

TO ADOPT OR NOT TO ADOPT: FACTORS AFFECTING AGRICULTURAL BEST
MANAGEMENT PRACTICE ACCEPTABILITY AND ADOPTION

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ACRONYMS AND DEFINITION OF TERMS

(Obtained from the USDA or NRCS)

- ASCS- *Agricultural Stabilization and Conservation Service* was an agency of the United States Department of Agriculture from 1961 to 1994. The service was incorporated into the Department of Agriculture's Farm Service Agency in 1994.
- BMP- *Best Management Practice* are methods that have been determined to be the most effective, practical means of preventing or reducing pollution from non-point sources.
- CEAP- *Conservation Effects Assessment Project* began in 2003 as a multi-agency effort to quantify the environmental benefits of conservation practices used by private landowners participating in selected U.S. Department of Agriculture (USDA) conservation programs.
- CREP- *Conservation Reserve Enhancement Program* is a voluntary land retirement program that helps agricultural producers protect environmentally sensitive land, decrease erosion, restore wildlife habitat, and safeguard ground and surface water.
- CRP- *Conservation Reserve Program* provides technical and financial assistance to eligible farmers and ranchers to address soil, water, and related natural resource concerns on their lands in an environmentally beneficial and cost-effective manner. It encourages farmers to convert highly erodible cropland or other environmentally sensitive acreage to vegetative cover.
- CSREES- *Cooperative State Research, Education, and Extension Service* is an agency within the U.S. Department of Agriculture. Congress created CSREES through the 1994 Department Reorganization Act, by combining the USDA's Cooperative State Research Service (CSRS) and Extension Service (ES) into a single agency.

- EQIP- *Environmental Quality Incentives Program* provides a voluntary conservation program for farmers and ranchers that promote agricultural production and environmental quality as compatible national goals. EQIP offers financial and technical help to assist eligible participants install or implement structural and management practices on eligible agricultural land.
- FSA- *Farm Service Agency* administers and manages farm commodity, credit, conservation, and disaster and loan programs as laid out by Congress through a network of federal, state and county offices.
- NRCS- *Natural Resource Conservation Service* (originally called the Soil Conservation Service) has provided leadership in a partnership effort to help America's private land owners and managers conserve their soil, water, and other natural resources.
- SWCD- *Soil and Water Conservation District* are local agencies within each state that work to help landowners conserve land, water, forests, wildlife and related natural resources

ABSTRACT

Weinkauff, Denise Caroline. M.S., Purdue University, August 2008. To Adopt or Not to Adopt: Factors Affecting Agricultural Best Management Practice Acceptability and Adoption. Co-Major Professors: Linda S. Prokopy and Terry R. West

Management of agricultural operations has the potential to negatively affect water quality, along with causing other environmental problems. Increasingly landowners and managers have been encouraged to adopt agricultural best management practices (BMPs), which are designed to mitigate this impact. Numerous studies have looked at what affects the voluntary decision to adopt BMPs, however, synthesis indicates the need for further analysis of this topic. This research study looks more in-depth at the issues surrounding BMP adoption in order to offer a new perspective on an old problem. Interviews with agricultural producers from three Indiana watersheds are used to examine the effect of their personal characteristics (e.g. age, education, information sources) and their perceptions of characteristics associated with BMPs (e.g. complexity, compatibility) to determine how these affect adoption decisions. In addition, those interviews along with interviews of non-operating landowners are used to analyze the relationship between land tenure and adoption decisions. In-depth qualitative analysis is used to bring to light new themes in these areas and further explain results of surveys that find aspects of the above mentioned concepts significant.

Results indicate that specific characteristics of BMPs are important in either facilitating or impeding their adoption. Specifically, the characteristics of soil, economic, and environmental advantages/disadvantages, compatibility, and observability (visually observable advantages) were found to most influence adoption decisions. It is suggested, practices be marketed in terms of their on-farm benefits and necessity. Personal characteristics of producers were found also to significantly influence conservation decisions. This study categorized producers into five groups based on their personal characteristics and main motivations for conservation adoption/non-adoption. It was determined that education and outreach should be targeted towards groups of producers based on their effort and attitudes towards conservation adoption instead of their demographic characteristics. Each group requires different levels and types of education and outreach efforts. Additionally, land tenure was found to influence conservation adoption in a number of ways. Interestingly, there were no instances of conservation being required by landlords; however, a few producers had gained rental acreage based on their use of conservation. It was determined that targeting education and outreach towards non-operating landowners is essential in influencing them to consider conservation in their rental decisions.

Finally it is important future research incorporate the findings of this qualitative analysis in order to construct better measures for collecting this information through quantitative surveys. In general, this study illustrates the importance of considering individual circumstances and perceptions when working with potential conservation adopters.

CHAPTER I

INTRODUCTION

Decisions regarding land management have a significant effect on water quality. Environmental degradation caused by agriculture has gained increased attention because associated costs to society (e.g. soil erosion, health hazards and groundwater pollution) have become better known and documented (Traore 1998). According to Schnepf and Cox (2006) in the past 15 years the environmental agenda including water quality, air quality, and biodiversity has superseded traditional objectives (e.g. improving productivity and “protecting the natural base”) as the primary purpose of agricultural conservation programs. There has been a push for farmers to adopt agricultural best management practices (BMPs), defined as actions to keep soil and other pollutants out of streams and lakes. BMPs are designed to protect water quality and prevent new pollution.

Research Background

The research conducted for this thesis is a component of a larger Conservation Effects Assessment Project (CEAP) (Figure 1.1) evaluating watershed-scale BMP effectiveness and acceptability in the Eagle Creek Watershed, Indiana. “The Conservation Effects Assessment Project began in 2003 as a multi-agency effort to

quantify the environmental benefits of conservation practices used by private landowners participating in selected U.S. Department of Agricultural conservation programs” (NRCS, 2008). One of the participating agencies is the Cooperative State Research, Education, and Extension Service (CSREES) that awarded 13 Competitive Grants for Watershed Studies. The studies are evaluating the effects of watershed conservation practices on water quality focusing on aspects that influence the effectiveness of the practices. Additionally the studies are supposed to evaluate social and economic factors influencing implementation and maintenance of practices and conduct outreach and education to transfer knowledge (NRCS, 2008). The research in this thesis is seeking to build our understanding of the social factors influencing implementation of agricultural best management practices.

Best Management Practices/Conservation Practices

In this research study the terms best management practice (BMP) and conservation practice are used interchangeably. Agricultural producers are more familiar with the term conservation practice; however, BMP is also often used in the published literature in this area. Below are descriptions of the conservation practices investigated in this research project. These were chosen by the local watershed projects as most critical and applicable to the area. With the exception of conservation tillage the definitions provided for each are from the NRCS list of current national conservation practices.

Cover Crops – Growing a crop of grass, small grain or legumes primarily for seasonal protection and soil improvement.

Conservation Tillage – Crops are grown with minimal cultivation of the soil. When the amount of tillage is reduced, the stubble or plant residues are not completely incorporated, and most or all remain on top of the soil rather than being plowed or disked into the soil. For this research project 30% residue cover is assumed for a system to be considered reduced tillage.

Grassed Waterways – A grassed waterway is a natural or constructed channel established in suitable vegetation for safe water disposal.

Filter Strips – A filter strip is an area of vegetation established for the purpose of removing sediment, organic material, and other pollutants from runoff and waste water.

Nutrient Management – This practice involves managing the amount, placement, and timing of plant nutrients to obtain optimum yields and minimize the risk of surface and groundwater pollution. In this research study participants were asked questions regarding crop rotation, soil testing and subsequent use of the results, grid or management zone sampling, and variable rate technology. In addition they were also asked if they had a written nutrient management plan.

Pest Management – Utilizing environmentally sensitive prevention, avoidance, monitoring and suppression strategies, to manage weeds, insects, diseases, animals and other organisms (including invasive and non-invasive species), that directly or indirectly cause damage or annoyance. In this research study participants were asked about their knowledge of integrated pest management (IPM), use of pest resistant corn varieties, scouting for pests, and utilizing economic thresholds.

What Affects the BMP Adoption Decision?

There is a relatively large literature that explores factors that affect farmer's voluntary adoption of best management practices. Many studies have examined the complexity of the decision process to adopt BMPs (e.g. Ervin and Ervin 1982; Westra and Olson 1997; Traore et al. 1998). Past research findings on the use/nonuse of conservation practices have been collected under many models of behavior adoption. Classic models of behavior adoption include Rogers' diffusion of innovation model (Rogers 2003) and Ajzen's Theory of Planned Behavior (Ajzen 1988; 1991) in which human behavior is guided by behavioral beliefs, social norms, and control beliefs. Examples of studies utilizing Theory of Planned Behavior include Lynne et al. (1995) and Beedell and Rehman (2000). A significant number of studies have employed the adoption-diffusion theoretical approach (e.g. Gamon and Scofield 1998; Napier and Camboni 1993).

Through the application of various behavioral models of the adoption decision, categories of variables have emerged as significant in affecting decisions. Some

examples of studies describing categories of variables include an Ervin and Ervin (1982) study identifying personal, physical, economic, and institutional categories of variables in their model of decision making processes. Guerin (1999) grouped variables into three major categories of constraints on adoption characterized by: the land user and the adoption process; the characteristics of, and issues associated with the developers of, the innovation; and the role of extension agents and the transfer process. Finally Rubas (2004) states in general that conservation adoption studies seem to fall into three categories of focus: how adoption spreads, characteristics of technologies to be adopted, and characteristics of decision makers or firms that relate to adoption. Following the Rubas (2004) classification of adoption studies, this research project will further analyze the effect of characteristics of technologies to be adopted and characteristics of decision makers that relate to adoption. Related to characteristics of decision makers specifically, Prokopy et al. (In Press) in a vote count analysis of 55 United States based adoption studies found that education levels, positive environmental attitudes, environmental awareness, and utilization of social networks are more commonly positively, rather than negatively, associated with adoption rates. In order to better understand adoption decisions, this study incorporates the influence of educational programs, information sources and assistance, and attitudes and perceptions.

Research Project

Human capacity to change to more sustainable natural resource management practices varies across catchments and localities (Cary et al. 2001). It has also been shown that a given practice will have different profitability and differing attractiveness to

farmers in different regions or localities (Barr and Cary 2000). A majority of adoption studies have only focused on a few of the many possible factors leading to adoption. Many adoption studies have relied on multiple regression statistical methods and variations in findings between studies make generalization difficult. For example the age variable has been shown to be negatively correlated with adoption (e.g. Featherstone and Goodwin 1993; Soule et al. 2000); positively correlated (e.g. Harper et al. 1990; Kim et al. 2005; Petrzalka et al. 1996); and insignificant (e.g. Daberkow and McBride 2003; McCann et al. 1997). In 2007, Knowler and Bradshaw conducted a global review and synthesis of recent research on the adoption of conservation agriculture to identify those independent variables that regularly explain adoption. The primary finding was that there are few if any universal variables (Knowler and Bradshaw 2007). Prokopy et al. (In Press), mentioned previously, also found in their vote count analysis that most variables were insignificant a majority of the time. Lockeretz (1990) described the research situation as follows: “most attempts to relate farmers’ conservation attitudes and behavior to personal, institutional, or farm structure variables have largely failed” (Lockeretz 1990, pg 518). Napier (2001) suggests researchers go out to the land owner-operators and inquire why they have or have not adopted conservation production systems. Using this information, it may be possible to build a theoretical perspective that will have predictive ability in the future (Napier 2001). Additionally, Darnhofer et al. (2005) states qualitatively oriented studies of farmers’ decision-making can offer additional insights and help interpret the findings of normative surveys.

Based on the above review of synthesized conservation adoption research studies it appears that conservation decision making is not fully understood. Using Napier’s

(2001) suggestion, this research project entailed interviewing land managers regarding their reasons for use/non-use of conservation practices. In-depth interviewing and subsequent qualitative analysis are used to comprehensively look at adoption decisions. The purpose of the study is to analyze an “old problem” with new methods and new watersheds to attempt to gain an increased understanding of what affects conservation adoption decisions. The results are then used to make recommendations for targeting education, policy and outreach. This study also provides direction for future research studies in this area by looking at the reasons certain variables emerge as significant in past studies. The thesis study is presented as three chapters providing an answer to these questions:

1. How do characteristics of a conservation practice affect the adoption decision?
2. How do characteristics of the agricultural producer affect the adoption decision?
3. How does land tenure affect the adoption decision?

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CHAPTER II

ACCEPTABILITY CHARACTERISTICS OF AGRICULTURAL CONSERVATION PRACTICES: HOW THE PRACTICE MATTERS

Abstract

Agricultural land management can have a significant effect on water quality. Agricultural best management practices (BMPs) or conservation practices are designed to help mitigate this impact. However they are only effective if land managers are willing to adopt and maintain them. There is a relatively large literature exploring factors that lead to producer's voluntary adoption of BMPs. However this literature has widely varying results, conflicting conclusions, and has somewhat omitted the inclusion of how characteristics of conservation practices affect adoption. To address these limitations, this study qualitatively analyzed which characteristics make BMPs more or less acceptable to agricultural producers using in-depth interviews. The first round of interviews was conducted with thirteen producers in South Fork Wildcat Creek-Blinn Ditch & Kilmore Creek-Boyle's Ditch Watersheds, Indiana. The final round of interviews was conducted in the Eagle Creek Watershed, Indiana with thirty-two producers. The producers were asked about their use of six common conservation practices and the reasons behind their decisions. This study outlines the specific characteristics of conservation practices that are most important in either facilitating or impeding adoption of those practices. Results

indicate that high levels of relative advantage (e.g. reduce inputs, time savings, and on-farm and environmental benefits), compatibility (with farm system and needs of producer), and observability (observing practice's advantages) are most important in increasing adoption of conservation practices. Low levels of relative advantage and perceived incompatibility of practices were found to be most important in non adoption of conservation practices. Conservation promoters should focus on raising awareness of the on-farm and financial benefits of conservation practices, the necessity, and the easiest and most efficient ways of incorporating practices into the farming system. In addition it is important that conservation promoters continue to think of new and interesting ways of demonstrating conservation concepts, because certain education and outreach approaches work for different people, promoters need make sure they cover all possibilities.

