emphasizing strong significance in the results from either of the quantitative or qualitative analyses is avoided.

To satisfy the quantitative component a mail survey questionnaire was employed to answer questions about producer population awareness, enrollment and participation level. Additionally data from the mail survey was combined with a series of three logit style regressions to detect any significant correlations between producers involvement in CSP and key demographics such as age, education, farm size, crop mix, number of conservation practices and perceptions about “land stewardship”.

For the qualitative component, a small number of surveyed producers who were agreeable to a face-to-face interview provided detailed farm information for a budgetary analysis. Each farm budget involved an examination of CSP payments and how they contribute to farm revenue and compensate conservation spending. Since specifics on the dollar amounts that CSP attaches to each eligible conservation practice were unavailable the farm budgets in this report focused on how CSP payments are rewarding and potentially attract stewardship through diversification, whether by crop mix, grazing livestock or increased use of set-aside land. Additionally, four of the farm budgets were expanded into detailed case studies, each modeling three or four scenarios of varying crop, livestock and conservation mixes for comparison to the baseline case.

By anchoring the CSP contract compensation level for the total 2005 cost of all on-farm conservation practices, each scenario compares the required adjustment in CSP contract amount that results from the change in farm design. The compensation levels of annual conservation costs, by annual CSP payments, are then also compared. By isolating the farm design scenario for each case that is best compensated under CSP, it becomes clearer what incentives the program is providing to improve stewardship levels, and in what form they are likely to be most appealing to the producer. This has strong implications for the "attract the rest" component of the program, especially if the case studies suggest increases in on-farm diversity can expect higher or lower compensation by CSP payments.

Examples of combining quantitative and qualitative methods in social science research are not common, even less so when dealing with agricultural policy assessments. One recent example is by Cramb examining the Australian designed "Landcare" conservation program and its early stages of implementation in the Philippines (Cramb, 2005). A combination of quantitative survey analysis and qualitative sociological methods were employed to explore connections between soil conservation adoption and social capital development.

3.2 Data Collection

The quantitative and qualitative research components each involve separate data collection. The quantitative component employed a mail survey with questionnaire to provide data for regression analysis as well as obtain basic insight into farmers' experiences and perceptions of the program. The qualitative component utilized producer interviews to provide the farm knowledge required for budgetary case studies and scenarios.

3.2.1 Mail Survey

A key component of the mail survey design was facilitating data preparation for the statistical component of the analysis. The questionnaire instrument was designed with reference to a number of other agricultural based surveys. The two most notable of these survey studies were the "Ohio Farmers' Conservation Decisions" Survey (Hua et al, 2004)

due its similar focus and style of questions, and "Farm Operator Opinion and Agricultural Policy; Kansas Survey Results" (Barkley and Flinchbaugh, 1990) since it also included regression analysis to assist with interpreting results. The resulting questionnaire used as the mail survey instrument in the current study contained the following key question areas:

1. Producer perceptions regarding the concept of "land stewardship."
2. On-farm conservation practices.
3. Level of CSP awareness, enrollment and participation.
4. Experiences with the CSP.
5. Basic farm information: crops, livestock, lease arrangements.
6. Farm operator demographics (including on and off-farm income).
7. On-farm labor.
8. Willingness to participate in an interview.

The data collection instrument was developed as a single-sheet, four-page "booklet" style questionnaire. This length of questionnaire was a compromise between data detail and boosting potential response rate. Two potential sub-contractors for conducting the survey, the Statistics Laboratory at Iowa State University (ISU) and National Agricultural Statistics Service (NASS) were contacted for assistance in survey design. While the Statistics Laboratory at ISU offered the more desirable alternative, mail addresses for Iowa producers were not at their disposal and even though NASS and the Farm Services Agency (FSA) had access to a suitable survey sample, they were not willing to publicly share producers' contact information. NASS were ultimately contracted to draw the producer sample, print questionnaires, perform two mailings plus a reminder postcard and collect all responses. The Statistics Laboratory at ISU were then contracted to collate and code all responses and provide a data file usable for descriptive and regression analysis.

The questionnaire was developed and pre-tested with Iowa producers. Responses and recommendations from this pre-test were used to develop the final draft of the questionnaire.

Some examples of feedback used to assist with fine-tuning the survey instrument were as follows:

1. *Income information is a very delicate subject*. Income questions were adjusted to multiple-choice ranges of income and moved to the very end of the questionnaire.
2. *Clarity of some questions was an issue, such as those relating to "Land stewardship" perception. These questions were troublesome since they were perceived to contain multiple questions.* Secondary meaning was either removed from these questions or broken out into an additional question.
3. *Some key conservation practices were missing*. Since all pre-testers had different opinions on this issue, the ultimate choice of ten key practices with space left over for respondents to indicate "other" unlisted practices was derived with assistance primarily from extension staff[12].
4. *The CSP payment rate question is too high/low.* Again pre-testers had a variety of opinions on this. Ultimately this question was deferred to and answered by NRCS staff[13].
5. *Education level should be included*. Included a four-answer multiple-choice question for respondents' education level.
6. *Is there compensation for participating in an interview?* The final draft of the questionnaire indicated that interviewees would be compensated at a rate commensurate with the author's salary.

The final draft of the questionnaire contained 36 questions (see Appendix A1): 13 Likert style[14], 7 continuous variable questions and 16 check-box questions (sometimes asking for secondary continuous variables). Once complete, the questionnaire was forwarded to

---

[12] Thanks especially to Dr. Mike Duffy and Dr. Margaret Smith for their time and assistance.

[13] Thanks to Mr. Tom O'Connor, CSP coordinator for Iowa, NRCS.

[14] A Likert question matrix is a series of survey style questions or statements designed to measure perceptions or attitudes towards a particular social issue or definition. Matrix questions/statements are designed with the intent of highlighting a spectrum of possibilities centered on a social issue or definition. Respondents select answers to each question/statement from a Likert scale (usually agreement versus disagreement).

NASS in early March of 2006. NASS began mailings on March 7th to a Stratified Random Sample[15] of producers within 10 Iowa counties purposively selected for their full or close to full coverage by CSP watersheds. Information presented in Table 3.3A shows the counties surveyed for each watershed.

It is worth noting the difference in the size of the mailing sample between watersheds. The two West-Central watersheds, the East Nishnabotna and North Raccoon, were responsible for only 961 or 38 percent of all 2500 mailings, whereas the Northeastern watersheds, the Upper Wapsipinicon and the Turkey were responsible for 1539 or 62 percent of all mailings. This is due to the larger area and the lower average farm size of some Northeastern counties, such as Clayton and Fayette as well as sparser farm populations in the West-Central counties, such as Greene and Cass.

Table 3.3.1A - CSP Counties selected for mail survey sample with totals for mailed surveys.

State Region	**West-Central**		**Northeast**	
Watershed	East Nishnabotna	North Raccoon	Upper Wapsipinicon	Turkey
Counties Surveyed (number mailed)	Audubon (169)	Buena Vista (211)	Buchanan (285)	Clayton (418)
	Cass (204)	Calhoun (193)	Chickasaw (255)	Fayette (350)
		Greene (184)	Howard (231)	
Total number of mailed surveys. 2500	373	588	771	768

Personnel from the NASS Des Moines office were responsible for drawing the sample along with printing and mailing the questionnaires. Two mailings were conducted, each going to the same addresses.

The timetable for the mailings was as follows:

- First mailing: Tuesday March 7th 2006

[15] A stratified sample attempts to reduce sampling error by increasing homogeneity. A random sample assigns a number to each element in the (stratified) population and using a random number generator, randomly selects sample members. (Source: Babbie, E, 2004. "The Practice of Social Research" 10thEd. pp 201-206.)

- Reminder postcard sent (See Appendix A2): Tuesday March 14th 2006.
- Second mailing (unless response from first mailing already received): Tuesday March 21st 2006.

The bulk or of responses were received by the end of April 2006. The 36 responses received after May 31st, 2006 were not included in the coded data in the interests of meeting project deadlines.

3.2.2 Producer Interviews

While basic farm descriptive information such as crop mix and acreages was requested in the mail survey questionnaires, a purposive[16] sample of willing respondents enrolled in the CSP was also chosen for in-depth face-to-face interviews. These interviews were designed to satisfy the budget analysis questions of the producer economics component of the study while also expanding on producer perceptions about "land stewardship" and the CSP.

The initial target was to interview at least one producer from each tier in each of the four watersheds, for a total of 12 interviews. During the interview process this was adjusted due to the small pool of respondents that were agreeable to an interview. The more achievable and perhaps more representative approach then became to interview at least one tier 3, one tier 2 and two tier 1 farmers in each survey region; the West-Central region being North Raccoon and East Nishnabotna watersheds and the Northeastern region being the Upper Wapsipinicon and Turkey watersheds. A total of 13 producers were interviewed: 4 cash grain (corn and soybeans), 3 cash grain farmers with confinement livestock (corn, soybeans and hogs), 1 partially diversified cash grain farmer (corn and soybeans with a very small portion of hay and pasture beef), 4 diversified farmers with hay and/or small grain and

[16] A "purposive" sample is non-random and indicates a deliberate intent in the sampling method. The sample of producers interviewed for this study was *purposively* chosen to include a balance of watershed locations and CSP participation levels (tiers).

pasture livestock (corn, soybeans with combinations of hay, small grains, beef and dairy) and one organic farmer (corn, soybeans, hay, barley and hoop hogs)[17].

The producer interviews employed questions focusing on six areas (see Appendix B for more detail):

1. Operation Basics: farm description; crop choices, acreages, rotations, yields, tillage practices, fertilizer application rates, pesticide/herbicide use, livestock.
2. Equipment: buildings and machinery; models, age, quantity, costs.
3. Labor: how household labor is used on the farm: number of employees, hours.
4. CSP: contract information; tier, acres, payments, enhancements.
5. General Conservation: conservation approach and practices; history of conservation on the farm.
6. General Discussion: farming vision; what motivates, what are goals for the farm, what has worked, what hasn't; how farmers see agriculture as a profession surviving and thriving in Iowa; thoughts and wish list for 2007 Farm Bill.

Each Interview required between one and two hours and took place on the producer's farm. Interviewees were offered a small honorarium for their time.

3.3 Measurement

For the purpose of answering key research questions explicit to achieving project goals, this study employed the following three data measurement components:

1. CSP producer characteristics. A logit style statistical regression model was used to model producer respondent characteristics as they related to levels of CSP awareness, enrollment and participation. This information was obtained from the mail survey responses. Such an analysis is used to determine how program variables, such as number of conservation

[17] The Results Section 4.4 "Farm Budget Model" provides expanded detail on the operation of farms for interviewed producers.

practices and non-program variables, and total farm acres are influencing program involvement and implementation.

2. Producer economics. Two key questions for the program are (a) "How do CSP payments contribute to farm income?" which is of much interest in light of the latest WTO rules on agricultural income support; and (b) "What kind of incentive do CSP payments provide for increased adoption of conservation practices?" Using information gathered in the farm interviews, budgets of a spectrum of CSP farm types and select case studies were created to determine the impact of CSP payments on conservation costs and farm profits.

3. Producer perceptions. Thirteen producer interviews were conducted across the four CSP watersheds in Iowa with agreeable survey respondents in the late summer and fall of 2006. Interviews were designed to expand on responses in the survey questionnaire and became the basis for the budgetary analysis and case studies outlined in item 2, Producer Economics.

3.4 Data Analysis

Regression analysis of producer involvement in the CSP was prepared and modeled using SAS (Statistical Analysis Software) software. Using a stepwise logit regression as the model form, questionnaire variables were tested for general significance against key variables of program participation. Key dependent variables were CSP Awareness, CSP Enrollment, and CSP Participation Level i.e. tier of enrollment (1, 2 or 3), for those actually enrolled. More detail on the logit model is provided in Section 3.6.

For analysis of producer economics, a farm enterprise budget was developed and projected for each interviewee using CSP contract, farm description, and conservation information collected during each interview. This portion of the study was designed as a partial budgetary analysis to determine the influence of CSP contract amounts and annual payments on farmers' decision-making that relates specifically to conservation spending and stewardship. The purpose of the budget models was not to gauge the impact of CSP payments on a producer's bottom line; such a detailed analysis of farm cash flow is beyond the scope of this study. During interviews, summaries of equipment and building use (including age), acreages, crop mix and yields, livestock populations and productivity and

labor use were collected. Since the terms used to discuss yields and productivities tended to vary across interviewees - some preferring five-year averages rather than the most recent year's (2005) production levels - all collected data was standardized using county and regional costs and prices from the relevant Iowa State extension publications for the 2005 financial year or best possible substitute (Smith et al, 2006; Ellis et al, 2005; Barnhart et al, 2006; Lawrence, 2006; Lawrence, 2006; Edwards, 2006; Smith, 2006).

In addition to modeling budgets for each interviewee's farm, a more involved case study analysis of one interviewed producer from each of the four watersheds was performed. Apart from a general breakdown of conservation practices and costs, a number of scenarios simulating various degrees of stewardship were modeled for each of the four case farms. The goal was to isolate the conservation incentives that the CSP provides as a green payment. For more detail see Section 3.7.

3.5 The Statistical Model

3.5.1 Regression

While descriptive information can be gleaned from mail survey responses, the size of the survey questionnaire response allows for the addition of a more involved quantitative analysis. Regression analysis was employed to provide this deeper level of analysis since it allows for statistical inference of the larger population of Iowa producers.

Regression is a form of analysis found within the larger group of statistical tools known as probability models. A probability model can serve many functions, but its primary design is to predict the likely outcomes for larger populations based on the correlations that exist between selected variables of a smaller sample (Fox, 1997).

Modern statistical modeling software such as SAS is a commonly used program for both calculating the probability predictions and assisting with determining the degree of precision to which we can make these inferences. Typically the more representative the subset is of the larger whole, the greater the potential precision of the inferences.

In developing a model for predictive purposes, a key by-product is the level of influence or "significance" of independent variables such as age, education and gender has on a dependent variable such as enrollment in the CSP. This study will focus on the significance of producer characteristics as they relate to CSP awareness, enrollment and level of participation for the purpose of generalized predictions about the larger population of Iowa producer the regression models.

3.5.2 Sampling

As far as states go, Iowa is reasonably uniform in geography, arability and demography. To the indigenous Iowan there are distinct regions of the state, but by comparison to even neighboring states, its relatively homogeneous nature lends itself well to a representative sample.

A Stratified Random Sample (SRS) was used to draw a sample for this study. For SRS, stratification of the population occurs before the random sample is drawn. For this study the overall population of producers within CSP watersheds was stratified into counties that were completely or almost completely within the respective watershed boundaries. Counties were used as the unit of stratification since producer records were not maintained at the watershed level; the inclusion of the chosen counties ensured only areas active with the CSP received questionnaires. This was done to minimize the non-response that might occur from mailing to recipients outside a CSP watershed and also maximize the response from producers to whom the program was available.

Personnel from NASS, a division of the American Census maintained a database of Iowa producers grouped by county. With the assistance of NASS a stratified selection of ten counties was chosen to represent producers whose farms resided within CSP watershed boundaries (see Table 3.3.1A). A random sample of 2500 producer addresses, from within these ten counties, was then drawn by computer directly from the state Census database of producers. NASS printed all questionnaires and stenciled each response using an internal coding system to assist with managing the survey mailings and collections while maintaining producer anonymity. This code also retained the county and watershed of each respondent, but was otherwise devoid of markings to link the questionnaire to the mailed address.

3.5.3 Logit Regression Models

Being confident the sampling method maximized representativeness for all producers in the four Iowa CSP watersheds, regression model type was selected for the "CSP Producer Characteristics" analysis. When dealing with a continuous dependent variable[18], such as farm size (in acres), linear regression, based on a linear function, is the most common choice for modeling such relationships. A discrete variable, such as CSP Enroll (0 for not enrolled and 1 for enrolled), is problematic for linear regression. The most immediate issue is that a linear model could potentially (and usually does) make predictions that fall outside the bounds of the discrete dependent variable; for CSP Enroll this would be a model prediction of less than 0 or greater than 1 (Liao, 1994).

This problem exists, quite simply because the relationship between a discrete variable and any continuous independent variable lacks sufficient linearity for meaningful predictions to be made with a linear model. To account for this lack of linearity a model was chosen from a family of non-linear discrete choice probability models, the most commonly used being the logit and probit models. The econometrics literature has many examples of both logit and probit models used in agricultural studies: Capps, Randall and Kramer compared logit and probit[19] (similar to logit) models for Food Stamp participation (Capps, et al, 1985); Schnitkey, et al. used logit models to examine the informational preferences of Ohio producers in farm business decision making (Schnitkey, et al, 1992); and more recently Moreno and Sunding used a logit model to examine the implications for conservation policy with regards to farmers adoption of new technologies and crop choices (Moreno, et al, 2005).

Unless the sample size is extremely large there is nothing to separate logit and probit models other than personal preference. The logit model was chosen for this study since the sample size was not extremely large and it is a log-based function allowing for easier

---

[18] In regression analysis a "dependent variable" is the subject of a (linear) representation of "independent" variables.

[19] The Probit model is another form of discrete choice probability model. The algorithm for use is identical to logit, the probability density function (pdf) being slightly different.

interpretation of SAS output parameters. The logit model transforms[20] what would otherwise be a linear output into discrete output based on a unique logit "probability distribution function" (pdf) across the bounds of the dependent variable (Liao, 1994). For CSP Enrollment this would be from 0.0 to 1.0, for CSP Tier this would be from 1.0 to 3.0. The resulting model takes the form shown in Equation 3.6.3A.

Equation 3.6.3A – Logit regression model form using the example of CSP Enrollment as the dependant variable

$$\text{CSP Enrollment} = \log\left[\frac{\beta_0 + \beta_1 X_1 + \ldots + \beta_n X_n}{1 - \beta_0 + \beta_1 X_1 + \ldots + \beta_n X_n}\right]$$

n = number of independent variables.

X_i = i-th independent variable.

β_i = parameter estimate for the i-th independent variable (i = 0 for ordinate).

For multiple-choice dependent variables such as CSP Participation Level (tier 1, 2 or 3), this becomes a little more involved but the principle remains the same.

This study is only interested in general predictions about the larger producer populations in Iowa so will not calculate coefficient marginal effects explicitly. The primary purpose of the regressions is to establish significant characteristics and their trends of influence. For continuous variables such as Crop Acres, the logit regression output parameter is not an indication of the marginal effects as for linear regression, since the marginal effect changes as the dependent variable changes, but the sign (positive or negative) of the parameter does indicate the trend of influence. For discrete variables, the variable categories' trends of influence on the dependent variable will be assessed via way of odds ratios that will be discussed in greater detail in the logit regression results (Section 4.3).

[20] The transformation calculation for a logit function uses a parametric estimation technique known as "Maximum Likelihood Estimation" (MLE). Most linear transformations use the "Optimum Least Squares" (OLS) for parameter estimation.

3.5.4 Stepwise Regression

A stepwise logit regression model using the PROC LOGISTIC function, available in SAS (See Appendix C for the SAS code used in this study), was chosen for all the regressions performed in this study. Stepwise regression performs repeated iterations of the same regression using entry and exit criteria to reduce (or then increase) the number of independent variables in the model. The stepwise regression model converges when the model fails to include or exclude additional independent variables with a subsequent iteration. The benefit of stepwise regression is the potential elimination of correlation effects between independent variables, sometimes known as multicollinearity[21]. This study has used an entry criteria of $p = 0.30$ for each independent variable and an exit criteria of $p = 0.35$. These are relatively non-restrictive for stepwise selection criteria allowing variables of interest with weaker correlations to remain in the model.

3.6 The Budgetary Model

Farm descriptive information or "metrics" pertinent to producer revenue and conservation cost were collected during the on-site producer interviews. These metrics were then incorporated into budget models representing each of the visited farms using a series of MS-Excel™ spreadsheet models (See Appendix D). Completed budget models were then used to compare the different farm designs of each interviewee in terms of financial compensation for conservation costs obtained from CSP contracts and annual payments. Additionally these levels of compensation by CSP were compared with likely payments from commodity programs.

In addition to a general comparison of conservation cost compensation by program payments for all interviewed producers, a smaller group of case studies was also selected for

[21] Multicollinearity occurs when two independent variables included in a multivariate regression model essentially carry the same information. This is usually identifiable when, separate from the regression, both are highly correlated. The result is if both remain included in the regression standard error calculation is disrupted for all independent variables that can lead to the misinterpretation of significance i.e. over or under-sized "p-values."

a more in-depth analysis. Four farms were selected for this portion of the study, one from each watershed also accounting for all three of the program tiers. Each of the four case farms was chosen to best represent different combinations of farm size, enterprise diversity and CSP participation level found within the four watersheds. The purpose of the case studies was not just to give a more involved breakdown of conservation practices and their separate costs on the farm, but to also model the impact of CSP payments on varied farm enterprise mixes and determine if incentives might exist to adopt more (or less) conservation practices.

The CSP's payment structure has a number of unique qualities, most notable is its capacity to reward farmers for conservation practices already incorporated into the enterprise mix that may have been paid for prior to program enrollment. This addresses a criticism of previous conservation programs that while the financial incentive existed farmers were more than happy to comply, but if funds were exhausted or diverted elsewhere, farmers would return to previous practices. While many long-time land stewards have been acknowledged and "rewarded" by CSP (SWCS, 2007), what isn't as clear is the incentive that these rewards provide to producers that so far have maintained only minimal levels of stewardship on their farms and are reluctant to do more without additional financial incentives.

All of the farms interviewed for this part of the study are enrolled in CSP and all are at different stages in paying off conservation infrastructure on the farm. Whether it is the cost of some supplemental equipment to include an additional crop in the rotation or that of restoring wetlands and wildlife habitat, each conservation practice has a different economic story. Some, such as an additional crop, may have low total transition cost but a persistent annual variable cost, while others; such as wetland restoration have higher total cost and minimal annual maintenance costs.

Depending on what stage in this investment process a producer starts to receive compensation and the form it takes can play a significant role in the level of influence a green payment such as CSP plays in the stewardship and profit elements of producers' conservation decisions. The case study analysis looks more closely at this part of the research with a goal to potentially isolate the likely incentive CSP payments are providing on these particular farms for continued and improved conservation. By identifying the incentives for

current CSP participants it becomes clearer if the program has the potential to effectively balance rewarding the best stewards with attracting aspiring stewards into the program or whether lawmakers will need to rethink program goals.

4 RESULTS

4.1 Survey Response

The Mail Survey had 1077 returns from 2500 mailings, a response rate of 43.1 percent. Of these, 66 responses were left blank or returned on behalf of addressees who were no longer farming; leaving 1011 or 40.1 percent usable for the analysis. There was also an additional 77 duplicate responses from the second mailing that were not included in these totals or the analysis.

The response rate is very good and indicates a high level of interest. The Iowa Land Values Survey (ILVS), performed by Iowa State University Extension (Duffy, 2007) on an annual basis is closely followed within the Iowa farming community and by the media (Perkins, 2007). The ILVS consistently achieves a response rate of 40-55% and by comparison this suggests producers within CSP active watersheds are closely following progress of the CSP. There were 241 respondents or 9.6 percent of the original mailing that indicated they were enrolled in CSP. This is equivalent to about 10 percent of the 2252 producers in Iowa who were enrolled in the CSP prior to the 2006 sign-up.

Table 4.1A provides information on survey mailings and responses by county, watershed and survey region. Even though county mailing levels for the Northeastern watersheds are higher than for West-Central counties this can be attributed to the smaller average farm size for that portion of the state[22]. More importantly response rate, as evident in Figure 4.1A is relatively consistent across all watersheds.

[22] Average farm size for counties surveyed in the Turkey watershed is 288 and 303 acres for the Upper Wapsipinicon versus 445 acres for the North Raccoon and 426 acres for the East Nishnabotna watersheds.

Table 4.1A - Counties selected for CSP mail survey sample with total number of mailed surveys and usable responses

State Region:	**West-Central**		**Northeast**	
Watershed:	East Nishnabotna	North Raccoon	Upper Wapsipinicon	Turkey
County totals: (mailed/ **usable**)	Audubon (169 / **70**)	Buena Vista (211 / **103**)	Buchanan (285 / **105**)	Clayton (418 / **179**)
	Cass (204 / **75**)	Calhoun (193 / **80**)	Chickasaw (255 / **102**)	Fayette (350 / **146**)
		Greene (184 / **66**)	Howard (231 / **83**)	
Watershed totals: mailed/**usable**	373 / **145**	588 / **249**	771 / **290**	768 / **325**
Survey totals mailed/**usable**	2500 / **1011**			

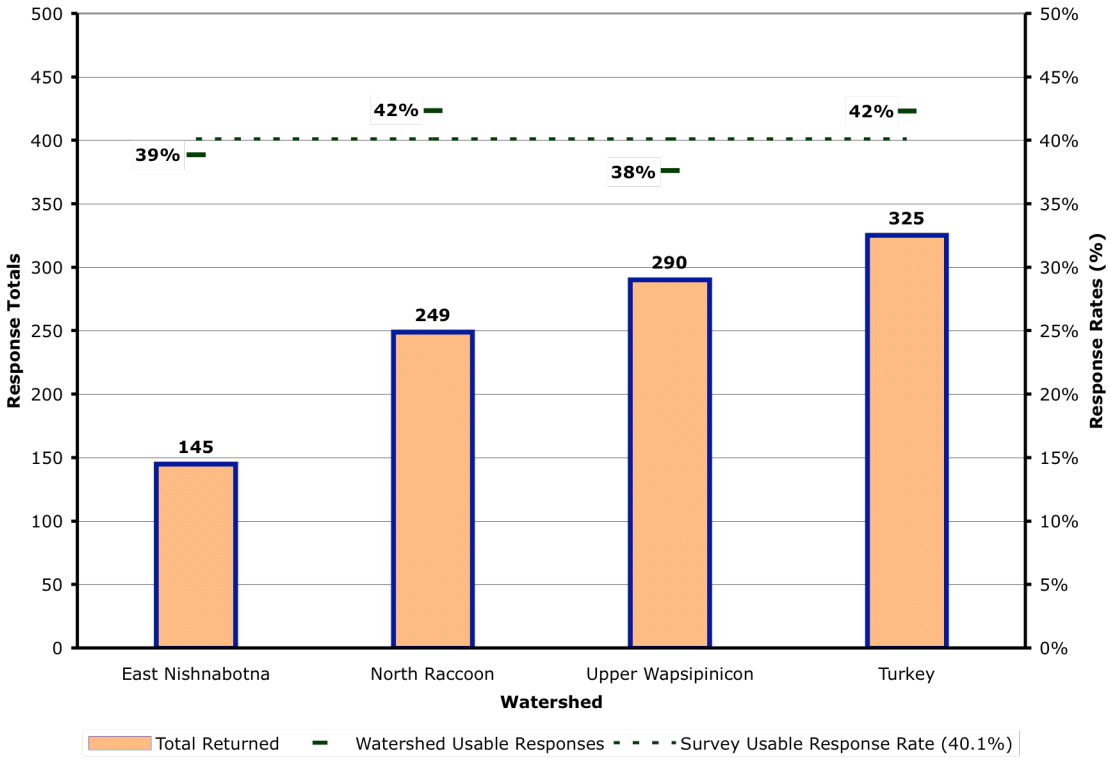


Figure 4.1.A – Number of usable mail surveys and response rates

4.2 Survey Descriptive Analysis

4.2.1 Preliminary Data

The survey instrument was a four-paged questionnaire covering 36 questions and the following eight question areas:

1. Producer perceptions regarding the concept of "land stewardship."
2. On-farm conservation practices.
3. Level of CSP awareness, enrollment and participation.
4. Experiences with the CSP.
5. Basic farm information: crops, livestock, lease arrangements.
6. Farm operator demographics (including on and off-farm income).
7. On-farm labor.
8. Willingness to participate in an interview.

Respondents not participating in the CSP were not asked to answer the fourth question area "Experiences with CSP." Of the other seven question areas there was a spectrum of usable response rates to respective questions, with the general trend being that usable response levels for question areas were close to 100 percent for the stewardship (question area 1) and demographic (question area 6) question areas but otherwise showed a decreasing trend from the beginning to the end of the questionnaire.

4.2.2 Producer Perceptions Regarding "Land Stewardship"

The concept of "land stewardship" is a term of resurging popularity for summarizing certain groups of producers and their conservation ethic. It is also a term of some subjectivity and ambiguity especially since it lacks consistent discussion in academic literature or USDA publications. For the purposes of this study "land stewardship" has been defined as "the ongoing preservation of natural resources such as soil, water, air, energy and wildlife habitat" (see Section 3.1). Also since producers are the recipients of CSP payments in return for

"agri-environmental" services, they represent an ideal source of comparison for the benchmark definition. Eight Likert scale type questions were developed on "land stewardship" (see Table 4.2.2A), each pertaining to key issues surrounding the CSP or agricultural conservation in Iowa that have often been raised in the popular press, CSP publications, academia or among farmer groups.

Table 4.2.2A – Distribution of respondents to the eight "land stewardship" questions

Stewardship Definition Statements	Usable* Responses	Rank†	Strongly Agree (5)	Somewhat Agree (4)	Neutral (3)	Somewhat Disagree (2)	Strongly Disagree (1)
"Land Stewardship" is about farming in a manner that conserves natural resources such as soil and water.	997	4.62	68.4%	27.0%	3.7%	0.3%	0.6%
"Land Stewardship" is a good term to describe responsible farming.	1003	4.54	64.0%	28.3%	6.1%	0.8%	0.8%
"Land Stewardship" is about balancing farm profitability with preservation of farmland for the use of future generations.	1002	4.52	62.9%	29.1%	6.1%	0.8%	1.1%
"Land Stewardship" includes accounting for off-farm impacts such as soil and nutrient loss into public waterways.	996	4.38	52.4%	37.2%	7.2%	2.0%	1.2%
"Land Stewardship" means minimizing the use of off-farm inputs such as fertilizer and pesticides.	992	3.50	23.8%	34.0%	18.5%	15.9%	7.9%
"Land Stewardship" means maximizing the production of your land.	995	3.47	24.9%	28.5%	22.3%	17.4%	6.8%
"Land Stewardship" includes a crop rotation with 3 or more crops.	992	3.13	17.3%	22.8%	26.9%	21.1%	11.9%
"Land Stewardship" is impossible without grazing livestock as part of a crop rotation.	995	2.30	5.6%	10.4%	25.8%	24.3%	33.9%

*"Usable" refers to completed responses with one answer.

† "Rank" refers to level of agreement based on a scale of 5 (Strongly Agree) through 1 (Strongly Disagree).

The general trend for the Likert matrix was that of agreement (a rank of over 3.0) with stewardship definition statements, except for the last statement on the need to integrate livestock into the farm operation to satisfy the respondent's definition of "land stewardship". This definition statement was more emphatic in nature than the other seven and the use of the word "impossible" was probably as much responsible for the high level of disagreement as any lack of livestock grazing among respondents. Still, 16 percent of respondents answered with some level of agreement to this statement, which represents a little under half of all respondents who had pasture of some form[23].

Of the other seven definition statements, the seventh statement had a mostly neutral response on average with only a slight tendency towards agreement regarding the need for three or more crops in a rotation in the definition for "land stewardship." Responses to the remaining six statements showed a slight tendency towards agreement or strong agreement. Respondents had a strong tendency towards agreement for statement two, "'land stewardship' is a good term to describe responsible farming" and statement three, "'land stewardship' is about balancing farm profitability with preservation of farmland for future generations." Interestingly, respondents were strongly in favor of statement four, "accounting for off-farm impacts such as soil and nutrient loss into public waterways," and statement one, "farming in a manner that conserves natural resources such as soil and water," being included in the definition for "land stewardship," but also were somewhat in favor of "maximizing the production of your land" being included in the definition.

Achieving maximum production simultaneously with minimizing off-farm impacts and conserving soil and water presents some interesting challenges. Corn, Iowa's signature crop has seen yields increase from a state average of 123 bushels per acre in 1995 to 173 bushels per acre in 2005, a 41 percent increase over 10 years (Holste, 2006); soybean yields have also increased, 44 bushels per acre in 1995 to 53 bushels per acre in 2005, a 20 percent increase over 10 years. Such increases have been attributable to a number of factors but most significantly, in terms of agricultural conservation, it has been due to the strategic addition of

[23] Total farm acreage for all respondents was 422,964 of which 6.2% or 26,255 acres was pasture.

essential crop nutrients as fertilizer. In contrast there has been mounting evidence that nitrate and phosphate leaching as a result of fertilizer addition on farms is the primary cause of many environmental problems in the Mississippi watershed including the zone of hypoxia in the Gulf of Mexico (Doering, 1999). The responses to the "off-farm impacts" definition statement makes it clear this is not lost on Iowa producers, but the debate continues as to where the acceptable balance lies between a reliable, affordable food supply and environmental protection.

For this trend of increasing yields to exist, Iowa farmers have clearly had an ongoing incentive to strive for high levels of production. While the strong agreement with the notion that "land stewardship" should include "balancing farm profitability with preservation of farmland for the use of future generations" would suggest profit is a likely part of the explanation, risk is probably a bigger factor. It may seem a stretch to connect risk with "land stewardship" but successful risk management ensures profitability on a consistent basis, an unavoidable perquisite for a sustainable livelihood and "use of future generations". The modern Iowa farmer has remained hesitant to spread risk beyond a corn and soybean rotation due to belief that other crop markets are under developed (Kintzle, 2005), which if true can indeed exacerbate risk problems (McNew, 2001). Hence the most popular risk management strategy in the state has been to farm land in a manner that ensures consistently high production of corn and soybeans in combination with a good marketing strategy and reputable crop insurance (Hart and Babcock, 2001; Kintzle, 2005). While survey respondents are probably acknowledging this strategy is potentially at odds with some of the essentials of "land stewardship" by way of their responses to other definition statements, it also suggests risk management cannot be overlooked if Iowa farmers are to continue providing food in the manner and at the price that consumers are accustomed to.

Perceptions about "land stewardship" among producers provide some distinct insights into a key term that is used as part of the description of CSP goals. Responses to the eight stewardship definition statements in the mail survey of this study suggest that producers in Iowa's CSP watersheds believe that off-farm impacts from soil and nutrient loss, conserving soil and water and profitability balanced with use of future generations are priorities for "land stewardship;" while including pasture based livestock in crop mixes is far from critical.

Additionally a slight majority of respondents felt production maximization was a component in "land stewardship". While potentially at odds with responses to other definition statements this particular response suggests producers are drawing attention to the need for resilient risk management strategies if they are to remain the source of a secure food supply.

4.2.3 Stewardship Practices

After the Likert matrix addressing "land stewardship" definitions, respondents were asked to indicate the stewardship practices they employed in their operation (see Table 4.2.3A).

The two practices that account for the larger portion of responses are use of the reserve programs, "CRP or WRP programs" and "use of manure in place of commercial fertilizer", both being used in a manner that is perceived to contribute positively to land stewardship by at least half or more of the respondents. Only one-third or 34 percent of the state's farms receive government payments for CRP or WRP[24], which is a strong indication that the program is reaching producers who have already invested to some degree in conservation.

Six other practices were notable in their response with close to one-in-four or more of respondents acknowledging their use and positive contribution to land stewardship for: "terraces," "Integrated Pest Management (IPM)," "fall or spring nitrate tests," "three or more crops in rotation," "side dress nitrogen fertilizer" and "managed or rotational grazing." The remaining three practices: "glyphosate pesticides only," "ridge tillage," and "other" had lower levels of usage in terms of contributing to land stewardship.

While CRP and WRP land are not eligible for the CSP program, the use of land retirement is indicative of producers who are willing to forgo potential income on land that could otherwise be tilled or grazed. This is discussed further as part of the CSP farmer budget and case studies later in this chapter. When discussing other listed practices with producers

---

[2424] Source: 2002 Census of Agriculture.

interviewed for this study, IPM and leaf tests were typically following the guidelines from Iowa State Extension[25].

Table 4.2.3A – Distribution of respondents for stewardship practice participation

Question **/ Response**	**Checked responses**	**Percent of all responses (n=1011)**
Check the farming practices <u>you use</u> that <u>you think</u> contribute positively to Land Stewardship. (*please check **all** that apply*).		
CRP or WRP programs	632	62.5%
Use of manure in place of commercial fertilizer	504	49.9%
Terraces	432	42.7%
Integrated Pest Management (IPM)	330	32.6%
Fall or Spring Nitrate tests	295	29.2%
3 or more crops in rotation	295	29.2%
Side-dress Nitrogen fertilizer	273	27.0%
Managed or rotational grazing	248	24.5%
Glyphosate pesticides only	104	10.3%
Ridge tillage	96	9.5%
Other(s) (please describe)	174	17.2%
"No Till" or Conservation Till	89	8.8%
Did not indicate any practices	6	0.6%

[25] All Iowa State University Extension publications on Integrated Pest Management and Leaf Test techniques are available at https://www.extension.iastate.edu/store/ListItems.aspx?CategoryID=62

The omission of "No Till" or Conservation tillage from the primary list should be noted. It is likely if it had been included in the primary list, the response rate would have been higher, since in the majority of counties surveyed no-till is used at a rate in excess of 20 percent for all cropland (see figure 4.2.3A). It was left for respondents to include since there is some evidence to suggest that no-till or conservation tillage promotes nutrient leaching into waterways (Gassman et al, 2006). While other tillage practices can also create damaging side effects "no-till" continues to be well rewarded by the CSP in the absence of a water quality measure[26] for practices approved by the program (Heller, 2005; SWCS, 2007).

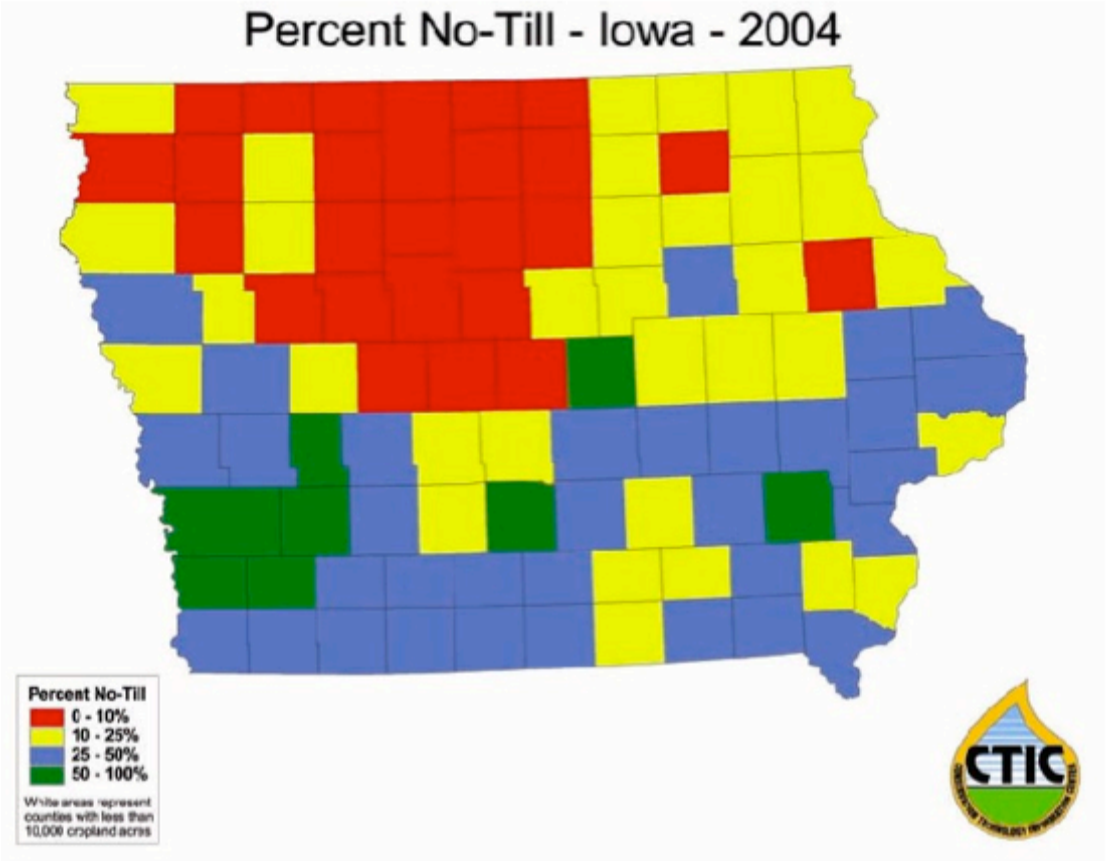


Figure 4.2.3A – No-till use in Iowa by county (Source: Iowa NRCS)

[26] "No-till" unlike other tillage practices can contribute to multiple enhanced payments: as part a high Soil Conditioning Index (SCI) or low Soil Tillage Intensity Rating (STIR) score under "Soil Quality Management", also as part of a low STIR score under "Energy Management," and as a practice under "Soil Disturbance Activities." (Source: SWCS, 2007)

Practices apart from no-till or conservation till equivalents that were included as "Other" stewardship practices were: filter strips, grid soil sampling, manure plow, fostering wildlife habitat, shelterbelts, grass waterways, no-till diversion areas, no fall anhydrous, no fall nitrogen, riparian strips, timber stand improvement, avoiding use of giant machinery, maintaining furrows, mulching management, fall soil tests, strip crops, stalk tests for nitrogen, one pass fieldwork, half glyphosate, use of no chemicals, use of cover crops, and contour farming.

Examining responses by number of practices as provided in Table 4.2.3B, show that over two-thirds, or 68 percent of respondents utilized between one and four stewardship practices on the farm and over one-quarter, or 26.4 percent had more than four stewardship practices incorporated into the operation. Only one-in-twenty or 5.6 percent did not indicate the use of any stewardship practices.

Table 4.2.3B – Distribution of responses for stewardship practices by number of practices per farm.

Number of Stewardship Practices	Number of Responses (n=1011)	As percent of responses
0	57	5.6%
1	145	14.3%
2	169	16.7%
3	201	19.9%
4	173	17.1%
5	123	12.2%
6	73	7.2%
7	33	3.3%
8	19	1.9%
9	12	1.2%
10	5	0.5%
11	1	0.1%

4.2.4 CSP Awareness, Enrollment and Participation

Two questions in the mail survey instrument address the CSP directly, the first investigates the level of CSP awareness and if they were enrolled and the second, the level (tier) of CSP participation for those that were enrolled.

Information provided in Table 4.2.4A shows that over half of respondents to this question had either had not heard of the CSP program or simply had no interest in enrolling. About one-in-fourteen or 7.0 percent of usable responses indicated wanting to enroll in CSP but being rejected. About one-in-twenty or 5.6 percent of respondents received the survey but did not reside inside a CSP watershed. About one in four or 27 percent were enrolled in the CSP. This compares to about 14 percent[27] of Iowa producers enrolled in the program from within CSP eligible areas. This is not surprising since producers not enrolled in the program are typically less likely to have an interest in responding.

Table 4.2.4A –Distribution of respondents for awareness and enrollment in the CSP

Question **/ Response**	**Usable* Responses (n=892)**	**Percent of Usable***
What is the nature of participation in the CSP? (not CRP)		
Never Heard of CSP	207	23.2%
Heard of CSP, made no attempt to enroll	332	37.2%
Wanted to enroll but was not available in my area	50	5.6%
Attempted to enroll in CSP but was rejected	62	7.0%
Enrolled in CSP	**241**	**27.0%**

* "Usable" refers to completed responses with one answer.

Information in Table 4.2.4B addresses the participation level of respondents who were enrolled in the CSP. The 218 respondents who indicated some level (tier) of

[27] Calculated for the 2,252 Iowa producers enrolled in CSP for 2005 as a proportion of producers within 17 Iowan counties that together represent an area approximately equivalent to all land eligible for CSP in the state.

participation in CSP does not match with the 241 respondents who indicated they were "Enrolled in CSP" in the prior question as shown in Table 4.2.4A. This suggests that respondents were either unwilling to reveal their level (tier) of program participation, were not aware of their program tier, or possibly there was some confusion with the CRP program.

The distribution of tier enrollments is to be expected, with about two-thirds or 62.8 percent of enrollments at tier 1, tapering to about one-quarter or 26.2 percent at tier 2, and a tenth (10.0 percent) at tier 3. This tracks with the national figures of slightly over one half or 54 percent enrolled in tier 1, around one-in-three or 28 percent at tier 2 and about one-in-five or 18 percent at tier 3 enrollments (SWCS, 2007; GAO, 2006) with the implication that proportionally there are more tier 1 stewards than tier 2 and 3 stewards in Iowa than the national average. This is especially so for tier 3 stewards where the national level of almost one-fifth is about twice the survey response level of one-tenth.

Table 4.2.4B – Respondents enrolled in CSP and their distribution among CSP tiers

Question **/ Response**	**Usable* Responses (n=218)**	**Percent of Usable***	**National Percent (n=14,516)**
Enrolled in which CSP tier?			
Tier 1†	137	62.8%	54%
Tier 2	57	26.2%	28%
Tier 3	24	10.0%	18%

* "Usable" refers to completed responses with one answer.

† Tier 1 acreages: 123 Responses (89.8% of 137) at an average of 358.9 acres enrolled.

Of additional interest is the number of tier 1 acres. Of 123 tier 1 respondents, 109 or 88.6 percent indicated their CSP acres, averaging 359 acres. In comparison the 71 tier 2 and

tier 3 respondents had an average of 698 acres enrolled[28]. The survey average for all 194 CSP respondents[29] willing to provide acreage information was 483 CSP acres[30].

4.2.5 CSP Experiences

In addition to the questions on CSP awareness and level of participation, respondents were asked five questions about the enterprise mix employed on the portion of their land enrolled in CSP followed by five questions on personal experiences with the program. Table 4.2.5A summarizes questions and responses to the CSP enterprise mix questions.

The majority of respondents or 91.3 percent indicated their cropland included corn acres and an equivalent amount or 87.6 percent indicated the inclusion of soybeans. Slightly over a third or 37.9 percent indicated incorporating alfalfa/hay into their mix, with slightly over one-eighth or 15.4 percent using small grains. These responses generate trends higher than state census averages for Iowa[31] where over a half or 58.2 percent harvest corn for grain, 53.8 percent harvest soybeans for beans, and a fraction under one-tenth or 8.3 percent harvest small grains (oats, barley, wheat, sorghum) for grain. A specific number for alfalfa/hay is not available for comparison but 36.8 percent of all farms in Iowa harvest forage which includes silage and green-chop in addition to hay.

It is worth noting that 50 respondents indicated raising livestock on pasture, while only 36 indicated growing pasture on their CSP acres. It is unclear why this occurred but it is probably a small group of tier 1 producers who may have incorrectly indicated for livestock that was not raised on CSP acres.

---

[28] Enrollment in CSP tiers 2 and 3 require whole farm eligibility (not including CRP or WRP acres), while enrollment in tier 1 requires only a part of the farm be eligible.

[29] This figure does not account for respondents who included CRP or WRP acres with acres eligible for CSP enrollment.

[30] Point of interest: The national average farm size is 432 acres. The Iowa average farm size is 350 acres (Source: 2002 Census of Agriculture).

[31] Iowa has 67,338 of 90,655 farms with cropland (source: 2002 Census of Agriculture).

Table 4.2.5A – CSP respondent information for farm acres enrolled in CSP

Question **/ Response**		**Checked Responses**	**Percent of Usable***
What crops do you have on your CSP acres? (n=240)			
Corn		219	91.3%
Soybeans		210	87.5%
Alfalfa/Hay		91	37.9%
Small Grains		37	15.4%
Pasture		36	15.0%
Organic Corn		5	2.1%
Organic Soybeans		5	2.1%
Vegetables		3	1.3%
Other (fruits, trees)		4	1.7%
What livestock do you have on your CSP acres? (n=211)			
None on CSP acres		163	77.3%
Cow-calf		35	16.6%
Sheep / goats		7	3.3%
Pasture dairy herd		5	2.4%
Pasture farrowed hogs		2	1.0%
Pasture-raised beef		1	0.5%
Pasture poultry		0	0.0%
Others (llamas)		1	0.5%
How many of your CSP acres are organic? (n=207)		5	117.8 ac. average
What is your total annual CSP payment rate per acre? (n=214)			
$1 to $50		185	87.3%
$51 to $75		12	5.7%
$76 to $100		8	3.8%
over $100		7	3.3%
Enrolled for enhanced payments? (Y/N) (n=187)	Answering Yes:	89	47.6%

* "Usable" refers to checks against listed answers for Crop and Livestock questions, and a check against one answer for payment questions.

The proportion of CSP farmers that have organically certified land was 5 responses out of 241, or 2.1 percent. This is relatively small but higher than the 0.4 percent of farms statewide that grew organically certified crops in 2002[32]. The statewide percentage of producers growing organically certified crops in 2005 is probably higher than 0.4 percent given the dramatic increase that has occurred in the production of organic products in recent years.

Only about one-in-five, or 22.8 percent of respondents indicated pasture livestock was part of their enterprise mix. The most popular choice for respondent livestock operations was cow-calf at 16.6 percent, with pasture dairies, beef, sheep, goats and hogs accounting for other uses of CSP pasture acres for livestock; these were quite low at 3.3 percent or less for each one. State census data on pasture-raised livestock was not available, but 35.5 percent of farms in Iowa had an inventory of cattle and calves[33]. It is possible with special maintenance practices for beef feedlots and hog or dairy confinements to be incorporated into and used on CSP ground. However, these options were omitted since most livestock operators have found the conditions to make this possible prohibitive. No respondents indicated feedlot or confinement operations in the space for "other" operations; there was only one "other" response and that was for llamas.

The majority of respondents, nearly nine-in-ten or 87.3 percent indicated their CSP contract was paying between $1 and $50 per acre annually. For the respondent average of 483 acres enrolled in CSP this represents an assumed average payment of about $12,500 ($25 per acre x 483 acres) per year in CSP payments per farm, which is within range of the state average figures of $5,561 for tier 1, $9,498 for tier 2 and $11,069 for tier 3 (see Table 2.2B). It is worth noting that during the face-to-face interviews it became apparent that most producers understand their contract by annual payment or total contract amounts.

Almost half of respondents, or 47.6 percent indicated their CSP contract included enhanced payments. If Iowa follows the national trend of incorporating enhanced payments,

---

[32] 364 of 90,655 farms in Iowa grow organically certified crops (source: 2002 Census of Agriculture).

[33] 32,169 of 90,655 farms in Iowa have an inventory of cattle and calves (source: 2002 Census of Agriculture).

then approximately half of Iowa's CSP producers are receiving more than three-quarters[34] of all CSP payments; the other half is receiving less than one-quarter of CSP payments. Nationally CSP enrollees averaged 4.7 enhanced stewardship practices per contract (SWCS, 2007). This compares to 29.3 percent of survey respondents who indicated either four or five stewardship practices were in place on their farm (see Section 4.2.3).

Table 4.2.5B summarizes responses to the CSP experience questions. It is worth considering that the number of respondents for the first two questions, which are specifically for CSP enrollees, were higher than those who had indicated enrollment in the program (see Table 4.2.2A), suggesting that some of these responses were from producers who had either not indicated their participation or who were familiar with the enrollment procedure due to a failed attempt to enroll. The last two questions regarding the program's "reward the best, attract the rest" motto, and opinions on the watershed approach to introducing the CSP were asked of all respondents, regardless of program enrollment.

Responses to questions regarding the understanding of CSP enrollment procedures and CSP payment structures were relatively evenly distributed about "moderately understood" (2nd level of understanding out of 3): about one half or 53.6 percent felt they "moderately understood" the enrollment procedure, and about six-in-ten or 60.5 percent felt they "moderately understood" the payment structure. One-in-four respondents or 25.0 percent felt they "understood well" the enrollment procedure, while about one-in-five responded that they "understood well" the payment structure. About one-in-five or 21.4 percent of respondents found the program "hard to understand, " while about one-in-five or 21.0 percent found the payment structure "hard to understand."

Compensation of enrollment costs by CSP payments was typically perceived to be "somewhat" compensatory. When examining compensation responses by watershed as provided in Table 4.2.5C, the East Nishnabotna, Upper Wapsipinicon and Turkey watersheds had a tendency towards feeling they were "fully" compensated, while the North Raccoon watershed had a slight tendency towards only "somewhat" compensated.

---

[34] Nationally enhanced payments account for 81 percent of all CSP payments. (Source: SWCS, 2007)

Table 4.2.5B – Distribution of respondents to CSP experience questions

Question **/ Statement**	**Usable Response***	**Response Scale**				
Check best answer		Understood Well	Moderately Understood	Found it hard to Understand		
How well did you understand the enrollment procedure for the CSP?	252	25.0%	53.6%	21.4%		
How well have you understood the payment structure for the CSP?	248	18.6%	60.5%	21.0%		
Check based on your level of compensation:		More than compensates	Fully compensates	Somewhat compensates	Not worth time it took to enroll	
Since making the decision to enroll in CSP, how has the additional cost of achieving enrollment been compensated by your CSP payments?	230	10.4%	39.6%	41.7%	8.3%	
Check based on your level of agreement or disagreement:		Strongly Agree	Somewhat Agree	Not Sure	Somewhat Disagree	Strongly Disagree
The CSP has been designed to "reward the best land stewards and attract the rest"	884	14.5%	33.9%	37.0%	9.5%	5.1%
The watershed-by-watershed approach to CSP enrollment is a necessary pilot phase	872	9.8%	32.5%	47.6%	6.4%	3.8%

* "Usable" refers to completed responses with one answer.

Curiously the four North Raccoon CSP producers who were interviewed for the budgetary analysis averaged the highest first year compensation levels of all the interviewed producers.

Compensation will be explored in greater depth in the budget and case study results (Section 4.4).

Table 4.2.5C – Distribution of respondents' perceptions on the degree of compensation provided by CSP towards the costs of enrollment.

Watershed	East Nishnabotna (n=29)	North Raccoon (n=66)	Upper Wapsipinicon (n=81)	Turkey (n=52)
More than compensates	20.7%	3.0%	14.8%	7.7%
Fully Compensates	48.3%	28.8%	42.0%	44.2%
Somewhat Compensates	31.0%	48.5%	37.0%	46.2%
Not worth the time it took to enroll	0.0%	19.7%	6.2%	1.9%
TOTAL (n=228)	100%	100%	100%	100%

Two Likert questions were asked of all respondents regarding the design of the program. Respondents to the questions on how successful CSP has been at rewarding "the best" and attracting "the rest" and the watershed-by-watershed introductions to the program were somewhat undecided with a tendency towards agreement. A little over one-third or 37.0 percent of respondents were "not sure" whether CSP has been designed to "reward the best land stewards and attract the rest." They were similarly undecided, with slightly under one-half or 47.6 percent of respondents "not sure" if the watershed-by-watershed approach for introducing the program was necessary

4.2.6 General Land Use

Table 4.2.6A summarizes the three questions asked of all surveyed producers regarding general land use and ownership pattern. The first of the questions asked respondents whether they had calculated a Soil Conditioning Index (SCI) for any part of their land. The SCI is one of the key indexes used by NRCS to evaluate soil quality and soil loss, calculated from farm climate, soil types, land topography, crop choice and tillage methods

(USDA, 2002). The SCI is also a key component in calculating CSP enhanced payments. Secondly respondents were asked to provide an acreage breakdown of owned and rented land, both for cropping and grazing. Thirdly respondents that indicated they had leased land were asked to provide a general description of the lease arrangement.

The majority of respondents indicated that a SCI was not calculated for their land with only 100 or about one-in-eight of usable responses indicated that they knew of an SCI being calculated for a portion of their land. This implies most enrollees have never calculated a SCI themselves. For CSP enrollees this implies it was calculated by NRCS and included as a part of each CSP contract.

Responses for acreages of general land ownership were evenly shared between owned and rented acres with 193 average acres owned and 199 average acres rented for crop use, but there was a noticeable separation in land tenure for pasture land; with 19 average acres owned almost double that of 10 average acres rented. Without differentiating by land use, respondents averaged 240 acres for rented and also for owned land area. Only about one-in-eight or 12.7 percent of respondents rented all their land and over two-out-of-five respondents, or 43.7 percent, owned all their land suggesting that a half-owned, half-rented farm was not necessarily representative of all respondents' farms. Statewide over half or 55.0 percent of all farms[35] were fully owned, about one third or 33.4 percent were partially owned and a minority or 11.6 percent were fully rented[36].

The distribution of tenure arrangements indicated a little under half of respondents or 46.1 percent cash rented land, while about one quarter or 25.9 percent of operators owned all the land they farmed. About one-in-ten or 10.3 percent had a crop-share arrangement. An additional 21 respondents or 2.1 percent indicated they had both cash rent and crop share lease arrangements, while 158 or 15.6 percent did not indicate a lease arrangement.

---

[35] It is important to note that by Census definition a "farm" can have multiple "operators". Census figures are in terms of farms, while the mail survey in this study dealt with operators.

[36] Of the 90,655 farms in Iowa 49,889 operators had full ownership, 30,265 had partial ownership and10,501 were fully rented (Source: 2002 Census of Agriculture).

Table 4.2.6A – Distribution of respondents for general land use questions.

Question **/ Response**		**Usable* Responses**	**Percent of Usable***
Soil Conditioning Index (SCI) calculated for any part of your land? (Y/N) (n=828)	Answered Yes:	100	12.1%
Number of acres farmed?			
Crops Owned:	192.5 acres average (n=898)		
Rented:	199.9 acres average (n=914)		
Pasture Owned:	16.34 acres average (n=896)		
Rented:	9.63 acres average (n=914)		
TOTAL†**:**	480.1 acres average (n=881)		
If you rent land what is your predominant lease arrangement? (n=1011)			
Cash Rent:		466	46.1%
Crop Share:		104	10.3%
Both Cash Rent and Crop Share:§		21	2.1%
Do not rent land:		262	25.9%
Did not respond:		158	15.6%

*"Usable" refers to completed responses with one answer for the SCI and Lease Arrangement questions (see also §). Number of acres farmed was answered with a continuous variable.

† "TOTAL" acreage was calculated after survey responses were coded.

§ While not an available response "Both Cash Rent and Crop Share" was included in the survey results due to the number of respondents who checked both "Cash Rent" and "Crop Share."

4.2.7 Demographics

Three characteristics were addressed with the demographic questions: education level, age and gender. Table 4.2.7A summarizes responses for each of these questions.

Education level indicated that the majority, or 94.4 percent of respondents had graduated from high school[37], while about one-fifth or 20.7 percent had completed a bachelor

[37] This is the sum of all responses except for "11th grade or less"

degree or better[38]. This compares to state census figures of 89.6 percent for completing high school and 23.8 percent for completing a bachelor degree or better[39].

Table 4.2.7A – Survey response distribution for education, age and gender questions

***Questions*/Responses**		**Usable Responses**	**Percent of Usable***
Education Level completed? (n=978)			
11th grade or less		57	5.8%
High school diploma (includes GED)		522	53.4%
2 year degree or part of a 4 year degree		197	20.1%
4 year degree or more		202	20.7%
Age today?	57.2 average, 13.5 std dev (n=970)		
Gender? (M/F) (n=1002)	Answered: Male	923	92.1%

*"Usable" refers to responses with a check against one answer for the Education and Gender questions. Age was answered with a continuous variable.

Respondents' average age of 57.2 years was slightly above the state census figure of 54.3 years for principal farm operators. The gender of respondents was predominantly male at 92.1 percent that is comparable with the state census figure for primary farm operators of 93.2 percent.

4.2.8 Household Information

Respondents were also queried on the number of household occupants and their working habits. Table 4.2.8A provides the distribution of responses to these questions.

Over half, or 54.0 percent of households had two members, with one, three and four occupants accounting for about one-third or 35.9 percent of responses.

---

[38] This is the sum of the last two responses: "2 year degree or part of a 4 year degree." and "4 year degree or more."

[39] Source: 2000 American Census (Iowa).

Table 4.2.8A – Distribution of respondents for household population, work and labor choice questions

***Questions*/Responses**		**Usable* Responses**	**Percent of Usable***
How many people currently live in your household?			
one:		129	13.0%
two:		535	54.0%
three:		119	12.0%
four:		108	10.9%
five or more:		101	10.2%
TOTAL:		991	100%
How many receive most of their income from <u>on-farm</u> work?			
none:		361	38.9%
one:		347	37.4%
two:		191	20.6%
three or more:		29	3.1%
TOTAL:		928	100%
How many receive most of their income from <u>off-farm</u> work?			
none:		293	32.9%
one:		310	34.8%
two:		239	26.8%
three or more:		49	5.5%
TOTAL:		891	100%
Do you employ any additional labor?			
Yes / No	Answering Yes	221	23.8%

*"Usable" refers to completed responses with one answer for the additional labor question. All household questions were answered with a continuous variable.

Interestingly nearly four-in-ten or 38.9 percent of responses had no occupants working on the farm for most of their income, while only about a third, or 32.9 percent had no occupants

working off the farm for most of their income[40]. Instances of operators supplementing farm income with off-farm sources of income is growing within Iowa, with almost one-third or 31.7 percent of all primary operators in the state indicating farming is not their primary occupation[41]. Additionally over half or 54.3 percent of primary operators indicated doing some work off the farm[42]. Over three-quarters or 76.2 percent of respondents indicated no additional labor was employed, which is comparable with state census data of 69.0 percent[43].

4.2.9 Income

Two questions were asked regarding gross income: on-farm and off-farm. Each question relied on a series of ranges to assist with response rate. Table 4.2.9A summarizes this information.

On and off-farm gross income responses indicated nearly half of the respondents or 49.7 percent earned less than $50,000 gross from their farm business, while about one-third or 34.3 percent earned over $100,000 gross. Slightly less than one-in-six or 16.0 percent earned between $50,000 and $100,000 from the farm. A little less than one-third of the respondents or 31.8 percent earned either no income or up to $10,000 gross off the farm; under one-fifth or 17.7 percent earned between $10,000 and $25,000; while about a half or 50.5 percent earned over $25,000 off the farm. State Census data indicates 56.8 percent of farms earn less than $50,000 in gross income or sales per year[44].

---

[40] Census references for this paragraph: 2002 Census of Agriculture.

[41] 28,720 of 90,655 primary operators did not consider farming their primary occupation (Source: 2002 Census of Agriculture).

[42] 49,246 of 90,655 primary operators did some work off the farm (Source: 2002 Census of Agriculture).

[43] Source: 2002 Census of Agriculture

[44] Source: 2002 Census of Agriculture.

Table 4.2.9A – Distribution of respondents' gross income levels

Question **/ Response**	**Usable* Responses**	**Percent of Usable***
Approximate 2005 gross farm income? (n=904)		
$1 to $50,000	449	49.7%
$50,001 to $100,000	145	16.0%
$100,001 to $500,000	252	27.9%
over $500,000	58	6.4%
Approximate 2005 gross off-farm income? (n=853)		
$0 to $10,000	271	31.8%
$10,001 to $25,000	151	17.7%
$25,001 to $50,000	236	27.7%
$50,001 to $100,000	155	18.2%
over $100,000	40	4.7%

*"Usable" refers to complete responses with one answer.

4.2.10 Conclusions from the Survey Descriptive Analysis

In answering the mail survey questionnaire, respondents provided perceptions on "land stewardship;" which stewardship practices they employ; the nature of their CSP awareness, enrollment and participation; their opinions on two key CSP objectives; their general land use and acreages; basic demographic and household information including working habits and labor use; and gross income information. Producers who indicated enrollment in the program additionally provided information on the enterprise mix and payment levels on their CSP acres; and their opinions on the program as it related to their experience with enrollment. Key points of interest from survey responses were as follows:

- Respondents perceived "land stewardship" as accounting for the off-farm impacts of farming and the sustainability of their operations, some also seeing production maximization as being an ingredient, possibly as a risk management practice.

- Almost two-thirds or 63 percent of respondents indicated use of CRP or WRP as a practice that contributes positively to "land stewardship," where only one-third or 34 percent of producers statewide receive reserve program payments.
- Two-thirds of respondents had between one and four stewardship practices in use on the farm, while only about five percent indicated no use of stewardship practices.
- Over one-in four respondents indicated enrollment with the program at an average of 483 CSP acres, while half of those eligible either didn't know of the program or made no attempt to enroll.
- Tier 1 enrollees accounted for over half of CSP respondents, tier 2 about one third and tier 3 about one-tenth, this is proportionally more tier 1 enrollees and less tier 3 enrollees than national averages.
- CSP respondents indicated annual payment rates per acre that were within range of average payment amounts for the state. Slightly less than half indicated they were receiving enhanced payments.
- CSP respondents' experiences with and opinions on the program were generally neutral, with most enrolled respondents feeling they were compensated at least "somewhat" for the costs of enrollment.
- Most CSP respondents, indicated corn and soybeans were grown on their land, with about a third growing alfalfa/hay. All CSP respondents were in excess of percentages of Iowa farms with corn, soybeans and forage according to the 2002 Census of Agriculture averages.
- Less than one-in-four CSP respondents raised pasture livestock on their CSP acres, with the vast majority being cow-calf operations. Slightly over one-third of Iowa farms have an inventory of cattle and calves according to the 2002 Census of Agriculture.
- About two percent of CSP respondents indicated their CSP acres were organically certified and they raised organic crops or livestock. The 2002 Census of Agriculture indicates less than one percent of the states farmers are organically certified, a number

that has almost certainly increased between 2002 and the time of the mail survey, March 2006.

- All Respondents (including both CSP respondents and non-CSP respondents) were generally "not sure" if slightly in agreement that: CSP "rewards the best" land stewards and "attracts the rest;" and that the watershed-by-watershed approach to introducing the program was necessary.
- Land use was in favor of cropping with less than one-in-five of all respondents having pasture acres.
- Respondents' Land tenure saw an even split based on average acreages of 240 acres owned and 240 acres rented, but there were twice as many farms wholly owned as there were wholly rented suggesting a 50:50 owned and rented farm is not representative of all farms. Of respondents who indicated renting a portion of their land, about half indicated cash rent was the predominant lease arrangement. More than half the farms in the state were wholly owned and about one-third cash rented according to the 2002 census.
- Education responses were equivalent to state 2002 census figures, with slightly more survey respondents than census or about nine-in-ten having graduated from high school but slightly less than census or about one-in-four having completed an associates degree or better.
- Respondents were slightly older than ages reflected in the 2002 census Iowa figures for primary operator age. The average age of respondents was about 57 years compared to the state average of 53 years.
- Most respondents were men or about 95 percent, which is equivalent to 2002 census percentages for the proportion of male primary operators in the state.
- Over half of respondents' households had two occupants. There were also more respondent households with no occupants working primarily on the farm than respondent households who had no occupants working primarily off the farm.

- Small farms or farms grossing less than $50,000 annually dominated on-farm income responses. Additionally about half of respondents indicated earning less than $25,000 gross income off the farm.

4.3 Logit Regression Analysis

The regression analysis represents the core of the study's quantitative component. The primary goal of this section is to determine mail survey respondent characteristics that correlate with surveyed producers' awareness of and enrollment in CSP as well as the participation level of enrolled producers. With this information it then becomes possible to make inferences about the larger population of Iowa producers and their likely involvement in and support of the CSP.

Three separate regression models were employed to help explain trends among Iowa producers for CSP awareness, enrollment and level of participation in the program. Each model employed a selection of independent variables to best describe producer behavior within a multivariate logit regression calculated with the PROC LOGISTIC function in the SAS software. By stepwise selection, models were iteratively simplified to include variables that correlate most significantly with CSP awareness, enrollment and level of participation while still accounting for interactive effects between chosen independent variables.

The descriptive analysis of Section 4.2 provided some insight into the distribution of answers among the sample population to various questions of interest. An obvious next step would be to examine the "simple effects" of each question against each of the major variables of interest: CSP Awareness, Enrollment and Participation Level, such as a table or bivariate regression of Farm Income (income levels: 1,2,3,4) against CSP Awareness (awareness level: 0,1). The benefit of a multivariate regression is it combines all these simple effect comparisons into one model, determining the relative significance of each effect as if all other effects were held constant. This "ceteris paribus" or partial effect characteristic of multivariate regression is an important tool in determining causality beyond mere correlation (Wooldridge, 2003). For instance a simple effect comparison of Farm Income to CSP awareness may appear to hold a strong correlation, but a multivariate regression analysis that

accounts for the influence of other variables such as Age and Education, which tend to have an influence on Income levels and may conclude that the partial effect of Farm Income on CSP Awareness is insignificant.

4.3.1 Regression Sampling

Of the 1011 usable responses, smaller sub-samples were usable for the purpose of statistical analysis. A respondent's answers to the mail survey were included as variables in a particular regression model when all of the questions relevant to that model were explicitly answered. This approach removes all of a respondent's answers if they have any unusable answers to survey questions of interest. The result is a data set with less uncertainty, which assists with making meaningful inferences from regression results about the greater population of Iowa producers.

For example: Respondent A completed questions regarding Stewardship Practices, Age and CSP Participation Level (tier), with explicit answers but did not have any other questions explicitly complete. A regression model with CSP Participation Level as the dependent variable, modeling Stewardship Practices, Age and Gender as independent variables would mean none of respondent A's answers would be included in the model since Gender had not been explicitly answered. If Respondent A had answered the Gender question explicitly in addition to the existing responses for Stewardship Practices and Age, then A's responses for Stewardship Practices, Age and Gender would all be included in the CSP Participation Level model.

4.3.2 Description of Regression Variables

Two of the survey questions were the source of the three dependent variables: CSP Awareness, CSP Enrollment and CSP Participation Level (also see Section 4.2.4). Not all other survey variables were incorporated as independent variables into the three regression models. Variables were selected as a compromise between maintaining an adequate sample size and answering all questions of interest. Variables typically vulnerable to multicollinearity were tested for collinear correlations that might influence the outcome of the model. Total Acres was found to have a strong correlation with Crop Acres evident with

a residual sum of squares[45] (R^2) value of 0.9823 displayed in Figure 4.3.2A. Given this, Total Acres was not included in any of the regression models.

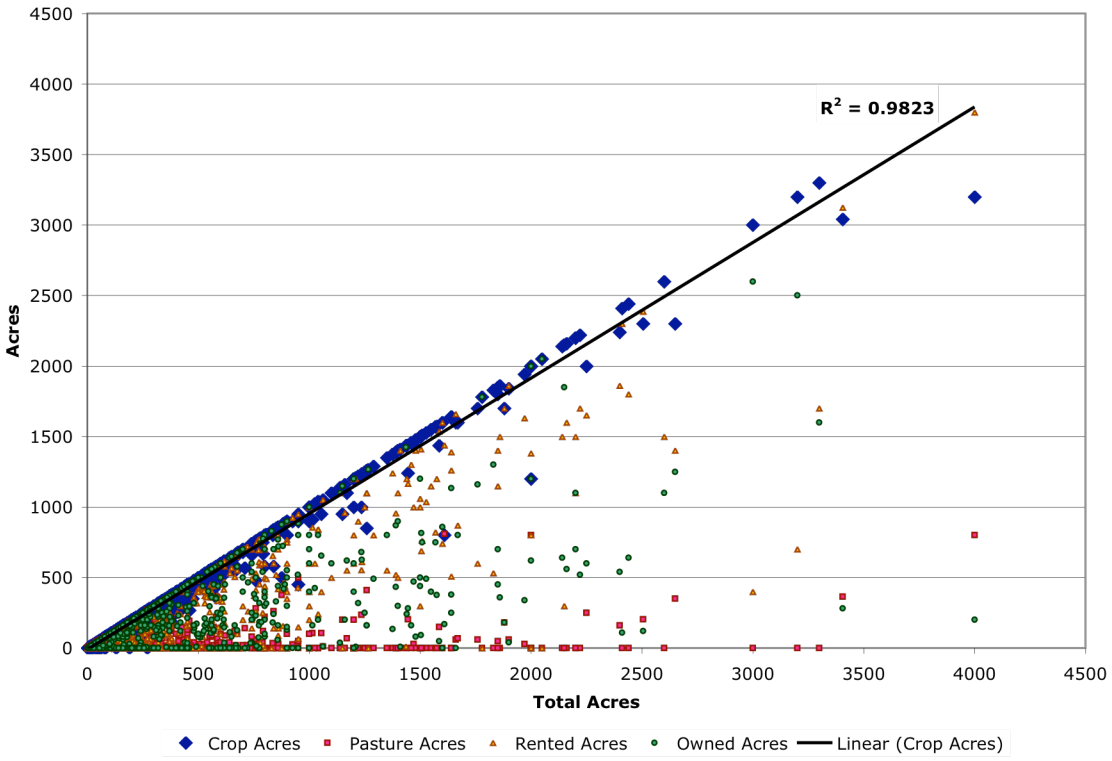


Figure 4.3.2A – The variable Total Acres had a strong correlation with the Crop Acres variable and was removed from the model as a precaution against multicollinearity.

Variables considered for regression modeling were as follows (see also Table 4.3.2A):

Dependent Variables

- **CSP Awareness** (Y_1), **CSP Enrollment** (Y_2) and **CSP Participation Level** (by CSP tier) (Y_3) were the chosen dependent variables for regression analysis. CSP Awareness and CSP Enrollment are discrete variables that relate to all respondents familiarity with

[45] Residual Sum of Squares (RSS) or Sum of Squared Residuals, also indicated as R^2 is the sum of: each vertical (y-axis) separation of actual values from predicted values squared. For the purposes of bivariate regression it is a measure used to evaluate the strength of correlation or predictive power of the regression model; 0.0 being no correlation and 1.0 being complete correlation. R^2 values over 0.90 typically suggest a high degree of correlation (Source:.Wooldridge, 2003)

the CSP. CSP Participation Level is an ordinal variable corresponding with the tier (1, 2 or 3) of enrollment for those respondents who indicated they had CSP contracts.