Introduction

What makes a certain best management practice (BMP) or conservation practice acceptable to a landowner is a complex question to answer. Social acceptability has been defined as how judgments are made, what they are based on, and what factors affect the durability of such judgments (Shindler et al. 2002). Cary et al. (2001) stated that in order to understand key influences determining whether sustainable land management practices are adopted, it is necessary to understand both the nature of natural resource management practices and, more particularly, how landholders see individual NRM practices.

Additional researchers have pointed out the importance of characteristics of conservation practices in either facilitating or impeding adoption (e.g. Fliegel and Kivlin 1966; Guerin 1999; Nowak 1983; Pannell 2006; Rubas 2004; Vanclay 2004). Adesina and Zinnah (1993) state omission of technology-specific characteristics in adoption models may bias the results of the factors determining adoption decisions of farmers.

Rogers has summarized the results of many of the adoption and diffusion studies conducted in the 1950s, 60s, and 70s (Roger 1962; Rogers & Shoemaker 1971; Rogers 1983). Adoption-diffusion theory is defined as “the process by which an innovation is communicated through certain channels over time among the members of a social system” (Rogers 2003). Rogers identified five stages of innovation adoption and diffusion: knowledge, persuasion, decision, implementation, and confirmation. In the persuasion stage an individual (or other decision making unit) forms a favorable or unfavorable attitude toward an innovation. Perceived characteristics of the innovation that affect adoption or rejection are relative advantage, compatibility, complexity,

trialability, and observability (Rogers 2003). The same characteristics were identified in a Barr and Cary (2000) study analyzing the important attributes of sustainable agricultural practices that make them more or less acceptable to landowners. Cary et al. (2001) named Roger's five attributes plus the attribute of risk "the forgotten focus" in the adoption of sustainable practices. These concepts have also separately appeared in other studies on BMP adoption (e.g. Alonge and Martin 1995; Gamon et al. 1994; Gamon 1998; Guerin and Guerin 1994; Marra et al. 2003; Pannell 2006).

There have been numerous studies exploring factors that lead to voluntary adoption of BMPs. A good portion of these studies utilize a multiple regression statistical method. In 2007, Knowler and Bradshaw conducted a global review and synthesis of recent research on the adoption of conservation agriculture to identify those independent variables that regularly explain adoption. The primary finding was that there are few if any universal variables (Knowler and Bradshaw 2007). Prokopy et al. (In press) also found in a vote count analysis of adoption related variables (e.g. age, education, environmental awareness) in 55 United States based research articles pertaining to conservation adoption, that most variables were insignificant a majority of the time. In 1990, Lockeretz had described the research situation as follows: "most attempts to relate farmers' conservation attitudes and behavior to personal, institutional, or farm structure variables have largely failed" (Lockeretz 1990, pg 518). Variables are found significant in these studies, however generalization proves difficult. Lockeretz (1990) recommended that new research methodologies and explanatory models are needed. Then again in 2001, Napier suggested researchers go out to the land owner-operators and inquire why they have or have not adopted conservation production systems. Using this information, it may

be possible to build a theoretical perspective that will have predictive ability in the future (Napier 2001). It can be seen from this evaluation of studies reviewing conservation adoption, that decisions regarding conservation practices are still not fully understood. Additionally, many studies focus primarily on characteristics associated with the producer and how they affect conservation adoption decisions. Using Napier's (2001) suggestion of asking the producer why they have or have not adopted practices, this research study attempts to better understand conservation adoption decisions from the perspective of perceived characteristics of conservation practices that make them acceptable or not. Cary et al. (2001) deemed these characteristics the "forgotten focus."

Acceptability Characteristics

Relative advantage:

The characteristic of relative advantage "is the degree to which an innovation is perceived as being better than the idea it supersedes" (Rogers 2003). This is normally interpreted in terms of financial advantage to the farm business. Many researchers have found economic factors important in affecting adoption (e.g. Carboni and Napier 1993; Fuglie and Kascak, 2001; McCann et al. 2006). Reviewing the history of farm innovation adoption, Barr and Cary (1992) conclude that environmental innovations that were believed to be profitable were usually readily adopted, while those with a net financial cost were rarely adopted. However, relative advantage can be thought of in other terms than economics. Examples of additional benefits include an increase in social prestige, time-savings, reduction of discomfort, and immediacy of the rewards from the innovation (Rogers 2003). The relative environmental advantages of a practice have also been found

to be important. Some environmentally friendly innovations are adopted even if they are considered unprofitable (Nowak 1983).

Compatibility:

Rogers (2003) describes compatibility as “the degree to which an innovation is perceived as consistent with the existing values, past experiences, and needs of potential adopters.” Compatibility of a new conservation practice with an existing system has been found important in past research (e.g. Alonge and Martin 1995; Gamon et al. 1994; Westra & Olson 1997). Webb (2004) states that two systems are important, the current farming system and the social system embracing the region’s farming or broader community. Another concept within the characteristic of compatibility is necessity or applicability of a practice, both perceived and actual. Necessity and applicability have also been found significant in past studies on adoption (e.g. Battershill and Gilg 1997; Gillespie et al. 2007)

Complexity:

The characteristic of complexity is described as “the degree to which an innovation is perceived as relatively difficult to understand and use” (Rogers 2003). Sometimes agricultural innovations which appear simple may in fact imply significant and complex changes to the farming system. More complex practices are less likely to be adopted (Gamon et al. 1994; Vanclay and Lawrence 1995).

Observability:

Rogers (2003) describes observability as “the degree to which the results of an innovation are visible to others” (Rogers 2003). Observability to the landowner adopting a given conservation practice seems intuitive also. BMPs whose advantages are observable are more likely to be adopted (Gamon et al. 1994; Guerin & Guerin 1994).

Trialability:

Trialability is “the degree to which an innovation may be experimented with on a limited basis” (Rogers 2003). Practices which can be tried out on a small scale prior to full implementation are more likely to be adopted (Gamon et al. 1994; Pannell 2006). Being able to try out a practice enables decisions to be made about its’ utility of with minimal risk. Webb (2004) states that trialability is dependent upon the observability of results.

Risk:

This refers to uncertainty regarding likely benefits or costs associated with a sustainable practice, uncertainty about the effectiveness of the practice, and uncertainty as to when the benefits might be realized (Cary et al. 2001). Some practices will encompass greater risks than others in their adoption to a farming enterprise. Differing risk implications of various sustainable practices will be an important consideration in their adoption (Cary et al. 2001). Uncertainty about a technology has been found to affect adoption of that technology in past studies (e.g. Pannell 1999; Shortle and Miranowski 1986). It is important to note that whether or not a conservation practice has risks

associated with its adoption will be analyzed in the research study as opposed to a land managers' attitude toward risk (e.g. risk aversion). Risk attitudes have also been studied extensively in the literature (e.g. Belknap and Saupe 1988; Guerin & Guerin 1994; Zhong 2003).

Methods

In order to fully analyze how acceptability characteristics influence adoption of conservation practices, a significant amount of new data and information regarding these factors needed to be collected. Marshall and Rossman (1999) state an interview is a useful way to obtain large amounts of data quickly. In addition face to face interviews provided the opportunity to visit land managers and inquire why they have or have not adopted conservation production systems. In depth qualitative analysis was used to bring to light new themes regarding conservation acceptability.

The Interview Questions

A thorough description of research methods and a copy of the interview guide are located in Appendix A. The interview guide was developed based on an extensive review of conservation adoption and social acceptability literature. In order to allow interviewees to explore the topic fully, open-ended questioning was used to collect information regarding the characteristics of acceptability for each specific BMP. The interview was structured such that they were asked whether or not they used a particular BMP, for what specific reasons they were or were not using it, and then they were asked to comment on the acceptability characteristics for each practice. For example "How compatible is the

conservation practice with your current farming system?” The conservation practices focused on during the interviews were cover crops, conservation tillage, grassed waterways, filter strips, and nutrient and pest management practices. For nutrient management practices, producers were asked if they had a nutrient management plan, practiced soil sampling and use of the results, and if they practiced grid sampling and variable rate application. Pest management practices included knowledge of Integrated Pest Management, use of pest resistant crop varieties, and scouting for pests and utilization of economic thresholds. The research focused on these specific practices because they were chosen by the local watershed projects as most critical and applicable to the area.

Interview Procedure and Response Rate

Interviews took place in two Indiana watersheds. The first round of interviews was accomplished in summer of 2007 in the South Fork Wildcat Creek-Blinn Ditch and Kilmore Creek-Boyle’s Ditch Watersheds (SFWC-BD & KC-BD). The second round was conducted in winter 2007-2008 in the Eagle Creek Watershed (ECW). Between the interview periods minor revisions were made to the interview guide. Addresses were provided by local Soil and Water Conservation Districts (SWCDs) of potential land owners/managers to contact. Advance letters were sent before the land owners/managers were contacted by telephone to set up interview times. Data saturation was reached through the number of interviews conducted for this study.

In both samples the contact list contained non-operating landowners and people having nothing to do with agricultural. If it was determined that someone was not a

producer they were removed from the overall sample used for response rates. For the (SFWC-BD & KC-BD) watershed, 13 interviews were conducted out of a 23 person sample for a response rate of 56.5%. Five names on the list were never reached by telephone, one producer's wife refused for him, and four producers were not interested in being interviewed. Therefore the refusal rate (refusals from producer specifically) was 17.4%. For the Eagle Creek Watershed, 32 interviews were conducted out of a 54 person sample, for a response rate of 59.2%. Nine people were never reached by telephone, one had a recent death in the family, two producers' wives said no for them, and 10 producers were not interested or did not have the time. This yielded a refusal rate of 18.5%.

Data Analysis Method

The data set consisted of 45 transcribed interviews; 802 pages and approximately 280,000 words. Owing to the size of the sample and the objectives of the research project (discovering new factors affecting adoption and depth of analysis), the interviews were analyzed qualitatively. Grounded theory method was applied in analyzing the interviews. Grounded theory can be used with "received" theories or variables if the purpose is to analyze them to find new meaning (Strauss and Corbin 1990). The researcher attempted to follow the "received" theory of diffusion of innovations and the acceptability framework when coding the interviews. Open coding is the first step in the process of grounded theory and entails breaking down, examining, comparing, conceptualizing, and categorizing data (Strauss and Corbin 1990). The next step is axial coding; a set of procedures whereby the data are put back together in new ways after open coding, and connections can be made between the categories (Strauss and Corbin 1990). Coding was

done using QSR NVivo 7, a qualitative research analysis tool (Figure 2.1). The example illustrated in Figure 2.1 shows how the researcher coded all statements regarding motivations for adoption into one category, and then examined the text for common themes, patterns and relationships. Under the motivations category there were statements regarding seeing wildlife in conservation areas. These statements could be connected as a theme pertaining to the observability of the environmental advantages (wildlife presence) seen with the adoption of conservation practices. Landowners' reasons for adoption/non-adoption of conservation practices were coded based on the innovation attributes discussed previously.

The screenshot displays the NVivo 7 interface for a project named 'Eagle Creek Interviews.nvp'. The 'Tree Nodes' table is visible, listing various nodes and their associated sources and references. The node 'Like to see the wildlife and place for hunting' is selected, and its references are shown below.

Name	Sources	References	Created
Motivations	0	0	2/12/2008 12:46 PM
Addressing a perceived problem	6	7	2/27/2008 2:37 PM
Cost Savings in long term vs short term	2	2	3/27/2008 8:06 PM
Good payments from Government	3	3	3/27/2008 6:32 PM
Land isn't suitable for farming can get \$ this way	1	1	3/27/2008 3:50 PM
Like to see the wildlife and place for hunting	4	4	3/27/2008 1:59 PM
Love the land leave it better than when got it	3	4	2/27/2008 2:09 PM
Observe neg effects of lack conservation	4	8	2/27/2008 2:51 PM
Problem with the way others are doing it	1	1	3/24/2008 3:29 PM
Requirements	1	1	4/17/2008 11:28 AM
Time Savings leaves time for other things	0	0	3/31/2008 12:57 PM
Try to influence others to do conservation	2	2	2/27/2008 2:37 PM
Networking and Info Sources	0	0	2/12/2008 12:48 PM

The selected node 'Like to see the wildlife and place for hunting' has the following references:

- <Documents\3018> - § 1 reference coded [0.88% Coverage]
- Reference 1 - 0.88% Coverage

Reference 1 - 0.88% Coverage

D: Um, are there any other reasons I guess besides the ones you've mentioned to why you're using grassed waterways?

I: It's, it's a nice place for, for the quail, you know.

D: Uh huh.

I: If you don't go in there and mow them, certain times of the year, just let them grow up a little bit, it's great for wildlife.

D: Uh huh.

I: You know, which some farmers don't [care] about that, but I do.

- <Documents\3048> - § 1 reference coded [1.18% Coverage]
- Reference 1 - 1.18% Coverage

449 Items | Sources: 4 | References: 4

Figure 2.1. A screenshot of NVivo results obtained through coding acceptability themes.

Deciding Where to Code Specific Statements

The question could be asked how it was decided under which acceptability characteristic to code producers' statements. The first guideline was the definition of the characteristic. The second guideline was where the producers themselves specifically listed themes pertaining to their reasons for adoption/non-adoption of practices. In the pre-test every producer was asked specifically about each of the acceptability characteristics. For example, a producer was asked "How compatible do you feel this practice is with your current farming system?" or "Do you see any risk associated with this practice?" Themes emerged from coding the producers' answers to these questions. Each subsequent interview that was coded may have fit with the themes already present or if there were new themes, they were added at that time. There is of course potential overlap in the categories; however statements were placed into themes within the characteristic with which the majority of producers thought about them. Table 2.1 summarizes what types of statements were coded as themes under each of the acceptability characteristics. From these general types of statements emerged themes pertaining to each characteristic.

Table 2.1 General statements that would pertain to each of the acceptability characteristics.

<i>Characteristics</i>	<i>Statements pertaining to:</i>
Relative Advantage	Economic and environmental advantages/disadvantages of practices
Compatibility	How well the practice fits in with the current farming system
Complexity	How hard the practice is to install, maintain, understand
Observability	Whether the producer or other people are visually observing advantages/disadvantages of practices
Trialability	Whether the producer had tried practices on a limited basis
Risk	Whether the producer saw any risk associated with the use of the practice

Research Locations and Differences

South Fork Wildcat Creek-Blinn Ditch and Kilmore Creek-Boyle's Ditch Watersheds (Information from their Watershed Management Plan 2008)

The SFWC-BD & KC-BD Watersheds (Figure 2.2) are located within the larger Wildcat Creek Watershed in Clinton County, Indiana. The land use of the watersheds is predominately agricultural. Over 12,649 acres of the total 17,943 combined watershed acreage (71%) is in row crops, primarily corn and soybeans. The north-west portion of the City of Frankfort and the small community of Kilmore make up the urban and residential areas of the watersheds. The waterways in the SFWC-BD & KC-BD Watersheds are small streams or drainage ditches. Several stream reaches in the watersheds are listed on the Indiana Department of Environmental Management's 303(d) List of Impaired Waterbodies. The South Fork of Wildcat Creek is designated as one of three State Scenic Rivers. The topography of the SFWC-BL Watershed differs greatly from that of the KC-BD Watershed. Within the SFWC-BL Watershed, the southern portion is relatively flat, but moving into the middle to northern regions of the watershed rolling hills prevail. The hills primarily follow the South Fork Wildcat Creek. However, along Kilmore Creek the land is less rolling and the entire watershed is more flat.

Eagle Creek Watershed (Information from their Watershed Management Plan 2005)

The Eagle Creek Watershed is located in Central Indiana approximately 10 miles northwest of downtown Indianapolis (Figure 2.2). The watershed is relatively flat and has a 162 square mile drainage area upstream of the Eagle Creek Reservoir dam (located at

the very southern tip of the watershed). The Eagle Creek Reservoir, which is used as a public drinking water supply for the City of Indianapolis, is located completely within Marion County, whereas the rest of Eagle Creek Watershed runs through parts of Marion, Hendricks, Boone, and Hamilton counties. In 2000, 52% of the watershed land cover was agriculture (corn and soybeans), 29.9% was herbaceous land cover, 9.3% was forested, and 4.3% was high and low density development. Agriculture and herbaceous land cover has declined since then. The greatest percent of agricultural land is located at the northern portions of the watershed whereas the portions closer to Eagle Creek Reservoir are undergoing significant urbanization. The watershed is located in the Tipton Till Plain Section, which is described as topographically uniform and of very low relief with slope angles of mostly 1-2°, with some 2-6° slopes.

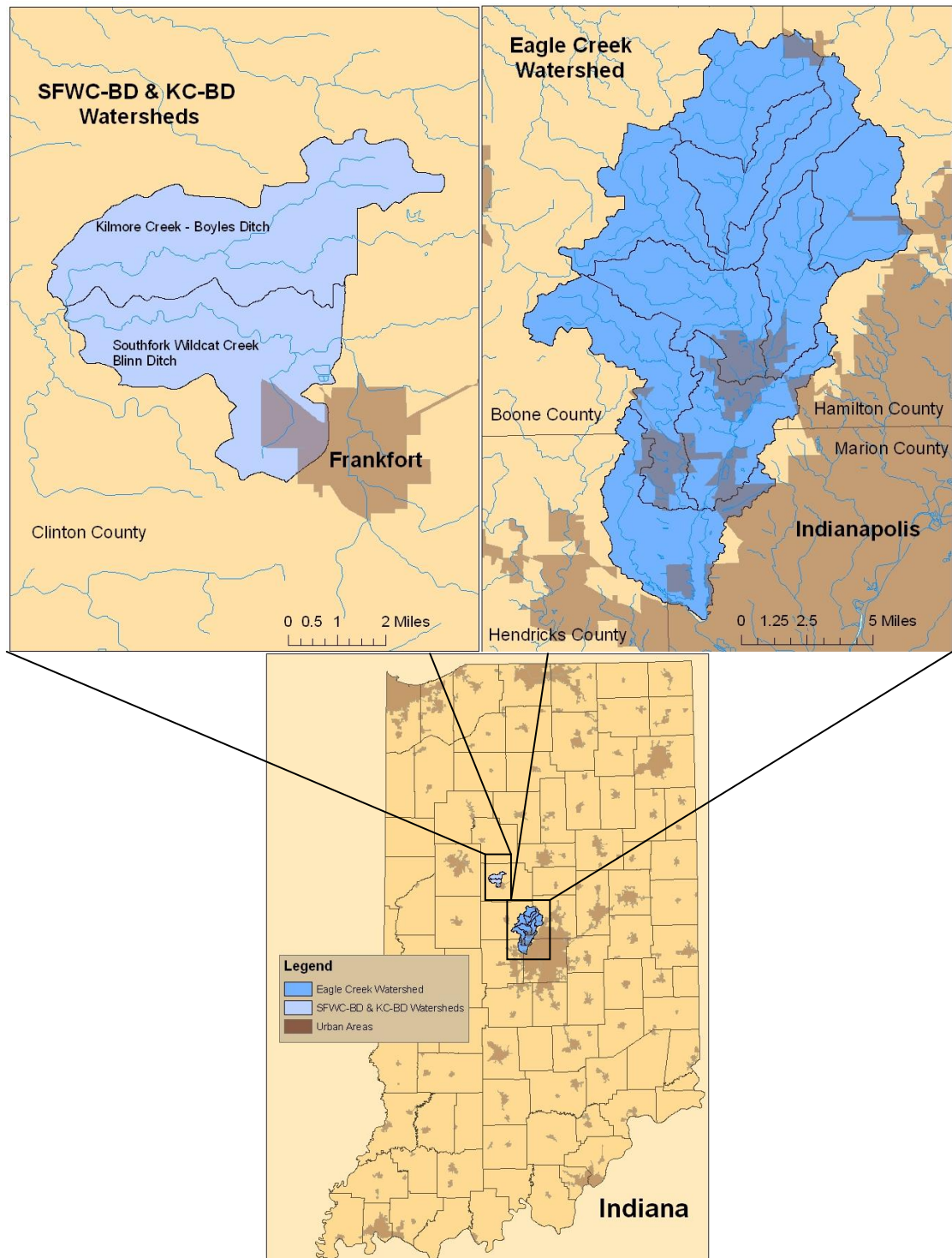


Figure 2.2 Study Area Locations

Differences between Study Areas

It is important to note a few differences between these study areas. The SFWC-BD & KC-BD Watersheds are still predominately agriculture with very little development pressure. In contrast, the ECW already consists of 19% less agriculture (using estimated values presented earlier) and is marked by rapid urbanization. Their difference in slope is also important, the SFWC-BD & KC-BD Watersheds have some rolling topography while the ECW is described as having low relief. The last major difference is the length of conservation activity in the watershed. Active research projects and conservation outreach efforts have been conducted in the ECW owing to its location near Indianapolis and the importance of the Eagle Creek Reservoir as a drinking water supply. The ECW implemented their watershed management plan in 2005. The SFWC-BD & KC-BD Watersheds have just finished writing their watershed management plan in 2008, so there has been less conservation outreach in this watershed compared to the ECW. These differences had an effect when analyzing the acceptability of conservation practices for the two sets of agricultural producers.

Results and Discussion

Characteristics of Agricultural Producers in the Watersheds

Thirteen agricultural producers were interviewed in the SFWC-BD & KC-BD Watersheds. They were all Caucasian males, ages 34-72 (mean 50), farming mainly corn and soybean operations between 160 and 3500 acres in size. Thirty-two producers were interviewed in ECW. They were also all Caucasian males, ages 27-81 (mean 55), farming mainly corn and soybeans operations between 120 and 7000 acres in size.

Conservation Adoption Rates

Adoption rates (% people adopting practices) were calculated for four of the conservation practices discussed during the interviews (Tables 2.2 and 2.3). Adoption rates were not calculated for nutrient and pest management practices due to the very wide variation in adoption. There are 5 levels of adoption for the four conservation practices. The levels are 1) using the practice with some type of cost-share or incentive payment, 2) using the practice without cost-share or incentive payment, 3) trying the practice during the next planting season (experimenting), 4) used to use practice but have since abandoned, and 5) never used and do not plan to in next planting season. Grassed waterways had 100% adoption in the SFWC-BD & KC-BD Watersheds and 53% adoption in the ECW. Filter Strips were adopted 61% of the time in the SFWC-BD & KC-BD Watersheds and 38% in the ECW. Cover crops showed adoption rates of 0% in SFWC-BD & KC-BD Watersheds and 19% in ECW. Conservation tillage was split by crop type and then tillage type. There are categories for corn and soybeans, no-tillage, reduced tillage and conventional tillage. Reduced tillage assumes a 30% residue cover. There was also a “Mixed Tillage” category that describes a single operation that had many types of tillage based for example on sensitivity of the ground or compatibility with other practices (e.g. manure application). In the SFWC-BD & KC-BD Watersheds 31% of agricultural producers were currently using a completely no-till system, 15% were experimenting with no-till corn, 31% were no-till soybeans with reduced or conventional corn, 8% were completely reduced tillage, and 8% were completely conventional tillage. In the ECW 44% were currently using a completely no-till system, 3% were experimenting with no-till corn, 28% were no-till on soybeans and reduced or

conventional corn, 6% were using strip till on their corn and no-till on soybeans, and 12% were completely conventional tillage.

Table 2.2 Adoption rates for grassed waterways, filter strips, and cover crops for the two study areas. (% is approximate due to rounding)

SFWC-BD & KC-BD	Using Practice with Cost-Share	Using Practice w/o Cost Share	Experimenting with Practice	Used to Use Practice	Never use/Not plan to next season
Grassed Waterways	4 (31%)	9 (69%)			
Filter Strips	3 (23%)	5 (38%)			5 (38%)
Cover Crops				3 (23%)	10 (77%)
ECW					
Grassed Waterways	6 (19%)	11 (34%)	1 (3%)		14 (44%)
Filter Strips	7 (22%)	5 (16%)	1 (3%)		19 (59%)
Cover Crops		6 (19%)	1 (3%)	6 (19%)	21 (66%)

Table 2.3 Adoption rates for tillage systems in the two study areas.
(Exp. = Experimenting, Conv. = Conventional) (% is approximate due to rounding)

Tillage System	SFWC-BD & KC-BD	Eagle Creek Watershed
Complete No-till	4 (31%)	2 with cost-share (6%) 12 (38%) 14 Total (44%)
No-till Bean/Exp. No-till Corn	2 (15%)	1 (3%)
No-till Bean/Strip-till Corn		1 with cost-share (3%) 1 (3%) 2 Total (6%)
No-till Bean/Reduced Corn	3 (23%)	3 (9%)
No-till Bean/Conv. Corn	1 (8%)	6 (19%)
Complete Reduced Till	1 (8%)	
Complete Conv. Till	1 (8%)	4 (12%)
Mixed Tillage	1 (8%)	2 (6%)

Acceptability Results

Interviews from the 45 agricultural producers were used to see what effect acceptability characteristics of conservation practices had on their adoption. As mentioned previously the conservation practices were analyzed with respect to their relative advantage, compatibility, complexity, observability, trialability, and associated risk characteristics. Producers' perceptions of innovations' characteristics can have both a positive and negative influence on their adoption. The following are results of this analysis grouped by acceptability characteristic and supported by direct quotations from the agricultural producers. Appendix B contains an outline of the results of this analysis grouped instead by each particular conservation practice.

Relative Advantage

This characteristic can both motivate and limit adoption of conservation practices. Results indicate financial and environmental advantages and disadvantages significantly influence producers' adoption decisions. Benefits and losses associated with relative advantage are separated into the main categories of soil, economic, and environmental. Relative advantage of a practice was found to be important for all conservation practices investigated in this research.

Motivations associated with Relative Advantage

1) Soil Benefits

Soil conservation was one of the most frequently mentioned motivations for adopting conservation practices. It warrants its own category due to the fact that soil

conservation provides both economic and environmental benefits. It was especially important for adoption of grassed waterways, conservation tillage, cover crops and filter strips. One producer put it simply when asked why he is using grassed waterways, *“Keep the soil there and if we didn’t do anything it would just keep washing away. Once it’s gone, it’s gone.”*

Additional soil benefits associated with using conservation practices were improved drainage, decreased compaction, improved soil structure, and improved fertility. Improved drainage accompanied adoption of conservation tillage, one producer mentioned *“our ground is much looser on top; the worm holes... we can dig it and break a chunk apart and just see lots of little worm holes. It drains off quicker.”*

There were only six producers using cover crops in the ECW and none in the SFWC-BD & KC-BD Watersheds. The type of cover crop being used was annual ryegrass. Two reasons the producers were using cover crops was to improve soil fertility and soil structure. The practice is new to the ECW in the last few years but it had the producers excited about the advantages it could offer as shown by this quotation, *“It also, which is really interesting...it’s a scavenger for nitrogen. Meaning that it can actually suck up, attract nitrogen that is in the organic matter of the soil, and then, after you kill it in the spring, it will release that throughout the growing season.”* Annual ryegrass is meant to be used with conservation tillage because of its deep root system.

Soil benefits were also mentioned often in regard to nutrient management practices, especially when it came to variable rate application of lime; many producers talked about realizing the benefits. One said, *“You know we put lime on, that works out*

really really well, Okay. Putting the right amount of lime on you don't get too much ground too acidic or too acidity, you balance your ground out on your lime."