Independent Variables

- **Watershed** (X_1) was chosen as the variable to represent the geographical location of each respondent. Watershed rather than county was selected since watersheds were the unit of implementation for the CSP[46] and location characteristics are similar among counties in the same watershed. Also using watershed meant less impact on degrees of freedom for each regression model (four watersheds versus ten counties).
- The eight **Stewardship Definitions Statements** (X_2..X_9) were included since together they represent how respondents think of conservation independent of the CSP. While these variables were of a Likert style and entered by respondents as discrete variables with 5 different response categories, to preserve degrees of freedom they were treated as continuous variables in the data set, such that:

  1.0 = Strongly Agree
  2.0 = Somewhat Agree
  3.0 = Neutral
  4.0 = Somewhat Disagree
  5.0 = Strongly Disagree

- **Total Stewardship Practices** (X_{10}) indicates the number of practices of a conservation-based nature respondents were currently utilizing in their operation. This variable was also included to test as a possible proxy for the three independent variables: CSP Awareness, CSP Enrollment and CSP Participation Level.
- For each respondent total **Crop Acres** (X_{11}) was incorporated in regression models since together with pasture acres, how enterprise mix influences conservation choices is a question of interest.

[46] It is worth noting CSP is administered at the county level by NRCS.

- For each respondent total **Pasture Acres** (X_{12}) was incorporated in regression models since together with crop acres, how enterprise mix influences conservation choices was a question of interest.
- For each respondent total **Owned Acres** (X_{13}) was incorporated in regression models since together with rented acres, how tenure mix influences conservation choices was a question of interest.
- For each respondent total **Rented Acres** (X_{14}) was incorporated in regression models since together with crop acres how tenure mix influences conservation choices was a question of interest.
- **Lease** (X_{15}) arrangement was also included. Respondents who rent land were asked to indicate the nature of their rent contract:
    1. Cash rent
    2. Crop share
    3. Do not rent any land

  Two additional categories were added to accommodate the following responses:
    4. Both cash rent and crop share (checked both)
    5. Did not indicate a lease arrangement (nothing checked)
- Other studies show that **Education** (X_{16}) can be correlated with levels of on-farm conservation activity (Fuglie and Kascak, 2001). It was included as a categorical question with respondents selecting either:
    1. 11^{th} grade or less
    2. high school graduate
    3. associates degree or some tertiary
    4. four-year degree or better
- **Age** (X_{17}) also appears in other studies and has exhibited correlations with levels of on-farm conservation activity (Fuglie and Kascak, 2001). Respondents were asked to provide their age in years as a continuous variable.

- **Gender (X_{18}).** Women have also been linked with influencing higher levels of on-farm conservation[47] (Bridges and Napier, 2003). Respondents were asked to indicate their gender:
    1. Male
    2. Female
- **Farm Income** (X_{19}) was included as a variable of interest. As already discussed, small farms (less than $50,000 in gross income) tend to have different enterprise mixes than farms of larger sizes. Respondents were asked to select one of four gross income categories:
    1. $1 to $10,000
    2. $10,001 to $25,000
    3. $25,001 to $50,000
    4. $50,001 to $100,000
- **Off-farm Income** (X_{20}) was also included as a variable of interest. Respondents were asked to select one of five off-farm gross income categories:
    1. $0 to $10,000
    2. $10,001 to $25,000
    3. $25,001 to $50,000
    4. $50,001 to $100,000
    5. over $100,000.

Additionally for the **CSP Participation Level** (by tier) model the following CSP specific variables were included:

- **Enhancements** (X_{21}). Respondents were asked to indicate if they were receiving enhanced payments as part of their CSP contract.

[47] While women are a part of most households and can influence conservation choices on the farm without being the primary operator, this is hard to incorporate at the quantitative level since only the gender of the respondent was available.

Table 4.3.2A – Variables selected for regression analysis models

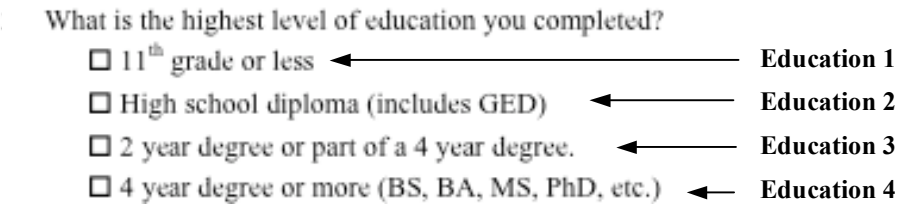
Model Component	Model Variable	Variable Name	Description	Nature of Variable
Dependent variables	Y_1	CSP Awareness	Respondent is or is not aware of CSP	Binary (0,1)
	Y_2	CSP Enrollment	Respondent is or is not enrolled in CSP	Binary (0,1)
	Y_3	CSP Participation	Tier of CSP contract for CSP Participants	Ordinal (1,2,3)
Independent variables	X_1	Watershed	CSP Watershed corresponding to respondent's mailing address	Categorical (1,2,3,4)
	X_2	Def 1: Responsible	Stewardship Definition Statements (see Section 4.2.2)	Ordinal (Likert) (1,2,3,4,5) Treated as continuous (1.0,…,5.0)
	X_3	Def 2: Impacts		
	X_4	Def 3: Production		
	X_5	Def 4: Future use		
	X_6	Def 5: Inputs		
	X_7	Def 6: Three Crops		
	X_8	Def 7: Resources		
	X_9	Def 8: Livestock		
	X_{10}	Total Practices	Total number of stewardship practices	Continuous
	X_{11}	Crop Acres	Total crop acres	Continuous
	X_{12}	Pasture Acres	Total pasture acres	Continuous
	X_{13}	Owned Acres	Total owned acres	Continuous
	X_{14}	Rented Acres	Total rented acres	Continuous
	X_{15}	Lease	Lease arrangement	Categorical (1,2,3,4,5)
	X_{16}	Education	Education level	Ordinal (1,2,3,4)
	X_{17}	Age	Age of respondent	Continuous
	X_{18}	Gender	Gender of respondent	Binary (0,1)
	X_{19}	Farm Income	On-farm Gross Income	Ordinal (1,2,3,4)
	X_{20}	Off-Farm Income	Off-farm Gross Income	Ordinal (1,2,3,4,5)
	Independent variables for CSP Participation Level model only:			
	X_{21}	Enhanced?	Receiving Enhanced?	Binary (0,1)
	X_{22}	Payment	CSP payment per acre?	Ordinal (1,2,3,4)
	X_{23}	Compensation	Compensation by CSP?	Ordinal (1,2,3,4)

- **Payment (X_{22}).** Respondents were asked to indicate their approximate CSP payment rate per acre per year as one of the following four categories:
    1. $1 to $50
    2. $50 to $75
    3. $75 to $100
    4. over $100
- **Compensation (X_{23}).** What do respondents believe the level of compensation for the cost to enroll from CSP payments to be:
    1. More than the cost it took to enroll
    2. Fully compensated for the cost to enroll
    3. Somewhat compensates for the cost to enroll
    4. Not worth the time it took to enroll

4.3.3 Regression Output for Discrete Variables

The logit regression models employed for the statistical portion of this study included combinations of continuous and discrete variables. The dependent variables: CSP Awareness (0,1), CSP Enrollment (0,1) and CSP Participation Level (1,2,3) were all discrete and as such were designated an "event" by the SAS software for the purposes of performing a logit regression. For each of these variables this became the lowest relative value i.e. CSP Awareness = 0 or "lack of awareness", CSP Enrollment = 0 or "lack of enrollment", and CSP Participation Level = tier 1 versus tier 2; tier 2 versus tier 3 or "lower tier". Each regression model then tested the partial effects between independent variables and the likelihood of dependent variable events.

The SAS software also has a specific approach to displaying output for the discrete independent variables. SAS separates independent discrete variables into their original categories, for example Education, a discrete variable used in this study, is separated into the four categories found in the survey instrument: Education 1, 2, 3 and 4:



When SAS displays the output for Education the first three of four categories are listed but the fourth is not. For the general model or maximum likelihood output this is due to the "distance from means" method SAS uses for classing discrete variables. For the odds ratio output this is so the output of displayed categories can be compared to the one absent category.

Since this study used output from the regression model only for general predictions about the greater population of Iowa producers, specific marginal effects for independent variables were not calculated. Parameters' "p-values" were used to determine significance, and significant variables were examined in terms of their trend of influence on the dependent variable event. For continuous variables the sign of the maximum likelihood parameter estimate for that variable determined the nature of this trend. For discrete variables odds ratios were used for likelihood comparisons of discrete variable categories.

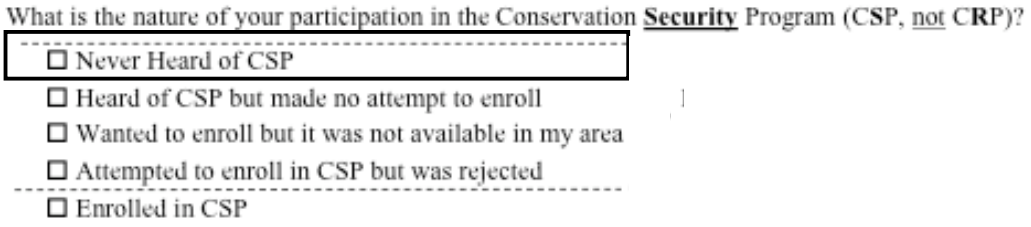
For example: Age, a continuous variable, proved to be notably significant ($p<0.1$) from the maximum likelihood output. Its maximum likelihood parameter estimate was -0.4678, which suggests that increases in age are negatively correlated with the dependent variable event. The absolute value (0.4678) of the estimate was not used for any of the general predictions made in this study.

Also: In the case of the discrete variable Education, Education 1 appeared as notably significant ($p<0.1$) in the maximum likelihood output and as such was worthy of examination by odds ratio comparisons. The odds ratio point estimate for Education 1 was given as "Education 1 (vs 4)," which describes the difference in likelihood that the category in question, Education 1, was positively correlated with the dependent variable event compared to the fourth category, Education 4. An odds ratio point estimate of greater than 1.0 suggests Education 1 had a greater likelihood than Education 4 of positive correlation with the

dependent variable event. A point estimate less than 1.0 suggests a lower likelihood of positive correlation with the dependent variable event for Education 1 than for Education 4.

4.3.4 CSP Awareness Model

The first regression analysis model related to CSP Awareness. The value assigned to CSP Awareness was determined by each respondent's answer to the following instrument question:


What is the nature of your participation in the Conservation **Security** Program (CSP, not CRP)?

- ☐ Never Heard of CSP
- ☐ Heard of CSP but made no attempt to enroll
- ☐ Wanted to enroll but it was not available in my area
- ☐ Attempted to enroll in CSP but was rejected
- ☐ Enrolled in CSP

CSP Awareness related to the first response of the five, "Never Heard of CSP". For all usable responses, a check in the box next to "Never Heard of CSP" assigned a value of 0 to CSP Awareness and a check in any other box resulted in a value of 1 for CSP Awareness. Responses with more or less than one box checked for this question were not included in the model.

Table 4.3.4A – Regional distributions of mail survey responses included in the CSP Awareness regression model.

State Region:	**West-Central**		**Northeast**	
Watershed:	East Nishnabotna	North Raccoon	Upper Wapsipinicon	Turkey
County totals:	Audubon (40)	Buena Vista (73)	Buchanan (70)	Clayton (114)
	Cass (44)	Calhoun (56)	Chickasaw (69)	Fayette (100)
		Greene (48)	Howard (56)	
Watershed totals:	84	177	195	214
Survey totals	670			

The data set for the CSP Awareness regression included 670 responses. There were 341 responses not complete or without explicit answers to all the questions of interest for this

model. Table 4.3.4A summarizes the number of responses for the CSP Awareness model by region.

Using CSP Awareness as the dependent variable, the regression analysis model took the form presented in Equation 4.3.4A (see Table 4.3.2A for variable descriptions).

Equation 4.3.4A – CSP Awareness regression model

$$\log\left[\frac{P(Y_1 = 0)}{1 - P(Y_1 = 0)}\right] = \sum_{i=1}^{21} \beta_i X_i$$

$P(\ )$ = probability of (occurrence)
Y_1 = CSP Awareness
β_i = ith independent variable parameter
X_i = ith independent variable

Table 4.3.4B details the simplified model and output for CSP Awareness.

The CSP Awareness model converged on 11 of the original 20 independent variables. Of these 11, there were eight variables or variable categories of noteworthy significance ($p \leq 0.10$). Firstly for continuous variables, Crop Acres was significant (p=0.0722), with only a negative correlation with lack of awareness, (-0.0009) i.e. positive correlation with awareness. Secondly, of note was Total (Stewardship) Practices, which perhaps not surprisingly the model considered highly significant (p<0.0001) and negatively correlated with a lack of awareness (-0.2719) i.e. positively correlated with CSP Awareness. Age was also significant (p=0.0472), and was also negatively correlated (-0.0185) with a lack of awareness i.e. positively correlated with CSP Awareness.

While the eight Stewardship Definitions were posed as discrete choices to the respondent, to minimize the reduction in degrees of freedom[48] for statistical analysis the

[48] Degrees of freedom refers to the number of variables that a model is attempting to include. If degrees of freedom is large, the number of variables being included in the model is typically also large. If the degrees of freedom is large and the size of the sample is proportionately small then the resolution and accuracy of the model output can be detrimentally affected.

model treated them as continuous variables scoring from 1.0 for "Strongly Agree" through to 5.0 for "Strongly Disagree".

Table 4.3.4B – CSP Awareness regression model output

Stepwise **Binary Logit** Regression (p=0.30 Entry, p=0.35 Exit, 13 steps).
SAS **Maximum Likelihood** Statistical Analysis: PROC LOGISTIC (n=670)
Dependent Variable **Event**: CSP Awareness = 0 ("lack of awareness")

Maximum Likelihood Estimates

Parameter (X_i)	**DF**	**Estimate**	**Std. Error**	**Wald Chi-Sq**	**Pr > Chi-Sq**
Intercept	1/2	1.0393	0.8683	1.4329	0.2313
Def 1: Responsible* (X_2)	1	0.3009	0.1593	3.5661	0.0590
Def 3: Production** (X_4)	1	0.2108	0.0998	4.4603	0.0347
Def 5: Inputs** (X_6)	1	-0.2054	0.1043	3.8759	0.0490
Def 8: Livestock (X_9)	1	-0.1318	0.1081	1.4861	0.2228
Total Practices*** (X_{10})	1	-0.2719	0.0615	19.5214	<0.0001
Crop Acres* (X_{11})	1	-0.0009	0.0005	2.319	0.0722
Education 1† (X_{16})	1/4	0.5359	0.4025	1.7734	0.1830
Education 2 (X_{16})	1/4	0.2058	0.1898	1.1747	0.2784
Education 3 (X_{16})	1/4	-0.1126	0.2408	0.2186	0.6401
Age** (X_{17})	1	-0.0185	0.0093	3.9372	0.0472
Gender 1 (Male)*** (X_{18})	1/2	-0.7197	0.2172	10.9812	0.0009
Farm Income 1*** (X_{19})	1/4	1.0214	0.3727	7.5115	0.0061
Farm Income 2 (X_{19})	1/4	0.0751	0.3705	0.0411	0.8393
Farm Income 3 (X_{19})	1/4	-0.4239	0.3564	1.4144	0.2343
Off-Farm Income 1 (X_{20})	1/5	0.0054	0.2320	0.0005	0.9814
Off-Farm Income 2** (X_{20})	1/5	-0.7311	0.2892	6.3894	0.0115
Off-Farm Income 3† (X_{20})	1/5	0.2921	0.2034	2.0622	0.1510
Off-Farm Income 4 (X_{20})	1/5	0.00795	0.2273	0.0012	0.9721

*** Significant at the 99 percent level
** Significant at the 95 percent level
* Significant at the 90 percent level
† Significant at the 80 percent level

Of these eight Definition Statements, four were included in the final form of the model, and Definition Statements 3 and 5 showed significance at the 95 percent level, while statement 1 showed significance for the 90 percent level:

*For Questions 1 to 8, please check the **box** that **best represents** your level of agreement or disagreement with each statement.*

	Strongly Agree	Somewhat Agree	Neutral	Somewhat Disagree	Strongly Disagree
1. "Land Stewardship" is a good term to describe responsible farming.	☐	☐	☐	☐	☐
2. "Land Stewardship" includes accounting for off-farm impacts such as soil and nutrient loss into public waterways.	☐	☐	☐	☐	☐
3. "Land Stewardship" means maximizing the production of your land.	☐	☐	☐	☐	☐
4. "Land Stewardship" is about balancing farm profitability with preservation of farmland for the use of future generations.	☐	☐	☐	☐	☐
5. "Land Stewardship" means minimizing the use of off-farm inputs such as fertilizer and pesticides.	☐	☐	☐	☐	☐

Stewardship Definition Statement 1 displayed a positive disagreement correlation (0.3009) with lack of CSP awareness i.e. respondents who agreed with the notion of "land stewardship" being a good term for "responsible farming" were also likely to be aware of the CSP. Definition Statement 3 showed a similar correlation (0.2108) i.e. respondents who agreed with the notion of maximizing production were also likely to be more aware of the CSP than those who disagreed. Definition Statement 5 exhibited a negative disagreement correlation (-0.2504), suggesting respondents who disagreed with minimizing off-farm inputs being synonymous with "land stewardship" were more likely to be aware of the CSP.

Of the significant discrete variable categories, Gender 1 i.e. Male (p=0.0009), Farm Income 1 (p=0.0061), respondents grossing less than $50,000 from the farm, and Off-Farm Income 2 (p=0.0115), respondents grossing between $10,000 and $25,000, were the significant discrete variable categories. Table 4.3.4C details the odds ratios for these discrete variable categories of significance. The most telling of these was Gender 1 (Male). Odds ratio output suggests even at the 95 percent level, men were at least half (0.555) as likely as women to lack awareness of the CSP, and potentially as little as a tenth (0.101) as likely i.e.

Male respondents were between two and ten times more likely than female respondents to be aware of the CSP.

Table 4.3.4C – CSP Awareness model output odds ratios.

Odds Ratios Estimates (Discrete Variable Categories)					
Parameter	**Point Estimate**	**Wald Confidence Limits**			
		90%		**95%**	
99% Significance					
Gender 1 (vs 2)	0.237	0.116	0.484	0.101	0.555
Farm Income 1 (vs 4)	5.442	0.775	38.195	0.534	55.479
Off-Farm Income 2 (vs 5)	0.315	0.115	0.857	0.095	1.039
80% Significance					
Education 1 (vs 4)	3.206	1.218	8.437	1.012	10.155
Off-Farm Income 3 (vs 5)	0.875	0.361	2.120	0.305	2.512

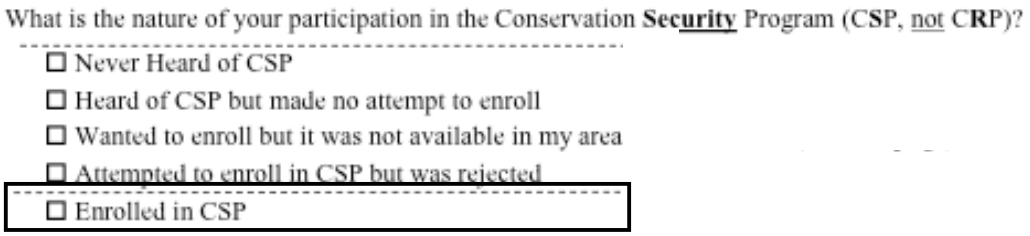
Farm Income 1 respondents, those grossing under $50,000 from the farm, were between half (0.534) and as high as 55 times more likely (55.479) to lack awareness of the CSP when compared to respondents grossing over $500,000 from the farm i.e. large farms were more likely to be aware of the CSP than very small farms. Off-Farm Income 2 respondents, those grossing $10,000 to $25,000 off-farm, were at most as likely (1.039) and as little as a tenth (0.095) as likely to lack awareness of CSP as compared to respondents grossing over $100,000 off the farm.

Education 1 respondents, those who had not graduated from high school, and Off-Farm Income 3, those grossing $25,000 to $50,000 off-farm, both had tendencies toward significance ($p \leq 0.20$). Education 1 respondents tended towards eight times (8.437) less awareness of the CSP than those with a four year degree or more; and Off-Farm Income respondents earning between $25,000 and $50,000 tended to be between a third (0.361) and two-and-a-half times (2.120) less likely as those earning more than $100,000 off the farm to be aware of the CSP.

In summary, results from the CSP Awareness model suggest that respondents who were most likely to be aware of the CSP were those with more stewardship practices, were male, did not gross under $50,000 in on-farm income and likely earned between $10,000 and $25,000 gross income off the farm. They perceived maximizing production to be a component of "land stewardship," which they also considered a good term to describe responsible farming, but generally disagreed that minimizing input use should be included in the same definition. They also had a tendency to be older than producers who were not aware of the program, and had a tendency to have continued education beyond high school.

4.3.5 CSP Enrollment Model

The second regression analysis model related to CSP Enrollment. The value assigned to CSP Enrollment was determined by each respondent's answer to the following instrument question:


What is the nature of your participation in the Conservation **Security** Program (CSP, not CRP)?

- ☐ Never Heard of CSP
- ☐ Heard of CSP but made no attempt to enroll
- ☐ Wanted to enroll but it was not available in my area
- ☐ Attempted to enroll in CSP but was rejected
- ☐ Enrolled in CSP

Enrollment related to the last response of the five or, "Enrolled in CSP". With the CSP Enrollment as the dependent variable, a check in this box assigned a value of 1 to CSP Enrollment and a check in any other box apart from "Wanted to enroll but it was not available in my area" resulted in a value of 0 for CSP Enrollment. Responses to "Wanted to enroll but it was not available in my area" or responses with more or less than one box checked for this question were not included in the regression. "Wanted to enroll but it was not available in my area" indicated awareness since there was a desire to enroll but this response did not tell us enough about the respondent to determine if enrollment would have been successful.

The data set for the CSP Enrollment regression included 634 responses, 377 responses did not have complete or explicit answers to all the questions of interest for this model. The other 36 responses included in the CSP Awareness regression but not used in the

CSP Enrollment regression were responses from respondents who indicated the program "was not available in my area," and were considered not to be enrolled due to ineligible location. Table 4.3.5A summarizes the number of responses for the CSP Enrollment model by region.

Table 4.3.5A - Regional distributions of survey responses included in the CSP Enrollment regression model.

State Region:	**West-Central**		**Northeast**	
Watershed:	East Nishnabotna	North Raccoon	Upper Wapsipinicon	Turkey
County totals:	Audubon (38)	Buena Vista (68)	Buchanan (67)	Clayton (109)
	Cass (40)	Calhoun (56)	Chickasaw (63)	Fayette (98)
		Greene (45)	Howard (50)	
Watershed totals:	78	169	180	207
Survey totals	634			

Using CSP Enrollment as the dependent variable, the regression analysis model took the form presented in Equation 4.3.5A (see Table 4.3.2A for variable descriptions).

Equation 4.3.5A – CSP Enrollment regression model

$$\log\left[\frac{P(Y_2 = 0)}{1 - P(Y_2 = 0)}\right] = \sum_{i=1}^{21} \beta_i X_i$$

$P(\ )$ = probability of (occurrence)
Y_2 = CSP Enrollment
β_i = *i*th independent variable parameter
X_i = *i*th independent variable

Table 4.3.5B details the simplified model and output for CSP Enrollment.

The CSP Enrollment model converged on 11 of the original 20 independent variables, of which there were 9 variables or variable categories of noteworthy significance ($p \leq 0.10$).

Table 4.3.5B – CSP Enrollment regression model output

Stepwise **Binary Logit** Regression (p=0.30 Entry, p=0.35 Exit, 11 steps). SAS **Maximum Likelihood** Statistical Analysis: PROC LOGISTIC (n=634) Dependent Variable **Event**: CSP Enrollment = 0 ("lack of enrollment")					
Maximum Likelihood Estimates					
Parameter	**DF**	**Estimate**	**Std. Error**	**Wald Chi-Sq**	**Pr > Chi-Sq**
Intercept	1/2	2.7229	0.6061	20.1846	<0.0001
Watershed 1 (E Nish) (X_1)	1/4	0.2108	0.2478	0.7234	0.3950
Watershed 2 (Racc) (X_1)	1/4	-0.1264	0.1837	0.4732	0.4915
Watershed 3 (U Wap)** (X_1)	1/4	-0.3981	0.1715	5.3910	0.0202
Def 1: Responsible* (X_2)	1	0.3368	0.2039	2.7270	0.0987
Def 2: Impacts† (X_3)	1	0.2209	0.1699	1.6907	0.1935
Def 6: Three Crops* (X_7)	1	-0.1797	0.1067	2.8369	0.0921
Def 8: Livestock† (X_9)	1	-0.1700	0.1152	2.1748	0.1403
Total Practices*** (X_{10})	1	-0.2681	0.0526	26.0041	<0.0001
Crop Acres*** (X_{11})	1	-0.0009	0.0003	9.8535	0.0017
Pasture Acres** (X_{12})	1	0.0037	0.0017	4.8826	0.0271
Lease 1 (X_{15})	1/5	0.1183	0.2027	0.3404	0.5596
Lease 2 (X_{15})	1/5	0.3762	0.2951	1.6245	0.2025
Lease 3* (X_{15})	1/5	-0.4394	0.2403	3.3431	0.0675
Lease 4 (X_{15})	1/5	-0.2882	0.4748	0.3684	0.5439
Farm Income 1** (X_{19})	1/4	0.5445	0.2336	5.4306	0.0198
Farm Income 2 (X_{19})	1/4	-0.1183	0.2208	0.2868	0.5923
Farm Income 3*** (X_{19})	1/4	-0.5193	0.1717	9.1450	0.0025
Off-Farm Income 1* (X_{20})	1/5	-0.3616	0.1963	3.3941	0.0654
Off-Farm Income 2 (X_{20})	1/5	0.2213	0.2242	0.9741	0.3237
Off-Farm Income 3 (X_{20})	1/5	-0.2507	0.1962	1.6320	0.2014
Off-Farm Income 4 (X_{20})	1/5	0.2232	0.2342	0.9083	0.3406

*** Significant at the 99% level
** Significant at the 95% level
* Significant at the 90% level
† Significant at the 80% level

Firstly for continuous variables, similarly to CSP Awareness, Total (stewardship) Practices was highly significant (p<0.0001), correlating negatively (-0.2644) with lack of

enrollment i.e. correlated positively with enrollment. Crop Acres was also significant at the 99 percentile (p=0.0017), also correlating negatively (-0.0009) with lack of enrollment i.e. positively correlated with enrollment. Pasture Acres (p=0.0271) exhibited a positive correlation with lack of enrollment (0.0037) i.e. the more pasture acres operated by a respondent the less likely enrollment becomes, which was consistent with the opinion expressed by a number of interviewees that CSP discourages pasture livestock.

Of the eight Stewardship Definitions, Statement 1 (p=0.0987), suggesting that "land stewardship" was a good term to describe responsible farming, and statement 6 (p=0.0921), suggesting that "land stewardship" includes a crop rotation with three or more crops, showed significance above the 90 percent level.

*For Questions 1 to 8, please check the **box** that **best represents** your level of agreement or disagreement with each statement.*

	Strongly Agree	Somewhat Agree	Neutral	Somewhat Disagree	Strongly Disagree
1. "Land Stewardship" is a good term to describe responsible farming.	☐	☐	☐	☐	☐
2. "Land Stewardship" includes accounting for off-farm impacts such as soil and nutrient loss into public waterways.	☐	☐	☐	☐	☐
3. "Land Stewardship" means maximizing the production of your land.	☐	☐	☐	☐	☐
4. "Land Stewardship" is about balancing farm profitability with preservation of farmland for the use of future generations.	☐	☐	☐	☐	☐
5. "Land Stewardship" means minimizing the use of off-farm inputs such as fertilizer and pesticides.	☐	☐	☐	☐	☐
6. "Land Stewardship" includes a crop rotation with 3 or more crops.	☐	☐	☐	☐	☐

Definition Statement 1 proposed to respondents that "land stewardship" was a good term to describe "responsible farming," and answers exhibited a positive disagreement correlation (0.3368) with a lack of enrollment i.e. respondents who agreed this was a good definition were more likely to be enrolled than those who disagreed. Definition Statement 6 proposed that "land stewardship" includes a crop rotation with "three or more crops", and answers provided a negative disagreement correlation (-0.1797) with a lack of enrollment i.e.

respondents who agreed with this definition were less likely to be enrolled than those who disagreed.

When examining discrete variables the following categories were notably significant; Watershed 1 respondents (p=0.0202), those from the Upper Wapsipinicon watershed; Farm Income 1 respondents (p=0.0198), those grossing less than $50,000 from the farm; Farm Income 3 respondents (p=0.0025), those earning between $100,000 and $500,000 gross from the farm; Off-Farm Income 1 respondents (p=0.0654), those grossing less than $10,000 off the farm.

While Lease 3 respondents, those who indicated they did not rent any land showed significance (p=0.0675), the odds ratio compares this to Lease 5 respondents, those who did check any answer to the question:

If you rent land, what is the predominant lease arrangement?

- ☐ Cash rent
- ☐ Crop share
- ☐ Do not rent any land.

Hence Lease 5 respondents were also not likely to be renting any land. This makes the significance of Lease 3 with respect to Lease 5 effectively redundant in terms of any correlation with CSP enrollment. Still, since Lease 3 was significant and other Lease categories were not, landowners as opposed to land-renters probably have some significance with respect to CSP enrollment. An examination of the simple effects between Lease and CSP Enrollment is presented in Table 4.3.5C.

The distribution of CSP Enrollment respondents, without including other effects, suggests that proportionately more enrollee respondents cash rent or crop share some land (73 percent) than non-enrollees (61 percent). A higher percentage of respondents (13 percent) who were not enrolled in the program also did not answer the Lease question, which means any significance the regression model determined with Lease variable categories was largely inconclusive.

Table 4.3.5C - Distribution of Lease variable categories against CSP Enrollment.

Lease variable. Predominant lease arrangement:	**CSP Enrollment**			
	Not Enrolled		**Enrolled**	
	0		**1**	
Lease 1 – Cash Rent	232	48%	112	60%
Lease 2 – Crop Share	51	11%	19	10%
Lease 3 – Do not Rent any Land	128	27%	41	22%
Lease 4 – Both Cash Rent and Crop Share	9	2%	6	3%
Lease 5 – No Response	63	13%	9	5%
TOTAL (n=670)	483	100%	187	100%

Odds ratios of the significant discrete variable categories are provided in Table 4.3.5D. At the 95 percent level, respondents located in the Upper Wapsipinicon watershed were as little as one-third (0.365) as likely and as much as one and one-eight as likely (1.136) as those in other watersheds to not enroll in CSP i.e. Upper Wapsipinicon respondents were more likely to enroll in CSP. Farm Income 1 respondents, those who grossed less than $50,000 from the farm, and Farm Income 3 respondents, those who grossed $100,000 to $250,000 both showed odds differences from Farm Income 4 respondents, those who earned over $500,000 gross from the farm. Farm Income 1 respondents were from between half (0.540) and four and one-half times (4.563) as likely as Farm Income 4 not to be enrolled in the CSP, and Farm Income 3 respondents were between one-quarter (0.228) and one and one-quarter (1.286) times as likely not to be enrolled in CSP as Farm Income 4 respondents.

Off-Farm Income 1 respondents, those earning up to $10,000 off the farm were also significant at the 90 percent level (p=0.0654) and odds suggest that respondents were between one-in-four (0.251) and one and one-third (1.384) times as likely to not be enrolled in CSP as Off-Farm Income 5 respondents, those earning over $100,000 off the farm.

Table 4.3.5D – CSP Enrollment model output odds ratios

Odds Ratios Estimates (Discrete Variable Categories)					
Parameter	**Point Estimate**	**Wald Confidence Limits**			
		90%		**95%**	
95% Significance					
Watershed 3 (vs 4)	0.491	0.701	0.996	0.365	1.136
Farm Income 1 (vs 4)	1.570	0.642	3.844	0.540	4.563
Farm Income 3 (vs 4)	0.542	0.262	1.119	0.228	1.286
90% Significance					
Lease 3 (vs 5)	0.510	0.249	1.047	0.217	1.201
Off-Farm Income 1 (vs 5)	0.589	0.251	1.384	0.213	1.630

Summarizing, the results of the CSP Enrollment model suggest that those enrolling in the CSP were more likely to have crop acres than pasture acres, which was consistent with on-farm interviewees' verbally expressed concerns that the program seemed to offer little encouragement for livestock production. CSP enrollees also typically agreed that "land stewardship" was a good term for "responsible farming" but did not agree that it should include a crop rotation with three or more crops. Enrollees were more likely to have an on-farm gross income of $100,000 to $500,000 than over $500,000 and were highly unlikely to have an on-farm gross income of less that $50,000; they were also more likely to earn less than $10,000 gross income off-farm. Enrollees were also more likely to come from the Upper Wapsipinicon watershed than the other three watersheds.

4.3.6 CSP Participation Level Model

The third regression analysis model related to CSP Participation Level. The data set used for this model included only those respondents who were enrolled in CSP and answered the subsequent questions on enrollment experience.

The value assigned to CSP Participation was determined by each respondent's answer to the following instrument question:

What CSP tier are you currently enrolled at?

☐ Tier 1

☐ Tier 2

☐ Tier 3

With the dependent variable for this model, CSP Participation Level, being assigned a value based on CSP tier as opposed to a binary values assigned to CSP Awareness and CSP Enrollment, the three levels of response changes the logit regression model type from binary to ordinal. For all usable responses, a check in the "Tier 1" box assigned a value of 1 to CSP Participation Level, a check in the "Tier 2" box would result in a value of 2 for CSP Participation Level, and finally checking "Tier 3" means a value of 3 is assigned to CSP Participation Level. Responses with more or less than one box checked for this question were not included in the model.

Table 4.3.6A - Regional distributions of usable mail survey responses included in the CSP Participation regression model..

State Region:	**West-Central**		**Northeast**	
Watershed:	East Nishnabotna	North Raccoon	Upper Wapsipinicon	Turkey
County totals:	Audubon (11)	Buena Vista (14)	Buchanan (17)	Clayton (18)
	Cass (3)	Calhoun (12)	Chickasaw (15)	Fayette (11)
		Greene (15)	Howard (18)	
Watershed totals:	14	41	50	29
Survey totals	134			

The data set for the CSP Participation Level regression model included 134 responses from CSP enrollees: 84 tier 1, 34 tier 2 and 14 tier 3. This is 107 responses less than the 241 who indicated enrollment in the mail survey (see Table 4.2.4A), and 53 less than the 187 included in the CSP Enrollment regression. These 107 responses were not included since they lacked complete or explicit answers for all variables used in the CSP Participation Level model. There were an additional 770 survey responses not incorporated into the model since they were from respondents not enrolled in the CSP.

Table 4.3.6A summarizes the number of responses for the CSP Participation Level regression model by region.

Using CSP Participation Level as the dependent variable, the regression analysis model took the form presented in Equation 4.3.6A (see Table 4.3.2A for variable descriptions).

Equation 4.3.6A – CSP Awareness regression model

$$\log\left[\frac{P(Y_3 \geq j \mid X)}{1-P(Y_3 \geq j \mid X)}\right] = \mu_j - \sum_{i=1}^{24} \beta_i X_i$$

$P(\ )$ = probability of (occurrence)
Y_3 = CSP Participation Level
β_i = *i*th independent variable parameter
X_i = *i*th independent variable
j = observed value of dependent variable
μ = independent threshold parameters

The model converged on 6 of the original 23 independent variables. While the model was simplified due to stepwise iteration, there were problems with the stability of the final model. This was clearly evident with the disproportionately large standard errors for the model intercepts. The Education variable was the likely cause since its standard errors were similarly disproportionate. Table 4.3.6B provides the "unstable" output of the model's first attempt to run the CSP Participation Level regression model.

Examining the distribution of responses for the Education variable from the 134 included in the model it became clear, as shown in table 4.3.6C, that Education 1, "11th grade or less," had no respondents who were in tier 2 or tier 3 of the program. This lack of entries for the second and third ordinals in the dependent variable, CSP Participation, was the cause of the instability.

Of the 53 CSP responses that were in the CSP Enrollment regression but not included in the CSP Participation regression, there were 3 respondents with an education level of "11th grade or less" and only one of these was not a tier 1 enrollee, the other being a tier 3. This suggests without even performing a regression analysis that Education 1 was potentially

correlated with both lack of CSP enrollment and a lower level of participation (tier) when enrolled.