There were a number of producers that expressed their willingness to trade economic profits for soil benefits. For example one producer commented, *"I think no-till you lose a little profit because your crops aren't quite as good, but you saved the soil and everything, so it's a wash."*

2) Economic Benefits

Economics were the main motivating factor in many of the producers' comments regarding reasons for adoption. In fact some form of economic benefits was mentioned 100% of the time in adoption of conservation tillage. This producer illustrated the sentiments of many producers very well with this simple statement, *"If it works economically, we'll do it, if it doesn't work economically, we won't."*

Input Savings (Labor, Time, Cost)

The purpose of conservation practices is often thought to be things such as improving water quality, reducing soil erosion, and increasing wildlife habitat. However many producers discussed how certain conservation practices also help to reduce their farm inputs. This includes labor, time, and cost savings (e.g. fuel). These financial advantages were mentioned most in regards to adoption of conservation tillage, in fact 83% of the producers practicing no-till in the watersheds mentioned these savings initially when asked why they had adopted this conservation practice. This producer's quotation illustrates all the input savings he associates with no-till, *"The ground pounders*

are just spending a tremendous amount of money on iron, horsepower, fuel, and labor, where I'm not." In many cases producers indicated input savings as a more important reason than conservation for adopting conservation tillage, for example one producer said, *"You know, some of it, [you] need to do cause of conservation but honestly a lot of it is just I don't have the time to go over it three times for driving the tractor. I just can't do it."*

Additional conservation practices that provided input savings were grassed waterways, cover crops, and nutrient management practices. Grassed waterways provided cost savings through ease of farming and protection of equipment. In one producer's words if he did not use them, *"We get erosion through the fields; and if you let that go, then it's hard to cross that with your equipment and actually guys have broken wheels off of their tractors because they try to farm...you might as well make it so it's crossable."* Cover crops provided input savings in the form of natural nitrogen release. Cost savings were the number one reason producers used nutrient management strategies such as soil testing and variable rate technology (VRT), in fact only two producers (6%) in the ECW initially mentioned something besides economic reasons for using any type of nutrient management practices. Feelings regarding cost savings from nutrient management are illustrated by this producer's comment, *"Money...you can save some money. Instead of shotgun application, you can narrow it down and spend less money. This five acres may not need as much as this five acres and they can come pretty close from VRT on that."* Cost savings in chemical applications for weeds and insects were also one of the main motivating factors in adoption of alternative pest management strategies such as pest resistant corn varieties, scouting and utilizing economic thresholds.

Yield Increases

Yield increase was another economic benefit that was seen with the adoption of certain conservation practices. A producer when asked why he was utilizing scouting for pest management said, *“Crop health... would be the biggest thing. Plus, crop health has built itself into increased yield, because if your plant is healthier, then you have a better chance to get a little better yield.”* Yield increases were also mentioned in reference to conservation tillage, some would say yields *“are as good or better”* with conservation tillage. In addition, although the use of cover crops in ECW was fairly new, increases in corn yield was one of reasons the producers were trying the practice.

Program Payments

Economic benefits also came in the way of program payments from the government. For example one producer mentioned the payments he was receiving for his filter strips, *“They pay so much an acre, and, like I say, we had originally mowed around the outside of it anyhow and so we just added a little more, few more feet to it and they’d pay us for it.”* Two producers were receiving incentive payments for conservation tillage practices in ECW and in both watersheds, a number of producers were enrolled in programs and receiving payments on their grassed waterways and filter strips. One producer even mentioned how you can get paid more for grassed waterways than cash-renting the land.

Increased Land Value

This advantage also ties in with observability of a conservation practice. It is the idea that taking care of the land and use of conservation practices increases the value of

the land. This advantage was most important when considering structural conservation changes and nutrient management practices to keep up soil fertility. One producer when asked why he uses grassed waterways commented, *“It’s adding value to your balance sheet because it’s going to increase the value of that land. I mean if you’ve got a farm that’s cut up with gullies then it’s really difficult to farm. That can take off a few \$100 an acre in terms of land value.”*

3) Environmental Benefits

Quite a few of the producers talked about how they had adopted conservation practices for the environmental benefits such as protecting the creeks or the land. These advantages were mentioned most often in relation to grassed waterways, filter strips and conservation tillage. Producers would frequently talk about being good stewards of the land and some even traded profits for the environment, for example one producer commented on adopting a grassed waterway, *“Yeah, we’re paying for grass, for property out of production. But that’s all part of being a good steward, I don’t know if I’m a conservationist putting the grass waterways where they belong, I would say it’s being more of a good steward.”* Responsibility and “doing the right thing” were reasons for utilizing conservation practices stated by a number of producers. For this producer filter strips are something you need to do, *“It’s just responsible. It’s the way to do it if you wanna have, have the healthy waterways you just need to do it.”* Wildlife habitat, especially quail, was another environmental advantage mentioned when discussing conservation practices.

For pest management practices, notions of personal safety along with environmental safety were concepts the producers discussed. They would talk about how pest resistant corn varieties offered them the opportunity to significantly decrease the amount of insecticides they had to handle. Additionally, one producer had environmental considerations in his utilization of economic thresholds for pest management, he stated, *“They may say, even though you don’t see the pressure there, there is an economic advantage to going out there and doing that [putting on insecticide]. We refused to do it on a large scale just because we don’t feel like it’s the right thing environmentally to do, just to go out there and kill off all the insects because not only are we killing off the predators we’re also killing off the beneficial insects and we could be causing bigger problems down the road.”*

However, there were also producer comments regarding what order they considered the advantages of conservation practices. In many cases especially for conservation tillage and cover crop adoption, environmental advantages were second to economics as illustrated in these examples. The first quotation specifies reasons for cover crop use, *“So we’re trying to number one, reduce costs, and two, be better stewards.”* An additional producer was honest regarding implementation of a no-till system, *“I mean, we got to the point where economically fuel was beginning to take off. Uh, and, you know, I don’t know that I could sit here and say that we were worried about the land, honestly, you know, we weren’t, and I think a lot of guys that have went to a no till, especially within the past two or three years, it’s down to the economics of it.”*

Finally, some producers also saw long-term environmental advantages as far as passing the land to the next generation. Producers would talk about taking care of the

land and passing it on in “*good shape*” or wanting to “*keep the fertility up.*” There were a number of producers that made comments similar to this one, “*I just think its good stewardship...I, I just like to leave it better than it was when I got it you know, pass it on.*”

Limitations associated with Relative Advantage

1) Economic Losses

Input Increases (Cost, Labor, Management Level, Time)

Just as input savings were a motivating factor in adoption of some conservation practices, they served as a limitation in other cases. Input increases were mentioned in one form or another as a barrier to adoption of every practice analyzed for this research project. Among the input increases, cost was cited most often as a limitation. This producer’s comment regarding cover crops is typical of what a producer would say when talking about cost, “*The economics of it. It cost too much to put it out and the benefit doesn’t overweigh the cost.*” Cost was the most significant barrier, close to 100%, to adoption of alternative nutrient management practices and pest management practices. It was also referred to when discussing installation of grassed waterways and filter strips. A few producers said installation would have been too expensive without government programs. With conservation tillage some producers felt inputs simply changed with changing practices and that it did not benefit them to adopt conservation tillage. One producer explained, “*The costs, they can say what they want, but by the time you buy the chemicals and everything it’s about the same cost to pay for the fuel or the chemicals.*”

Management level, labor and time increases were also referred to as factors preventing producers from adopting certain conservation practices. Time and labor were major issues in the adoption of cover crops, illustrated by these two comments regarding future adoption, *“Time issue yeah getting in, getting it burnt down. It’s a very good idea I don’t have anything against it except that,”* or *“Probably not unless I get more organized and better, labor help I guess, something like that, but yeah probably not foreseeable right now.”* Time increases were also mentioned regarding grassed waterways and filter strips, due to maintenance and having to farm around them. Increased management level was an important factor in cover crops, conservation tillage, and pest management strategies.

Decrease in Yield

Decrease in yield was an additional economic loss that kept producers from adopting conservation practices, especially conservation tillage. A producer pointed out that farming is a business and they need to do what works, illustrated by this comment comparing his reduced tillage system to no-till, *“That’s what we found works at least makes it acceptable for us from a yield standpoint. And, we have to face the fact that this is a business and I can’t afford to take a 30 to 40 bushel loss and I still have to pay the rent and everything else.”* Additionally when talking about reasons for not adopting complete no-till systems, a couple of producers mentioned how they could miss planting early because the ground does not dry out as fast. One producer said if they miss the first week they miss 20 bushels of corn yield per acre.

Loss of Productive Land

Finally loss of productive ground was another stated economic loss associated with conservation adoption. It was a common reason for not adopting grassed waterways and filter strips. In fact in the ECW, five of the twenty producers not using filter strips attributed it specifically to land out of production and other producers mentioned it along with other reasons. Some producers talked about how especially recently with the price of corn, soybeans, and inputs (e.g. fertilizer) increasing drastically that it is even more important to farm all your ground. Additional producers would say the payments from the government programs were not enough to cover the loss of productive land, demonstrated by this comment regarding use of filter strips, *“At one time I thought, you know, this [is a] pretty good deal, that’s what he [NRCS contact] said, and we counted the numbers a little bit, seemed like it was kind of a good deal. But now since you know, corn’s high, you know the price is... They need to increase [payments] with the value of commodities.”* Another producer had a similar sentiment about taking land out of production coupled with complaints about how the filter strip program works, *“Filter strips are basically set up for the landlords, to collect the [payments] from those and the tenants gonna be maintaining it and that grounds usually the most productive ground you’ve got, you know it’s usually the lower ground and right along the edge of an open ditch or waterway, it’s not necessarily the waterway but an open ditch is usually good ground and it’s just going to take away from my income and cost me on top of that so.”* Numerous other producers said simply they just did not want to give up the land.

2) Immediacy of Rewards

This concept was brought up in regards to when benefits are realized from certain conservation practices. There were multiple reasons why immediacy of rewards was found important. One producer explained why it was important for conservation tillage, *“You're not getting the benefits of no-tilling for 5-7 years, when it really kicks in.”* This might have been too long a time frame for some producers. Another said basically the same thing regarding adoption of variable rate technology, *“With the amount of outlay as far as cost wise to go to that, it'd take a good while [to get] your benefit back from it for it to really show and start proving it.”* Other producers perceive themselves as too close to retiring for the practice to matter like this producer's comment regarding installing grassed waterways, *“I've got few enough years of farming left that I don't care that much. We don't have any really bad places, that need them, probably. There might be a few places where it would be a good thing, but not hardly good enough thing to be worth the effort right now.”* Immediacy of rewards is also important from the standpoint of land tenure and length of rental contracts. Producers do not want to invest in long-term conservation practices if they are uncertain if they will be farming the land in the future.

3) Knowing Relative Advantages and Perceiving Value

Knowing all the advantages of a given conservation practice and perceiving the value of those advantages were themes that emerged for every conservation practice as a limitation to adoption. Knowing all of the advantages of a practice was particularly important for annual ryegrass as a cover crop. This could be due to the fact that there are many types of cover crops and soil conservation is thought of as the only benefit of cover

crops. One producer said about the annual ryegrass, “*A lot of guys don’t know anything about it, but as soon as they hear about the program they’re really excited.*” I asked quite a few producers if they had heard of annual ryegrass and the potential nitrogen benefits it could provide and many had not. In some cases, producers also did not know all the advantages of nutrient and pest management practices. Additionally in discussing grassed waterways and filter strips, producers usually knew or had heard of all the advantages, but would not mention all of them when telling me their reasons for use/non-use of the practice. Many of the comments mentioned only soil conservation and producers would only discuss environmental advantages such as water quality when prompted.

Perceived value was important again for cover crops, evident in this producer’s comment, “*The timing to establish it, and I, if you’re talking about rye grass you’re talking about seeding it in the fall and burning it down in the spring and...I guess I don’t perceive the value of that.*” Some producers mentioned not seeing the value of using conservation tillage with the increase in chemicals. They also talked about how the soil is better with conventional tillage. Another producer discussed the value he perceived in filter strips, “*I just don’t see that they’re that big of an advantage for the simple fact that you get a big flood and rain, the water is going to come off of the hills and it’s going to go somewhere and it’s going to go in that ditch whether the grass is there or not.*” Value in this case was tied to believing a practice does or does not do the things that it is intended to do. In some cases, producers also mentioned the ineffectiveness of grassed waterways, cover crops, and nutrient management practices as a limitation in their adoption.

Compatibility

This characteristic refers to the degree in which an innovation is perceived as consistent with values, experiences, and needs of potential adopters. Again this characteristic can both motivate and limit adoption of conservation practices.

Compatibility of a practice was found to be important for every conservation practice analyzed in this research.

Motivations associated with Compatibility

1) Necessity

Necessity or perceived need was an important aspect of compatibility of conservation practices. In the SFWC-BD & KC-BD Watersheds there was 100% adoption of grassed waterways. While talking to the producers in these watersheds they discussed grassed waterways as if they were common sense and they needed them to control erosion. One producer talked about how grassed waterways can be a hassle to establish and maintain, so he was asked *“That didn’t keep you from adopting them?”* and he replied, *“You have to have them because it’s so hard on equipment and to cross them if you don’t. And yourself, you get beat around pretty good if you cross those. Plus you’re losing a lot of soil without those waterways.”* The only other conservation practice that necessity was found to be a motivating factor was conservation tillage. In utilizing conservation tillage, producers mentioned needs such as having highly erodible land (HEL), or not having the time or manpower to till the conventional way.

2) Compatibility with Current System

In some cases practice compatibility was dependant on tillage type or cropping system for adoption of certain conservation practices. For example a producer who had adopted a no-till system said the following about use of grassed waterways, *“I have noticed more of the smaller ones [washes] with no-till because they will start making a little tiny wash where conventionally you would fill it in every year by going back and forth with the equipment.”* The producers who were using annual ryegrass as a cover crop were using it based on the fact that they were practicing no-till also. One producer commented, *“I just started this a couple of years ago because [friend] referred me to it. It improves your soil structure for no-till farming. The root structure is incredible...the roots, I’ve seen roots go four or five feet deep just over the winter.”* The interplay of conservation practices with each other affects the compatibility of a given conservation practice.