Table 4.3.6B – CSP Participation Level regression output – First attempt

Stepwise **Ordinal Logit** Regression (p=0.30 Entry, p=0.35 Exit, 6 steps).
SAS **Maximum Likelihood** Statistical Analysis: PROC LOGISTIC (n=134)
Dependent Variable **Event**: CSP Participation Level = 1 vs 2; 2 vs 3 ("lower tier")

Maximum Likelihood Estimates

Parameter	DF	Estimate	Std. Error	Wald Chi-Sq	Pr > Chi-Sq
Intercept 1	1/3	2.5302	81.0911	0.0010	0.9751
Intercept 2	1/3	4.4278	81.0913	0.0030	0.9565
Watershed 1 (E Nish)** (X_1)	1/4	-0.9048	0.4515	4.0163	0.0451
Watershed 2 (N Racc)** (X_1)	1/4	0.9656	0.3863	6.2470	0.0124
Watershed 3 (U Wapsi) (X_1)	1/4	-0.3891	0.3245	1.4371	0.2306
Def 3: Production† (X_4)	1	0.2621	0.1834	2.0423	0.1530
Compensation 1** (X_{23})	1/4	1.4304	0.6381	5.0251	0.0250
Compensation 2† (X_{23})	1/4	-0.5226	0.3649	2.0509	0.1521
Compensation 3 (X_{23})	1/4	-0.0196	0.3735	0.0028	0.9581
Owned Acres† (X_{23})		0.0009	0.0006	2.1046	0.1469
Education 1 (X_{16})	1/4	9.3543	243.3	0.0015	0.9693
Education 2 (X_{16})	1/4	-2.1724	81.0897	0.0007	0.9786
Education 3 (X_{16})	1/4	-3.1797	81.0896	0.0015	0.9687
Farm Income 1 (X_{19})	1/4	-0.4141	0.4048	1.0469	0.3062
Farm Income 2* (X_{19})	1/4	0.6749	0.4082	2.7333	0.0983
Farm Income 3 (X_{19})	1/4	0.3167	0.3000	1.1144	0.2911

*** Significant at the 99% level
** Significant at the 95% level
* Significant at the 90% level
† Significant at the 80% level

The data set was then reduced from 134 to 132 responses, eliminating the two (tier 1) responses with an education level of "11th grade or less." Education was then re-classed as a discrete variable with only three categories, Education 2, 3, and 4. With the new data set, the CSP Participation was remodeled. The output from the revised regression model is displayed in Table 4.3.6D.

Table 4.3.6C - Distribution of Education variable categories against CSP Participation Level.

Education variable. Education level:	**CSP Participation Level**		
	1st Ordinal	**2nd Ordinal**	**3rd Ordinal**
	Tier 1	**Tier 2**	**Tier 3**
Education 1 "11th grade or less"	2	0	0
Education 2 "High School Diploma"	48	12	3
Education 3 "2 year degree or part of 4-year degree"	18	12	5
Education 4, "4 year degree or more"	18	10	6
TOTAL (n=134)	86	34	14

Table 4.3.6D – CSP Participation Level regression output – Second attempt (Education 1 eliminated)

Stepwise **Ordinal Logit** Regression (p=0.30 Entry, p=0.35 Exit, 6 steps).
SAS **Maximum Likelihood** Statistical Analysis: PROC LOGISTIC (n=132)
Dependent Variable **Event**: CSP Participation Level = 1 vs 2; 2 vs 3 ("lower tier")

Maximum Likelihood Estimates

Parameter	**DF**	**Estimate**	**Std. Error**	**Wald Chi-Sq**	**Pr > Chi-Sq**
Intercept 1	1/3	-0.5879	0.6407	0.8418	0.3589
Intercept 2	1/3	1.3097	0.6555	3.9920	0.0457
Watershed 1 (E Nish)** (X_1)	1/4	0.9656	0.3863	6.2468	0.0124
Watershed 2 (Racc)** (X_1)	1/4	-0.9047	0.4515	4.0159	0.0451
Watershed 3 (U Wapsi) (X_1)	1/4	-0.3891	0.3245	1.4370	0.2306
Def 3: Production† (X_4)	1	0.2621	0.1834	2.0423	0.1530
Compensation 1** (X_{23})	1/4	1.4303	0.6381	5.0247	0.0250
Compensation 2† (X_{23})	1/4	-0.5226	0.3649	2.0507	0.1521
Compensation 3 (X_{23})	1/4	-0.0196	0.3735	0.0028	0.9582
Owned Acres† (X_{11})	1	0.0009	0.0007	2.1045	0.1469
Education 2*** (X_{16})	1/3	0.9457	0.2995	9.9696	0.0016
Education 3 (X_{16})	1/3	-0.0616	0.2930	0.0442	0.8334
Farm Income 1 (X_{19})	1/4	-0.4141	0.4048	1.0469	0.3062
Farm Income 2* (X_{19})	1/4	0.6748	0.4082	2.7333	0.0983
Farm Income 3 (X_{19})	1/4	0.3167	0.3000	1.1144	0.2911

*** Significant at the 99% level
** Significant at the 95% level
* Significant at the 90% level

The revised CSP Participation regression with the simplified Education variable and reduced data set simplified to a stable model that included the same six variables as the first attempt. This large stepwise simplification from the 23 initial variables was likely attributable in part to the smaller sample size, but also suggests there was less to separate enrolled farmers by tier than non-enrolled from enrolled farmers using survey variables. An increase in homogeneity such as this is an indication that surveyed CSP participants were more uniform as a group than the larger population within CSP watersheds, which also implies there was not a lot to separate tier 1 stewards from tier 3 stewards.

Of the continuous variables, neither owned acres ($p=0.1469$) nor the third Stewardship Definition Statement ($p=0.1530$) bore notable significance ($p\leq0.10$). Owned acres had a tendency to be correlated (0.0009) with a lower level of participation, i.e. respondents with a higher number of owned farm acres were potentially more likely to be in a lower CSP tier than those with less owned acres. The third Definition Statement, asking respondents if "maximizing production" was a part of "land stewardship" also showed a tendency for disagreement to be correlated (0.2621) with a low level of participation, i.e. respondents who were in agreement with "maximizing production" as a part of "land stewardship" were potentially more likely to be enrolled in a higher tier than those who were not in agreement.

Of the discrete variables Compensation 1 ($p=0.0250$) respondents, those who thought they were more than compensated for the costs of enrollment; Education 2 ($p=0.0016$) respondents, those who indicated they had graduated from high school but had not pursued any tertiary education; and Farm Income 2 ($p=0.0983$) respondents, those grossing between $50,000 and $100,000 from the farm, were all notably significant ($p\leq0.10$). Also respondents from Watershed 1, the East Nishnabotna watershed ($p=0.0451$), and Watershed 2, the North Raccoon watershed ($p=0.0124$) also exhibited notable significance.

Examining the odds ratios for the significant discrete variable categories in Table 4.3.6E, Compensation 1, Education 2, and Farm Income 2 had the highest odds point estimates. Compensation 1, those respondents who perceived CSP payments as more than compensating for the costs of enrollment were up to 97 times (97.740) more likely than a

respondent who thought it was "not worth the time it took to enroll" to be enrolled in a lower tier. Education 2, those respondents who did not pursue tertiary study after high school were at least twice (2.123) and up to 18 (18.299) times more likely than a respondent who had a "four-year degree or better" to be enrolled in a lower tier. Farm Income 2, those respondents grossing $50,000 to $100,000 from the farm were between 1 (0.980) and 12 (12.488) times more likely than a respondent grossing over $500,000 from the farm to be enrolled in a lower tier.

Table 4.3.6E – CSP Participation Odds Ratios – with Education 1 eliminated

Odds Ratios Estimates (Discrete Variable Categories)					
Parameter	**Point Estimate**	**Wald Confidence Limits**			
		90%		**95%**	
99% Significance					
Education 2 (vs 4) §	6.233	2.524	15.389	2.123	18.299
95% Significance					
Compensation 1 (vs 4)	10.160	1.520	67.920	1.056	97.740
Watershed 1 (E. Nish)	0.291	0.091	0.937	0.073	1.171
Watershed 2 (Raccoon) **	1.891	0.672	5.323	0.551	6.491
90% Significance					
Farm Income 2 (vs 4)	3.498	0.980	12.488	0.768	15.935
80% Significance					
Compensation 2 (vs 4)	1.441	0.345	6.013	0.263	7.905

§ The variable Education has only 3 degrees of freedom due to the elimination of Education 1 for the purpose of stabilizing the regression.

It is possibly surprising that respondents who believed CSP payments overcompensated them for their costs of enrollment were more likely to be enrolled in a *lower* tier of enrollment than those who felt program payments didn't even cover the "time it took to enroll;" especially since the intent of the program is to create incentives for less active stewards to improve and expand their on-farm conservation practices by rewarding more active stewards with better payments. This is a result that should be examined carefully and benefits from an examination of the simple effects provided in Table 4.6.3F.

Table 4.3.6F - Distribution of Education variable categories against CSP Participation Level.

CSP Compensation variable. Compensation level:	**CSP Participation Level**		
	1st Ordinal	**2nd Ordinal**	**3rd Ordinal**
	Tier 1	**Tier 2**	**Tier 3**
Compensation 1 "More than compensates"	12	0	2
Compensation 2 "Fully compensates"	34	17	8
Compensation 3 "Somewhat compensates"	33	15	3
Compensation 4, "Not worth the time took to enroll"	5	2	1
TOTAL (n=132)	84	34	14

It is important to remember that an odds ratio is simply a comparison of results between two categories within a discrete variable. The biggest influence on the Compensation 1 (n=14) result was the lack of responses for tier 2 (n=0) and tier 3 (n=2). With so few respondents in tier 2 and tier 3, this means only a small number of tier 1 respondents had to indicate that CSP "more than compensated" them for the costs of enrollment to create an odds ratio heavily weighted in favor of suggesting respondents who believed they were better compensated were more likely to be in a lower CSP tier. If we ignore Compensation 1 responses, trends within the other three Compensation variable categories were less dramatic but more intuitive. Two-thirds of the remaining tier 3 respondents indicated they were fully compensated and only one-half of tier 2 respondents and slightly less than half of tier 1 respondents did the same.

Even so there were a significant proportion of producers that perceived CSP payments as providing less than full compensation. Results from the regression model also accounted for the influence of other variables so there may still be some counter intuitive effect present not fully evident in the simple effect examination. It is important to remember the responses to this question were prone to be influenced by what farmers *believed* they should have received in payments rather than simply how well it covered their enrollment costs. Farmers in higher tiers were likely to have invested more into stewardship over the long term and may have been more disappointed with funding cuts and the resulting payment reductions than lower tiered farmers.

Even if we set the potential impartiality of responses aside, it does draw attention to the "reward the best" facet of the CSP's goals and how a small but strategic investment in conservation akin to what a typical tier 1 enrollee, may result in better compensation from the program than a comprehensive whole farm investment evident with tier 2 and tier 3 enrollees. This will be investigated further in the Farm Budget Model section of this study.

In summary the results from the CSP Participation Level model suggest that higher tiered enrollees were more likely to have a belief they were not as well compensated for the cost of enrollment, more likely to have some tertiary education and more likely to gross between $50,000 and $100,000 from the farm than lower tiered enrollees. Higher tiered enrollees were also more likely to come from the East Nishnabotna watershed than Northeastern watersheds, while respondents from the North Raccoon watershed were the least likely to be in a higher tier of enrollment.

4.3.7 Conclusions from the Logit Regression Analysis

The use of three separate regressions allowed for the more holistic trends with regards to CSP involvement to emerge as shown in Table 4.3.7A. Education and location proved a significant factor in increased involvement with the CSP, while number of acres of cropland, pasture, owned land and perceptions of "land stewardship" tested significantly as factors that correlated with decreased program involvement. Education was particularly significant in that only six respondents out of the 241 who indicated enrollment in the program did not graduate from high school, and only one of those was enrolled above tier 1. There was also the trend that those aware of the program and those who tended to be enrolled in a higher tier were more likely to agree that "maximized production" was part of the definition for "land stewardship."

Location also became more significant as involvement in the program increased, with Upper Wapsipinicon respondents being more likely to be enrolled in the program than respondents from other watersheds. Of enrolled respondents, those from the East Nishnabotna watershed were more likely to be enrolled at a higher tier than the Northeastern watersheds, while North Raccoon respondents were more likely to be enrolled at a lower tier.

Table 4.3.7A – Summary of results from the three regression models.

Model Variable	Variable Name	CSP Awareness	CSP Enrollment	CSP Participation Level
Y_i	Independent Variable Event	Increasing CSP Awareness	Increasing Likelihood of CSP Enrollment	Increasing CSP Tier
Continuous Variables of Significance (p<0.2)				
X_2	Def 1: Responsible	C (-)	C (-)	
X_4	**Def 3: Production**	**B (-)**		D (-)
X_6	**Def 5: Inputs**	**B (+)**		
X_7	Def 6: Three Crops		C (+)	
X_9	Def 8: Livestock		D (+)	
X_{10}	**Total Practices**	**A (+)**	**A (+)**	
X_{11}	**Crop Acres**	**C (+)**	**A (+)**	
X_{12}	**Pasture Acres**		**B (-)**	
X_{13}	Owned Acres			D (-)
X_{17}	**Age**	**B (+)**		
Categorical Variables of Significance (p<0.2)				
X_1	**Watershed (vs 4)**		**Watershed 3 : B (>)**	**Watershed 1 : B (<)** **Watershed 2 : B (>)**
X_{15}	Lease (vs 5)		Lease 3 : C (>)	
X_{16}	**Education (vs 4)**	**Education 1 : A (<)**		**Education 2 : A (<)**
X_{18}	**Gender (vs 2)**	**Gender 1 : A (<)**		
X_{19}	**Farm Income (vs 4)**	**Farm Income 1 : A (<)**	**Farm Income 1 : B (<)** **Farm Income 3 : A (>)**	Farm Income 2 : C (<)
X_{20}	**Off-Farm Income (vs 5)**	**Off-Farm Income 2 : B (<)** Off-Farm Income 3 : D (>)	Off-Farm Income 1 : C (>)	
X_{23}	**Compensation (vs 4)**			**Compensation 1 : B (<)** Compensation 2 : D (>)
Variables of No Significance (p≥0.2)				
X_{21}	Enhanced? (vs 2)			
X_{22}	Payment (vs 4)			
X_3	Def 2: Impacts			
X_5	Def 4: Future use			
X_8	Def 7: Resources			
X_{14}	Rented Acres			

A Significant at the 99% level

B Significant at the 95% level

C Significant at the 90% level

D Significant at the 80% level

(+,-,>,<) Trend of Correlation with Independent Variable Event

Total number of Stewardship practices was highly significant for determining awareness and enrollment but was not for determining participation level. Gender and Age were significant for awareness of the program but were not significant for enrollment or participation. There was also a tendency to be skeptical of the need for more than a two crop rotation for "land stewardship" to be possible among enrolled respondents.

The stepwise simplification of regressions resulted in a smaller model for CSP Participation Level, with only six variables versus 11 for both the Awareness and Enrollment models. While this is probably partly due to the smaller sample size for the CSP Participation Level model it also suggests greater homogeneity amongst the CSP enrollees who responded to the survey and less to separate higher tiered respondents from lower tiered, than enrolled respondents from those not enrolled.

All levels of involvement with the CSP suggested those earning less than $50,000 gross income from the farm were not likely to be involved with the program, though respondents grossing between $10,000 and $25,000 off the farm were significant with awareness and enrollment compared to those earning less or more off-farm gross income.

Most interestingly those who were enrolled and believed they were "more than compensated" for the costs of enrollment were more likely to be enrolled at tier 1 than those who felt they were less compensated. While this was most likely influenced by the small sample (n=132) for the regression it may imply that respondents were using this question to vent over program funding and payment reductions irrespective of their investment in conservation. There is also the possibility that the payment structure for CSP does compensate lower tier enrollees better than higher tiers but an examination of the simple effects of Compensation on CSP Participation Level suggested this was unlikely.

4.4 Farm Budget Model

"Reward the best and attract the rest" has been the catchphrase used most often to describe the primary goal of the CSP. "The best" refers to land stewards who have established conservation practices that can be examples for others to follow and "the rest" are those who, with the right incentives, would emulate them. In this short statement there are

both explicit and implicit statements regarding the incentives that the CSP is attempting to provide producers to improve and maintain their conservation efforts. While payments to stewards who have practices in place are unambiguously rewards for "the best," how "the rest" are being attracted is not as obvious. One way is that the broader knowledge of reward payments to established stewards acts as an incentive for aspiring stewards to invest more in conservation. The other more pragmatic option is through cost sharing incentives that payments provide a producer to enroll and adopt more conservation practices. Ideally both of these incentives would be working together. Attracting "the rest" is one area where the program has drawn some criticism for failing to provide enough incentive for aspiring stewards (SWCS, 2007). The first objective of the farm budget model and the farm case studies that follow is to assess this problem among the interviewed producers and discuss some of the likely reasons for its occurrence.

Additionally, WTO rulings on agricultural income support are of interest to supporters of CSP. While the latest WTO deliberations on international trade, known as the Doha round, have yet to overcome repeated disruptions due to negotiations breaking down, the current Agreement on Agriculture ratified by the Uruguay round of the WTO assembly in 1996 has some explicit conditions for green payment programs such as the CSP. The Agreement on Agriculture has three "boxes" which refer to income support payments for producers: the amber and blue boxes relate to payments that affect product prices such as the commodity programs, while the green box refers to payments that are decoupled from production levels or prices, which includes environmental programs. The rules for the green box payments are relatively explicit. Most notable is that payments should compensate for a proportion of a producer's "income loss" and that for environmental programs "the amount of payment shall be limited to the extra costs or loss of income involved in complying with the government program" (WTO, 2002). Given this, the secondary objective of the farm budget models and the case studies that follow is to explore the possibility of producers being overcompensated for their costs of conservation.

It is worth noting that establishing and evaluating trends in the level of CSP compensation for the costs of conservation is somewhat contrary to the original intent of CSP, that "payments should be indexed with conservation performance and the impact on

natural resources rather than the cost to implement them" (SWCS, 2007). Even so, the rulings from the WTO's Agriculture Agreement combined with confusion among producers over payment structure are possibly responsible for CSP administrators planning a 2008 payment rule revision. The revision is likely to tie CSP payments more directly with the costs of practices (Howard, 2007), rather than the more ambiguous value of estimated benefits.

4.4.1 Budget model Outline

The budget model and case studies were created from a sample of on-farm interviews collected from the group of usable survey respondents who indicated they were both participating in the CSP program and willing to take part in a face-to-face interview. The sample was purposively selected from across the four CSP watersheds with a mix of producers from tiers 1, 2 and 3. The intent was to contact and interview 12 producers from this group, one of each tier from each watershed. As producers were contacted, starting mid-summer and continuing into fall 2006, this balance proved increasingly challenging and proved unachievable. Ultimately a sample of 13[49] was selected due to availability, but as shown in Table 4.4A, the interviewed producers were reasonably representative of the overall program participation with six tier 1, five tier 2 and two tier 3 producers generously sharing their time and their farms for between one and two hours.

Once relevant farm information, or metrics were collected, a budget model was completed using the MS-Excel™ spreadsheet template (an example of this template is included in Appendix D).

The template includes 5 major budget areas:

1. Crop and livestock revenue
2. CSP, CRP, Commodity payments and insurance payment
3. Conservation costs: equipment and buildings

[49] The 13th producer was included ensure that at least two tier 3 producers were interviewed.

4. Conservation costs: stewardship practices
5. Conservation costs: crop rotations and labor

Table 4.4A – Location and general farm descriptions of the interviewed producers.

State Region	**West-Central**		**Northeast**	
Watershed	East Nishnabotna	North Raccoon	Upper Wapsipinicon	Turkey
Producer ***Basic Farm Description***	Nish1 *1020 acres. Corn, soybeans and CRP/buffer.*	Rac1 *320 acres (80 rented). Corn, soybeans, alfalfa, permanent pasture with beef cow-calf.*	Wapsi1 *1500 acres (480 rented). Corn and soybeans.*	Turk1 *3350 acres (700 rented). Corn, soybeans and farrow-to-finish confinement hogs.*
	Nish2 *6930 acres (5330 rented). Corn, soybeans and confinement finishing hogs*	Rac2 *1430 acres (830 rented). Corn, soybeans and specialty crop.*	Wapsi2 *390 acres. Corn, soybeans and confinement finishing hogs.*	Turk2 *400 acres (115 rented). Corn, soybeans, alfalfa, permanent pasture with beef cow-calf and confinement finishing hogs.*
		Rac3 *1250 acres. Corn and soybeans.*	Wapsi3 *360 acres (85 rented). All organic. Corn, soybeans, alfalfa/hay, barley and pasture farrow-to-finish hoop hogs.*	Turk3 *445 acres. Corn, oats, alfalfa/hay and feedlot cattle.*
		Rac4 *1150 acres (60 rented). Corn, soybeans, hay and permanent pasture with beef cattle.*		Turk4 *2120 acres. Corn, soybeans, alfalfa/hay, winter rye, permanent pasture with dairy cows.*

Areas 1 and 2 pertain to gross farm revenue, while areas 3, 4 and 5 are included under overall conservation cost. Each relies to a degree on farm descriptive information supplied by the producer and the remainder is derived from either extension or generic on-line sources[50].

4.4.2 Methods of Compensation Comparison

For answering both questions about incentive and compensation provided by CSP payments, the budget model and the case studies compared estimated costs of conservation and stewardship with the financial payment provided by the CSP. This study used the following three approaches to measure compensation of conservation costs by CSP:

1. *Total compensation level.* This is a percentage comparison of the total contract amount[51] to the total cost to install and maintain all conservation practices on the farm at the time of the interview in 2005 dollars.

   For example: A $60,000 CSP contract over 10 years compared to $150,000 total cost for conservation practices (in 2005 dollars) yields a total compensation level of $60,000/$150,000, which is 40 percent compensation.

2. *The average annual compensation level*. This is the total CSP contract amount divided by the life of the contract in years calculated as a percentage of the annual cost of maintaining conservation practices.

   For example: A $60,000 CSP contract over 10 years compared to a $30,000 annual conservation cost. The average annual payment = $60,000/10 = $6,000. This yields an average annual compensation level of $6,000/$30,000 resulting in 20 percent compensation.

3. *The maximum annual or "first year" compensation level*. This is one-third[52] of the total CSP contract amount calculated as a percentage of the annual cost of maintaining conservation practices.

---

[50] These sources will be described in the relevant sub-sections later in this chapter.

[51] The total contract amount is the sum of all contracted payments to be received over the term of the contract.

[52] The one-third fraction was chosen based on the CSP contracts that interviewees shared with the author.

For example: A $60,000 CSP contract over 10 years compared to a $30,000 annual conservation cost. The likely maximum or first year payment = $60,000/3 = $20,000. This yields a "first year" annual compensation level of $20,000/$30,000 which is 67 percent compensation.

All comparisons used 2005 dollars for estimating "current" values of investment and maintenance; 2005 was chosen since it was the most recent year with a full availability of price and average yield information from extension publications[53]. Furthermore about half of the interviews were conducted part way into the 2006 growing season, limiting the bulk of discussion for these interviewees to 2005 experiences.

A profitability approach was initially to be used in place of compensation level for the budget and case study portion of this study. However that approach required data collection beyond the scope of this project. The partial budget approach of using compensation levels has proven very useful for meeting the study objectives regarding CSP contract and payment contributions to farm income. For instance if a producer's annual conservation cost is overcompensated (greater than 100 percent) by annual CSP payments, this is equivalent to a boost in farm income beyond income forgone.

Since the budgetary analysis for this study focused on conservation cost and compensation by CSP, it may seem redundant to have calculated revenue as well. Revenue itself was not the primary interest of this study, but in calculating revenue an estimate of commodity program payments and CRP payments was achievable, both of which were financial incentives worth comparing to CSP payments.

It should be stressed that a strictly quantitative analysis of cash flow was not the intent of this section of the study. Attempts to gain explicit costs and returns information from each interviewee were felt to potentially jeopardize access to other less sensitive, but equally important information. The dollar values discussed in the model results were not

[53] ISU extension summaries for 2006 average Iowa farm information will not be released until after this study is complete

intended to be precise, but rather representative of qualitative financial trends among the producers who were interviewed and included in the case studies.

4.4.3 Crop and Livestock Revenue

Interviewees were consistently able to provide detailed information for crop acreages and livestock populations as well as equipment and building use. There was less specificity available for product sale prices, yields or livestock productivity and weight gains. If producers were not inclined to be specific about crop and livestock yields a 5-year (2001 to 2005) county average for crops and 2005 budget averages for livestock were employed (Smith and Edwards, 2006; Ellis et al, 2005; Lawrence, 2006). All similar information unavailable from the interviewee was obtained from either a county, economic region or state average[54] sourced from Iowa State University Extension's Ag Decision Maker cost and return summaries as well as livestock budgetary projections (Smith and Edwards, 2006; Ellis et al., 2005).

The notable exception to this approach was the one organic farmer. While this farmer was willing to be specific about yields, he was not as comfortable with revealing prices. Organic grain prices used in this farmer's model and case study were the 2005 price averages from the Minneapolis Organic Price Exchange (OPX)[55]. Livestock prices for this producer's organic "hoop" raised hogs were obtained from the farrow-to-finish "partial confinement" sale prices within extension budget literature. Organic hog prices are typically higher than conventional hog prices so while this non-organic price was likely to be lower than the average organic price it represents a nominal price floor for organic pork.

4.4.4 Government Program and Insurance payments

Once a subtotal for crop and livestock revenue was calculated it was possible to estimate the commodity and insurance payments. Due to the sensitive nature of the topic,

---

[54] The most location specific source available was always employed; starting with county, then economic region, then state.

[55] http://www.newfarm.org/opx

farmers were not asked about these amounts. This was estimated using a linear correlation that existed between the county averages for crop income and total government payments as provided in Table 4.4.4A and Figure 4.4.4A (Smith and Edwards, 2006).

The graph contains two trend-lines, the steeper sloped trend-line indicates average government payment for an average value of gross crop income and the other trend-line indicates average insurance payment also against average gross crop income. The fractions that government payments and insurance was of total crop income were each estimated from a set of nine points created by three clusters of three data points.

Each cluster of three points represents one of the three ranges for total average value of agricultural production per farm from each the three economic regions of Iowa that the ten counties from this study were a part of. The three ranges for total value of agricultural production are $40,000 to $99,999, $100,000 to $249,999, and $250,000 and above. The three economic regions considered are Southwest Iowa for the East Nishnabotna watershed includes two counties from this study, Audubon and Cass counties; North Central Iowa for the North Raccoon watershed which includes three counties from this study, Greene, Buena Vista[56] and Calhoun counties; and Northeast Iowa for both the Upper Wapsipinicon and Turkey watersheds which includes other five counties from this study, Howard, Chickasaw, Buchanan, Fayette and Clayton counties.

Government payment averages as listed in extension publications also include conservation program payments[57]. Figure 4.4.4A shows a strong correlation ($R^2 = 0.981$[58]) between crop income and government payments. This result suggests conservation program income was minimal on top of commodity program income since crop income is responsible for the commodity payment portion of government payments. Hence for the purposes of this study, "government payments" were assumed to include commodity payments only. This

---

[56] Buena Vista County is actually in the North-East Iowa economic region, on the border of the North-Central economic region. For simplicity it was included in with the other North Raccoon watershed counties as part of the North-Central economic region for this study.

[57] This was confirmed in a discussion with Iowa State University Extension publication co-author Dr. William Edwards.

[58] See Section 4.3.2A and the discussion attached to Figure 4.3.2A for more on correlation and R^2 values.

allows for a revenue estimation that includes commodity payments as a proportion of crop income to be calculated separately from any conservation program, most notably CRP and CSP, payments that also have been received.

Table 4.4.4A – Average gross crop income, government payments and insurance payments by economic region corresponding to each CSP watershed

Economic Region	Value of Ag Production	Gross Crop Income	Government Payments	Insurance Payments
South-West: East Nishnabotna	$40 to $99.9K	$71,216	$12,745	$202
	$100 to $249.9K	$167,930	$27,881	$973
	over $250K	$610,925	$81,222	$3,746
North-Central: North Raccoon	$40 to $99.9K	$62,328	$10,587	$0
	$100 to $249.9K	$187,957	$27,123	$1,296
	over $250K	$631,398	$98,264	$2,081
North-East: Upper Wapsipinicon and Turkey	$40 to $99.9K	$95,822	$10,197	$107
	$100 to $249.9K	$169,780	$30,204	$1,070
	over $250K	$605,341	$82,944	$375

(Source: ISU Ag Decision Maker C1-10: Smith and Edwards, 2006)

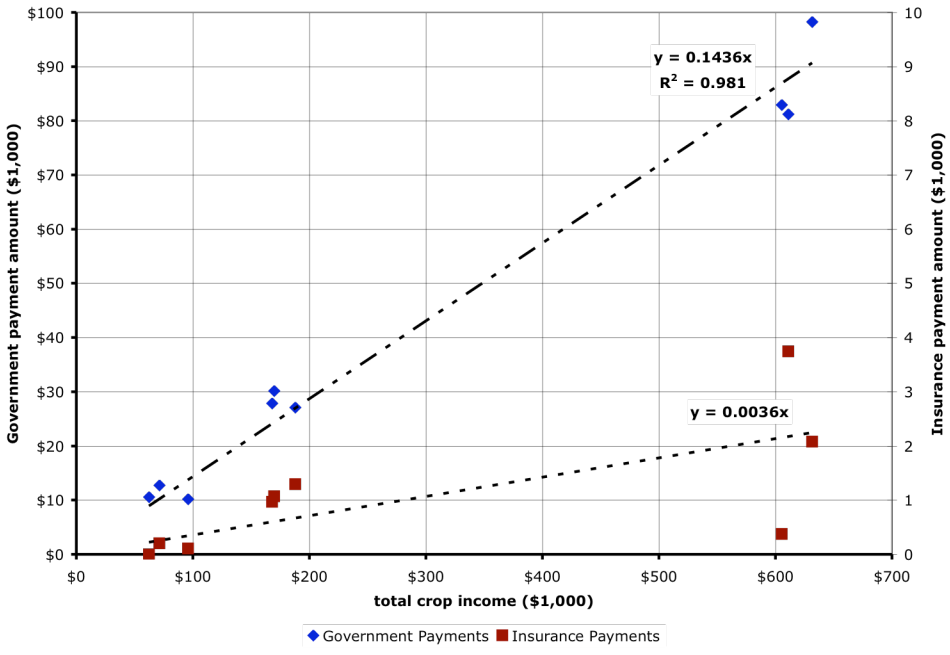


Figure 4.4.4A – Calculation of government and insurance payments fractions as a proportion of crop income.

CRP ground is not eligible for CSP contracts (NRCS, 2005). Given this, farmland enrolled in the CRP was excluded from any analysis related to the compensation level of CSP contracts or payments. CRP payments were calculated separately and only included for the purpose of estimating overall revenue approximated as 2005 county rental rate[59] averages (Smith and Edwards, 2006). Where producers had not been specific about what type of land they set aside for CRP, it was assumed to have previously been corn and soybean ground.

With regards to CSP contract detail, most farmers were willing to divulge their enrollment history with the program, their current tier and an overall contract amount. Some were willing to briefly share their entire contract document and with the additional help of some contract examples (Land Stewardship Project, 2005), patterns within CSP contracts from the corn-belt area became apparent and were put to use in the budgets. First year payments were nearly always the highest, and unless it meant exceeding the payment cap were approximately one third of the overall contract amount (even for the shorter duration tier 1 contracts)[60]. Hence with an eye to the greater goal of analyzing CSP payments relative to conservation costs, CSP contracts were calculated and included at three levels, the overall contract amount, the higher first year payment that was calculated as exactly one-third of the overall amount, and the average annual payment that was calculated as the total contract amount divided by contract length.

4.4.5 Conservation Costs: Equipment and Buildings.

When calculating the cost of conservation practices, estimating the costs for use of equipment and buildings presented some challenges. This section of the budget was simplified so that only the fraction of capital costs dedicated to conservation was included. Even for the most conservation minded of farm operators most of their equipment and

---

[59] The CRP includes other smaller payment categories other than rental rate. For simplicity this study assumes average rental rate is equivalent to total CRP payment. CRP is driven off a bidding system and producers can bid a low rental rate bid to improve their chances of securing a contract. For more information on CRP see www.fsa.gov/programs/crp

[60] While tier 2 and tier 3 enrollees could elect for between a five and ten year contract, there is only knowledge of one enrolled tier 2 or tier 3 producer in Iowa who elected for a contract less than ten years. All interviewed tier 2 and tier 3 contract holders had a ten-year contract. (Source: Iowa NRCS)

building costs stems from crop and livestock production rather than conservation. The cases where farmers were able to provide detail to what extent they used their equipment for conservation, an approximation was still required to generate the annual cost fraction for each piece of equipment and housing that reflected conservation. More recent machinery purchases had a greater impact on overall costs, but usually interviewees were able to provide more detail regarding their use of newer equipment than for older more depreciated items.

Current i.e. 2005 vintage, values for equipment were estimated based on cost information provided by some interviewees. Where such sources were not available estimates of equipment cost were obtained from average sale prices (of 2005 vintage items) listed on TractorHouse.com[61]. TractorHouse.com proved to be the most comprehensive of all the online classifieds for farm equipment investigated as part of this study. Estimates of 2005 values for equipment were then depreciated at a 10 percent declining rate allotted over ten years. The interest rate on investment was 7 percent on the investment or 3.5 percent on the average annual investment. Insurance and taxes were estimated at 1.5 percent. The sum of 2005 value estimates on equipment was considered the total value of all equipment conservation use.

Building values were obtained directly from interviewees or were estimated with comparable structures from other interviewed farmers. Building cost estimates were straight line depreciated at 5 percent over 20 years. The interest rate on investment was 7 percent on the investment or 3.5 percent on the average annual investment. Insurance and taxes were estimated at 1.5 percent.

4.4.6 Conservation Costs: Stewardship Practices

Interviewees were asked to provide detail about the nature and history of conservation on their farms. The description of practices was cross-referenced with the Iowa NRCS Conservation Installation and Maintenance Costs table (see Appendix E). A local earthworks

[61] Other online classifieds such as local.com, webfarmer.com and fastline.com showed comparable prices to TractorHouse.com

contractor in the Story County, Iowa area was contacted for more detail on terrace and grassed waterway construction. This enabled costs for these two items to be adjusted based on the extent of local topographical relief: the North Raccoon farms were generally "flat", the East Nishnabotna and Upper Wapsipinicon were normally "undulating" and farms in the Turkey watershed was typically "hilly". As the respective practice description and costs were obtained, they were incorporated into the spreadsheet using the same approach as used for equipment and buildings, with the exception that the entire cost of each practice was conservation related. Structural conservation practices, such as terraces and ponds had their total cost depreciated while non-structural practices such as additional crop rotations and reduced tillage were included only as an annual investment[62]. Conservation infrastructure such as terraces and ponds were straight line depreciated at 5 percent over 20 years. The interest rate on investment was 7 percent or 3.5 percent on the average annual investment. Insurance and taxes were estimated at 1.5 percent.

4.4.7 Conservation Costs: Crop Rotations and Labor.

The final elements of overall conservation cost were crop rotations being added purely for the purpose of conservation. An example of this is the inclusion of a small grain into a corn and soybean rotation to break up the disease cycle as well as potentially reduce erosion and chemical use. Most operators that were interviewed did not have rotations included specifically for conservation purposes. A notable exception was the organic producer who was required for certification purposes to have a four crop rotation.

Interviewees were also asked for estimates of hired labor dedicated to the maintenance of conservation practices, which were translated into an annual conservation labor cost. In the case study section of this report some farms were modeled with increased crop rotation diversity that also required hired labor in addition to household labor. Additional labor requirements for conservation were generally in the order of one to six man weeks per year. The cost of household labor was not included in the budget model.

---

[62] Conservation infrastructure such as terraces was assumed not to add significantly to land value for the purposes of this study.

Some producers incorporated perennials such as switch grass and brome grass into their enterprise mix as a component of their stewardship practices. This ground was often not enrolled in CRP since a portion of it often satisfied some of the resources of concern requirements for tier 3 eligibility, such as wildlife. Without the CRP rental rate payments this land incurred an opportunity cost of income forgone through cropping or grazing livestock. This opportunity cost was included in annual conservation costs as a difference in revenue from crops or livestock forgone less their respective maintenance costs.

4.4.8 Conservation Costs: Transition

It should be noted that the transition costs for recently acquired conservation practices assumed producers were already familiar with their application and required no further education and that yields were not adversely affected on pre-existing crops and livestock by their implementation. This also applies to the farm case studies where budget scenarios are modeled to include new crops and livestock.

4.4.9 Seed and Chemical Use

Not all information that interviewees provided was utilized in the budgets. Most notably seed, fertilizer (manure included) and pesticide use, which was in general freely discussed, was not included due to the wide variety of choices available to farmers. For simplicity and consistency county averages for quantity and cost information, available in the extension literature previously mentioned, were used to estimate these costs.

4.4.10 Results of Compensation Comparisons

Upon completing the budgets of interviewed producers, initial comparisons were made between CSP payment amounts and the corresponding costs of conservation. Table 4.4.10A provides a breakdown of the interviewed producers and how the three levels of CSP payment, first year, average annual and total contract amount compare to the corresponding annual and total costs of conservation. This study assumed compensation of total conservation costs by overall CSP contract amount to be the over-riding incentive for producers to enroll and adopt more stewardship practices. Measures of first year and average

annual payment compensation were also considered when evaluating program incentives, but as a complement to the total contract amount. Total conservation costs and CSP contract amounts for the 13 interviewed producers are provided graphically in Figure 4.4.10A. Total compensation levels calculated from these amounts are included in Figure 4.4.10B. It is important to note tier 1 producers were not be receiving compensation for the entire farm, hence the compensation measure for all CSP tiers incorporates conservation costs for CSP land only.

Table 4.4.10A - Estimated compensation of CSP payments: first year, average annual and total contract as percent of conservation costs.

Survey Region:	**West-Central**						**Northeast**					
Watershed:	**East Nishnabotna**			**North Raccoon**			**Upper Wapsipinicon**			**Turkey**		
Interviewed Producer:	CSP Annual **First Year**	CSP Annual **Average**	CSP **Total**	CSP Annual **First Year**	CSP Annual **Average**	CSP **Total**	CSP Annual **First Year**	CSP Annual **Average**	CSP **Total**	CSP Annual **First Year**	CSP Annual **Average**	CSP **Total**
Farmer 1	**86%**	**26%**	**32%**	233%	70%	213%	56%	34%	21%	**38%**	**23%**	**17%**
Farmer 2	74%	59%	65%	208%	62%	172%	37%	11%	24%	17%	10%	3%
Farmer 3				**293%**	**186%**	**205%**	**58%**	**18%**	**30%**	220%	132%	74%
Farmer 4				15%	9%	11%				194%	78%	59%

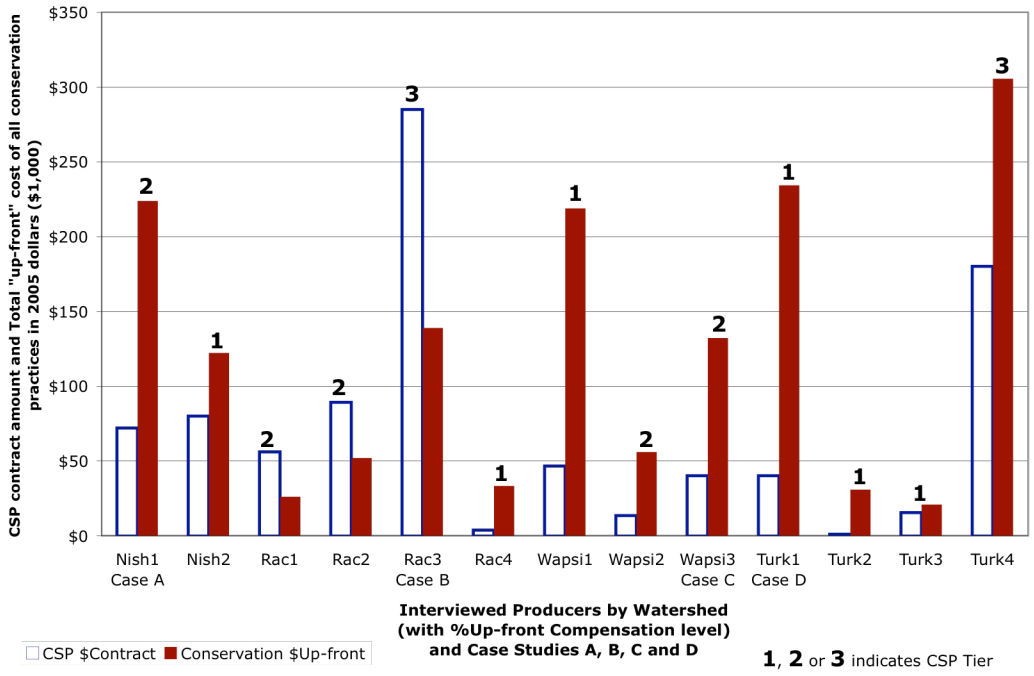


Figure 4.4.10A – Interviewed producers' estimated total conservation costs and total CSP contract amounts.

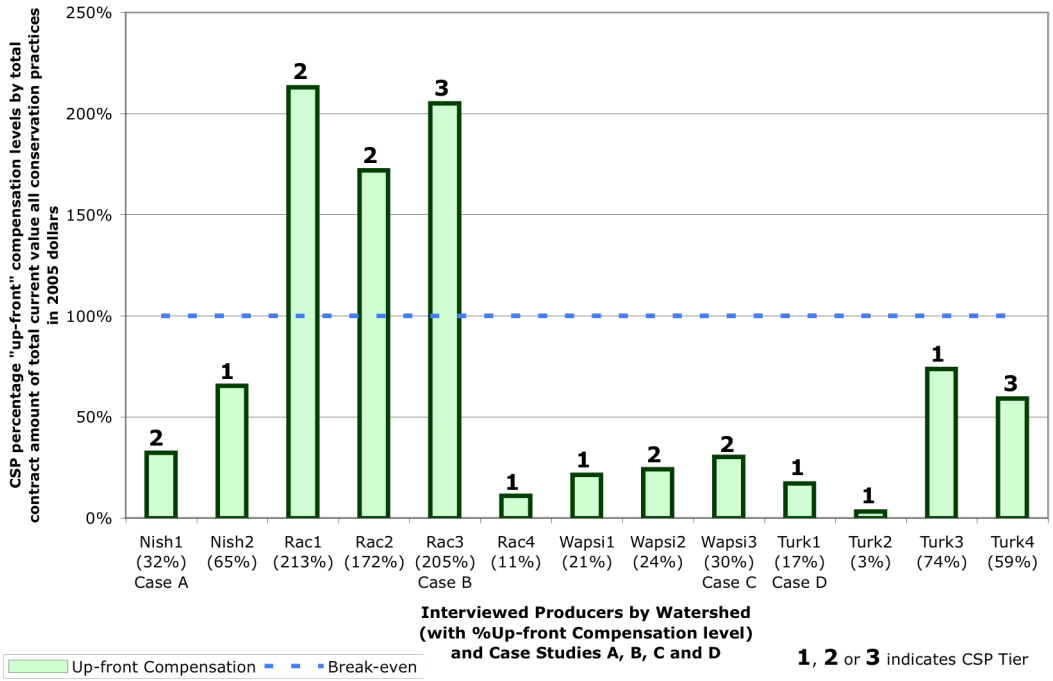


Figure 4.4.10B - Interviewed producers' estimated total compensation levels: ratio of total CSP contract amount to total conservation costs.

West-Central producers, those in the East Nishnabotna and North Raccoon watersheds were, on average, significantly better compensated than Northeastern farmers, those located in the Upper Wapsipinicon and Turkey watersheds. The West-Central producers averaged 116 percent total compensation compared to an average of 36 percent compensation for the Northeastern producers. This is a curious separation, perhaps largely due to the three North Raccoon watershed producers, Rac1, Rac2 and Rac3 that had exceptionally high total compensation levels with 213 percent, 172 percent and 205 percent respectively.

Five of the six West-Central operators (East Nishnabotna and North Raccoon watersheds) and three of the Northeastern operators (Upper Wapsipinicon and Turkey watersheds) obtained the majority of their revenue through corn and soybeans and/or confinement raised hogs (Nish1, Nish2, Rac2, Rac3, Rac4, Wapsi1, Wapsi2 and Turk1). The remaining five producers from both regions all had three or four crop rotations that typically included hay or a small grain or both, and four of them had pasture-based livestock enterprises. The fifth, Turk3, only recently quit pasture livestock production for health reasons. While there are obvious agronomic differences between the West-Central and Northeastern regions of the state and why producers may chose to farm differently in each region, if farmers were instead separated by these two types (cash grain/hogs and diversified), rather than by region, the compensation level was noticeably more balanced with the more diverse farmer averaging 80 percent for total compensation and the seven cash grain/hog farmers averaging 68 percent. Due to the small sample it was not possible to draw in depth conclusions from these numbers at a regional or farmer-type level.

The four North Raccoon watershed producers averaged 150 percent total compensation, a clear separation from the other watersheds. The two East Nishnabotna watershed producers had the next highest average level of total compensation at 49 percent. Once again, while this may imply a regional difference for North Raccoon producers, when all 13 interviewed producers were compared by tier as provided in Table 4.4.10B, the average compensation levels were consistent with tier of participation. The six tier 1 producers averaged 32 percent, the five tier 2 producers averaged 94 percent and the two tier 3 producers averaged 132 percent total compensation.

Table 4.4.10B – Interviewed producers budget model values by CSP tier for total compensation level by CSP contract amount of 2005 value for all conservation costs.

Watershed	Tier 1 (n=6)	Tier 2 (n=5)	Tier 3 (n=2)
East Nishnabotna	65%	32%	-
North Raccoon	11%	193%	205%
Upper Wapsipinicon	21%	27%	-
Turkey	31%	-	59%
AVERAGE	32%	94%	132%

Survey respondents' *perceptions* from the mail survey regarding costs of enrollment were also compared with interviewed producers first year payment compensation levels. Table 4.4.10C provides the distribution of respondent perceptions on enrollment cost compensation by tier. Perception of compensation tended to increase with tier, from 51 percent who perceived payments fully compensated or better for tier 1 respondents, to 54 percent for tier 2 respondents and 64 percent for tier 3 respondents. First year compensation levels for the 13 interviewed producers are provided in Table 4.4.10D. Of these, tier 1 producers were on average less than fully compensated at 70 percent for first year compensation level. Tier 2 and tier 3 producers were both on average overcompensated for the annual costs of conservation in the first year of payments with first year compensation levels of 124 percent and 244 percent respectively.

Table 4.4.10C – Distribution of CSP enrollee survey respondents by perception of compensation level on costs of enrollment.

Compensation Perception	Tier 1 (n=131)	Tier 2 (n=54)	Tier 3 (n=22)
More than compensates	14%	6%	14%
Fully Compensates	37%	48%	50%
Somewhat Compensates	44%	41%	27%
Not worth the time it took to enroll	6%	6%	9%
TOTAL	100%	100%	100%

Table 4.4.10D – Interviewed producers budget model values by CSP tier for compensation level by CSP first year payment of 2005 value for total conservation costs.

Watershed	Tier 1 (n=6)	Tier 2 (n=5)	Tier 3 (n=2)
East Nishnabotna	74%	86%	-
North Raccoon	15%	221%	293%
Upper Wapsipinicon	56%	47%	-
Turkey	92%	-	194%
AVERAGE	70%	124%	244%

It is also curious that first-year compensation levels for the North Raccoon producers contradict their perceptions of how well payments compensate for the costs of enrollment (Table 4.2.5C). This result was somewhat contradictory to the findings from the CSP Participation Level regression in Section 4.3.6, which suggested those who perceived overcompensation of enrollment costs were more likely to be enrolled in a lower tier than other compensation levels. It is important to note that the sample included in the CSP Participation Level regression was smaller (n=132) than the comparison in Table 4.4.10C (n=207). Table 4.4.10C also only compares the simple effects of Compensation level against CSP Tier i.e. without other influencing variables being accounted for.

Results from the mail survey regarding perceptions of compensation and the farm budget model's analysis of first year compensation levels suggested that the compensation level of enrollment costs or equivalently, the compensation of conservation costs in the first year of enrollment, increases with tier. Results from the CSP Participation Level regression regarding perceptions of compensation and tier of enrollment were less conclusive and suggested the influence of other factors such as respondents' feelings about program payment rates should not be overlooked.

4.4.11 CSP and Commodity Payments

The four case studies in the next section of this report endeavor to isolate the CSP incentive level for each farm, but it is somewhat naïve to do so without at least acknowledging the unbalanced nature of CSP and commodity program payment levels.

Commodity programs account for over a half a billion dollars of Iowa farm income, with most going to corn and soybean farms[63]. Iowa receives, on average, about eight percent of the federal total commodity program payments[64]. The total CSP payment for the state was a little under $12 million in 2005 for enrolled producers (see Table 2.2B), making the commodity payment more than 80 times higher than CSP payments received by Iowa farmers.

Commodity programs provide a strong incentive, with protection from low prices, to maximize the production of corn and soybeans in a two-crop rotation, or in lay terms "grow as much as one can." It is possible with commodity programs that lower county corn prices can sometimes mean a better financial reward. Yet for many farms in Iowa to produce "as much as one can" means crossing a line where the risk of environmental damage via leaching excess nutrients or losing soil, increases exponentially (Sagoff, 1995).

Since the CSP is a working lands program, producers can receive the CSP with no penalty to their commodity programs other than the limits they impose on their own production. While it should be noted most of the farmers interviewed seem less concerned with yield than with long-term profitability, many were producing at or below county average level of production, there does seem to be a clear case of mixed messages from the USDA with regards to priorities for (Iowa) farmers. As figures 4.4.11A and 4.4.11B show, the interviewed farmers enrolled in CSP were estimated to be annually receiving anywhere as little as one-hundredth to two-thirds as much in average annual CSP payments as they were in commodity payments, averaging about one-fifth as much in CSP payments as they were from commodity payments.

For the 13 interviewed producers, CSP payments consistently provided a smaller relative incentive when compared to the commodity programs. While there is likely an optimum balance between production and conservation, for these 13 producers there seemed to be stewardship incentives other than what is provided by CSP payments.

---

[63] Iowa received $538,896 in commodity payments in 2002 (Source: Census of Agriculture)

[64] Total commodity payments for the US in 2002 was $6,545,678 (Source: Census of Agriculture)

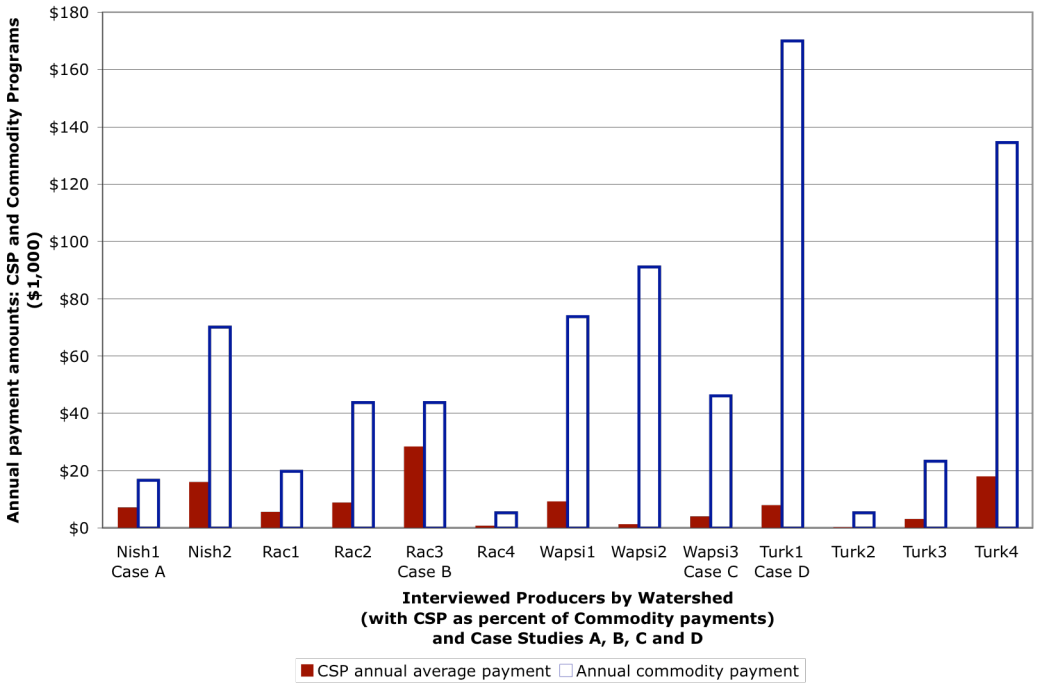


Figure 4.4.11A – Estimated average annual CSP payments and estimated commodity payments for interviewed producers.

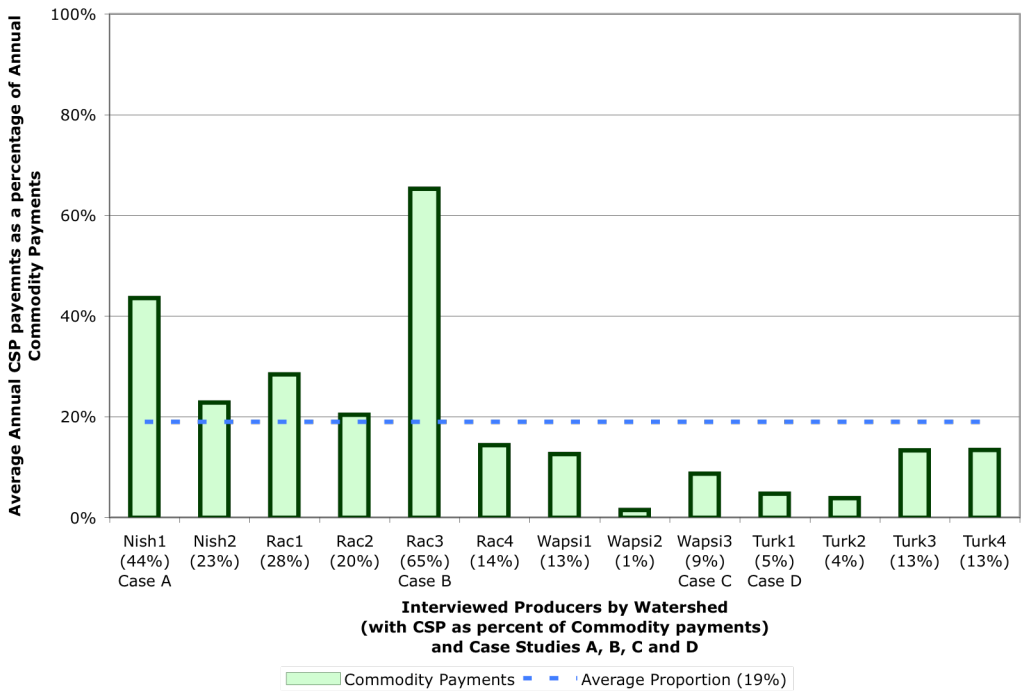


Figure 4.4.11B – Estimated average annual CSP payments as a percentage of estimated commodity payments for interviewed producers.

Indeed most of the interviewed producers indicated they were willing to sacrifice a certain percentage of their potential yield for conservation purposes, which probably meant lower commodity payments. This did not necessarily mean less profit (see Case Study B, Section 4.5.2).

The existence of stewardship incentives beyond what is provided by conservation program payments was supported by interviews with all 13 producers who perceived themselves as being "rewarded" by the CSP. All 13 described most of their stewardship activity as practices that, in the vast majority of instances, they would have implemented irrespective of payment. Closer examination of their conservation spending was consistent with this, as all 13 had paid off the majority of their conservation practices well before the CSP was even implemented.

4.4.12 Conclusions from the Farm Budget Model

An initial examination of the 13 interviewed producers' total compensation levels suggests that there was potentially a regional benefit for North Raccoon producers, with total compensation levels well above 100 percent. Examining total compensation levels by farm type suggests that the five producers who were diversified beyond corn, soybeans and confinement hog operations were slightly better compensated, averaging 80 percent total compensation, while the seven cash grain and confinement hog operators averaged 68 percent total compensation. To confirm if these trends apply more generally to the greater population of Iowa producers enrolled in the CSP would require budget examinations of a sample larger than the 13 producers included in this study.

First year compensation levels of interviewed producers and survey respondents perceptions of enrollment cost compensation were found to be relatively equivalent. First year compensation levels and compensation perception levels were both found to increase with tier of enrollment.

If CSP is to "attract the rest," the larger group of farmers who would spend more on conservation if provided with sufficient financial incentive, as well as continue rewarding "the best," there is clearly a question of how likely this is to be achieved with the CSP's

conservation incentives competing with production incentives from commodity programs. Based on producers' responses to surveys and the statistical analysis, the answer is most likely a combination of less competition for CSP in terms of incentives from commodity programs combined with the incorporation of a comprehensive risk management strategy into the payments structure. Such a strategy could be designed with the goal of easing transition from a two-crop system heavily dependent on production levels and price protection into a more diversified enterprise mix that can both absorb price shocks and promote conservation of natural resources.

4.5 Four Case Studies

Of the 13 CSP producers interviewed, four were selected, one from each watershed, to provide a more detailed picture of how CSP payments, conservation spending and revenue sources impact the farm budget analysis. The case studies were chosen to be representative of the larger sample of 13 but also to highlight the full spectrum of conservation approaches and program participation.

Each case study was designed assuming that the payments each operator is currently receiving were providing some incentive for stewardship, and if an incentive were to be increased proportionate to desired improvements in conservation, the operator would adjust conservation efforts to match the incentive. Incentives are by nature imperfect and rarely linear but the benefit of this approach was to give a sense of CSP contract increases that may be needed to encourage producers already enrolled to adopt higher standards of conservation as well as attract those not yet enrolled into signing up for the program.

The mechanism for measuring the baseline incentive being provided by a CSP contract was the calculation of the *total level of compensation level* as described in Section 4.4.2. For each of the four case studies this compensation level was applied to the total conservation cost of three or four "scenarios" that simulate enterprise mix changes on the farm, each supporting alternative levels of conservation. By calculating change in the CSP total contract amount required to maintain total compensation level for each scenario, an estimate of the proportionate increase (or decrease) in total CSP contract amount was

possible. Additionally, the resulting annual incentive levels, *average annual compensation* and *first year compensation* by annual CSP payments could be compared to the baseline case.

For example: If a case farm currently has a 10 year CSP contract for $100,000 and current total costs of conservation in 2005 dollars are $200,000 then the baseline "incentive" or total compensation level = $100,000/$200,000 = 50%. If a scenario is modeled which increases crop rotation diversity on the farm, raising total costs of conservation to $300,000, maintaining a 50 percent total compensation level for this scenario would require a total CSP contract increase to $300,000 * 50 percent = $150,000.

Also: Annual conservation costs will also change, usually disproportionately to the change in total cost, but from this scenario's new CSP contract amount the average and maximum annual CSP payments can be calculated: $150,000/3 = $50,000 for the new maximum annual or first year payment and $150,000/10 = $15,000 for the new average annual. From both of these payment amounts new annual "incentives" or compensation levels can be calculated and compared to the baseline annual compensation levels.

The case studies were chosen to demonstrate farms that were not only of different size and CSP tier, but also farms that utilized different techniques for conservation and were at differing levels of diversity. The resulting scenarios demonstrate under what conditions the CSP acts as a "reward" and under what conditions it "attracts," and the potential costs of increasing attraction to the program without hurting payment rewards for proven stewards.

4.5.1 Case Study A: Farmer 1, East Nishnabotna Watershed

Farmer 1 from the East Nishnabotna watershed (Nish1) had a 1020-acre corn and soybean cash grain farm, with the operator's spouse working off-farm. Nish1 had enrolled during the 2004 sign-up as a tier 1 producer but had graduated to a 10-year $72,000 tier 2 contract by the time of the interview (fall of 2006) and was expecting to upgrade to a tier 3 contract in 2007 due to the most recent contract review. In terms of conservation, the key difference for Nish1 from other interviewees was the primary stewardship practice, being land retirement buffers and use of CRP land. Nish1 had 370 acres or 36 percent out of a total

of 1020 acres enrolled in either CRP or switch-grass buffer strips. While the CRP acreage was not eligible for the CSP, this represented the largest proportion of farmland in retirement for any of the producers interviewed.

Table 4.5.1A – Farmer 1, East Nishnabotna watershed. 2005 revenue budget.

CASE STUDY A: Farmer 1 – East Nishnabotna Watershed Farm Revenue					
CROPS					
	Corn	**Soybeans**	**Buffer**	**CRP**	**Total**
Acreages	325	325	155	215	1020
Owned	325	325	155	215	1020
Rented	0	0	0	0	0
YIELDS					
2005	n/a	n/a	-		
5 year average	168	49	-		
$ per bushel	$1.58	$5.38	-		
REVENUE					
Revenue	$86,268	$85,677	-	$25,454	$197,399
Revenue per acre	$265	$264	-	$118	$194
Government Programs					$24,691
Insurance					$619
				Totals	
	10 years			First Year	Average
CSP	$72,000			$24,000	$7,200
CSP per acre	$83			$28	$8
GROSS ANNUAL REVENUE				**$246,709**	**$229,909**
Annual Revenue per acre				$285	$266
CSP Payment as percent of Annual Revenue				10%	3%

Table 4.5.1A details Nish1's revenue including crops, commodity programs, CRP and CSP payments. Relative to other producers interviewed, Nish1's CSP average annual payments of $7,200 were a high proportion of annual revenue of $229,909, at 3 percent. Nish1 stressed that CSP payments had worked well in combination with CRP payments to offset the opportunity cost of crop income forgone. It also meant a more profitable operation, since land that had proven hard on equipment was no longer tilled. Also planting and harvesting were completed more efficiently.

It is worth noting that if Nish1's CRP contract were being funded at the full county rental rate for corn and soybean ground, payments from CRP payments were roughly equivalent with the likely first year CSP payment and around three times higher than the average annual CSP payment. This means CRP payments were potentially paying between four and 15 times as much per acre. The likely impacts on conservation incentives as a result of this disparity will be explored further in the farm scenario models for this case study.

Table 4.5.1B details Nish1's conservation spending and how CSP payments compensated at the three different levels, first year, average annual and the total contract amount. Total cost of installing all conservation practices in 2005 was $224,005 with annual costs of $27,437 including $6,222 of opportunity cost on income forgone for the 115 acres of buffer ground, as well as taxes, interest, insurance and labor. Nish1's CSP contract was approximately 32 percent compensation of total conservation costs. Annually this represents 88 percent compensation for a first year payment and 26 percent compensation from an average annual payment.

Table 4.5.1C outlines the predicted results from Nish1's operation subjected to three alternative crop and livestock mix scenarios. In Nish1's case, apart from the large fraction of acreage that was in set aside, the operation was reasonably conventional. Given this, two of the scenarios developed for this farm incorporated more diversity in the enterprise mix while the third scenario examined less diversity with reduced acreage in set-aside and buffer ground.

Table 4.5.1B – Farmer 1, East Nishnabotna watershed. 2005 conservation budget.

CASE STUDY A: Farmer 1 – East Nishnabotna Watershed Conservation Cost Compensation		
MACHINERY and BUILDINGS		
Cost is proportion of total item cost attributable to conservation practices.	**Annual Cost**	**Total 2005 Value**
Machinery	$1,382	$17,250
Buildings	$68	$15,000
Total	**$1,450**	**$47,250**
CONSERVATION PRACTICES		
Terraces	$3,000	$89,026
Shaped Waterways	$3,600	$37,479
Contour Cropping	$339	$6,525
No/Reduced Tillage	$1,628	$1,625
Filter Strips	$124	$2,100
Waterway Buffer	$4,360	$40,000
Total	**$13,051**	**$176,755**
Opportunity Cost of Buffer Ground	$6,222	
Combined Cost (Equipment, Buildings and Conservation Practices)	**$19,273**	
Insurance and Taxes (1.5%) and Interest (3.5% over depreciation period)	$5,114	
SUB-TOTAL	**$25,837**	
Labor for Conservation Practices	$1,600	
TOTAL CONSERVATION COST	**$27,437**	**$224,005**
per acre	**$27**	**$220**
CSP COMPENSATION		
First Year annual compensation level	88%	32%
Average annual compensation level	26%	

Table 4.5.1C – Farmer 1, East Nishnabotna watershed. Enterprise mix scenarios evaluated.

CASE STUDY A: Farmer 1 – East Nishnabotna Watershed Scenarios				
ACREAGES	**Baseline**	**Reduced CRP**	**Increased Crop Rotation**	**Increased Crop Rotation plus Livestock**
Corn	325	500	265	265
Soybeans	325	500	265	265
Alfalfa/Hay	-	-	225	145
Small Grain	-	-	150	150
Buffer	155	10	15	15
CRP	215	10	115	115
Pasture	-	-	-	80 (40 Cows)
Total	1020	1020	1020	1020
CSP		-29%	+116%	+140%
Tier 2 Contract	$72,000	$58,128	$155,265	$172,485
First Year	$24,000	$19,376	$45,000	$45,000
Average Annual	$7,200	$5,813	$15,526	$17,249
CONSERVATION COSTS				
Total Annual	$27,437	$18,222	$88,166	$84,527
Total	$224,005	$181,447	$483,691	$537,337
CSP COMPENSATION				
First Year: %Annual	86%	103%	51%	53%
Average: %Annual	26%	31%	18%	20%
Contract: %Total	32%	(32%)	(32%)	(32%)

As discussed in Section 4.5 "Farm Budget Case Studies," the farm scenarios were modeled by maintaining the same constant total compensation level of all conservation costs as the baseline case. In the case of Nish1 the baseline $72,000 contract compensated for 32 percent of the 2005 value of all conservation costs. Maximum or first year and annual average payment amounts for each scenario were calculated as before (one-third of contract

total for maximum first year payment and total divided by contract length for average annual payment) and were displayed in Figure 4.5.1A. The respective compensation rates for annual payments were then compared to the baseline scenario as shown in Figure 4.5.1B

For Nish1's first scenario, the majority of the CRP and buffer land was returned to producing corn and soybeans. To maintain the 32 percent of current value compensation rate, the CSP contract total was reduced by 29 percent or to $58,128. Annual compensation rates improved slightly: from 86 to 103 percent for first year payment and from 26 to 31 percent for average annual payment.

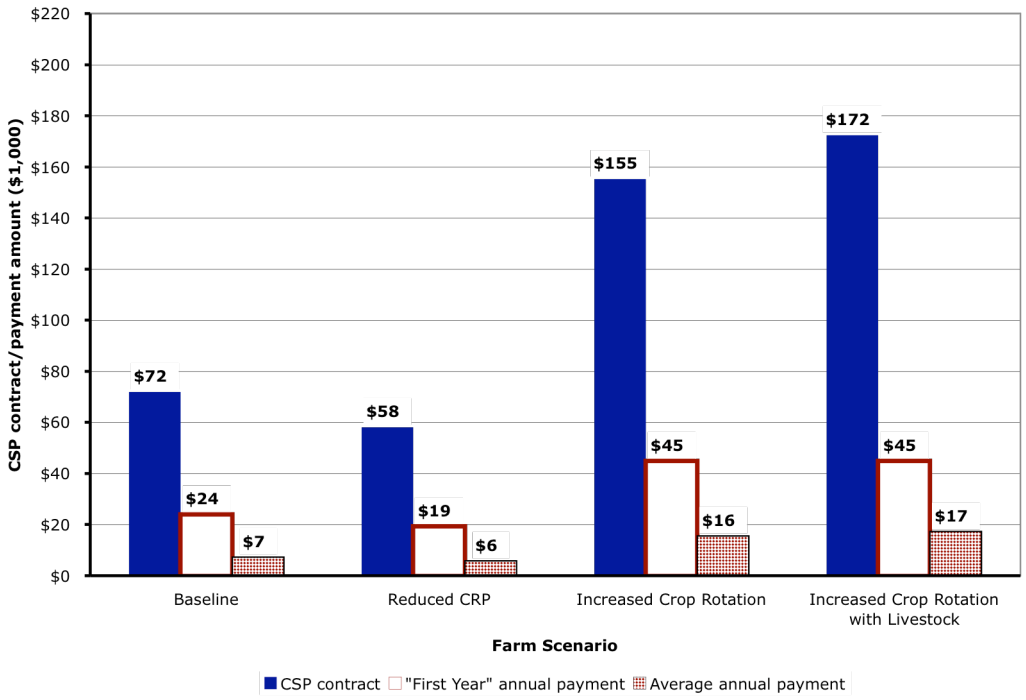


Figure 4.5.1A – Farmer 1, East Nishnabotna watershed. Scenario effects on CSP contract with total compensation level fixed at the baseline condition of 32 percent.

The second and third scenarios modeled increases in rotation diversity. The second scenario added haying and a small grain while retaining 115 acres in CRP and 15 acres as buffer land, while for the third scenario pasture livestock replaced some cropping and set-aside land. Both of these scenarios incurred higher total and annual conservation costs. The second scenario resulted in a CSP contract increase of 116 percent to $155,265 to maintain

the 32 percent total compensation level. Annual remuneration slipped to 51 percent for first year and 18 percent for average annual.

For the third scenario, with increased crop rotation and livestock, the CSP contract increased to 140 percent or to $172,485 with annual payments achieving the slightly improved 53 percent compensation for first year and 20 percent for average annual. In spite of the slight improvement in annual incentives by adding pastured livestock, compensation levels were still lower for the increased rotation scenarios than the less diverse baseline case and first scenario.

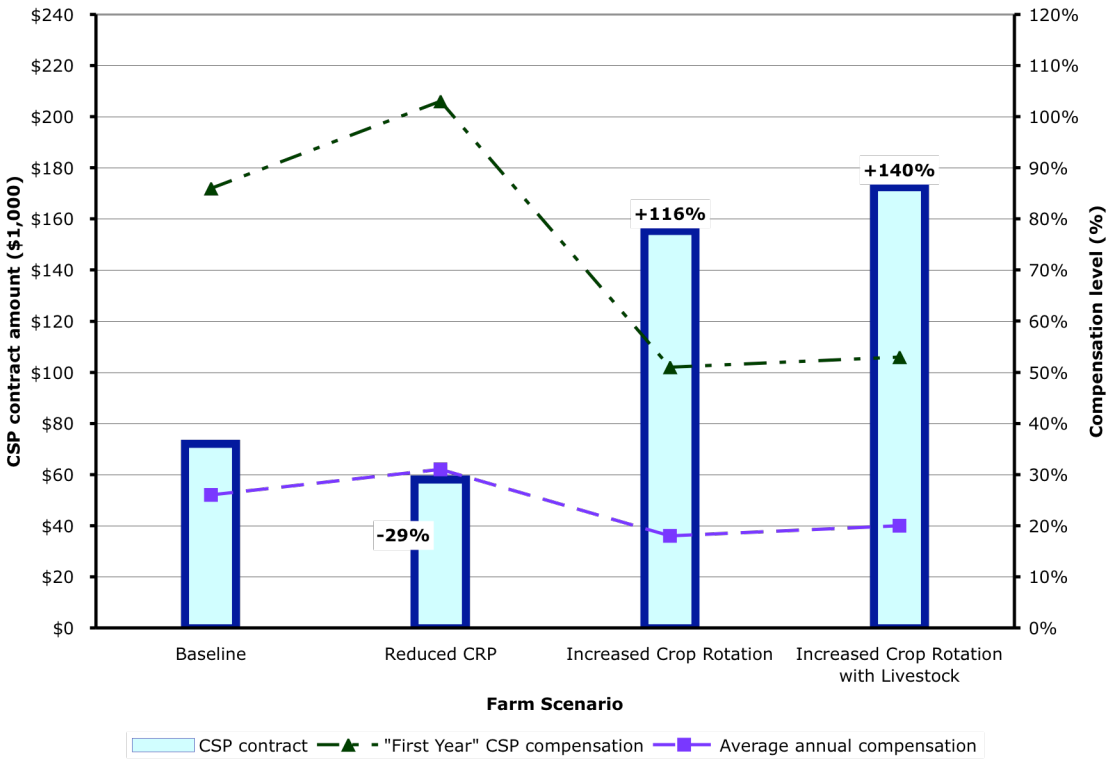


Figure 4.5.1B – Farmer 1, East Nishnabotna watershed. Total CSP contract and annual compensation level changes for farm scenarios.

In focusing on Nish1's CSP incentives, the second scenario with the two-crop system currently in place and reduced set-aside proved optimal. There are some intangibles that were not accounted for in the model, such as a reduction in insurance spending for the baseline case since planting and harvesting was over less area and was likely to have been completed more efficiently. Without the need to acquire new agronomic or husbandry skills and a desire

to reduce work-time and increase buffer protection, the baseline scenario was clearly optimal for Nish1 and may be for other producers. Even so the large difference in payment rates between a CRP contract for this ground and CSP practice payments suggests most producers would be better placed pursuing a CRP contract if this is their primary stewardship approach. Considering we are now entering a period of higher corn and soybean prices with opportunity costs of set-aside land increasing, the incentives to increase land retirement acres with either the CSP or CRP will likely continue to decrease.

4.5.2 Case Study B: Farmer 3, North Raccoon Watershed

Farmer 3 from the North Raccoon watershed (Rac3) operated a cash grain corn and soybean farm of 1250 acres. Rac3 had a 10-year tier 3 CSP contract worth $285,000. While not an unusually large farm for the area, it was above average for the state in acreage and Rac3 was not restricted by needing to rent land, inheriting not only conservation based practices but also much of its infrastructure such as terraces and grassed waterways with the farm from the previous generation. The primary stewardship practices for Rac3 were no-till soybeans and nutrient management that included a history of on-farm research in reduced nitrogen application working with university extension. Rac3 was a strong advocate for conservation tillage methods and was heavily involved in assisting other producers with its adoption.