3) Conveniences

Motivations associated with compatibility of conservation practices also took the form of providing other conveniences for the producers. Thus the practice was compatible with their needs. Twenty percent of the producers in the ECW specifically mentioned how filter strips provided a maintenance area, one producer explained, *“We like being able to drive a ditch bank, we think it’s good even management wise to be able to. We can scout the crops better because we can go down the ditch bank and then get out in the fields. We can check drainage outlet tiles better because anytime of the year you can get in there and see what’s happening. So it’s partly a management tool also to have*

strips.” Remarks regarding grassed waterway and filter strip adoption pointed out how they were usually in areas of the farm that were not suitable for crops anyway. This is illustrated by this comment, *“We don't grow much along these creek banks anyway with the trees growing out over them. So, this way I can go along once a year and trim the trees back where they belong with a mower and haven't wasted a lot of seed and fertilizer.”* Ease of farming was an additional convenience that was revealed in regards to adoption of grassed waterways.

Limitations associated with Compatibility

1) Necessity

Lack of necessity or perceived lack of need was one of the major limitations in adoption of many of the conservation practices. The reason for the difference in adoption rates of grassed waterways between the SFWC-BD & KC-BD Watersheds and ECW was perceived lack of need. In the ECW 67% of the producers not using grassed waterways stated it was due to lack of need, exemplified by this comment, *“I just don't, don't have any land that is hilly enough to use it on.”* For the producers who considered soil conservation the primary purpose of cover crops, lack of need was a common limitation also. One producer said, *“Grounds level enough that it doesn't wash I just haven't used any.”* A similar comment was made by a producer in considering adoption of no-till practices in the future, *“I suppose if it [soil] was eroding away or something then we'd have to look at a different situation. But, that ground's flat as a pancake so it's not going anywhere.”* Again with filter strips the lack of need associated with flat ground was

expressed by comments such as this one, *“Pretty much it’s all flat, I mean, yeah I got some generally rolling ground, it don’t erode or nothing. Or even wash the stream banks.”*

2) Incompatibility with Current System

Compatibility with the current farming system was seen as a limitation in adoption also. Just as a previously mentioned producer said he needed more grassed waterways in a no-till system, there was another producer who believed that he didn’t need waterways because he was no-tilling. Many producers in both ECW and SFWC-BD & KC-BD Watersheds said they did not need cover crops because they were no-till operations and did not need the additional erosion protection. One producer said, *“Basically the cover crops as far as I am familiar with [them] are very good to stop erosion and then they, to get the benefit of the nitrogen value from them, they need to be turned under where as in a no till operation the only thing I could actually do is just go in and burn them down with Round-Up. So, since I don’t till it doesn’t seem to be something that I think I should be doing.”* A couple of producers who were using manure as their fertilizer source mentioned that they could not use no-till practices because they needed to till the manure into the soil. An additional limitation came from crop type and adoption of pest resistant corn varieties. Producers growing crops such as waxy corn, popcorn, or other specialty market corn, were unable to use genetically modified seed.

3) Inconveniences

Just as conveniences were motivations for adoption, inconveniences associated with compatibility of conservation practices are limitations in their adoption. Additional equipment and education requirements were an inconvenience in the adoption of conservation tillage especially and also nutrient management if the producer was applying nutrient management themselves. Ease of farming was also a limitation in adoption, illustrated by this statement from a producer regarding adoption of additional grassed waterways, *“I should probably add more grass waterways, but with the big equipment, it’s a little more of a hassle, cause no waterway goes straight across like a ditch. None of our farms have open ditches, we have so many angle fields, I’ve had them with the 40 foot wide planters and it just makes it a little more difficult to farm.”*

4) Government Programs

Limitations producers associated with government programs seemed to fit in with the idea of compatibility with their needs. Government program compatibility is somewhat different than compatibility characteristics of the conservation practice itself; however, the conservation program compatibility issues were a significant limitation that needed to be addressed. One issue within the area of government program compatibility is the adoption and abandonment of cover crops as a practice. This was the case both in the ECW and SFWC-BD & KC-BD Watersheds and the reason for abandonment was the end of government set aside programs many years ago. The producers would say they no longer use cover crops because the government does not have that program anymore.

A larger issue within the ECW especially was the length, restrictions and requirements of programs for grassed waterway and filter strip adoption. In the ECW the length of the contracts was a common problem due to development in the area, one producer cited this when talking about adopting grassed waterways, *“When I found out that it had to be left for ten years or it had to be paid back I discussed it a little bit with [landlord] and we felt at that time the development was coming so fast, and I knew at [landlords] age...but that’s the reason I didn’t, I talked to [District Conservationist] about it but when I found out that they could be penalized or had to pay that all back it, they would’ve gotten paid to do that, but when I found out about that, that’s why I didn’t do it.”* In both study areas general complaints about many aspects and restrictions of the programs kept producers from wanting to participate. One producer summed up many of the producers’ issues in one long remark,

“I think that the government programs are intimidating, and they’re not well explained, they’re cumbersome, and people in general are resistant to signing a ten year contract with the government for anything...So, that’s part of my frustration and when we went, – I told ya we been doing these wildlife buffers – well, we started this process last year, been doing this over a year ago, and we actually left some ground where we didn’t plant it this spring expecting, cause we’d applied, we had the paper work in, we thought it was all gonna go through. We left some ground unplanted that we were gonna put these warm season grasses in, in the summer. We never got the paperwork back until about two weeks ago, and so we had ground that actually just sat there with nothing this year... the staffing is so tight that our guy that we talked to is in the office 1 or 2 days a week, you don’t really know when, it’s kinda hard to make an appointment with him, you really have to seek them out. And then you start the process, and it takes a long time and I, you know, it’s just cumbersome. And that’s the thing that’s frustrating to me about the programs, and why then I don’t think more people will do it.”

It will be important to address program limitations in the future in order to get more people involved in conservation.

5) Land Ownership

The notion of land ownership and who is making the decision to use certain conservation practices warrants its own analysis entirely, however, it will be discussed briefly here in terms of how it affects compatibility of practices with the producers needs. In some cases a producer wanted to use a conservation practice, however, it was not compatible with the current farming system as a cash-rent because the landlord did not want to adopt the practice. This is more of an issue with adoption of grassed waterways and filter strips since the landlord would receive the payment or might have to make the initial investment. In some cases the landlord did not understand why the practice was needed, for example this producer's comment on not having filter strips, "*Why aren't they there yet? Landlord acceptability. I mean wondering, 'why are we taking land out of production, I farmed this for the last 40 years, why do we need to take it out,' that type of thing.*" Paying for land in conservation was also an issue with cash-rented ground, one producer said, "*I feel that would be up to the landlord to decide if he wanted the filter strips. They're charging me rent for a specific area of land. If they're gonna put filter strips in, they need to reduce that rent. Cause none of them are really interested.*" Land ownership presents many issues for getting conservation on the ground.

Complexity

This characteristic was described as the degree to which an innovation is perceived as relatively difficult to understand and use. Aspects of complexity were found only to be limitations in adoption. Complexity was found to be mildly important for all practices except nutrient and pest management practices. This is due to the fact that in

most cases nutrient and pest management practices are hired out so the producers do not personally consider how complex a practice is because they are not doing it themselves.

1) Implementation and Maintenance

There were a few comments regarding the complexity of installing grassed waterways and filter strips. One producer explained how complex the installation of his grassed waterways was, *“It's fairly complex. You're working with slope... not only slope and distance but slope and building the waterway. Not an easy thing to do, I couldn't do it.”* Grassed waterway maintenance was also mentioned to be complex in some cases, *“You know you can't spray, no waterway runs straight. And so it's hard to spray around those areas to control weeds in a crop and then you know you're skipping it and you end up killing off a lot of it, and you've gotta mow it and I just as soon be farming those areas if I'm not dealing with a lot of erosion.”* In many cases, producers mentioned how conservation tillage involved practices that were *“just different”* not necessarily more complex. Complexity for cover crops came in the form of adding an additional crop to the system and everything that it entails.

2) Quality of Conservation

An interesting finding emerged from analyzing statements regarding the complexity of conservation practices. There were directly conflicting notions of whether a practice was complex or not. This was mostly seen for grassed waterways. For example there was the producer in the last section talking about how complex installation of grassed waterways is; yet there was another producer who had this to say about grassed

waterways, *“It’s not complex... Yeah, I put one in when I was eight.”* There were also conflicting statements regarding the price of a grassed waterway. One producer said, *“Disadvantage is what it cost to put it in, especially if you don’t have a program, because they are very expensive,”* another producer stated, *“Yeah that was the best way to control it. The easiest way and cost, you know, pretty inexpensive to do it.”* The difference for grassed waterways had a lot to do with program participation, as one producer explained it, *“Well the one, the waterway that we had put in by ourselves before we kinda got connected all with the soil and water conservation, we didn’t form them deep enough to where they were actually channeling water. They were a little flat so they, it would kinda tend to move a little bit. And so these waterways we had redone, we did it to their specs.”* There was also an issue of quality in conservation tillage practice. One producer told me, *“I am a true no-tiller; I don’t work the ground at all,”* while other producers will till some years depending on factors such as the previous years weather. Some producers described conservation tillage as complex while many said it was not. Could this difference be attributed to whether a producer was a “true no-tiller” or not? Future research should look at the quality of conservation practice adoption.

Observability

This characteristic is the degree to which the results of an innovation are visible to others and to the adopter. This characteristic was one found to both motivate and limit adoption of many of the conservation practices.

Motivations associated with Observability

1) Add Value/Attractiveness

Many producers talked about how certain conservation practices added attractiveness and value to a farm. They would say things such as this about grassed waterways, *“It adds value to a farm, a farm that has a good established waterways is attractive to me.”* or *“Well it gives you the appearance of a farm being well taken care of.”* Or in the case of the annual ryegrass a producer commented, *“That rye I sowed the rye, you know it looks good.”* Producers would also comment on how the land looked without a certain conservation practice. Some talked about how without the utilization of conservation tillage there was more *“brown snow”* or *“snirt (snow + dirt).”* One producer discussed how conservation tillage was keeping waterways clean, he said, *“Muddy water takes dirt...if we get two inches of rain that’s a river running through there, and since I’ve went to the ridges and the no-till both that water has stayed much cleaner. They used to be muddy just like in the other creek, but it stayed clean. So I feel like there that tells me that we’re doing some good with our, with our no-till.”* Cleaner waterways were also mentioned in regards to filter strip adoption.

2) Wildlife Habitat

Producers often mentioned seeing wildlife in the conservation areas. This producer purposely leaves an area through filter strip adoption for wildlife, *“It’s a nice place for wildlife, you know. There used to be a lot of quail in this, in this watershed and a lot of bobwhite quail, there’s hardly any more, and I’m probably one of the few farmers that purposely leaves area for them.”* Wildlife habitat was mentioned in regards to grassed waterways also.

3) Other Producer's Actions

Producers did not necessarily say they were doing something because another producer was doing it, but through their comments one can see that it did make a difference. In the SFWC-BD & KC-BD Watersheds grassed waterways were considered common practice and producers noticed that the neighbors were using them also, one producer commented, *“Every farmer’s got them.”* A farmer in ECW when talking about wanting to use annual ryegrass as a cover crop said, *“There’s a [producer’s name] down here south of Lebanon....And I don’t know him that well, but I think he comes to the dealer and I’m gonna try to get to know him a little bit better and talk to him about some of this stuff and see what his ideas might be on some of these cover crops.”* In Rogers’ (2003) classification he split adopters into categories. It seems the effect of one of Rogers’ (2003) categories, the “Early Adopter,” is at work in the ECW with the adoption of Oregon Ryegrass as a cover crop. One producer started a few years ago, he is an integral part of the social system, and others are looking to him for advice and information on Oregon Ryegrass. Another producer compared himself to an “Early Adopter” that had influenced his decision to use conservation tillage, *“Real close guy has done no till probably 30 years, most of my time...He’s always a pioneer, he’s one of those guys that you know buys the new electric thing when it comes out and so in farming he does the same thing. Whenever there’s something on the horizon showing up he reaches out there and does it...[In comparison] I’m not the first one to do things. I’m the last one to do things.”* Other producer’s actions and experiences might influence a producer to try a practice again that he felt did not work in the past, like in this case, *“I tried it [no-till] for a few years and threw the towel in on that. I just could not get the yields, I had*

problems with it. But now, through other farmers' experiences, we have seen great improvements in how to go to no-till, with other support on learning throughout, I started again in 2001, gradually. And once I had the mindset and the confidence that this was going to work, then I started a 100% in 2005." In some cases a producer wanted to do the opposite of what his neighbors were doing, *"We watched all the neighbors out working the ground in the mud, and I said we're not going to do that. I said we're going to plant the crop but we're going to do it in one pass so we're just gonna start planting them. We started planting corn in the weeds that were 4 or 5 feet tall and people were just shaking their head at us and I said it's not a problem, I had all the confidence in the world that I could kill those weeds and I said when a lot of people realize there is a corn crop out there they're not, the weeds will be dead and fortunately it worked."* The important thing to note here is that producers' actions have the ability to influence each other.

Limitations associated with Observability

1) Looks Worse

A limitation to adoption or maintenance of a conservation practice in some cases was linked to it "looking worse." This was true of conservation tillage. Conventional producers liked the look of tilled ground without the residue left over the winter. Another aspect to this theme was the look of the crop, one producer said, *"Well, I'm going to have to see how this corn yield[s], because I got corn that is just now starting to tassel, with the no-till. And the conventional corn tasseled it was planted about the same time, the conventional corn tasseled three weeks ago, so it don't look good. It don't look good at all."* This producer was considering going back to conventional tillage because his corn

was not looking good. Another example of a conservation practice “looking bad” was a producer’s comments about how he had gotten criticized for having “stuff” grow up alongside the creek when he implemented a filter strip.

2) Other Producer’s Actions

Just as other producer’s actions had the potential to motivate adoption of conservation practices it also has the potential to limit it. Comments surrounding this idea could be as simple as this one regarding cover crops, *“I don’t know about anybody that’s used it around here to tell you the truth.”* Additionally, in the SFWC-BD & KC-BD Watersheds there were a couple of stories of how seeing a neighbor’s bad experience with cover crops affected that person’s decision, for example one producer remarked, *“We had a neighbor that did that and he got an army worm or a wire worm; and when he went out and killed his field off, to plant into it; they all went into my neighbor’s field. So then he had to pay to have my neighbor’s field sprayed, so it just looked like a bad idea.”* In regards to conservation tillage there is also the idea that a producer is going to do it the same way that *“dad did it”* or the *“old fashioned way.”*

An additional aspect to what others are doing was the idea that producers are not the only ones that need to take care of the land or waterways. A lot of times producers feel they are doing their part and the non-agricultural population needs to be helping, one producer put it this way when talking about filter strips and water quality protection, *“I mean, I don’t really want to be part of the problem, but I want everybody to help too.”*

Observable Proof

An interesting finding that emerged from analyzing comments regarding limitations and motivations associated with observability of a practice was the idea of observable proof. This included, proof that there is a problem (e.g. soil erosion), proof that a problem (e.g. water quality impairment) is caused by the producer and proof that the recommended practice works.

First, proof that there is a conservation problem, which could be as simple as this comment regarding soil erosion, *“You know the grass kept growing up through the silt all the time, and so that’s taught me that the dirt does move.”* Another producer told me of how he realized rain could cause an erosion problem if there is no residue cover, he said, *“I didn’t realize until I was on that committee, they showed a picture of a raindrop coming down, hitting the soil and it exploding...Okay, if that raindrop has a piece of residue to strike, than that the soil doesn’t explode and start moving.”* As mentioned before a lot of producers did not feel that soil erosion was a problem because their land is flat. One producer told me it depended on the “yardstick” you were using, that my yardstick for pollution and soil erosion was different than his yardstick. Proof of the effects of water pollution for two producers living on one creek came through personal recollection of a hazardous waste spill that killed all the fish in their creek in the past. These producers were using filter strips and careful spraying practices because they had seen what water pollution could do.

Second, proof that the problem, water quality impairment for example, is caused by the producer was an issue that came up with a few producers. One explained about filter strip adoption, *“We have such high ditch banks down here when they dredged the*

ditch, they didn't spread it out, they banked it so it's hard for water to get there unless you open it up to do it. But it still could be leaching through the ground and if you know somebody would do a study that I believed was fair and honest and not, and it was something we would look at things in some of our practices. I mean I don't really want to be part of the problem." He went on to say, *"If they would prove to me that I was, you know that my Nitrogen was leaching than yeah, I'd try to address it. And I'd be willing to work with that."* He wanted proof that he was part of the problem, and then he would be willing to address it.

Third, proof that the conservation practice works was another aspect to observable proof. This is related to the earlier statements of perceiving the advantage of a practice, but these comments have to do with actual observation of results. At times producers made comments regarding evidence that a practice was working like this producers grassed waterway adoption, *"I can think of one specific place where there's a man that's got a nice pond and when we put in a grass waterway, he commented to us that it made a difference in how clean his pond was just in the way it looked. For the most part, there's cleaner water."* However there were also comments on how a conservation practice looked like it did not work, for example, *"I'd run up corn stalks last year, I went back to beans, got ten acres I worked and conventional tillage is about two foot taller than no-till. Beans are the same way. Right there it tells you, too, conventional does yield better than the no-till. Proof's there."* Proof that a practice works was not a passive activity. Producers were not waiting around for someone to come and tell them something worked, they were talking to other producers, doing their own research, or experimenting and seeing the results like this producer's experience with cover crops, *"It's an*

experiment at this point, we'll see what soil structure does underneath it. And how we control our nitrogen input and our fertilizer input to see what's actually available. [Producer Friend] has done some deep, deep soil analysis; I haven't seen the results of it yet." There were other comments from producers about obtaining research results or having the local college do water sampling, and other examples of that sort.

Trialability

This characteristic is the degree to which an innovation may be experimented with on a limited basis. Trialability was found to be important only as a motivating factor. There were no comments about lack of trialability inhibiting a person from using a conservation practice.

Trialability was mentioned most often in regard to conservation tillage and cover crop adoption. Some producers found these practices easier to adopt because they did not have to convert their entire operation at one time. One producer illustrated this concept really well when he explained how he did trials on cover crops, *"It's something that we have to be patient with and learn. So, therefore, I'm not putting my whole farm out in the cover crops because it can really back-fire. So, we're just – like this year, we only have 250 acres of it out. The year before, I only had 50. The year before, I only had 20. So, just through the learning process, that's the reason you have to be patient with it."*

Trialability is tied to observability if the producers cannot see the advantages of the practice they are not going to continue to do it. This producer's statement shows how he only continued with the practice of no-till because he was able to see that it was working, he said, *"Well I took that step not knowing and I no-tilled 80 acres and for a 400 acre*

farm, that's a lot of soybean acres that way, and I've proved to myself and it's been reinforced over the years, so I'm feeling really good about it." Trialability was probably less important for grassed waterways and filter strip adoption due to the fact that the advantages are not as observable. For example one producer mentioned how observable the advantages associated with filter strips were, *"It's aesthetically pleasing... that's the observable [part] to it. As far as actually observing it catching the soil and pesticide that have moved across, and nutrients... I don't know that you observe that."* Producers do not necessarily need to try out a practice if they cannot tell if it is doing what it is suppose to. In addition it is hard to do trial filter strips and grassed waterways due to the fact that the change to the land is more permanent than, for example, planting a cover crop for a year.

Associated Risk

This characteristic refers to uncertainty about likely benefits or costs associated with a sustainable practice, uncertainty about the effectiveness of the practice, and uncertainty as to when the benefits might be realized. Comments about risk associated with a conservation practice were only in reference to it being a limitation to adopting the given practice.

Associated risk was found to be most important for conservation tillage, cover crops, and nutrient and pest management practices. Conservation tillage had a lot of uncertainty associated with it, demonstrated by this producer's comment, *"There was a lot of uncertainty, does it really work? There, you see other people using it and you know it can work, but does it work for our operation? And we make it work so, there's some uncertainty there that we've worked though. And it's done well for us."* This producer

worked through the uncertainty, but would all producers be willing to do the same?

Another risk commonly mentioned in regard to conservation tillage was planting dates and weather. A producer remarked, *“We can’t get out as soon as some people, seems like our window is smaller and smaller every year. Some guys really get out there and probably farm in the mud where we can’t do that with no-till.”* Cover crops held a lot of associated risk for many of the producers. Risk and uncertainty were the deciding factor in this producer’s non- adoption of the practice, *“Cover crop takes the management level to a new level. There is a certain amount of risk involved if you do not get it killed off early enough in the year, it can draw in other insect pressure, it can take too much moisture from the ground, it can be too competitive with the crop if you don’t get it killed off soon enough, but then again if it’s properly managed it can do a lot for your soil structure.”* He lists the many risks associated with the practice ending with one benefit that doesn’t outweigh the risks in his opinion. Some of the risk producers associated with cover crops also came from hearing stories of failures from other producers. With nutrient and pest management practices the risk was mostly associated with uncertainty of the effectiveness of practices and when the benefits would be realized. A few producers also mentioned resistance as a risk with the pest resistant corn varieties, *“volunteer corn fear,”* that they would not be able to get it killed off if needed.

Any risk associated with grassed waterways and filter strips had to do with their establishment. Meaning a producer might plant the grass and then get a rainstorm and have it wash away, or grassed waterways moving once established. These can amount to uncertainty about additional costs associated with these practices.

Summary and Conclusions

Characteristics of conservation practices play a significant role in their adoption. In this study six characteristics were observed; however, relative advantage, compatibility, and observability emerged as the most important in a producer's decision to adopt a conservation practice. Conservation promoters should focus on raising awareness of the benefits of conservation practices, necessity, and the easiest and most efficient ways of incorporating practices. Conservation promoters should also provide materials and facilitate activities to increase the observability of conservation practices.

Relative advantage was important for all of the conservation practices. In fact it was the most important limitation or motivation for adoption of conservation tillage, cover crops, and nutrient and pest management practices. Producers are concerned with the on-farm economic cost and benefits associated with these practices. Soil benefits, input increases/decreases, and economic benefits/losses weigh heavily on their decisions. Conservation promoters should be aware of this fact and market these practices based on what they can provide the producer in on-farm benefits as opposed to diffuse environmental benefits. Barr and Cary (1992) had stated that practices with a net financial cost are rarely adopted. However, this research showed with the case of filter strip adoption that producers were using them for other reasons such as providing a maintenance area. It is important to include in the marketing of conservation practices, especially ones providing mainly environmental advantages, additional benefits the practice can provide to the producer. Promoters should also not assume producers know all the costs and benefits of conservation practices, even if the practice has been around awhile. With the case of cover crop adoption in the study areas, many of the producers

did not seem aware of the nitrogen benefits of some cover crops. It is essential that promoters mention all possible benefits, not just the obvious and well known ones, to producers because there is no real way of knowing which is going to most affect the producer's decision.

Both policymakers and conservation promoters need to find ways to increase the compatibility of both the conservation practice itself and government conservation programs with the needs of the producers. Perceived necessity was a major limitation in adoption of conservation practices, especially grassed waterways, filters strips, and cover crops. The difference in adoption rates of grassed waterways in SFWC-BD & KC-BD Watersheds and ECW can be attributed to perceived necessity. In SFWC-BD & KC-BD Watersheds necessity outweighed any of the other characteristics. Therefore, the producers believed that grassed waterways were necessary and adopted them. In the ECW, flat land was the reason given for non-adoption of grassed waterways. There was no way of knowing whether the producers were correct in their assessment of not needing grassed waterways, but since this is what they perceived to be the case it is an important obstacle. Perceived need was also a limitation for cover crop adoption. Many producers stated they did not need cover crops because they were a no-till operation. However, all the producers using cover crops in the ECW were using the practice because they were a no-till operation. Conservation promoters need to address the necessity of a practice when marketing them to producers. Gillespie et al. (2007) had also found that producers cited non-applicability of a practice as a common reason for its non-adoption. They said this reflects a lack of knowledge about the BMP. From this research one could also reach that conclusion, however, in addition lack of knowledge of a problem that would require

a conservation practice (e.g. flat land not eroding) or knowing all the benefits of a practice were also found to be important. Again, knowing additional benefits besides the obvious and well known ones could prove useful in promoting practices to producers who perceive them to be incompatible. In the case that a practice is truly incompatible with a producer's operation, it is the challenge of the researcher to continue changing and discovering new conservation practices that are more compatible with the values and needs of the producers.

The compatibility of government conservation programs with the producers' needs provides an area for improvement for policy and promotion of conservation. With increasing urbanization in the ECW, the length of contracts was a significant limitation. The difference in filter strip adoption between the two study areas is most likely a reflection of program requirements conflicting with development pressure in the ECW. There are contract lengths for a reason; however policymakers need to address limitations associated with developing areas and conservation program enrollment. The complexity, cumbersome nature, and other restrictions of the programs were also an issue for many producers. Conservation promoters and policymakers should take this suggestion from one of the producers, *"If you could bring those programs out to a farmer and lay it down in one page in simple terms what happens, you know –one, two, these steps, you go through these steps right here, you get paid this amount of dollars, you're responsible for this, just if it was simply laid out."* Both policymakers and conservation promoters need to strive to make programs as compatible with a producer's needs as possible in order to increase enrollment. It was mentioned earlier that future research needs to look at quality of conservation adoption. It should also be added that producers that have already

adopted conservation practices outside a program would inherently be good candidates for program participation and improvement of their current practice. Conservation promoters should be aware of this fact.

Increasing observability associated with conservation practice advantages provides an interesting and important area for networking, education and outreach. Producers talk to each other, check out each other fields, and sometimes base their decisions on what other producers are doing or have done. Conservation promoters should use these connections to their advantage. Examples of networking opportunities would be to arrange for tours of operations utilizing new and exciting conservation practices, cost-sharing important conferences and meetings such as the national no-till conference, and providing increased incentives to attend local field days. All of the producers using annual ryegrass as a cover crop in the ECW learned about it either from another producer or through a local information sharing activity.

A central idea within observability was the idea of observable proof. According to Vanclay (2004) producers receive information from many sources and much of it is conflicting information. Producers are much like the scientific community in that they want to prove it to themselves or have it proven to them that something is factual. They do not want to simply take someone's word for it. Conservation promoters should take the advice given to us by one producer, "*If you become a NRCS person...you gotta look for ways to be creative in how you talk to people and work with them. Yeah, you gotta market it [conservation].*" Outreach and education practices are not futile, they are working. The greater adoption of no-till systems in the ECW than in the SFWC-BD & KC-BD Watersheds can probably be attributed to this. Gamon et al. (1994) came to the

conclusion that conservation promoters should increase field demonstration days for producers in the trial stage of the adoption process. Building on this conclusion, this research showed that we need to consider whether or not producers can visually see concepts related to conservation adoption/non-adoption. Promoters need to keep thinking of new, interesting and creative ways to demonstrate concepts such as the negative effects of lack of conservation, proof that agricultural practices contribute to pollution, and proof that conservation practices work. How can we prove it to the producer mentioned earlier that his filter strip really is holding pesticides even though he can not observe it? Certain education and outreach approaches work for certain people so promoters need to cover all possibilities. Education and outreach can become even more important for practices such as filter strips where the main advantage is to the environment and additional economic advantages are not necessarily seen by the producer.

In conclusion just as Vanclay (2004) pointed out, there are legitimate reasons for producer non-adoption of conservation practices. Many of these can be attributed to characteristics of relative advantage, compatibility, complexity, observability, trialability, and associated risk. This study has done what Napier (2001) suggested in that it asked producers why they have or have not adopted conservation practices. Now the challenge of future research is to build a new theoretical perspective, possibly incorporating the findings of this research. It is also the policymakers and conservation promoters' opportunity and challenge to overcome limitations associated with these characteristics through new and creative policy, education, outreach, and networking strategies.