Rac3's budgeted revenue is provided in Table 4.5.2A. Relative to other producers, Rac3's annual CSP payments were the highest proportion of annual revenue, with average annual payments of $28,500 accounting for 8 percent of $377,179 annual revenue.

Rac3 emphasized a long and strong relationship with local NRCS personnel, and how they were due much of the credit for assisting with sign-ups and preparing the farm for CSP enrollment. Rac3 also stressed that the major business concern for the farm operation was profit rather than yield. Rac3 had experienced reductions in machinery use with the adoption of practices such as no-till. Spring side dressing of nitrogen had resulted in only small reductions in yield and a healthier bottom line.

Table 4.5.2A - Farmer 3, North Raccoon watershed. 2005 revenue budget.

CASE STUDY B: Farmer 3 – North Raccoon Watershed Farm Revenue				
CROPS				
	Corn	**Soybeans**	**Buffer**	**Total**
Acreages	620	620	10	1250
Owned	620	620	10	1250
Rented	0	0	0	0
YIELDS				
2005	n/a	n/a		
5 year average	158	45		
$ per bushel	$1.58	$5.38		
REVENUE				
Revenue	$155,631	$148,308	-	$303,939
Revenue per acre	$251	$239	-	$243
Government Programs				$43,646
Insurance				$1,094
	Tier 3		**Totals**	
	10 years		First Year	Average
CSP	$285,000		$45,000	$28,500
CSP per acre	$228		$36	$23
GROSS ANNUAL REVENUE			**$393,679**	**$377,179**
Annual Revenue per acre			$315	$302
CSP Payment as percent of Annual Revenue			11%	8%

Rac3's conservation budget is outlined in Table 4.5.2B. Annual conservation cost was $15,362 including $861 of opportunity cost for income forgone on 10 acres of buffer ground as well as taxes, interest, insurance and labor. Total cost of all conservation practices was $139,054 and with the majority of these practices paid off, CSP contract compensation levels were high. Total contract compensation was 205 percent of all conservation costs.

Table 4.5.2B - Farmer 3, North Raccoon watershed. 2005 conservation budget.

CASE STUDY B: Farmer 3 – North Raccoon Watershed Conservation Cost Compensation		
EXISTING		
Cost is proportion of total item cost attributable to conservation practices.	**Annual Cost**	**Total 2005 Value**
Machinery	$176	$53,250
Buildings	$14	$3,000
Total	**$189**	**$56,250**
CONSERVATION		
Terraces	$2,000	$14,163
Shaped Waterways	$600	$6,017
Conservation Cover	$40	$1,200
No/Reduced Tillage	$3,125	$3,125
Field Borders	$625	$12,500
Filter Strips	$805	$15,800
Ponds	$1,275	$30,000
Total	**$8,469**	**$82,804**
Opportunity Cost of Buffer Ground	$861	
Combined Cost (Equipment, Buildings and Conservation Practices)	**$9,520**	
Insurance and Taxes (1.5%) and Interest (3.5% over depreciation period)	$4,642	
SUB-TOTAL	**$14,162**	
Labor for Conservation Practices	$1,200	
TOTAL CONSERVATION COST	**$15,362**	**$139,054**
per acre	**$12**	**$111**
CSP COMPENSATION		
First Year annual compensation level	293%	205%
Average annual compensation level	186%	

First year CSP payment compensation was 293 percent of annual conservation cost, while average annual payment was at 186 percent of annual conservation cost.

Detail for Rac3's alternative farm scenarios are included in Table 4.5.2C. The first farm scenario transferred 400 acres of cropland into 150 acres of buffer and 250 acres of CRP which saw a 41 percent increase in CSP contract amount to $401,912 for maintaining 205 percent total compensation on all conservation costs. First year annual payment compensation of annual conservation costs dropped from 293 to 145 percent while average annual compensation increased from 186 to 130 percent.

The second and third scenarios, with increased rotation and increased rotation with livestock scenarios respectively, had results similar to Nish1. To remain at 205 percent total compensation, the increased rotation scenario saw CSP contract amounts increase 235 percent to $953,349. The increased rotation with pasture livestock raised the CSP contract amount 306 percent to $1,156,429.

Annual compensation levels for these two scenarios also followed a similar pattern to Nish1, with a noticeable loss in first year and average annual compensation levels. The second scenario resulted in 88 percent compensation for both first year and average annual payments. Likewise the third scenario, with some small benefit from including livestock, resulted in 111 percent compensation for both first year and average annual payments.

This lack of separation between first year and average annual compensation for the last two scenarios was due to maximum payment limits being exceeded. For both scenarios to maintain the 205 percent total compensation level required CSP contracts in the region of $1 million. This would mean annual payments in the order of $100,000 that is well in excess of the $45,000 annual payment cap for tier 3 enrollees.

Figure 4.5.2A displays the CSP contract amount changes for Rac3 as a result of the scenario adjustments to enterprise mix for conservation improvements. Annual compensation level shifts from the farm scenarios displayed in Figure 4.5.2B is noticeably similar to that of Nish1's scenarios. The second scenario for Rac3 included an increase in set-aside and buffer ground and was somewhat similar to Nish1's baseline condition. Similar to Nish1 this enterprise mix appeared somewhat sub-optimum for Rac3 and the current enterprise mix

appears to have provided the best compensation levels and was more affordable for the taxpayer. It is worth noting though that the third scenario with the diversified crop rotation and pasture-raised livestock offered in excess of 100 percent cost-share with 205 percent total compensation level maintained.

Table 4.5.2C – Farmer 3, North Raccoon. Crop and livestock mix scenarios evaluated.

CASE STUDY B: Farmer 3 – North Raccoon Watershed Scenarios				
ACREAGES	**Baseline**	**Increased Buffer/Fallow**	**Increased Crop Rotation**	**Increased Crop Rotation plus Livestock**
Corn	620	425	325	325
Soybeans	620	425	275	275
Alfalfa/Hay	-	-	300	200
Small Grain	-	-	200	150
Buffer/Fallow	10	150	150	150
CRP	-	250	-	-
Pasture	-	-	-	150 (60 Cows)
Total	1250	1250	1250	1250
CSP		+41%	+233%	+305%
Tier 3 (10 yr) Contract	$285,000	$401,912	$949,761	$1,152,841
First Year	$45,000	$45,000	$94,976†	$115,284†
Average Annual	$28,500	$40,191	$94,976†	$115,284†
CONSERVATION COSTS				
Total Annual	$15,362	$31,123	$108,375	$103,726
Total	$139,054	$196,054	$463,298	$562,362
CSP COMPENSATION				
First Year: %Annual	293%	145%	88%	111%
Average: %Annual	186%	130%	88%	111%
Contract: %Total	205%	(205%)	(205%)	(205%)

† Estimate only. Exceeds annual payment cap of $45,000 per year.

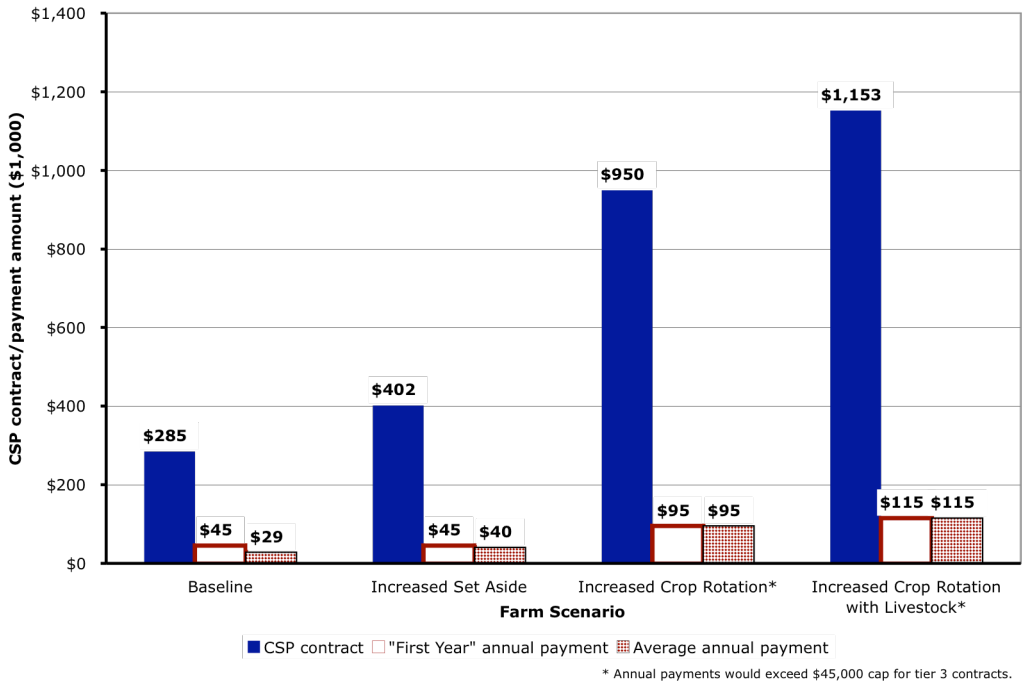


Figure 4.5.2A – Farmer 3, North Raccoon watershed. Scenario effects on CSP contract with total compensation level fixed at the baseline condition of 205 percent.

Rac1 and Nish1 are both historically cash grain farmers. Even if they might want to diversify their operation into additional crops and livestock they knowingly lack the experience and knowledge to do so without incurring significant costs from transition. The incorporation of retired land into their enterprise mix potentially represents a compromise in risk management between their current rotation and increased diversity since it ensures payment without a large total cost and also reduces maintenance costs on the farm. This allows for more efficient planting and harvesting which in turn gives more room for error during the more unpredictable spring and fall phases of the production season.

It is also likely that for the first scenario, with increased set-aside, if more land were enrolled in CRP than left to be covered by the CSP, compensation levels would be higher. This suggests that if Rac3 were to pursue a land retirement strategy similar to that of Nish1, the CRP program would be a more rewarding avenue for increased conservation.

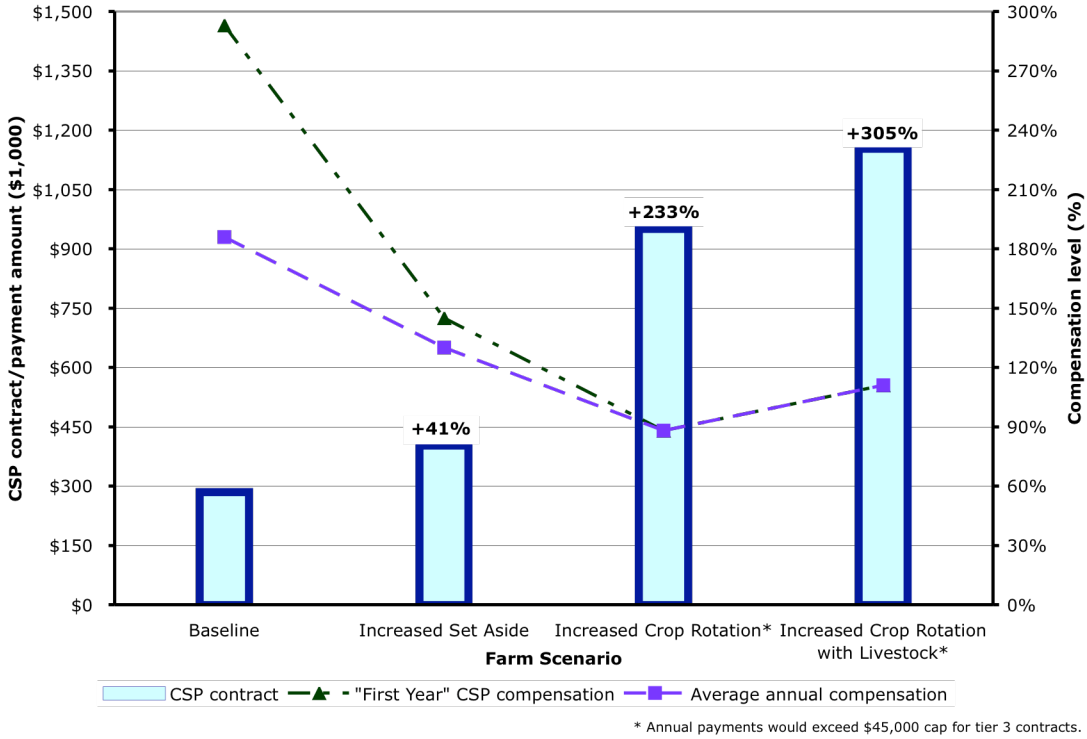


Figure 4.5.2B – Farmer 3, North Raccoon watershed. Total CSP contract and annual compensation level changes for farm scenarios.

4.5.3 Case Study C: Farmer 3, Upper Wapsipinicon Watershed

Farmer 3 from the Upper Wapsipinicon watershed (Wapsi3) operates a 360 acre organically certified farm and farm operation, making Wapsi3 unique in this capacity among the 13 interviewed producers. Wapsi3 had a 10-year tier 2 CSP contract worth $40,000 total. Wapsi3's conservation philosophy was grounded in the four-crop rotation required for organic certification: corn, soybeans, alfalfa/hay and a small grain (barley) as well as organic pasture-based livestock. Additionally no pesticides were used and the hog manure from the organic hog operation was applied to soil without any additional synthetic fertilizer. Wapsi3 was also a skeptic of no-till, arguing it does little to improve "soil aggregate structure", soil particles that aren't immediately soluble in water, advocating instead that pasture with grazed livestock or a perennial nitrogen fixing crop such as alfalfa, in combination with spring moldboard ploughing and ridge-till is essential for establishing organic matter and soil structure.

Table 4.5.3A – Farmer 3, Upper Wapsipinicon. 2005 revenue budget.

CASE STUDY C: Farmer 3 (Organic) – Upper Wapsipinicon Watershed Farm Revenue							
CROPS							
	Corn	**Soybeans**	**Alfalfa/Hay**	**Barley**	**Pasture**	**Buffer**	**Total**
Acreages	72	68	75	53	70 (120 sows)	22	360
Owned	30	25	75	53	70	22	275
Rented	42	43	0	0	0	0	85
YIELDS	bu/ac	bu/ac	t/ac	bu/ac	hogs (cwt)		
2005	186	36	3.8	65	n/a		
5 year average	137	35	3.6	60	2500		
$ per unit*	$5.45	$18.00	$90.00	$5.00	$46		
REVENUE							
Revenue	$72,986	$44,064	$25,650	$17,225	$114,827	-	$320,186
Revenue per acre	$1,014	$648	$342	$325	$1,640	-	$889
Government Programs							$45,979
Insurance							$1,153
	Tier 2						
	10 years					First Year	Average
CSP	$40,000					$13,334	$4,000
CSP per acre	$111					$37	$11
GROSS ANNUAL REVENUE						**$380,650**	**$371,317**
Annual Revenue per acre						$1,057	$1,011
CSP Payment as percent of Annual Revenue						4%	1%

*Regarding Organic prices: all crops were taken from relevant Organic Price Exchange (OPX) listings for Minneapolis (the closest OPX to Wapsi3's farm), except for Alfalfa/Hay which was taken from ISU extension organic farming budgets. Hog price also from ISU extension: Farm Costs and Returns for "partial confinement farrow-to-finish".

Wapsi3's revenue budget is outlined in Table 4.5.3A. While the farm size was one of the smallest of all interviewees at 360 acres, it grossed $1,011 per acre, which was high for all the interviewed producers that together averaged $732 per acre. This was partly due to organic price premiums that normally offset the higher operating costs typical for organic operations, but was also due to the integration of livestock into the farm operation; producers without livestock on their CSP acres averaged only $314 per acre revenue. Farmer 1 of the North Raccoon watershed (Rac1)[65], a non-organic farmer, had a farm of similar size with a 3 crop rotation plus pasture and achieved a similar boost in revenue per acre, with $563 per acre gross revenue, by grazing beef cattle. CSP payments for Wapsi3 were equivalent in their proportion of total revenue to other interviewees, at around 1 percent for the average annual payment.Wapsi3's conservation budget is provided in Table 4.5.3B. Despite a history of heavy investment in conservation on the farm, Wapsi3 had only achieved tier 2 status, and was prevented from achieving tier 3 status due to some issues involving livestock's proximity to waterways. Wapsi3 successfully resolved these issues in time for the farm's 2006 annual contract review and was graduating to tier 3 for the 2007 growing season.

The total cost of installing all conservation practices on the farm in 2005 dollars was $132,341 with annual costs for conservation totaling $22,849 including $1,207 of opportunity cost for income forgone on the 22 acres of buffer ground as well as taxes, interest, insurance and labor. Compensation levels for CSP payments were at 30 percent of total conservation costs, with 58 percent of annual conservation costs compensated by a first year CSP payment and 18 percent of annual conservation costs covered by average annual CSP payments.

Since Wapsi3's operation included both a four-crop rotation and pasture livestock it lent itself well to a comparison of CSP contracts and compensation rates with operations of lesser diversity. Farm scenarios for Wapsi3 are outlined in Table 4.5.3C with the total compensation rate of 30 percent applied to test for effects on CSP contract amount and annual conservation levels.

---

[65] No case study analysis was done on Rac1.

Table 4.5.3B - Farmer 3, Upper Wapsipinicon watershed. 2005 Conservation Budget

CASE STUDY C: Farmer 3 (Organic) – Upper Wapsipinicon Watershed Conservation Cost Compensation		
EXISTING		
Cost is proportion of total item cost attributable to conservation practices.	**Annual Cost**	**Total 2005 Value**
Machinery	$4,670	$79,750
Buildings	$656	$34,500
Total	**$5,326**	**$114,250**
CONSERVATION		
Shaped Waterways	$480	$4,997
Manure Nutrient Management	$1,501	$1,500
Shelterbelt Establishment	$171	$3,000
Wildlife Habitat Management	$278	$4,400
Conservation Crop Rotation	$594	$594
Conservation Cover	$137	$3,600
Total	**$3,160**	**$18,091**
Opportunity Cost of Buffer Ground	$1,207	
Combined Cost (Equipment, Buildings and Conservation Practices)	**$9,693**	
Insurance and Taxes (1.5%) and Interest (3.5% over depreciation period)	$11,156	
SUB-TOTAL	**$20,849**	
Labor for Conservation Practices	$2,000	
TOTAL CONSERVATION COST	**$22,849**	**$132,341**
per acre	**$63**	**$368**
CSP COMPENSATION		
First Year annual compensation level	58%	30%
Average annual compensation level	18%	

Table 4.5.3C – Farmer 3, Upper Wapsipinicon watershed. Enterprise mix scenarios evaluated.

ACREAGES	Baseline (All Organic)	Baseline as Conventional	Conventional Cash Grains	Conventional Cash Grains plus Livestock	Organic Cash Grains
Corn	72	72	172	172	107
Soybeans	68	68	171	166	103
Alfalfa/Hay	75	75	-	-	75
Small Grain	53	53	-	-	53
Buffer	22	22	17	17	22
Pasture	70 (120 sows)	70 (120 sows)	-	5 (120 confined sows)	-
Total	360	360	360	360	360
CSP		+0%	-67%	-46%	-13%
Tier 2 (10 yr) Contract	$40,000	$40,000	$13,257	$21,411	$34,649
First Year	$13,334	$13,334	$4,419	$7,137	$11,565
Average Annual	$4,000	$4,000	$1,326	$2,141	$3,469
CONSERVATION COSTS					
Total Annual	$22,849	$22,049	$15,308	$17,451	$19,156
Total	$132,341	$132,341	$43,897	$70,897	$114,881
CSP COMPENSATION					
First Year: %Annual	58%	61%	29%	41%	57%
Average: %Annual	18%	18%	9%	12%	17%
Contract: %Total	30%	(30%)	(30%)	(30%)	(30%)

The first scenario, the baseline enterprise mix without organic certification, attracted the same CSP contract as the baseline case of $40,000. First year annual compensation level was slightly higher, due to the lower conservation maintenance costs, at 61 versus 58 percent, while the average annual compensation rate was unchanged at 19 percent.

The second scenario, a more traditional corn and soybeans rotation without livestock, resulted in a drop of 67 percent in CSP contract amount to $13,257 for maintaining the 30

percent total compensation incentive. Annual compensation levels were also lower with 29 percent for first year compensation rate and 9 percent for average annual compensation rate.

The third scenario, a cash grain operation with confinement livestock, resulted in a 46 percent reduction in CSP contract to $21,411. Annual compensation levels followed a similar trend with first year compensation at 41 percent and average annual compensation at 12 percent. Similarly to the Nish1 and Rac3 studies, the addition of livestock provided a slight improvement to annual compensation rates.

The fourth and final scenario utilized the baseline organic grain mix but without livestock. CSP contract amount for maintaining total compensation incentive was 13 percent less than the baseline amount at $34,649. Annual compensation rates were also comparable to the baseline condition at 57 percent for first year compensation level and 17 percent for average annual. This was consistent with the previous scenario and scenarios from previous case farms that livestock potentially adds a small boost to annual compensation rates.

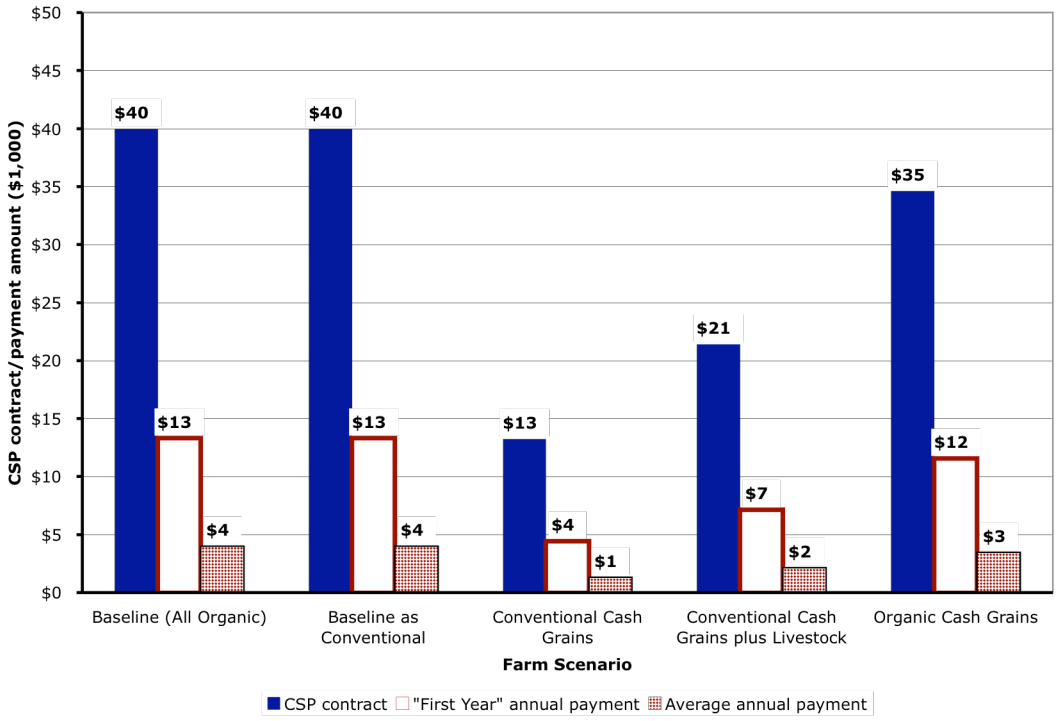


Figure 4.5.3A – Farmer 3, Upper Wapsipinicon watershed. Scenario effects on CSP contract with total compensation level fixed at the baseline condition of 30 percent.

As displayed in Figure 4.5.3A all four scenarios resulted in either equivalent or smaller amounts for total CSP contract when compared to the baseline case. Unlike previous case studies, Nish1 and Rac3, annual compensation levels tracked closely with CSP contract adjustments as evident from Figure 4.5.3B. This was likely due to the extensive nature of conservation infrastructure that Wapsi3's baseline scenario contained and the need for little or no additional spending when modeling the alternative reduced conservation scenarios.

Wapsi3 was an example of a comprehensive level of stewardship across all acres on the farm since there was little opportunity to improve or expand on these conservation practices. Under such conditions it is reasonable to say that Wapsi3's entire CSP contract was a reward. This is in contrast to Nish1 and Rac3 who were faced with steep transition costs if moving to a more diverse crop rotation such as evident in Wapsi3's baseline scenario.

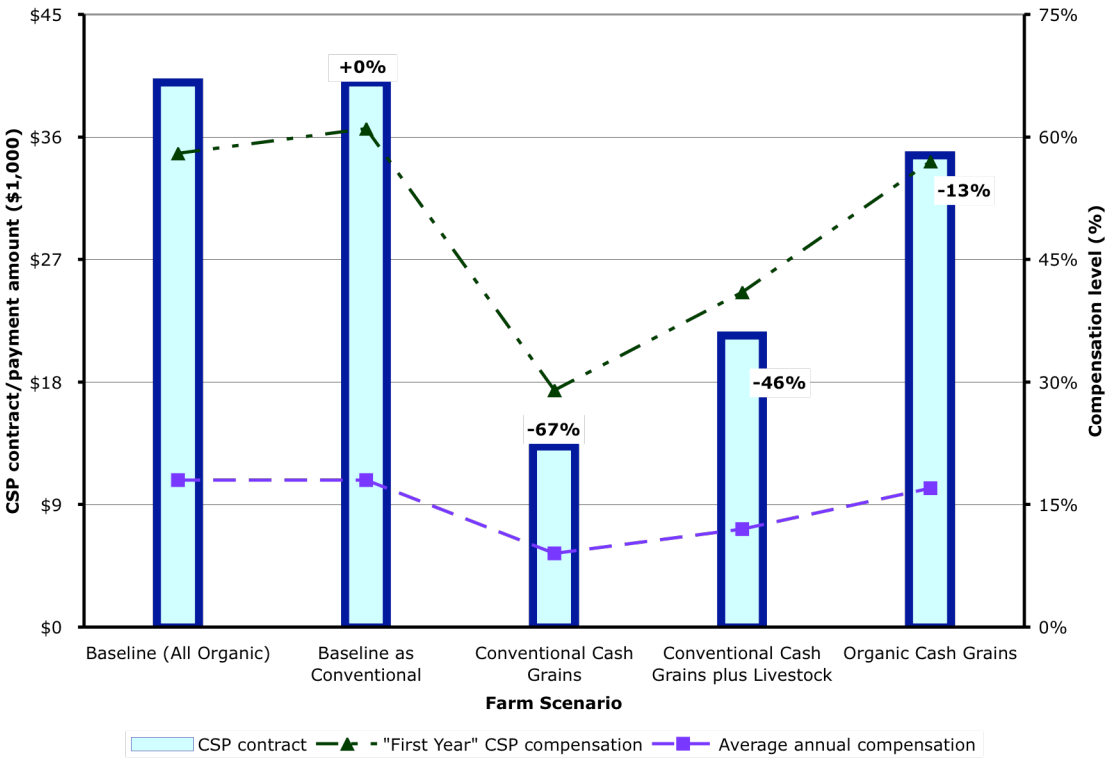


Figure 4.5.3B – Farmer 3, Upper Wapsipinicon watershed. Total CSP contract and annual compensation level changes for farm scenarios.

4.5.4 Case Study D: Farmer 1, Turkey Watershed

Farmer 1 of the Turkey watershed (Turk1) operated the largest farm of the four case studies and was one of only two interviewees farming more than 1500 acres[66], with 3350 acres of corn and soybeans and a confinement farrow-to-finish hog operation. Turk1 had 600 acres of land enrolled in a 5-year $40,000 tier 1 CSP contract. Turk1 began buying into the father's operation upon graduating from high school in the late 1970s and was one of the first producers in the area to invest heavily in large hog confinements, indicating that it had been very reliable as collateral for expanding the overall size of the farm business throughout the years. Turk1 has had full control of the farm business for over ten years and owns 2650 acres of the 3350 acres farmed.

Turk1's farmland was in a hilly portion of an otherwise relatively flat or undulating state. Loss of soil from hills and ridges was a more significant concern than for other portions of the state and tillage practices had become the basis for Turk1's conservation philosophy. No-till soybeans and no-till corn combined with a rigorous nutrient and pesticide management program were the primary stewardship practices within the 600 acres of CSP ground.

Table 4.5.4A outlines Turk1's revenue budget. Revenue per acre was clearly significant at over $2,000 per acre largely due to the value added by the livestock operation. Turk1's CSP contract accounted for 600 acres of corn and soybean ground that included about 20 acres of buffer strips and grassed waterways. The remainder of the farm, not under CSP contract contained 200 acres of CRP woodland and an additional 180 acres of buffer strips and grassed waterways. While Turk1 was receiving an above average CSP payment per acre ($13 per acre average annual), it was only for 17 percent of the farmed land and only accounted for around 1 percent of average annual revenue, which is consistent with most of the producers interviewed.

[66] Farmer 2 from the Nishnabotna watershed (Nish2) had 6930 acres. There was not a case study analysis conducted for Nish2's farm.

Table 4.5.4A - Farmer 1, Turkey - 2005 revenue budget.

CASE STUDY D: Farmer 1 – Turkey Watershed Farm Revenue						
CROPS			F-F hogs		Woodlot	
	Corn	**Soybeans**	**Confinement**	**Buffer**	**CRP**	**Total**
Acreages	1875	1075	10 (1400 sows)	200	200	3360
CSP	300	300	-	20	-	600
Owned	1475	775	10	180	200	2660
Rented	400	300	0	0	0	700
YIELDS	bu/ac	bu/ac	hogs (cwt)			
2005	186	36	n/a			
5 year average	137	35	2500			
$ per unit*	$5.45	$18.00	$46			
REVENUE						
Revenue	$558,469	$346,365	$4,771,076		$8,077	$5,675,909
Revenue per acre	$298	$322	-		$40	$1,689
Government Programs						$815,061
Insurance						$20,433
	Tier 1					
	5 years	\			First Year	Average
CSP	$40,000				$13,334	$8,000
CSP per acre	$67	600 ac			$22	$13
GROSS ANNUAL REVENUE					**$6,532,813**	**$6,527,480**
Annual Revenue per acre					$2,074	$2,072
CSP Payment as percent of Annual Revenue					1%	1%

Table 4.5.4B provides detail on Turk1's conservation budget. Since Turk1's CSP contract was tier 1 and only covered 600 acres, conservation costs detailed in this budget are only for this portion of the farm operation.

Table 4.5.4B – Farmer 1, Turkey watershed. 2005 Conservation budget.

CASE STUDY D: Farmer 1 – Turkey Watershed Conservation Cost Compensation		
EXISTING		
Cost is proportion of total item cost attributable to conservation practices (on CSP ground)	**Annual Cost**	**Total 2005 Value**
Machinery	$3,240	$57,000
Buildings	$68	$15,000
Total	**$3,308**	**$72,000**
CONSERVATION		
Terraces	$2,000	$61,061
Shaped Waterways	$6,000	$64,579
Manure Nutrient Management	$1,501	$1,500
Non-Manure Nutrient Management	$2,268	$2,500
Wildlife Habitat Management	$308	$5,000
Conservation Cover	$779	$25,000
No/Reduced Tillage	$3,038	$3,000
Total	**$15,892**	**$162,391**
Combined Cost (Equipment, Buildings and Conservation Practices)	**$19,201**	
Insurance and Taxes (1.5%) and Interest (3.5% over depreciation period)	$15,930	
SUB-TOTAL	**$35,131**	
Labor for Conservation Practices	$2,400	
TOTAL CONSERVATION COST	**$37,531**	**$234,391**
per acre	**$12**	**$74**
CSP COMPENSATION		
First Year annual compensation level	36%	17%
Average annual compensation level	21%	

Total annual cost of conservation was $37,531 including interest, taxes, insurance and labor that was equivalent to $12 per CSP acre. There was no buffer ground within these 600 acres so opportunity cost for income forgone was not included. The total cost of all conservation practices on the farm, including the first year of maintenance was $234,391 at $74 per CSP acre. The total compensation rate of the $40,000 CSP contract for the $234,391 of conservation costs was the lowest of all case studies at 17 percent. First year annual compensation by a $13,334 payment of $37,531 was 36 percent and an average annual CSP payment of $8,000 was at 21 percent compensation.

Table 4.5.4C displays the modeled results from Turk1's baseline farm and three additional scenarios. As for the previous case farms, each scenario tested the impacts of adjusting the total CSP contract amount to maintain the 17 percent compensation rate of all conservation costs. Turk1's CSP acres accounted for a 600-acre portion of a cash grain operation similar to the Nish1 and Rac3 case studies. The difference for Turk1's scenarios was the expansion from 600 tier 1 CSP acres to include the whole farm under a tier 2 or tier 3 contract. This incurred higher transition costs evident in the scenario results, but since Turk1 was a tier 1 farmer with large acreage it represented an excellent opportunity to assess the relative expense of transitioning a farm of this size to varying degrees of increased diversity.

The first scenario took the 600 tier 1 acres and all conservation practices associated with those acres and expanded them to include the remaining 2550 tillable acres on the farm, making Turk1 eligible for tier 2. Turk1's CSP contract was upgraded to tier 2 for this scenario rather than tier 3 as it is typically difficult for confinement livestock operators to account for all county resources of concern, the key eligibility requirement that separates tier 3 requirements from tier 2. Even with tier 2 status, retaining the confinement hog operation required the inclusion of some additional waste management practices to comply with CSP rules. The upgraded tier 2 CSP contract amount that maintained the 17 percent total compensation level for all conservation practices was $110,816, a 177 percent increase from the baseline condition. Compensation rates of annual conservation costs for this scenario were 47 percent for the first year CSP payment compensation level and 14 percent for the average annual CSP payment compensation level.

The second scenario increases rotation diversity to include alfalfa/hay and a small grain such as oats and expands this to the entire farm and dispenses with livestock. The CSP contract was upgraded to tier 3 since accounting for all county resources of concern and was considered achievable without livestock. The result was a CSP contract increase of 271 percent to $148,582 for maintaining 17 percent total compensation and annual compensation incentives of 14 percent for first year CSP payment and 5 percent for average annual CSP payment.

The third scenario incorporated the same crop mix as the first scenario along with the confinement hog operation from the baseline condition. Similar to the first scenario this required the inclusion of some additional practices to manage the confinement livestock. The result was a CSP contract amount increase of 325 percent from the baseline condition to $153,712 for maintaining 17 percent compensation of the total current-value of conservation. First year CSP payment compensation of annual conservation costs was 11 percent and average annual CSP payment provided 5 percent compensation.

The fourth and final scenario also incorporated the same crop mix as the first scenario but with pasture-raised rather than confinement livestock. During the on-farm interview Turk1 discussed first being exposed to beef cattle prior to investing more in hogs. Due to the size of the farm this scenario included 350 beef cows on 500 acres rather than pasture-raised hogs. The CSP contract was upgraded to tier 3 and resulted in a total contract amount of 235 percent to $133,927 for maintaining 17 percent total compensation level, where first year CSP payment compensation of annual conservation costs were 17 percent and average annual CSP payment accounting for 5 percent of annual conservation costs. As with previous case farms the addition of pasture livestock slightly improved annual compensation rates, though for Turk1 this was only for first year CSP payment compensation level.

When attempting to isolate Turk1's financial incentives provided by CSP contracts and payment, Turk1 exhibited similar trends between scenarios as Nish1 and Rac3. Increasing diversity as a conservation approach required significant total transition cost especially for Turk1 since scenarios included the added cost of tier graduation that was absent from the other case studies. Figure 4.5.4A shows the increases in total CSP amount for

the scenarios and the effect of graduating to a higher tier was especially evident when examining the second scenario which modeled expanding the cash grain operation from the 600 tier 1 acres to the entire farm.

Table 4.5.4C – Farmer 1, Turkey watershed. Enterprise mix scenarios evaluated.