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CHAPTER III
DIFFERENCES IN TYPES OF AGRICULTURAL PRODUCERS: WHY THE
PERSON MATTERS

Abstract

Increasingly, attention and funding have been directed towards encouraging producers to adopt agricultural best management practices (BMPs) or conservation practices. It has been demonstrated that personal characteristics associated with agricultural producers have an effect on their conservation adoption decisions. However, there are wide variations in findings related to explanatory variables (e.g. age, education, and information sources) illustrating the need to further analyze the relationship between producer's personal characteristics and their adoption decisions. Using interviews and in-depth analysis this research study offers new insights into this issue. A qualitative analysis of how the personal characteristics of thirty-two producers in the Eagle Creek Watershed, Indiana affected their conservation decisions was undertaken as a part of this research study. Subsequently, this analysis was coupled with producer's main motivations for adoption/non-adoption of six common conservation practices, in order to separate them into five categories indicative of their level of conservation adoption and effort. The categories are a slightly modified version of the "Participation Spectrum Model" put forth by Morris and Potter (1995). The categories include 1) active adopters,

who adopt conservation practices almost completely for environmental protection reasons

2) active adopters, who adopt conservation practices for both environmental protection and financial reasons; 3) passive adopters who adopt mainly for financial reasons with little inconvenience; 4) conditional non-adopters who would consider adoption under different circumstances; and 5) resistant non-adopters who are not using most conservation practices for multiple reasons and probably will not in the future. The results indicate making generalizations based on characteristics such as age or education can lead to ineffective outreach. Instead policymakers and promoters should be targeting categories of producers hoping they share information within their groups. Also illustrated is the importance of recruiting active adopters to demonstrate conservation practices and provide advice to potential adopters.

Introduction

Decisions regarding land management have a significant effect on water quality. Concern about environmental degradation caused by agriculture has gained increased attention recently because its associated costs to society (e.g. soil erosion, health hazards and groundwater pollution) have become better known and documented (Traore 1998). To mitigate this impact, producers increasingly have been encouraged to adopt agricultural best management practices (BMPs), defined as actions to keep soil and other pollutants out of streams and lakes. BMPs are designed to protect water quality and to prevent new pollution.

There is a relatively large literature that explores factors that affect farmer's voluntary adoption of best management practices. Numerous studies have looked at the complexity of the decision process to adopt BMPs (e.g. Ervin and Ervin 1982; Westra and Olson 1997; Traore et al. 1998). Past research findings on the use/nonuse of conservation practices have been collected under many models of behavior adoption. Classic models of behavior adoption include Rogers' (2003) diffusion of innovation model and Ajzen's (1988; 1991) Theory of Planned Behavior in which human behavior is guided by behavioral beliefs, social norms, and control beliefs. Examples of studies utilizing Theory of Planned Behavior include Lynne et al. (1995) and Beedell and Rehman (2000). There are also many examples utilizing an adoption-diffusion theoretical approach (e.g. Gamon and Scofield 1998; Napier and Camboni 1993). Through the application of these models and other models to the adoption decision, categories of variables affecting the decision have emerged. Some examples include an

Ervin and Ervin (1982) study identifying personal, physical, economic, and institutional categories of variables in their model of decision making processes. Guerin (1999) concludes there are three major categories of constraints on adoption characterized by: the land user and the adoption process; the characteristics of, and issues associated with the developers of, the innovation; and the role of extension agents and the transfer process. Rubas (2004) states in general that innovation adoption studies seem to fall into three categories of focus: how adoption spreads, characteristics of technologies to be adopted, and characteristics of decision makers or firms that relate to adoption. These examples are a few of the common categories of variables that have emerged from adoption studies. Of these several categories of variables found to be potentially significant determinants of the decision to adopt, characteristics of the “adopting unit,” for this study’s purposes the agricultural producer, are usually found to be important and included as a category. However, it will be shown in the following literature review that the relationship between personal characteristics of the producer and conservation adoption decisions is not fully understood. I will then be address how this research study seeks to better understand this relationship using new methods, in order to reach education, outreach, policy, and future research recommendations.

Characteristics Associated with the Agricultural Producer

Producer and Farm Characteristics

Numerous studies have found relationships between producer and farm characteristics, including demographic and socio-economic characteristics, and adoption of conservation practices (e.g. Caswell et al. 2001; Ervin and Ervin 1982; Featherstone

and Goodwin 1993). Producer/farm characteristics include variables such as education, age, years farming, off farm employment, size of farm, debt, gross income and land tenure. Some examples of positive relationships found in past research include farmer's education level and tendency to adopt (e.g. Caswell et al. 2001; Gould et al. 1989; Kim et al. 2005; Park and Lohr 2005), having a relative to inherit the land (e.g. Kim et al. 2005; Napier et al. 1984) and farm size (e.g. Belnap and Saupe 1988; Featherstone and Goodwin 1993; Soule et al. 2000). Farmer's age has generally been found to have a negative relationship with adoption (e.g. Harper et al. 1990; Rubas 2004; Soule et al. 2000). Land tenure is taken into consideration in some studies. Drost et al. (1998) found that farmers who own their land are more likely to adopt BMPs. It should be noted here that these variables are not always found to be significant and are also their significance is found in opposite directions. For example the age variable has been shown to be negatively correlated with adoption (e.g. Featherstone and Goodwin 1993; Soule et al. 2000); positively correlated with it (e.g. Harper et al. 1990; Kim et al. 2005; Petrzalka et al. 1996); and insignificant (e.g. Daberkow and McBride 2003; McCann et al. 1997). However, it is important to conclude from the research in this area that these variables have a potential effect on a producer's adoption decision whether in a positive or negative way.

Awareness, Attitudes and Perceptions

Significant research exists which examines the relationship between attitudes, awareness and pro-environmental behaviors. An attitude is defined by Azjen (1988) as a negative or positive belief or evaluation that a person has towards an object. Kaiser et al.

(1999) point out that awareness of environmental issues precedes having an attitude about the issue. For this reason I have reviewed attitudes and awareness categories separately.

Napier et al. (1988) states in order to adopt a new technology the traditional diffusion model argues that potential adopters must be aware that a problem exists, perceive a need for change, and be aware of potential solutions. Awareness has been modeled as a stage in the decision making process related to conservation adoption (e.g. Daberkow and McBride 2003; Traore 1998). Additional research studies have included awareness of environmental problems, such as water quality impairments as variables in their models (e.g. D'Souza et al. 1993; Hindsley 2002; McCann et al. 1997; Napier 2000). Belknap and Saupe (1988) analyzed whether a producer's awareness of erosion impacts was significant, and found that it was. Further studies have investigated the effect of awareness of potential solutions, such as certain conservation practices or programs (e.g. Daberkow and McBride 2003; Obubuafo 2006; Zhong 2003). Intuitively, awareness of potential problems and the solutions has a major impact on adoption decisions.

Producer attitudes have been considered in a number of adoption studies. Urban (2005) states personal definitions of progressive or successful farming and ethical understandings of environmentally responsible behavior all drive farming decisions affecting the environment. There are many types of attitudes that have the potential to affect producer's conservation adoption decisions. Prokopy et al. (In Press) group attitudes into five categories (Environmental, profitability of a practice, heritage, quality of environment, and risk). Of these categories, elements of environmental, heritage, and risk attitudes are considered in this research study. Additionally a "profits oriented" attitude was also included. Lynne et al. (1988) found that strong believers in profit

maximization used less conservation effort. The details of each attitude are explored further in the results and discussion section.

Stronger attitudes favoring conservation raise the levels of effort (Lynne et al. 1988). Multiple studies have incorporated aspects of environmental attitudes into their models (e.g. Ervin and Ervin 1982; Gamon et al. 1998; Hindsley 2002; McCann et al. 1997; Napier 1984; Traore et al. 1998). Some studies have shown environmental attitudes to be significant in affecting BMP adoption decisions; however there are additional studies that find this variable to be insignificant. A reason for this might be as Clearfield and Osgood (1986) conclude, “Some farmers may have strong conservation attitudes but may not follow through on these attitudes due to financial limitations, lack of information, etc.” (Clearfield and Osgood 1986). According to Prokopy et al. (In Press) a heritage attitude refers to whether a farm will be taken over by a family member. It has been shown that producers who expect a farm to stay in the family are more likely to adopt BMPs (e.g. Kim et al. 2005). In this research study heritage also refers to passing both land and knowledge from past generations to the current producer and how that affects decisions. A risk attitude is a measure of willingness to take risks (Prokopy et al. In Press). Past research has shown producers who are more willing to take risks are more likely to adopt new practices (e.g. Belknap and Saupe 1988; Ervin and Ervin 1982). However, additional research studies have also found heritage and risk attitudes to be insignificant (e.g. Westra and Olsen 1997; Zhong 2003). Nevertheless, it can be seen that all of these attitudes play a part in producers’ decisions regarding BMP adoption.

Perceptions are also a crucial aspect in producer adoption of conservation practices and programs. Hefferman (1982) points out four assumptions in using the

adoption-diffusion model for soil conservation decisions. One of these assumptions is that farmers always perceive a problem and must therefore be made aware only of solutions. Past research has considered the effect of producers' perception of a problem (commonly soil erosion) and has found it influential (e.g. Ervin and Ervin 1982; Esseks and Kraft 1988; Gould 1989). Perception of a problem and awareness of a problem are similar ideas. For this study perception of a problem refers to a producer perceiving an issue, for example, soil erosion to be a problem on their land, whereas awareness would refer to being aware that soil erosion in general constitutes a problem. Another producer perception of importance is whether or not they perceive their actions are causing a specific problem. Pound et al. (2003) conducted a study where they investigated this concept and found the Ohio farmers they surveyed "did not see agriculture as a major polluter of water or air. In contrast, The Ohio Environmental Protection Agency ranks agriculture as the second largest source of impairment to aquatic life. Thus, Ohio farmers may exclude themselves from policy decisions because they see no problem." (Pound et al. 2003, abstract). A final perception of significance is producers' perception of solutions to pollution problems, in this case the conservation practice. Perceptions of solutions could take the form of the effectiveness and conservation value of adopting a conservation practice. Various aspects of perceptions of solutions have been found to be important in past studies (e.g Alonge and Martin 1995; Pannell 1999). A significant example is the whether the producers perceive the practice to be profitable, it is expected that producers who think practices will be profitable will be more likely to adopt them (e.g., Napier et al. 2000; Roberts et al. 2004). Producers' perception of a problem,

perception of their role in the problem, and perception of the effectiveness or value of the recommended solutions all impact the producers' conservation adoption decisions.

Information and Institutional Factors

According to Ervin and Ervin (1982) institutional factors are comprised of the role of education, technical assistance, and cost-share receipt in perceptions of problems and decisions to use conservation practices. Numerous studies have looked at how information, extension, and government technical and monetary assistance have been shown to increase farmer adoption of BMPs. Availability of adequate information on BMPs is influential (Traore et al. 1998). Alonge and Martin (1995) found that farmers who had access to sustainable agricultural information were more likely to adopt BMPs. Additionally; Gamon et al (1994) found actual use of information to be important. Petrzalka (1996) conducted a study that revealed information had a stronger impact than attitudes on producer behavior. The source of information has also been found to influence conservation adoption (e.g. McBride and Daberkow 2003; Tucker and Napier 2002; Warriner and Moul 1992). Westra and Olson (1997) found that producers who use other producers for tillage information are more likely to adopt conservation tillage. Rogers (2003) identifies five adopter categories in his diffusion of innovations theory based on how early an innovation is adopted. The "Early Adopters" are a more integrated part of the social system, have the greatest degree of opinion leadership, and potential adopters look to early adopters for advice (Rogers 2003). Producers who are "Early Adopters" are especially important as information sources.

Building on the idea of the significance of information acquisition and sources is the notion of the importance of education and extension on conservation adoption decisions. Harper et al. (1990) in a study of Texas rice producers found attendance at specific field days to significantly affect adoption of BMPs. Similarly, Forte-Gardner et al. (2004) discovered planning and execution of field research plays a significant and influential role in transferring more complex, and perhaps high-risk, conservation based farm technology. Tying into information sources, Drost et al. (1998) found that extension should work to improve cooperation between farmers practicing sustainable agriculture and those needing to learn these practices. Korsching and Malia (1991) conclude that most sustainable farmers' primary policy needs included more information and educational programs about sustainable agriculture. However, education programs are not a universal remedy as illustrated by a Napier and Bridges (2002) comparative analysis in Ohio. One of the studied watersheds received much more education input but did not have improved results. Additionally, Rubas (2004) in a meta-analytical analysis of universal adoption factors found outreach to be a non-universal factor.

Government technical and monetary assistance are additional factors that affect a producers' decision to adopt conservation practices. Friedrichsen (2003) identified the positive effect of government programs and sales/training from precision agricultural consultants. Government subsidies for BMPs have been shown to increase long-term conservation investments (e.g. Featherstone and Goodwin 1993). To the contrary, Napier et al. (2000) found a lack of predictive ability of government financial support in adoption decisions. They conclude "either farmers so affluent or amount of assistance too small and confined to such a small number land owners that investment of public funds

had little positive impact on adoption” (Napier et al. 2000, pg 134). However, overall this presentation of studies are examples illustrating the importance of producers’ information sources, participation in extension activities, and their receipt of various types of assistance for their decisions regarding conservation adoption.

Categorizing the Producer

Based on the preceding review of literature, mainly United States based, regarding characteristics associated with agricultural producers, some interesting observations can be made. Variables falling under the categories of producer and farm characteristics, awareness, attitudes and perceptions, and information and institutional factors have been included in countless studies about what influences conservation adoption. These variables all relate to characteristics associated with the producer, indicating the significance of the person in the adoption decision. However, the noted variation in findings associated with the characteristics, demonstrates that these effects are not fully understood. Lockeretz (1990) concluded, “most attempts to relate farmers’ conservation attitudes and behavior to personal, institutional, or farm structure variables have largely failed” (Lockeretz 1990, pg 518). He arrives at this conclusion for a variety of reasons including limitations associated with methodology (Lockeretz 1990). The most common method used in adoption studies is multiple regression analysis. Lockeretz (1990) summarizes that regressions usually have little explanatory power; he asks the question “Does a variable that accounts for two percent of the variance in farmers’ conservation practices have much meaning for policymakers, farmers, or conservationists?” (Lockeretz 1990, pg 518). Lockeretz may be right, however, it could

be argued the continued use of virtually the same set of variables in study after study suggests at the very least, theoretical importance and a need to further explore why these variables are found significant. In addition, to our knowledge, no singular study has examined all the above mentioned variables in one analysis. Napier (2001) recommended a more in-depth look at adoption decisions when he suggested researchers visit the land owner-operators and inquire why they have or have not adopted conservation production systems. Using this information, it may be possible in the future to build a theoretical perspective that will have predictive ability (Napier 2001). This study attempts to look at the effect of producers' personal characteristics using in depth questioning and analysis to try to better understand a problem that previously was not fully understood. Additionally, Darnhofer et al. (2005) states qualitatively oriented studies of farmers' decision-making can offer additional insights and help interpret the findings of normative surveys. By gaining an increased understanding of how producers' personal characteristics interact to affect conservation decisions we will be better able to target conservation outreach and education. In addition, subsequent research can incorporate findings from this analysis to improve future statistical studies of conservation decision making.