ACREAGES	Baseline (600 acres of Corn and Soybeans)	Baseline for whole farm	Increased Rotation and no Livestock	Increased Rotation with conf. Livestock	Increased Rotation with past. Livestock
Corn	1875	1875	900	900	900
Soybeans	1075	1075	800	800	800
Alfalfa/Hay	-	-	750	750	500
Small Grain	-	-	500	500	250
Buffer	200	200	210	200	210
CRP	200	200	200	200	200
Confinement	10 (1200 sows)	10 (1200 sows)	-	10 (1200 sows)	-
Pasture	-	-	-	-	500 (350 Cows)
Total	3360	3360	3360	3360	3360
CSP		+177% (and tier 2)	+271% (and tier 3)	+325% (and tier 2)	+235% (and tier 3)
Tier 1 (5 yr) Contract	$40,000	$110,816	$148,582	$170,128	$133,927
First Year	$13,334	$35,000	$45,000	$35,000	$44,642
Average Annual	$8,000	$11,082	$14,858	$17,013	$13,393
CONSERVATION COSTS					
Total Annual	$37,531	$80,943	$319,387	$321,428	$261,214
Total	$234,391	$648,049	$868,900	$898,900	$783,200
CSP COMPENSATION					
First Year: %Annual	36%	43%	14%	11%	17%
Average: %Annual	21%	14%	5%	5%	5%
Contract: %Total	17%	(17%)	(17%)	(17%)	(17%)

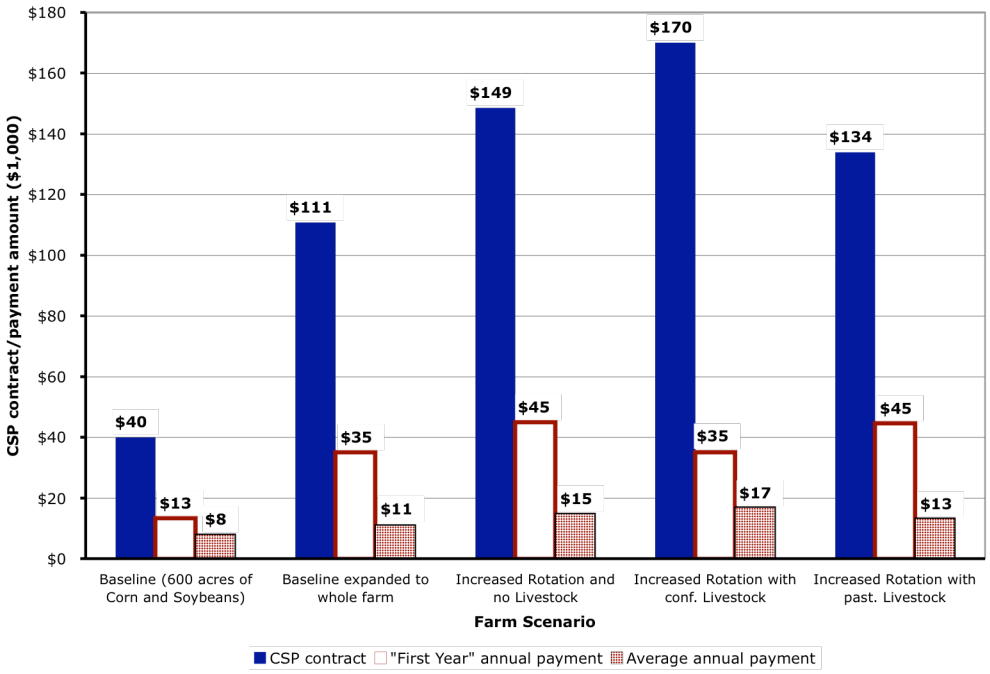


Figure 4.5.4A – Farmer 1, Turkey watershed. Scenario effects on CSP contract with total compensation level fixed at the baseline condition of 17 percent.

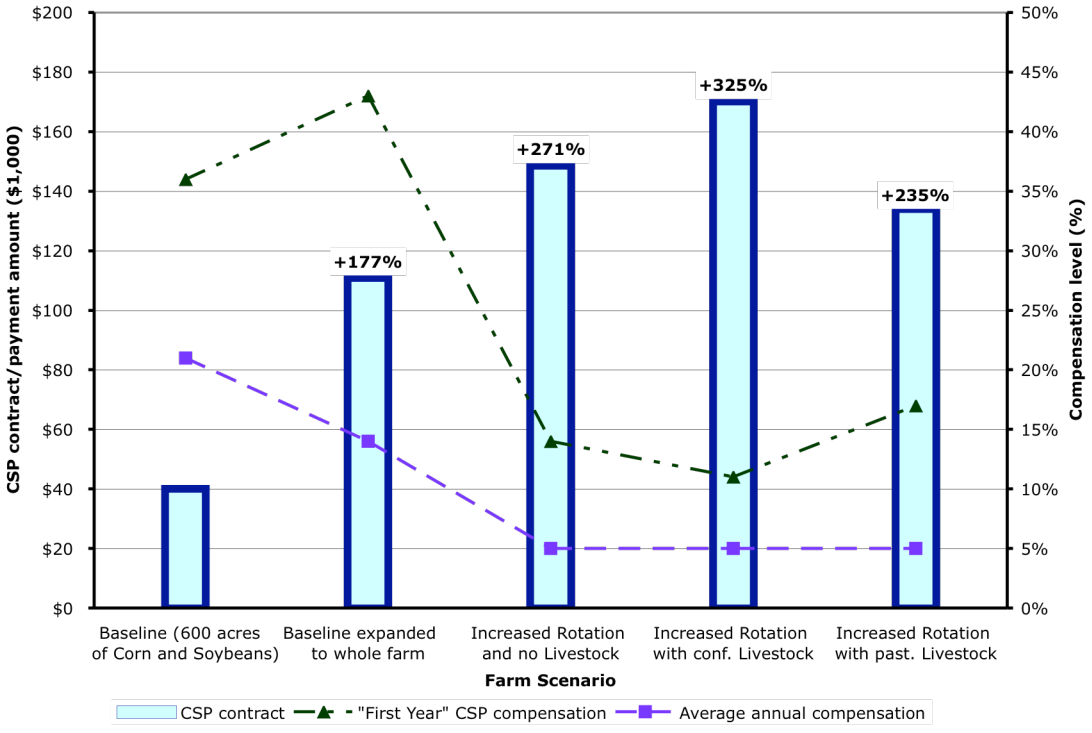


Figure 4.5.4B – Farmer 1, Turkey watershed. Total CSP contract and annual compensation level changes for farm scenarios.

Additionally, as displayed in Figure 4.5.4B, the second scenario showed a higher first year compensation level to even the baseline condition and while average annual compensation of annual conservation costs was lower than the baseline condition it was still higher than the more diversified condition. The significant increases in total contract amount and decreases in annual compensation levels for the diversified scenarios suggests anything beyond a corn and soybean rotation appears to be less than optimal for Turk1 in terms of compensation rates.

4.5.5 Conclusions from the Case Studies

The four case studies examined in this report allow for a closer examination of the incentives that CSP contracts and payments provided to four producers of differing tier level, enterprise mix and location. Three cash grain producers, one from each tier, with one also operating a confinement hog operation, were examined along with one organic producer with organic pasture raised hoop hogs. The three cash grain corn and soybean producers were fairly typical of producers statewide and provide a good simulation of program expansion should funding allow. The addition of the organic producer, allows for comparison with an operator who was operating under organic standards and who had invested heavily in a diversified approach to conservation.

Scenarios for each case farm were modeled by varying enterprise diversity and conservation level while anchoring the incentive provided by total baseline CSP contract amount. This incentive level was calculated as the percentage compensation provided by the total contract amount covering the cost of installing all conservation practices in 2005 dollars. For each scenario, the resulting changes in CSP payments were compared to the changes in annual costs of conservation.

For each case study modeled three or four alternative scenarios were compared to the baseline condition. The alternatives included increased or decreased crop diversity, and the addition or removal of pasture livestock for all four case farms. The results generated four central themes that were consistent through all four cases:

1. Cost of improved stewardship increased with enterprise diversity. The CSP Enrollment logit regression determined that the more respondents disagreed with the idea of three or more crops in a rotation being a part of "land stewardship" the more likely they were to be enrolled in the program. The case studies reinforced this finding, suggesting that incentives provided by the program for increased crop rotation diversity were low. The case study scenarios modeling increased enterprise diversity as a means for improved stewardship found that in one case a total contract amount increase in excess of 300 percent would be required to encourage adoption of a more diverse enterprise mix. It was clear even for Rac3, a tier 3 corn and soybean producer, a contract increase that would offset the cost of increased enterprise diversity at a level equivalent to the baseline contract amount is potentially beyond the scope of the program. Even with more program funding many of the payments calculated in Rac3's farm scenarios were over double the current maximum allowable for annual payments. This again raises the question of what is an appropriate compromise between environmental protection and a reliable, affordable food supply and how much the taxpayer is willing to pay for it.

2. High prices and duplicity with CRP. For cash grain producers there appears to be little incentive under CSP to remove larger portions of their land from production, perhaps areas that require higher maintenance cost or are more tillage sensitive, and convert them to some form of perennial buffer. While doing so assists with eligibility to the higher tiers of the program, the opportunity cost of income forgone on these areas would likely be better compensated through CRP rental payments. Even with CRP payments, producers generally stand to make more by farming such areas with corn and soybeans, especially with a period of extended high commodity prices, which appears imminent.

3. The possibilities provided by pasture raised livestock and duplicity with EQIP. There was the tendency for the inclusion of pasture-raised livestock in a diversified enterprise mix scenario to result in an improved annual compensation level for less CSP contract dollars. This was due to the inclusion of pasture and hay in the crop mix that has lower maintenance costs than raising an annual crop. Livestock also

represents a way to add value to the farm business relatively quickly, improving risk management and with proper precautions, also enhances environmental quality through grazing land sensitive to tillage. Still, similar to duplicity issues with CRP, incentives for pasture livestock conservation are potentially higher through the EQIP program (GAO, 2006), due to better cost-share incentives than CSP.

4. Variability with program compensation levels. The organic producer, Wapsi3, was an example of a program participant fully rewarded by the program. No adjustment in enterprise mix resulted in additional conservation costs and discussion of the adjustment made to advance from tier 2 to tier 3 suggests it required minimal investment of time or money. While organic producers may not necessarily represent the pinnacle of "land stewardship" they serve as a good benchmark for Iowa's better stewards. It also is hard to predict to what degree a producer with stewardship qualities such as Wapsi3 will be compensated by the program, especially in comparison to a traditional corn and soybean producer such as Rac3. Rac3 was being compensated over five times as much for the total cost of all conservation practices in 2005 dollars. If the USDA is serious about the longevity of CSP it should also be serious about the unified support of all producers, which is lacking while discrepancies such as this persist.

5 CONCLUSIONS

A mail survey of producers within four Iowa watersheds eligible for the Conservation Security Program (CSP) was combined with 13 in-depth interviews of enrolled producers to collect data pertinent to involvement and understanding of the CSP, and achieve the following research objectives:

(a) Determine the consistency the CSP has demonstrated at meeting its published goal, in particular how much success the program has had at "rewarding the best and attracting the rest" to "promote conservation" in Iowa.

(b) Establish the resulting impact of the CSP on Iowa farmers and their level of program understanding.

(c) Describe the implications of the CSP for national and international[67] farm policy.

A descriptive analysis of the mail survey, a series of three logit regressions with survey data, a budgetary model analysis of interviewed producers, and four in-depth farm case studies were conducted to answer key questions specific to these objectives:

1. What characteristics define Iowa producers who are aware of and enroll in the CSP and the patterns of participation for enrolled producers?
2. How consistent is the CSP at compensating Iowa producers for their conservation efforts?
3. How does the CSP fare as an incentive to continually improve conservation efforts among participating producers?
4. How does the CSP compare as an incentive to commodity program payments?
5. How do producers perceive compensation and incentives provided by the program?

[67] For more detail on the trade legalities of domestic agricultural support see an explanation of the WTO's "amber box" and "blue box" rulings at http://www.wto.org/english/tratop_e/agric_e/agboxes_e.htm

6. Are contract amounts proportionate with the practiced level of conservation or are certain approaches to conservation better rewarded than others?
7. Are CSP payments likely to be contributing to farm income or only covering costs of conservation?

5.1.1 Meeting CSP Goals

The meeting of CSP goals: "rewarding the best" land stewards, "attracting the rest" and "promoting conservation", was addressed by the first two research questions, "What characteristics define Iowa producers who are aware of and enroll in the CSP and the patterns of participation for enrolled producers?" And "how consistent is the CSP at compensating Iowa producers for their conservation efforts?" The degree to which CSP contracts awarded by Iowa NRCS are "rewarding the best" Iowa stewards and "attracting the rest" is the primary goal for the measurement of CSP progress. Results surrounding the analysis of CSP contracts implementation also has implications for the broader CSP and green payment missions of increased awareness and application of "land stewardship," ongoing preservation of natural resources such as soil, water, air, energy and wildlife habitat, and "multifunctionality," adjacently providing agricultural, environmental and social services within Iowa agriculture.

Mail survey responses by Iowa producers in CSP eligible areas suggests that producers were in agreement with the term "land stewardship" being used to describe "responsible farming," and thought "land stewardship" should focus on the impact of farming on the surrounding environment, farming for future generations and production maximization, the latter possibly as a means of risk management. Over half of all respondents were likely to rent some of their land, with most cash renting. Most were demographically similar to producers in the remainder of the state in terms of enterprise mix, age, education, income and household composition.

Over three-quarters of survey respondents had between 1 and 5 stewardship practices in place on the farm and were as likely to attempt CSP enrollment, as they were not to. Most respondents had neutral feelings about the implementation of CSP and about one-quarter of

all respondents were enrolled in the CSP, as compared to about 14 percent of eligible producers across Iowa. It was also proposed to all respondents that the CSP had been aimed at "rewarding the best" land stewards "and attracting the rest" and the watershed-by-watershed approach to program implementation was a necessary pilot phase; responses to both statements had a tendency towards agreement though the most popular choice in both instances was "not sure."

CSP Enrollees were mostly corn and soybean farmers with 91 percent growing corn, 88 percent growing soybeans. Beyond the typical corn and soybean rotation 38 percent of respondents indicated they grew alfalfa/hay, and 17 percent raised pastured livestock. There was a tendency for enrollees to also be generally neutral about the program's rule and payment structures while those in higher tiers tended to feel better compensated for the costs of enrollment.

The logit regression analysis identified a group of variables that were of most influence on the level of survey respondents' awareness of CSP, the likelihood of their enrollment and the tier at which they were participating. The perception that production maximization should be a component of "land stewardship" was linked with increased CSP involvement. The number of stewardship practices, amount of crop acreage and lack of pasture acres were positively correlated with increased CSP awareness and likelihood of enrollment, which suggests most stewardship practices employed by enrollees were limited to those specific to cropping. Demographically, younger males were more aware of the program, while education beyond high school was positively correlated with enrollment and a higher tier of participation. Also producers grossing above $50,000 per year in farm income and earning less than $25,000 gross income off the farm were positively correlated with increased program involvement.

The budgetary model analysis and case studies suggested that compensation levels were not consistent among enrolled producers, or relative to other incentives such as the commodity programs. These results suggest CSP offers minimal support to increases in stewardship through enterprise diversity. This is particularly pertinent to findings that suggest nitrification of Iowa's waterways is in large part due to tilled land that is left uncovered for

large parts of the year (Keeney and DeLuca, 1993). Increases in set-aside acreage and pasture raised livestock were two diversification options that offered slightly better payment incentives than a stewardship approach that depended completely on a four crop rotation. Interestingly both of these approaches are already covered to some degree by other conservation programs: the CRP and EQIP. In fact the Government Accounting Office evaluation of the CSP was titled "Despite cost controls, USDA management is needed to ensure proper payments and *to reduce duplication with other programs*;" and concluded, "that producers can receive duplicate payments… because of similarities in the conservation actions financed through these programs" (GAO, 2006). It also suggests that previous studies (Vondracek, Zimmerman and Westra, 2003; Westra, Vondracek and Zimmerman, 2004; Westra, 2005) that found combinations of CRP and CSP payments would compensate producers for crop and livestock income forgone on increased land retirement acres were possibly relying more heavily on CRP payments than CSP payments to achieve this.

The producer's consensus on a definition for "land stewardship" included a responsible approach to farming that includes production maximization and accounts for the impact of farming on the surrounding environment and farming for future generations. This definition also appears consistent with the action of most producers enrolled in the program. Still the need for risk protection often sought through maximized production from corn and soybeans combined with government price supports is proving a tough adversity for more holistic alternatives, such as those described in CSP goals, to overcome. The program does appear to offer some incentive to the "rest" for basic improvements in "land stewardship" with increased adoption of conservation tillage practices and reduced nutrient application. Beyond this, encouragement for transitioning to a more multifunctional enterprise mix, even the more proven options of increased set-aside and pasture raised livestock, appear to be less available through the program payment structure, despite the risk reducing, value-adding and environmental benefits these practices provide. Previous studies (Dobbs and Streff, 2005) suggest that program payments are heavily dependent on the level of income forgone from what would otherwise be corn and soybean acres to generate the incentive to diversify. Since prices and commodity payments contribute income forgone and with grain prices rising,

there is clearly more to conservation reward incentives than the cash amount of CSP payments.

Even with the challenges of promoting "land stewardship" and "multifunctionality," the most striking issue is the disproportionate nature in which the limited funding is being dispersed. The example from this study of a corn and soybean producer (Rac3) with no hay or pasture achieving tier 3 at the first enrollment attempt with payments compensation at an estimated 205 percent of total conservation costs while other producers many of them similar in size scope and approach to conservation are compensated at rates of well under 50 percent the total cost of conservation. Included in this group was a tier 2 organic producer whose certification requirements included the absence of synthetic fertilizer or pesticides, four crops in rotation and pasture livestock (Wapsi3).

Even with this disparity, all producers who were interviewed described program payments as a reward for practices they, for the most part, would have implemented anyway. The resulting implications for working lands conservation that stems from such conflicting incentives is that CSP is in most instances rewarding the "status quo" (SWCS, 2007) and still lacks the funding and political support to move beyond this position.

5.1.2 Impact of the CSP on Iowa Farmers

The impact of the CSP on Iowa farmers and their level of program understanding is addressed by the following research questions, "How does the CSP fare as an incentive to continually improve conservation efforts among participating producers?" "How does the CSP compare as an incentive to commodity program payments?" And "How do producers perceive compensation and incentives provided by the program?"

The budget models and case studies involved a comprehensive analysis of incentives provided by the CSP. Incentives were measured at three levels: *the total compensation level*, which compared the whole contract amount to the total costs of installing and maintaining all conservation practices in 2005 dollars; *first year compensation level,* which compared the likely first year CSP payment (one-third of the total contract amount), with the annual costs of conservation, including the opportunity cost of income forgone on buffer ground,

depreciation, insurance, taxes, interest and hired labor costs; and the *annual compensation level,* the total contract amount divided by the duration of the contract in years, also including opportunity costs of income forgone on buffer ground, depreciation, insurance, taxes, interest and hired labor costs.

All three compensation levels were calculated for the farms of the 13 interviewed producers. Even though the six producers interviewed in the West-Central East Nishnabotna and North Raccoon watersheds averaged 116 percent total compensation and the seven producers interviewed in the Northeastern Upper Wapsipinicon and Turkey watersheds averaged 36 percent total compensation, it was not conclusive that compensation levels were regionally influenced. Comparison of compensation between the eight cash grain producers, some with confined hog operations and the five other more diversified producers, those including at least hay and pasture livestock proved more consistent with program goals, with the diversified producers achieving an average total compensation level of 80 percent versus 68 percent for the cash grain/hog producers.

The descriptive analysis of the mail survey suggested respondents who were enrolled in the CSP were slightly more diversified than state averages. However, the logit regression suggested CSP producers were not necessarily diversified beyond corn and soybeans and were relatively homogenous, with only five variables or variable categories expressing enough significance ($p<0.1$) to separate survey respondents among tiers of CSP Participation Level, compared to nine and ten variables or variable categories exhibiting significant ($p<0.1$) influence on CSP Awareness and CSP Enrollment. While there is no way of knowing absolutely if all variables that influence CSP Participation Level were included in the regressions, it is curious that the logit analysis suggests that what separates a tier 1 producer from a tier 3 producer is less than what separates a tier 1 producer from the general population. This may be partly due to the short time period some producers have had to make conservation improvements with assistance from program payments, but it also implies that the future adoption of conservation practices will probably not involve dramatic changes to the enterprise mix on the farm.

The farm budget analysis compared average annual payments to average commodity payments calculated as a function of average payments received with respect to average crop income as reported in Iowa State University extension publications (Smith and Edwards, 2006). Commodity payments averaged about 5 times more than average annual CSP payments for the 13 interviewed producers ranging between one-and-a-half and 100 times greater. While such a payment discrepancy exists and at least 80 times as much is spent on commodity price support in Iowa as the CSP, there is always the potential that incentives provided by the CSP to promote conservation will be overshadowed by commodity payments.

Survey results regarding perceptions of compensation rates for enrollment costs suggest compensation improves as CSP tier level increases; though the logit regression analysis was less conclusive on this relationship. Measured compensation rates among the interviewed producers were also relatively consistent with tier level, with higher tiered producers experiencing better first year compensation levels than lower tiered producers. It is worth noting that the lowest proportion of CSP respondents who perceived CSP payments to less than fully compensate producers for the costs of enrollment was 38 percent of tier 3 producers (n=22), 47 percent for tier 2 producers (n=54) and as many as one-half or 50 percent of tier 1 producers (n=131). This trend appears consistent with calculated compensation rates of the interviewed producers. Of the 13 interviewed enrollees, 80 percent of tier 1 producers (n=6) had less than 100 percent first year compensation, 60 percent of tier 2 (n=5) were under compensated and none of the tier 3 producers (n=2) were compensated at less than 100 percent compensation in the first year of payments.

5.1.3 Implications of the CSP for Farm Policy.

The implications of the CSP for federal and international farm policy is addressed by the remaining research questions, “Are contract amounts proportionate with the practiced level of conservation or are certain approaches to conservation better rewarded than others?” And “are CSP payments likely to be contributing to farm income or only covering costs of conservation?”

Programs such as the CSP are attempting to facilitate improvements in the efficiency of on-farm conservation while also attempting to remain even-handed in the distribution of payments for environmental and public services provided. As some producers improve their skill at implementing certain practices, others will lag creating a challenge for administrators to retain fairness with payment amounts. This is especially so with the CSP, a program that doesn't want to discourage continued improvement among the "best" practitioners nor limit incentives to the rest who might still improve. Equitable distribution of payments becomes troublesome when enrollees either misrepresent themselves as "the best," or do not continue to pursue conservation improvement as "the rest," in spite of payments they receive being designed with that intent.

Additionally, with funding in short supply there is the issue of who gains access to payments. This is particularly evident at the "rest" end of the scale where 62 respondents indicated being rejected from enrolling. A number of the 241 who indicated CSP enrollment supplemented their survey responses with written notes indicating that they would not be receiving payments due to lack of funds. At the "best" end of the scale a subgroup of the interviewed producers similarly indicated that in spite of being allowed to upgrade to a higher tier or add new practices, their contract payments would not be adjusted due to lack of funds. While there is a ranking system in place to ensure more active stewards gain first access to program funds, stewardship rank is determined exclusively by SCI and STIR scores. SCI and STIR scores are well established measures of soil conservation, but it raises the issue as to why this was the only measure and why measures relating to other natural resources such as water, were not included (Heller et al, 2005; Lundgren et al, 2006).

Two of the interviewed producers talked openly of how their strong relationship with local administrators prior to the CSP commencement had assisted with preparations for program enrollment. Both of these producers had total and annual compensation rates of well over 100 percent. Other interviewed producers, who had minimal contact with local NRCS prior to the CSP, expressed frustration over the level of assistance they received from NRCS regarding the CSP enrollment procedure. All of these producers were in the bottom half of total and annual compensation levels.

The logit regression results also highlight concerns with payment consistency. As already discussed, crop acres and stewardship practices were both positively correlated with enrollment in the CSP, suggesting practices associated with crop production were being heavily rewarded. Additionally, the perception that production maximization is a component of "land stewardship" was associated with survey respondents who were more likely to be involved in the CSP. Together the influence and significance of these three variables suggests the program is enrolling producers who use production maximization as their primary risk management tool. This suggests there should be closer examination of whether producers who are driven by incentives to maximize crop production are also producers that can maximize conservation and should the CSP be encouraging or attempting to prevent this combination. If CSP payments were raised to match income forgone from the traditional corn and soybean rotation then producers who wished to adopt an enterprise mix that was more inherently risk resilient without risking overproduction and increased chance of environmental damage may have the financial incentive to do so.

The farm budget model suggests that while the interviewed CSP producers averaged less than 100 percent for total compensation (80 percent), there were some noteworthy examples of overcompensation. Three of the interviewed producers (all of whom were tier 2 or tier 3) averaged 227 percent for their total compensation level while five producers (four of which were tier 1 and the other tier 2) received less than 25 percent total compensation. This suggests that some enrollees, most likely those in higher tiers, are receiving payments that are beyond income forgone from conservation spending and their program payments are contributing to farm profits.

5.1.4 The CSP and Farm Bill 2007

The upcoming 2007 Farm Bill is the focus of much attention from both federal and international lawmakers. While discussion of the Title I commodity price support programs is an area of primary interest, especially with respect to higher commodity prices and WTO compliance, Title II conservation programs such as the CSP are also being subjected to scrutiny. The CSP was developed as part of the 2002 Farm Bill, but only commenced in 2004, giving enrolled producers a maximum of four full growing seasons of contract

payments through to the end of 2007. This is a short period for any nationwide program to be evaluated over and should be a serious consideration of all lawmakers when addressing improvements in the CSP, especially when producers in many watersheds never even had a chance to apply.

Whatever road lawmakers take with CSP, it is critical that confusion over the objectives of the program is addressed. If the program intends to promote the preservation of resources other than soil, then appropriate measures for all resources need to be in place and made explicit. A nutrient measure that addresses water quality concerns as discussed in other studies (Heller 2005) would be an important first step.

NRCS personnel have indicated that beginning in 2008 stewardship practice payments will be indexed with the costs of implementation rather than their estimated societal value. This is essential if the CSP compensation disparities to the degree highlighted in this report are to be removed so the program can remain eligible for the WTO's green box rules.

The USDA released a report of recommendations for improving all Title II programs in the 2007 Farm Bill (USDA, 2007). It concurs with the findings of this and other reports that duplicity between programs should be addressed. For the CSP they suggest this can be achieved as part of greater simplification where components such as cost sharing incentives for new practices, also offered by EQIP, might be removed. There is also the recommendation to expand the program from the current (2007) 15.5 million acres to 96.5 million acres with an additional $500 million in the next 10 years.

The challenge for the current administration is appropriating $5 million dollars per year for the next 10 years when the federal deficit is at record levels. Bruce Babcock from Iowa State University's Center for Agricultural and Rural Development (CARD) suggests one option is to capitalize on the drop in demand for loan deficiency and counter cyclical payments from grain producers, currently enjoying a period of sustained high prices, and spend "scarce public funds on programs that serve broad public interests" such as "conservation, research, energy, nutrition, and rural development" (Babcock, 2006).

The issues with the CSP contained in this report are merely a symptom of what lawmakers, producers and taxpayers have been wrestling with for a number of years: how to ensure an affordable reliable and secure food supply and protect the environment and the profession of farming for future generations. A truly progressive approach for lawmakers to take would be to design a stewardship program that facilitates more multifunctionality among farmers, where risk management, environmental protection and other social services such as "research, energy, nutrition and rural development" are all addressed simultaneously and become intrinsic components of the farm business with greater independence from price support.

As the UK experience with similar reward-based stewardship programs shows, even if this is achievable, diverting funds into programs that have the best intentions is only addressing part of the problem, and implementation of programs of this nature have struggled to have lasting impact. The pattern seems to be that most programs of this nature single out producers who would be inclined to invest in conservation even without program support. This does not have to be a bad thing; older conservation programs are notorious for spending more money on the program opportunist than the steward administrators would like other producers to use as an example. Where it becomes a problem is if we expect this approach to solve the broader environmental problems that modern agriculture in Iowa is contributing to. Rewarding the "best" only has an impact here if the "rest" have an incentive to at least cease practices that result in negative environmental externalities.

With this and the current high prices for commodity crops in mind, an effort could be made to enforce conservation compliance on those enrolled in commodity programs such that producers unwilling to participate in environmental protection do not negate the good work of environmental stewards. By all means encourage producers who are struggling with compliance to use cost-share programs such as EQIP to improve on-farm conservation. This will not only allow "the best" stewards conservation activities to have an impact on environmental problems, but will force them to become more familiar with conservation programs. If reward payments for "the best" are always more than what "the rest" can receive through cost share payments, then there is the potential for all producers to have an incentive

to participate in higher levels of conservation in a way that addresses larger environmental problems.

When lawmakers attempt to simplify CSP for administrators and producers, they may also want to consider the impact that program complexity has on political support for conservation programs. Of the 1077 producers who took the time to respond to the mail survey in this study over two dozen attached hand-written letters expressing their disappointment at the manner in which CSP was implemented. One approach lawmakers could take for simplifying the program and improve its efficiency is to include producers more in the administration of the program. A number of the interviewed producers would like to see the money distributed among farmer groups such as drainage districts that operate autonomously from administrators, being audited periodically. The Australian Landcare program has operated on this principle for over 15 years with much success in Australia and other countries such as New Zealand, South Africa and the Philippines (Sutherland and Scarsbirck, 2001; Cramb, 2005).

Whatever route lawmakers take with the CSP for the 2007 Farm Bill, it does have the potential to create a unique and lasting incentive for Iowa producers to improve and maintain their levels of stewardship and return value to the taxpayer through improvements in natural resource conservation. If key issues with the rule structure, duplicity, other Title II programs and complexity are addressed, and funds that might otherwise have been absorbed by price support payments for cash grain producers are made available to the program then it has the potential to grow and improve. Most importantly producers who are at all levels of stewardship and taxpayers stand to gain from fair transfers of public funds to support a safe and affordable food supply produced in an environmentally responsible manner.

6 REFERENCES

Babcock, B. A. Fall 2006. "Farm Policy amid high prices: Which direction will we take?" *Iowa Ag Review.* Center for Agricultural and Rural Development. Vol 12:4.

Barkley, A and Flinchblaugh, B. July 1990. "Farm Operator Opinion and Agricultural Policy; Kansas Survey Results." *North Central Journal of Agricultural Economics*, Vol. 12, No. 2, pp. 223-239.

Barnhart, S. et al. Feb 2006 (revised). "Estimated Costs of Pasture and Hay Production." *Iowa State University Extension – Ag Decision Maker.* File Economics 1-8 and Agronomy 3-3. AG-96.

Batie, S. and Lynch S. (editors). April 2005. "Building the Scientific Basis for Green Payments." *World Wildlife Foundation.* Workshop sponsored by USDA, CSREES, WWF, Michigan State University. Quote from session chaired by Clive Potter (UK).

Batie, S. and Lynch S. (editors). April 2005. "Building the Scientific Basis for Green Payments." *World Wildlife Foundation.* Workshop sponsored by USDA, CSREES, WWF, Michigan State University. Quote from session chaired by Ralph Heimlich (Ag Conservation Economics – Consultant).

Berry, W. 1985. "Preserving Wildness." Essay included in *Home Economics*, 1987, North Point Press –New York.

Boody, G., et al. 2005. "Multifunctional Agriculture in the United States." *BioScience.* Vol 55:1 pp 27-39.

Bridges, T. and Napier, T. June 2003. "Factors that influence farm women to advocate the adoption of environmentally benign agricultural production practices." *International Journal of Agricultural Resources, Governance and Ecology* 2.2: p201.

Bruckner, T. Sep 2006. "The Conservation Security Program; and Assessment of Farmer's Experiences with Program Implementation." *The Center for Rural Affairs.* www.cfra.org

Capps, O., et al. 1985. "Analysis of Food Stamp Participation Using Qualitative Choice Models." *American Journal of Agricultural Economics.* Feb-85: pp49-60.

Carson, R. 1962. *Silent Spring.* Boston: Houghton Mifflin.

Cramb, R. 2005. "Social capital and soil conservation: evidence from the Philippines." *The Australian Journal of Agricultural and Resource Economics.* 49: 211-226.

Daily, G.C., ed. 1997 *Nature's Services: Societal Dependence on Natural Ecosystems.* Washington DC: Island Press.

Dobbs, T. Sept 2006. "Working Lands Agri-environmental Policy Options and Issues for the Next United States Farm Bill" *Department of Economics, South Dakota State University*. Economics Staff Paper 2006-3.

Dobbs, T and Pretty, J. Aug 2001. "Future Directions for Joint Agricultural-Environmental Policies: Implications of the United Kingdom Experience for Europe and the United States." *South Dakota State University Economics* Research Report 2001-1 and *University of Essex Centre for Environment and Society* Occasional Paper 2001-5.

Dobbs, T. and Streff, N. 2005. "Potential for the Conservation Security Program to Induce More Ecologically Diverse Crop Rotations in the Western Corn Belt." Selected Paper for Presentation at the *American Agricultural Economics Association Annual Meeting*. Providence, Rhode Island July 24-27, 2005.

Doering, O. et al. May 1999. "Evaluation of the Economic Costs and Benefits of Methods for Reducing Nutrient Loads to the Gulf of Mexico." National Oceans and Atmospheric Administration (NOAA). *US Department of Commerce: Decision Analysis Series No. 20.*

Duffy, M. January 2007. "2006 Land Value Survey." *Iowa State University Extension* Publication FM 1825.

Edwards, W, et al. May 2005 (revised). "Cash Rental Rates for Iowa. 2005 Survey *Iowa State University Extension – Ag Decision Maker.* File C2-10.

Ellis, J et al. Feb 2005 (revised). "Livestock Enterprise Budgets for Iowa – 2005". *Iowa State University Extension – Ag Decision Maker.* File Economics 1-8, FM 1815.

Fox, J. 1997. *Applied Regression Analysis, Linear Models, and Related Methods.* Sage Publications, Thousand Oaks, California.

Fuglie, K. and Kascak, C. 2001. "Adoption and Diffusion of Natural-Resource-Conserving Agricultural Technology." *Review of Agricultural Economics,* Vol. 23:2, pp. 386-403.

Gassman, et al. May 2006. "Alternative practices for sediment and nutrient loss control on livestock farms in northeast Iowa." *Agriculture, Ecosystems and Environment.* 117:135-144.

Gesieke, T. 2006. "Leveraging Linkages to the Conservation Security Program." *The Minnesota Project* and *The Iowa National Heritage Foundation.*

Harkin, T. May 2004. "USDA Missing the boat with CSP." Press Release. www.harkin.senate.gov

Hart, C and Babcock, B. Feb 2001. "Rankings of Risk Management Strategies Combining Crop Insurance Products and Marketing Positions." *Center for Agricultural and Rural Development, Iowa State University.* Working Paper 01-WP 267.

Heller, M et al. Dec 2005. "Assessing and developing the opportunities for green payment programs for Maryland's farmers." *Maryland Center for Agro-Ecology.* MCAE Report No. 2005-05.

Hoefner, F. March 2003. "Draft Response To USDA's Advanced Notice Of Proposed Rule Making For The Conservation Security Program (CSP)." Filed on behalf of the *Sustainable Agriculture Coalition* as a letter to Charles Whitmore, Acting Director, Conservation Operations Division, NRCS. pp 13.

Hoefner, F. August 2004. "USDA Highlights First Conservation Security Program Sign-Up." *Sustainable Agriculture Coalition.* Press Release. pp 1.

Holste, A. Sept 2006. "Historical Corn Yields by County." *Iowa State University Extension - Ag Decision Maker.* File A1-12.

Holste, A. Sept 2006. "Historical Soybean Yields by County." *Iowa State University Extension - Ag Decision Maker.* File A1-13.

Horan, R., et al. 1999. "Green Payments for Non-point Pollution Control." *American Journal of Agricultural Economics.* Vol. 81 (No. 5) : pp 1210-1215.

Howard, D. 2007. Email to author regarding the status of CSP payments calculations. Dwayne Howard is a CSP specialist. NRCS, Washington, D.C.

Hua, W. et al. 2004. "Ohio Farmer's Conservation Decisions: 2004 Survey Results." *Department of Agricultural Environmental and Development Economics - Ohio State University.* AEDE-RP-0045-04.

Keeney, D.R. and DeLuca, T.H. 1993. Des Moines River nitrate in relation to watershed agricultural practices: 1945 versus 1980s. J. Environ. Qual. 22:267-272.

Kintzle, J. Dec 2005. "Production Risk – Corn and Soybeans." *Train the Trainer Handbook.* Risk Management Association. http://www.rma.usda.gov/training/trainer/kintzle.html

Knight, B (NRCS Chief). Feb 2003. Conservation Security Program – "Advance notice of proposed rule making and request for comments." *Proposed Rules – Federal Register.* Vol 68 No. 32:7 CFR Part 1470.

Land Stewardship Project. Jan 2005 (revised). "CSP: Payment Estimates for 3 Types of Midwestern Farms." *Conservation Security Program Fact Sheet 8.* www.landstewardshipproject.org

Lawrence, J. Aug 2006. "Historic Hog and Lamb Prices." *Iowa State University Extension – Ag Decision Maker.* File B2-10.

Lawrence, J. Aug 2006. "Historic Cattle Prices." *Iowa State University Extension – Ag Decision Maker.* File B2-12

Leopold, A. 1949. "The Land Ethic." *Sand County Almanac, and Sketches Here and There.* New York: Oxford University Press.

Liao, T. 1994. "Interpreting Probability Models: Logit, Probit and Other Generalized Linear Models." A Sage University Paper: *Quantitative Applications in the Social Sciences Series.* Paper #101.

Lundgren, B. et al. 2006. "The Conservation Security Program: Rewards and Challenges for New England Farmers." *The Friedman School of Nutrition Science and Policy, Tufts University* with *American Farmland Trust.*

Lynch, S. (editor). 1994. "Designing Green Support Programs." *Policy Studies Program Report No. 4.* Henry A. Wallace Institute for Alternative Agriculture. (December).

Manoj, K.J, Arnold, J.G, Gassman, P.W. 2006. "Water Quality Modeling for the Raccoon River Watershed Using SWAT." *Center for Agricultural and Rural Development – Iowa State University.* Working Paper 06-WP-428.

McNew, K. Nov 2001. "Expanded Crop Rotations and Price Risk Effect." *Agricultural Policy Marketing Center, Montana State University Extension, Briefing.* No. 16.

Moreno, G., et al. 2005. "Joint Estimation of Technology Adoption and Land Allocation with the Implications for the Design and Conservation Policy." *American Journal of Agricultural Economics.* Nov-05: pp1009-1021.

NRCS. June 2004. "Self-Assessment Workbook." *Conservation Security Program* - p2.

NRCS. Oct 2005. "Conservation Security Program, Program Description." *Farm Bill 2002.* http://www.nrcs.usda.gov/programs/csp. pp2.

Perkins, J. Mar 2007. "Iowa farmland prices go up 13.6%" *Des Moines Register.* Farm Editorial.

Sagoff, M. Oct 1995. "Carrying Capacity and Ecological Economics." *BioScience*, Vol. 45, No. 9. pp. 610-620.

Schnitkey, et al. 1992. "Information Preferences of Ohio Commercial Farmers: Implications for Extension." *American Journal of Agricultural Economics.* May-92: pp486-496.

Smith, D. April 2006. "Iowa Corn and Soybean County Yields." *Iowa State University Extension – Ag Decision Maker.* File A1-14.

Smith, D and Edwards, W. May 2006 (revised). "Cash Rental Rates for Iowa. 2006 Survey." *Iowa State University Extension – Ag Decision Maker.* File C2-10, FM 1851.

Smith, D and Edwards, W. Sept 2006 (revised). "2005 Iowa Farm Costs and Returns". *Iowa State University Extension – Ag Decision Maker.* File C1-10, FM 1789.

Soil and Water Conservation Society (SWCS) with Environmental Defense. Feb 2007. "Conservation Security Program (CSP) Assessment". www.swcs.org

Sutherland, M and Scarsbrick, B. 2001. "Keynote: Land care in Australia." *Sustaining the Global Farm.* Select papers from the 10th International Soil Conservation Organization Meetings. May 1999.

Swinton, M., et al. 2006. "Ecosystem Services from Agriculture: Looking Beyond the Usual Suspects." *American Journal of Agricultural Economics.* Vol. 88 (No.5) : pp1160-1166.

USDA (NRCS). Oct 2002. "Soil Management" *National Agronomy Manual.* Subpart 508C. pp 508:2-11.

USDA. 2007. "Title II – Conservation" *2007 Farm Bill Proposals.* http://www.usda.gov/wps/portal

United States Government Accountability Office (GAO). Apr 2006. "Conservation Security Program, despite cost controls improved USDA management is needed to ensure proper payments and reduce duplication with other programs." Report to the Chairman, *Committee on Appropriations, US Senate*. GAO-06-312.

Westra, J. 2005. "The Conservation Security Program: Economic and Environmental Benefits." This paper expands on a larger study titled *Economic Analysis of Agriculture for Multiple Benefits* funded by Legislative Commission on Minnesota Resources, USDA SARE North Central Region and Nebraska Agricultural Experiment Station.

Westra, J.V., J.K.H. Zimmerman and B. Vondracek. 2004. "Do Conservation Practices and Programs Benefit the Intended Resource Concern?" *Agricultural and Resource Economics Review.* 33(1):105-120.

Wooldridge, J. 2003. "Causality and the notion of Ceteris Paribus in Econometric Analysis." *Introductory Econometrics: A Modern Approach, 2e.* South-Western. Mason, OH.

World Trade Organization. 2002. "Annex 2. Domestic Support: The basis for exemption from the reduction commitments." *WTO Agriculture Agreement.* pp59-64.

Zimmerman, J.K.H., Vondracek, B. and J. Westra. 2003. "Agricultural land use effects on sediment loading and fish assemblages in two Minnesota watersheds," *Environmental Management*. 32(1): 93-105.

7 APPENDICIES

7.1 Appendix A1

Conservation Security Program Study

Iowa State University
Department of Economics

Please answer the following questions based on your experiences and opinion. For each item, below, fill in the blank or check the box for your answer.

*For Questions 1 to 8, please check the **box** that **best represents** your level of agreement or disagreement with each statement.*

	Strongly Agree	Somewhat Agree	Neutral	Somewhat Disagree	Strongly Disagree
1. "Land Stewardship" is a good term to describe responsible farming.	☐	☐	☐	☐	☐
2. "Land Stewardship" includes accounting for off-farm impacts such as soil and nutrient loss into public waterways.	☐	☐	☐	☐	☐
3. "Land Stewardship" means maximizing the production of your land.	☐	☐	☐	☐	☐
4. "Land Stewardship" is about balancing farm profitability with preservation of farmland for the use of future generations.	☐	☐	☐	☐	☐
5. "Land Stewardship" means minimizing the use of off-farm inputs such as fertilizer and pesticides.	☐	☐	☐	☐	☐
6. "Land Stewardship" includes a crop rotation with 3 or more crops.	☐	☐	☐	☐	☐
7. "Land Stewardship" is about farming in a manner that conserves natural resources such as soil and water.	☐	☐	☐	☐	☐
8. "Land Stewardship" is impossible without grazing livestock as part of a crop rotation.	☐	☐	☐	☐	☐

9. Check the farming practices you use that you think contribute positively to Land Stewardship. (*please check **all** that apply*).

- ☐ Fall or Spring Nitrate tests
- ☐ Integrated Pest Management (IPM)
- ☐ CRP or WRP programs
- ☐ use of manure in place of commercial fertilizer
- ☐ glyphosate pesticides only
- ☐ Other(s) (please describe)_____
- ☐ 3 or more crops in rotation
- ☐ ridge tillage
- ☐ terraces
- ☐ managed or rotational grazing
- ☐ side-dress Nitrogen fertilizer

10. Do you have any land certified organic or in transition to certified organic?

☐ YES
☐ NO

11. What is the nature of your participation in the Conservation **Security** Program (CSP, not CRP)?

☐ Never Heard of CSP
☐ Heard of CSP but made no attempt to enroll
☐ Wanted to enroll but it was not available in my area
☐ Attempted to enroll in CSP but was rejected

PLEASE SKIP TO QUESTION 21 (on next page)

☐ Enrolled in CSP

12. What CSP tier are you currently enrolled at?

☐ Tier 1 ➔ How many acres do you have enrolled in Tier 1? _____
☐ Tier 2
☐ Tier 3

13. How many of your CSP acres are organically certified or in transition to organic?_____

14. What crops do you have on your CSP acres?

(*please check **all** that apply*)

☐ corn ☐ organic corn ☐ alfalfa / hay ☐ small grains
☐ soybeans ☐ organic soybeans ☐ pasture ☐ vegetables
☐ Others: _____

15. Do you have livestock on your CSP acres?

*(Please check **all** that apply)*

☐ cow-calf ☐ pasture dairy herd ☐ pasture poultry
☐ pasture-raised beef ☐ pasture-farrowed hogs ☐ sheep / goats
☐ NONE on CSP acres
☐ Others (*please specify*) _____ _____

16. What is your total annual CSP payment rate per acre?

☐ $1 to $50 ☐ $75 to $100
☐ $50 to $75 ☐ over $100

17. Are you enrolled for enhanced payments?

☐ YES ➔ For what stewardship practices? (*please specify*):_____
_____
☐ NO

For 18 to 22 please check <u>one box per question</u>	Understood Well	Moderately Understood	Found it hard to Understand
18. How well did you understand the <u>enrollment procedure</u> for the CSP?	☐	☐	☐
19. How well have you understood the <u>payment structure</u> for the CSP?	☐	☐	☐

	More than compensates	Fully compensates	Somewhat compensates	Not worth time it took to enroll
20. Since <u>making the decision</u> to enroll in CSP, how has the <u>additional cost</u> of achieving enrollment been compensated by your CSP payments?	☐	☐	☐	☐

Check 21 and 22 based on your level of agreement or disagreement:	Strongly Agree	Somewhat Agree	Not Sure	Somewhat Disagree	Strongly Disagree
21. The CSP has been designed to "reward the best land stewards and attract the rest".	☐	☐	☐	☐	☐
22. The watershed-by-watershed approach to CSP enrollment is a necessary pilot phase.	☐	☐	☐	☐	☐

23. Have you had a <u>Soil Conditioning Index</u> (SCI) calculated for any part of your land?

☐ YES ➔ Please indicate SCI:_____ ➔ ☐ check here if this was for <u>CSP acres **only**</u>

☐ NO

24. Number of acres you farm: **Crops:** <u>owned</u>:_____acres <u>rented</u>:_____acres
Pasture: <u>owned</u>:_____acres <u>rented</u>:_____acres

25. <u>If you rent land</u>, what is the <u>predominant</u> lease arrangement?

☐ Cash rent

☐ Crop share

☐ Do not rent any land.

26. What is the highest level of education you completed?

☐ 11th grade or less

☐ High school diploma (includes GED)

☐ 2 year degree or part of a 4 year degree.

☐ 4 year degree or more (BS, BA, MS, PhD, etc.)

27. What is your age today?_____

28. What is your gender?
    - ☐ Male
    - ☐ Female

29. How many people currently live in your household? _____

30. How many people in your household work (including on and off the farm)? _____

31. How many of those people receive most of their income from working **on** the farm?_____

32. How many of those people receive most of their income from working **off** the farm?_____

33. Do you employ any additional labor (if this is variable please answer for busiest time of year)?
    - ☐ YES → How many of your employees work **no more than** 20 hours per week?_____
      How many of your employees work **more than** 20 hours per week?_____
    - ☐ NO

34. What is your approximate 2005 gross farm income?
    - ☐ $1 to $50,000
    - ☐ $50,001 to $100,000
    - ☐ $100,001 to $500,000
    - ☐ over $500,000

35. What is your approximate 2005 gross off-farm income?
    - ☐ $0 to $10,000
    - ☐ $10,000 to $25,000
    - ☐ $25,001 to $50,000
    - ☐ $50,001 to $100,000
    - ☐ over $100,000

36. So we can discuss your responses in greater detail and help build on the findings of this study, would you be willing to participate in a face-to-face or phone interview?
    (*Compensation will be available* : 30-90 minutes @ $17/hr)
    - ☐ YES → *Please provide the contact information below.* **Thank You!**
    - ☐ NO → **Thank you** for your time. *Please mail survey in **pre-paid** envelope.*

Name:_____ Phone: (___)-___-____ Email: _____

*When questionnaire is complete please refold mail survey in **pre-paid** business reply envelope*

No Return Postage Required.

7.2 Appendix A2

Recently a questionnaire was sent to you from Iowa State University seeking your opinions about the new Conservation Security Program (CSP) and Land Stewardship. Your name was selected as part of a sample of Iowa counties within CSP watersheds.

If you have completed and returned the questionnaire, please accept our sincere thanks. If not, please consider doing so today. Even if you are not enrolled in CSP your opinions and experiences are important to the study.

If you need another copy of the questionnaire, please contact me directly at 515-451-7034 or dareich@iatate.edu, and I will send you one. Thank you for your help.

Conservation Security Program Study
Iowa State University
Economics Department

Sincerely,

Denis Reich
Co-Principal Investigator

7.3 Appendix B

Interview Project: Denis Reich, "Evaluating the Conservation Security Program Utilizing the Perceptions and Economics of Producer Participation: Implications for Land Stewardship in Iowan Agriculture."

Iowa State Institutional Review Board (IRB) Case Number: 06-036

Purpose: the purpose of the interview portion of the Study, is to generate case farms of producer groups that emerge from the survey response data. These case farms will be developed for the purposes of understanding the economics of these different producer groups.

Note: Interviewees are selected from agreeable respondents to the Survey Questionnaire portion of the study. The PI will perform all interviews (approx 10). All questions are voluntary. Interviews can terminate the interview at any time. All answers are confidential.

Interview Outline (1-2 hours)

1. Operation Basics: farm description; crop choices, acreages, rotations, yields, tillage practices, fertilizer application rates, pesticide/herbicide use, livestock.
2. Equipment: buildings and machinery; models, age, quantity, costs.
3. Labor: how labor is used on the farm: number of employees, hours.
4. CSP: contract information; tier, acres, payments, enhancements.
5. General Conservation: conservation approach and practices; history of conservation on the farm.
6. General Discussion: farming vision; what motivates, what are goals for the farm, what has worked, what hasn't; how farmers see agriculture as a profession surviving and thriving in Iowa.; thoughts and wish list for 2007 Farm Bill.

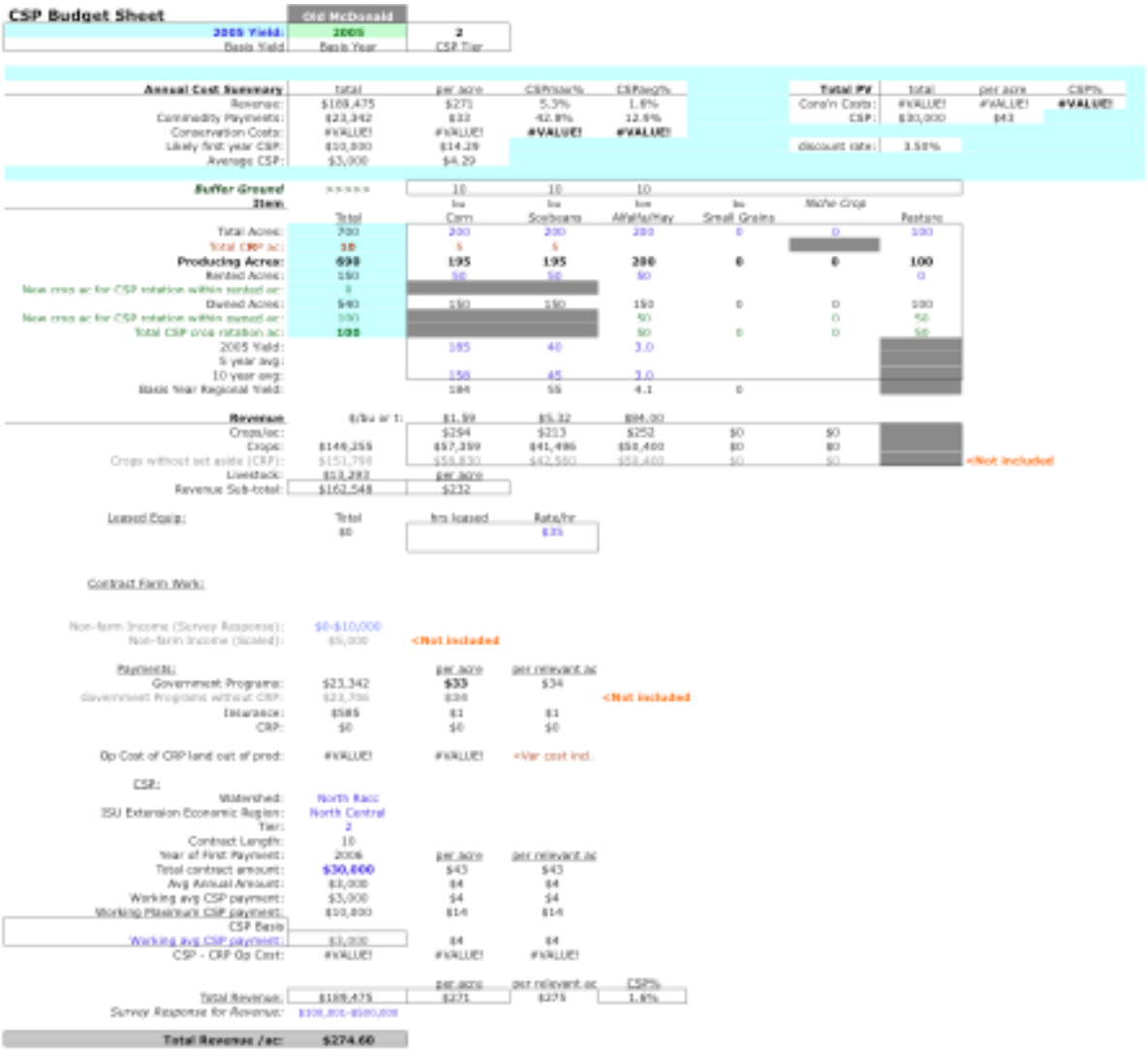
7.4 Appendix C

```
options formdlim = '-';
/*
*********************
** CSP AWARE Logit **
*********************
*/
data cspaware;
     infile "F:\a thesis\logit\SAS\<CSP-Aware>.txt";
     input watershed $ CSPAwareNew $ Q1 Q2 Q3 Q4 Q5 Q6 Q7   Q8
TotPrac Totalcrop TotalPast TotalAc TotalRent TotalOwn Lease
Educ Age Gender FarmIncome OffFarmInc ;
run;
proc logistic data=cspaware;
     class watershed Gender FarmIncome OffFarmInc Educ
     Lease;
```

```
     model CSPAware = watershed Q1 Q2 Q3 Q4 Q5 Q6 Q7 Q8
     TotPrac Totalcrop TotalRent TotalOwned Lease Educ Age
     Gender FarmIncome  OffFarmInc
     / selection = stepwise
     slentry=0.3
     slstay=0.35 ; /* alpha=0.05 default for 95% Odds
     alpha=0.1 */
run ;

/*
**********************
** CSP ENROLL Logit **
**********************
*/
data cspenroll;
     infile "F:\a thesis\logit\SAS\<CSP-Enroll>.txt";
     input watershed $ CSPEnroll $ Q1 Q2 Q3 Q4 Q5 Q6 Q7 Q8
     TotPrac Totalcrop TotalPast TotalAc TotalRent
     TotalOwned Lease Educ Age Gender FarmIncome
     OffFarmInc ;
     run;
proc logistic data=cspenroll;
     class watershed Gender FarmIncome OffFarmInc Educ
     Lease;
     model CSPEnroll = watershed Q1 Q2 Q3 Q4 Q5 Q6 Q7 Q8
     TotPrac Totalcrop TotalPast TotalRent TotalOwned Lease
     Educ Age Gender FarmIncome  OffFarmInc / selection =
     stepwise
     slentry=0.3
     slstay=0.35; /* alpha=0.05 default for 95% Odds
     alpha=0.1 */
run ;
```

```
/*
********************
** CSP TIER Logit **
********************
*/

data csptier;
     infile "F:\a thesis\logit\SAS\<CSP-tier>.txt";
     input watershed $ county $ CSPTier $ Q1 Q2 Q3 Q4 Q5 Q6
     Q7 Q8 TotPrac Payment $ Enh $ Compen $ TotCrop
     TotalPast TotalRent TotalOwn Lease $ Educ $ Age Gender
     $ FarmIncome $ OffFarmInc $  ;
run;

proc logistic data=csptier;
     class watershed Gender Enh Payment Compen Lease
     FarmIncome OffFarmInc Educ;
     model CSPTier= watershed Q1 Q2 Q3 Q4 Q5 Q6 Q7 Q8  TotPrac
Enh Payment Compen TotalCrop TotalPast  TotalOwn TotalRent
Lease Educ Age Gender  FarmIncome       OffFarmInc / selection
= stepwise
     slentry=0.3
     slstay=0.35; /* alpha=0.05 default for 95% Odds
     alpha=0.1 */
run;
```

7.5 Appendix D



CSP Budget Sheet — Old McDonald

2005 Yield:	2005	2
Basis Yield:	Basis Year	CSP Tier

Annual Cost Summary	total	per acre	CSP/total%	CSP/avg%
Revenue:	$169,475	$271	5.3%	1.8%
Commodity Payments:	$23,342	$33	42.8%	12.9%
Conservation Costs:	#VALUE!	#VALUE!	#VALUE!	#VALUE!
Likely first year CSP:	$30,800	$14.29		
Average CSP:	$5,000	$4.29		

Total PV	total	per acre	CSP%
Cons'n Costs:	#VALUE!	#VALUE!	#VALUE!
CSP:	$30,000	$43	
discount rate:	3.50%		

Buffer Ground	*****	10	10	10			
Item	Total	bu Corn	bu Soybeans	ton Alfalfa/Hay	bu Small Grains	Niche Crop	Pasture
Total Acres:	700	200	200	200	0	0	100
Total CRP ac:	10	5	5				
Producing Acres:	690	195	195	200	0	0	100
Rented Acres:	150	50	50	50			0
New cros ac for CSP intative within contract ac:	0						
Owned Acres:	540	150	150	150	0	0	100
New cros ac for CSP intative within owned ac:	100			50	0	0	50
Total CSP crop rotation ac:	100			50	0	0	50
2005 Yield:		185	40	3.0			
5 year avg:							
10 year avg:		150	45	3.0			
Basis Year Regional Yield:		184	55	4.1	0		

Revenue	$/bu or T:						
Crops/ac:		$294	$213	$252	$0	$0	
Crops:	$149,255	$57,359	$41,486	$50,400	$0	$0	
Crops without set aside (CRP):	$151,750	$58,830	$42,560	$50,400	$0	$0	<Not included
Livestock:	$13,293	per acre					
Revenue Sub-total:	$162,548	$232					

Leased Equip:	Total	hrs leased	Rate/hr
	$0		$35

Contract Farm Work:

Non-farm Income (Survey Response):	$0-$10,000		
Non-farm Income (Scaled):	$5,000	<Not included	
Payments:		per acre	per relevant ac
Government Programs:	$23,342	$33	$34
Government Programs without CRP:	$23,706	$34	<Not included
Insurance:	$585	$1	$1
CRP:	$0	$0	$0
Op Cost of CRP land out of prod:	#VALUE!	#VALUE!	<Var cost incl.

CSP:			
Watershed:	North Race		
ISU Extension Economic Region:	North Central		
Tier:	2		
Contract Length:	10		
Year of First Payment:	2006	per acre	per relevant ac
Total contract amount:	$30,800	$43	$43
Avg Annual Amount:	$3,000	$4	$4
Working avg CSP payment:	$5,000	$4	$4
Working Maximum CSP payment:	$10,000	$14	$14
CSP Basis			
Working avg CSP payment:	$3,000	$4	$4
CSP - CRP Op Cost:	#VALUE!	#VALUE!	#VALUE!

		per acre	per relevant ac	CSP%
Total Revenue:	$169,475	$271	$275	1.8%
Survey Response for Revenue:	$100,001-$500,000			
Total Revenue /ac:	$274.60			

Additional Equipment (for CSP Conservation)	Current Invest.	Fract	Current Value	Fract	yrs to deprec.	Age of unpaid	No. unpaid	No. Owned	Item Cost
Tractor (175HP+)	$417	0.101	$82,731	0.718	6	4	1	1	$115,000
"No Till" Drill	$3,534	0.124	$28,419	0.674	8	2	1	1	$32,500
Anhydrous Side Dresser	$137	0.009	$2,303	0.154	1	9	1	1	$15,000
Waterway plough	$1,995	0.081	$22,806	0.629	5	5	1	1	$35,000
Machinery Storage	$34	0.015	$45,000	0.308	3	7	1	1	$150,000
Hoop Buildings									
Other Bldgs									
Annual Conservation Equipment Costs:	$6,117		Tot PV:	$180,459					

Conservation (Terrain Dependent) (Terrain type: flat)	Current Invest.	Fract	Current Value	Fract	avg age unpaid	No. unpaid	Units	Unit Cost	Maint Cost
Terraces (ft cubic yds):	$2,000				20	0	7081	$2.00	$0.20
Shaped waterways - trapezoidal (ac):	$600				10	0	5	$1,283	$120
Specific Conservation Practices									
Conservation Cover	$124	0.030	$120	0.600	4	1	20	$200	$6
Residue Management - No Till and Strip Till*	$1,000				10	0	200	$5	$5
Field Border	$125	0.015	$4	0.308	7	28	5000	$1	$0
Filter Strip	$166	0.035	$420	0.700	3	3	15	$200	$10
Pond	$625	0.025	$15,000	0.500	5	2	1	$15,000	$450
Opportunity Costs of Buffer Ground:	#VALUE!								
Annual General Conservation Costs:	#VALUE!	Cost SubTotals:	$120						$126
Total Annual Investment:	#VALUE!		#VALUE!						
Insurance and taxes:	1.5%								
Interest:	7.0%								
Average interest over Depreciation period:	3.5%		#VALUE!						
Total fraction for annual cost on investment:	5.0%		$9,023	27068.75408					
Annual Cost on Investment:	#VALUE!								

Conservation Crop Rotations	1st								
		$2,925.60	$2,926.80	$3,444.00	$0.00	$0.00	$0.00		$ 9,295.60
		For CRP Var. Op Cost Only				Wehr Crop			Buffer Var Op Cost
		Corn	Soybeans	Alfalfa/Hay	Small Grains		Pasture		
Seed	#VALUE!	#VALUE!	#VALUE!	#VALUE!	#VALUE!		#VALUE!		#VALUE!
Fertilizer w/ Lime	#VALUE!	#VALUE!	#VALUE!	#VALUE!	#VALUE!		#VALUE!		#VALUE!
Herbicide	#VALUE!	#VALUE!	#VALUE!	#VALUE!	#VALUE!		#VALUE!		#VALUE!
Insecticide	#VALUE!	#VALUE!	#VALUE!	#VALUE!	#VALUE!		#VALUE!		#VALUE!
Drying and Storage	#VALUE!	#VALUE!	#VALUE!	#VALUE!	#VALUE!		#VALUE!		#VALUE!
Machinery, Fuel, Repairs, Hire	#VALUE!	#VALUE!	#VALUE!	#VALUE!	#VALUE!		#VALUE!		#VALUE!
Utilities	#VALUE!	#VALUE!	#VALUE!	#VALUE!	#VALUE!		#VALUE!		#VALUE!
Rent:	$0.00	109.60	109.60	94.02	85.28	0.00	45.76		
Property Tax:	$2,084.92	20.65	20.65	20.65	20.65	20.65	20.65		$619
Repairs:	#VALUE!	#VALUE!	#VALUE!	#VALUE!	#VALUE!				#VALUE!
Miscellaneous:	#VALUE!	#VALUE!	#VALUE!	#VALUE!	#VALUE!				#VALUE!
Conservation Crop Operating Costs (/ac):	#VALUE!							Buffer Costs	#VALUE!
Conservation Crop Cost Sub-total:	#VALUE!							Buffer DC	#VALUE!
Avg. Interest on Operating costs:	3.5%								
Total Interest Costs:	#VALUE!								
Crop Marketing Rate /ac:	$1.80								
Crop Marketing Cost:	$100								
Labor cost per hour:	$10.00								
Add'l Conservation Labor (40 hr) weeks:	3								
Total Labor Cost:	$1,200								
Conservation Crop Costs:	#VALUE!								
Total Conservation Costs:	#VALUE!								

Conservation Cost /ac:	#VALUE!	vs. CSP / ac:	$4.29
Percent of Conservation Costs:			#VALUE!

7.6 Appendix E

CSP PRACTICE INSTALLATION AND MAINTENANCE COSTS

DEMONSTRATION COUNTY, IOWA

Code	Practice Name	Unit	Unit Cost of Installation	Maint. %	Annual Maint. Cost
560	Access Road	Feet			$0.00
560	Gravel	Feet		10%	$0.00
560	Blacktop	Feet		5%	$0.00
560	Pavement	Feet		3%	$0.00
310	Bedding	Acre		10%	$0.00
314	Brush Management	Acre	$40.00	10%	$4.00
584	Channel Stabilization	Feet		10%	$0.00
326	Clearing & Snagging	Feet		5%	$0.00
317	Composting Facility	Number	$12,000.00	5%	$600.00
327	Conservation Cover	Acre	$200.00	3%	$6.00
328	Conservation Crop Rotation*	Acre	$3.00	100%	$3.00
332	Contour Buffer Strips	Acre	$15.00	5%	$0.75
330	Contour Farming	Acre	$6.00	3%	$0.18
340	Cover & Green Manure Crop*	Acre	$3.00	100%	$3.00
342	Critical Area Planting	Acre	$200.00	3%	$6.00
348	Dam, Diversion	Number or Feet		3%	$0.00
356	Dike	Feet	$5.00	1%	$0.05
362	Diversion	Feet	$3.00	5%	$0.15
647	Early Successional Habitat Development/Management*	Acre	$10.00	100%	$10.00
382	Fencing	Feet	$1.50	5%	$0.08
386	Field Border	Feet	$0.50	5%	$0.03
393	Filter Strip	Acre	$200.00	5%	$10.00
399	Fish Pond Management	Number		5%	$0.00
511	Forage Harvest Management*	Acre	$5.00	100%	$5.00
666	Forest Stand Improvement	Acre	$120.00	3%	$3.60
410	Grade Stabilization Structure	Number	$15,000.00	3%	$450.00
412	Grassed Waterway	Acre	$4,000.00	3%	$120.00
561	Heavy Use Area Protection	Acre	$8,700.00	3%	$261.00
422	Hedgerow Planting	Feet		5%	$0.00
449	Irrigation Water Management*	Acre	$5.00	100%	$5.00
450	Anionic Polyacrylamida ErosionControl*	Acre	$15.00	100%	$15.00
464	Irrigation Land Leveling	Acre		3%	$0.00
442	Irrigation System, Sprinkler	Number and Acre	$600.00	3%	$18.00
460	Land Clearing	Acre	$500.00	3%	$15.00
466	Land Smoothing	Acre		2%	$0.00
468	Lined Waterway or Outlet	Feet	$50.00	2%	$1.00
484	Mulching	Acre	$200.00	2%	$4.00
590	Nutrient Management	Acre			
	without manure*	Acre	$5.00	100%	$5.00
	with manure*	Acre	$10.00	100%	$10.00
500	Obstruction Removal	Acre		0%	$0.00
582	Open Channel	Feet	$5.00	3%	$0.15
512	Pasture & Hayland Planting	Acre	$120.00	5%	$6.00
595	Pest Management*	Acre	$5.00	100%	$5.00
516	Pipeline	Feet	$0.30	3%	$0.01
378	Pond	Number	$15,000.00	3%	$450.00
521-A	Pond Sealing or Lining - Flexible Membrane Lining	Number		1%	$0.00
521-B	Pond Sealing or Lining - Soil Dispersant	Number		1%	$0.00
521-C	Pond Sealing or Lining - Bentonite Sealant	Number		1%	$0.00
462	Precision Land Forming	Acre		1%	$0.00
338	Prescribed Burning	Acre	$35.00	3%	$1.05
528A	Prescribed Grazing	Acre	$20.00	10%	$2.00
533	Pumping Plant for Water Control	Number	$500.00	5%	$25.00
566	Recreation Land Grading and Shaping	Acre		3%	$0.00
568	Recreation Trail and Walkway	Feet		5%	$0.00
329A	Residue Management - No Till and Strip Till*	Acre	$5.00	100%	$5.00

329B	Residue Management - Mulch Till*	Acre	$2.00	100%	$2.00
329C	Residue Management - Ridge Till*	Acre	$5.00	100%	$5.00
344	Residue Management, Seasonal*	Acre	$5.00	100%	$5.00
391	Riparian Forest Buffer	Acre	$700.00	10%	$70.00
555	Rock Barrier	Feet		3%	$0.00
558	Roof Runoff Management	Number	$3,000.00	3%	$90.00
350	Sediment Basin	Number		5%	$0.00
574	Spring Development	Number	$2,000.00	5%	$100.00
580	Streambank and Shoreline Protection	Feet	$40.00	10%	$4.00
585	Stripcropping, Contour	Acre	$15.00	5%	$0.75
589	Cross Wind Trap Strips	Acre	$15.00	10%	$1.50
587	Structure for Water Control	Number	$1,000.00	5%	$50.00
606	Subsurface Drain	Feet	$4.00	3%	$0.12
607	Surface Drainage, Field Ditch	Feet	$10.00	3%	$0.30
608	Surface Drainage, Main or Lateral	Feet		5%	$0.00
609	Surface Roughening*	Acre	$5.00	100%	$5.00
600	Terrace, Level	Feet		5%	$0.00
600	Terrace, Tile-outlet	Feet	$4.00	5%	$0.20
980	Tile Intake Replacement	Number		0%	$0.00
612	Tree/Shrub Establishment	Acre	$700.00	1%	$7.00
620	Underground Outlet	Feet	$6.00	3%	$0.18
645	Upland Wildlife Habitat Management	Acre	$200.00	5%	$10.00
472	Use Exclusion	Acre	$50.00	5%	$2.50
638	Water and Sediment Control Basin with Tile	Number	$4,000.00	5%	$200.00
638	Water and Sediment Control Basin without Tile	Number		5%	$0.00
642	Water Well	Number	$12,000.00	1%	$120.00
614	Watering Facility	Number	$150.00	5%	$7.50
981	Wellhead Protection	Number		5%	$0.00
658	Wetland Creation	Acre	$2,500.00	5%	$125.00
659	Wetlands Enhancement	Acre	$1,500.00	5%	$75.00
657	Wetland Restoration	Acre	$1,500.00	5%	$75.00
644	Wetland Wildlife Habitat Management	Acre	$200.00	5%	$10.00
380	Windbreak/Shelterbelt Establishment	Feet	$6.00	5%	$0.30
650	Windbreak/Shelterbelt Renovation	Feet	$6.00	3%	$0.18
490	Woodland Site Preparation	Acre	$160.00	3%	$4.80

* Annual Practice, no installation cost.

8 ACKNOWLEDGEMENTS

To Jim Kliebenstein, thank you for you for your willingness to take a gamble on a student who was largely unproven and for your unwavering patience with my grandiose ideas and reams of convoluted prose. Rightly or wrongly I have never felt "supervised" and deeply appreciate the respect and care with which you guided me through my Master's program and the thesis writing process.

To my Master's committee: Mike Duffy, Francis Owusu and Bob Mazur for their assistance and support of this project. Also to Dr's Alicia Carriquiry and Phil Dixon from the Statistics Department for so generously and patiently assisting with the regression analysis.

To the Leopold Center for Sustainable Agriculture for investing so generously in this study.

Many thanks to all the staff at the Iowa State Statistical Laboratory and National Agricultural Statistics Service (NASS) for such great assistance with the mail survey, especially Jan Larson and Karen Fliehler at the Statistics Lab, and Jim Sands and Brad Parks from NASS.

To the agricultural producers of Iowa, especially those who responded to the mail survey or who participated in an interview.

To everyone involved in the Graduate Program in Sustainable Agriculture (GPSA) and Economics Department here at Iowa State or agriculturally sustainable endeavors who assisted with this study; especially Ferd Hoefner of Sustainable Agriculture Coalition, Traci Bruckner of the Center for Rural Affairs, Loni Kemp and Tim Gesieke of the Minnesota Project, Duane Sand of the Iowa National Heritage Foundation and Tom O'Connor of the National Resources Conservation Service.

To Rick Hartmann and Stacy Bastian whose passion for self sufficiency, social justice and growing healthy tasty food planted the seed that eventually grew into this document.

To Gretchen Zdorkowski, for smoothing my entrance into the GPSA here at Iowa State so professionally and compassionately and being a true friend throughout.

To Mark Honeyman, who conducted my admission interview for the GPSA and ultimately recommended me to Jim for a graduate assistantship; a true turning point in my life.

To my family: my late father, Norman and my mother, Marianne whose ongoing passion for agriculture and sustainable business practices provided the perfect backdrop for my pre-mid-life crisis career transition. Also to my sisters, Annabel and Michelle for their love and support, especially Michelle, whose vast knowledge of American and global agricultural policy proved invaluable to this study.

To my closest graduate school friends here in Ames: Ryan Atwell and Amanda Sparkman for supporting me (and feeding me) so unconditionally no matter how discouraging graduate school life became. Ryan, I doubt there is a running route left in Ames that hasn't provided relief to us both as we attempted to recover from another tough day on the path to the dastardly graduate degree.

To Alice McGary for being an amazing friend, songwriter, song finisher and band-mate. Alice, you are "great" and "fun" in ways I can only aspire to be. Thanks for your consistent and loving support, even when the demands of my thesis have not been convenient for you.

To my best friends, Nick Blackwell and Tim Anderson who are always only too willing to share in my graduate school frustrations and joys as only lifelong friends can and do. This document would not have been possible without you.

To Jeff Mohr, Jamie Heiman and Patrick Hultman for providing me with solutions I could use when all I saw was problems.

To the Lewis household(s): Barrs, Holly, Rosemary, Duncan, Sage and Aleigh for being my "family" away from home. Your hospitality, friendship and interest in me and my studies has not gone unnoticed. I am eternally indebted to all of you.

To Hannah Lewis. Hannah, your love and friendship have been of the rarest, most honest and precious quality. It is what consistently proved the difference during the times that I thought I couldn't or wouldn't finish this degree.