Finally, in order to make an analysis of personal characteristics of producers, and how they interact to affect adoption decisions more useful, this research study categorizes various producers. The categorizations are based on both the personal characteristics of the producer and the producers' main motivations for use/non-use of specific conservation practices. In doing this, generalizations can be made regarding producer characteristics and conservation motivations. These generalizations can help to increase our understanding of the many ways "the person" makes a difference in the adoption

decision. Drost et al. (1998) would find categorization of producers useful when he concluded we should target extension efforts towards homogeneous sub- groups to insure that appropriate information will be shared by all members of the group.

Participation Spectrum

To our knowledge there is limited United States based research that groups producers based on the above-mentioned characteristics and their level of adoption into more detailed categories than adopter/non-adopter. Rogers (2003) and subsequent studies have categorized producers based on how early or late they adopt. There is also a body of literature evaluating farm management style (e.g. Brodt et al. 2006; Walter 1997). Brodt et al. (2006) identified three distinct management styles based on economic and social values and goals as they relate to farm production, environmental stewardship, family and community, and leisure. A group of studies, conducted outside the United States, found multiple types of producers when analyzing their motivations and commitment to conventional or organic farming (e.g. Darnhofer et al. 2005; Fairweather 1999; Schoon and Te Grotenhuis 2000).

In the European Union (EU) there has been a significant amount of research examining factors affecting producer participation in Agri-Environmental Measures (AEM) such as the Environmentally Sensitive Areas (ESA) program. According to Defrancesco et al. (2008) “Based on a subsidiary principle, agri-environmental measures (AEMs) in the member states are designed to address specific problems, targets and spatial scale depending on the current status of the agricultural, natural and cultural environment” (Defrancesco et al. 2008. pg. 115). Morris and Potter (1995) conducted a

study investigating the level of engagement of producers enrolled in ESA programs. Focusing on motivational aspects they found wide variations in the level of commitment and sympathy with objectives of agri-environmental policy schemes. Based on their findings they proposed a “participation spectrum” that classifies producers in four groups: 1) active participants, who adopt voluntary AEMs for both environmental protection and financial reasons; 2) passive adopters who enter agri-environmental measures mainly for financial reasons; 3) conditional non-adopters who would participate under some circumstances; and 4) resistant non-adopters who do not participate in AEMs. This classification has been considered in subsequent studies in the EU (e.g. Defrancesco et al. 2008; Wilson 1996; Wilson and Hart 2000) and Canada (e.g. Smithers and Furman 2003). To our knowledge the “Participation Spectrum Model” (Morris and Potter 1995) has not been utilized in the United States to classify producers based on their motivations and ensuing adoption of conservation practices. I believe a slight variation on this classification would be useful in grouping producers in this study, based on their personal characteristics and main motivations for adopting conservation practices.

Methods

To review, the objectives of this research study were two-fold. The first objective was to analyze in-depth the effect of a producer’s personal characteristics (e.g. producer and farm characteristics, attitudes, information sources) on the decision to adopt conservation practices. The purpose of this objective is to “open up” these variables and determine if and why they matter. The next objective was to evaluate the interaction between these

personal characteristics and relate that to producers' main reasons for use/non-use of conservation practices in order to categorize the producers following a variation of the "Participation Spectrum Model" (Morris and Potter 1995). This constituted a significant amount of information to collect and as Marshall and Rossman (1999) point out an interview is a useful way to obtain large amounts of data quickly. Also as mentioned previously, Lockeretz (1990) concluded attempts to relate these personal factors to producer adoption of conservation practices have largely failed due somewhat to the limitations of statistical methodology. For these reasons, face to face interviews, with in depth qualitative analysis, were the methods chosen for this research study.

The Interview Questions

A thorough description of research methods and a copy of the interview guide is provided in Appendix A. The interview guide was developed based on an extensive review of conservation adoption literature. In order to allow interviewees to explore the topic fully, open-ended questioning was used to collect information regarding the personal characteristics and reasons for use/non-use of specific conservation practices. The interview was structured such that producers were asked personal and farm characteristic questions initially, followed by general conservation, environmental awareness, and attitude questions, ending with questions regarding use of specific conservation practices. For example a producer would be asked if they had heard of grassed waterways, if they are currently using them, and specific reasons for use/non-use. The conservation practices focused on in this analysis were cover crops, conservation tillage, grassed waterways, filter strips, and nutrient and pest management practices. The

research focused on these specific practices because they were chosen by the local watershed projects as being most critical and applicable to the area.

Research Location

A pre-test of the interview was conducted in the South Fork Wildcat Creek-Blinn Ditch & Kilmore Creek-Boyle's Ditch Watersheds (Figure 3.1). Interviews for the research study took place in the Eagle Creek Watershed (ECW), which crosses Marion, Boone, Hendricks and Hamilton Counties in Indiana (Figure 3.1). The following information about the watershed was obtained from their Watershed Management Plan (2005).

The Eagle Creek Watershed is located in Central Indiana approximately 10 miles northwest of downtown Indianapolis. The watershed is relatively flat and has a 162 square mile drainage area upstream of the Eagle Creek Reservoir dam (located at the very southern tip of the watershed). The Eagle Creek Reservoir, which is used as a public drinking water supply for the City of Indianapolis, is located completely within Marion County, whereas the rest of Eagle Creek Watershed runs through parts of Marion, Hendricks, Boone, and Hamilton counties. In 2000, 52% of the watershed land cover was agriculture (corn and soybeans), 29.9% was herbaceous land cover, 9.3% was forested, and 4.3% was high and low density development. Since that time agriculture and herbaceous land cover has declined. The greatest percent of agricultural land is located at the northern portions of the watershed whereas the portions closer to Eagle Creek Reservoir are undergoing significant urbanization. The watershed is located in the

Tipton Till Plain Section, which is described as topographically uniform and of very low relief with slope angles of mostly 1-2°, with some 2-6° slopes.

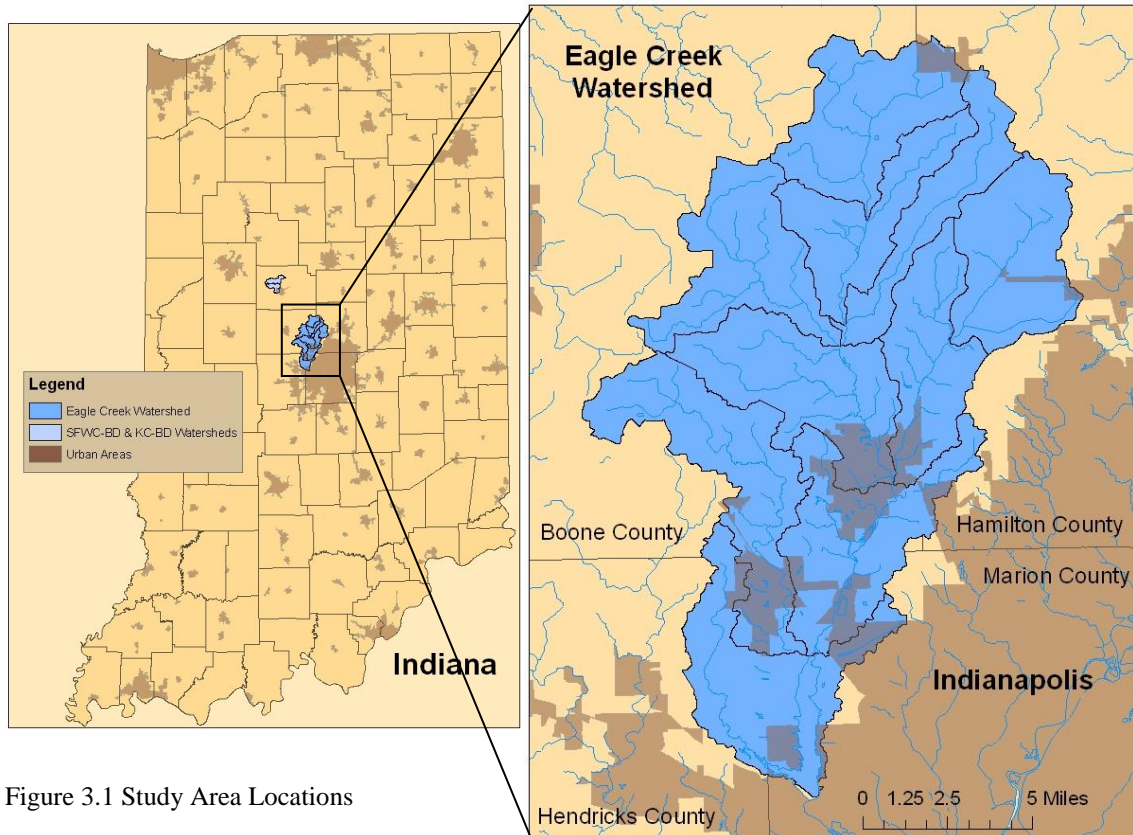


Figure 3.1 Study Area Locations

Interview Procedure and Response Rate

Addresses were obtained from the local Soil and Water Conservation Districts (SWCDs) of all owners/managers in the watershed. Advance letters were sent to them before these land owners/managers were contacted by telephone to set up interview times. The interview guide was pre-tested on thirteen producers in the South Fork Wildcat Creek-Blinn Ditch & Kilmore Creek-Boyle's Ditch Watersheds in the summer of 2007. In the winter of 2007-2008 research study interviews were conducted in the Eagle

Creek Watershed. Between interview periods, minor revisions were made to the interview guide.

The contact lists contained both non-operating landowners and people having no involvement with agricultural. If it was determined that someone was not a producer they were eliminated from the overall sample used for response rates. For the Eagle Creek Watershed, 32 interviews were conducted for a 54 person sample, yielding a response rate of 59.2%. Nine people were never reached by telephone, one had a recent death in the family, two producers' wives declined for them, and 10 producers were not interested or did not have the time. This yielded a refusal rate (refusals from producer specifically) of 18.5%.

Data Analysis Method

The data set consisted of 32 transcribed interviews; which totaled 550 pages and approximately 208,000 words. Due to the objectives of the research project interviews were analyzed qualitatively. The Grounded theory method was applied in analyzing the interviews. Grounded theory can be used with “received” theories or variables if the purpose is to expand these and to find new meaning (Strauss and Corbin 1990). The researcher attempted to find new meaning in the personal characteristic variables and their effect on conservation adoption. Open coding is the first step in the process of grounded theory and entails breaking down, examining, comparing, conceptualizing, and categorizing data (Strauss and Corbin 1990). The next step is axial coding; a set of procedures whereby the data are put back together in new ways after open coding, so that connections can be made between the categories (Strauss and Corbin 1990). Coding was

accomplished using QSR NVivo 7, a qualitative research analysis tool (Figure 3.2). The example illustrated in Figure 3.2 shows the results of the coding process. In this example the researcher had coded all statements alluding to producers' perception of soil erosion on their land. Under this category there were many statements of how the producer did not perceive there to be any erosion because they were currently using practices to control it. These statements could be connected as a theme, under perception of soil erosion, of the "level to which it has been addressed." Producers' statements regarding personal characteristics and reasons for adoption/non-adoption of conservation practices were coded into categories and themes in the above outlined process.

In order to categorize the producers based on the "Participation Spectrum Model" (Morris and Potter 1995) detailed notes were kept while coding the interviews for each producer. Their main motivations for adoption and non-adoption of each BMP were outlined along with any personal characteristics that affected their decision. The producer was looked at holistically regarding their adoption decisions. For this reason, they may have adopted one practice, but could still be considered a resistant non-adopter based on their attitudes and motivations. The categorization will become clearer in the results and discussion section.

The screenshot displays the NVivo interface for a project named 'Eagle Creek Interviews.nvp'. The main window shows a tree structure of nodes under 'Perceptions of Land'. The nodes and their associated sources and references are as follows:

Name	Sources	References	Created
Perceptions of Land	0	0	2/12/2008 12:48 PM
Conservation Plan	32	33	2/27/2008 2:23 PM
Future Conservation Easements	31	31	2/27/2008 2:23 PM
Slope	32	34	2/27/2008 2:11 PM
Soil Erosion	0	0	2/27/2008 2:26 PM
No	10	10	2/28/2008 11:44 AM
No - have addressed it places	5	5	3/19/2008 9:56 AM
Yes	2	2	4/10/2008 11:14 AM
Yes but addressing it	7	8	2/27/2008 2:26 PM
Yes on part	8	8	4/2/2008 12:11 PM
Soil Texture	32	33	2/27/2008 2:22 PM
Water Pollution	0	0	2/27/2008 2:28 PM
Waterways yes or no	31	36	2/27/2008 2:10 PM

The detailed view of the 'No' node shows three references with their respective coverage percentages:

- <Documents\3007> - § 1 reference coded [0.48% Coverage]
- Reference 1 - 0.48% Coverage
- Do you consider soil erosion to be a problem on the land, that you own or rent?
- No.
- <Documents\3009> - § 1 reference coded [0.50% Coverage]
- Reference 1 - 0.50% Coverage
- D: Okay. Uh and then will you consider, well you already said you're not highly erodable, but soil erosion to be a problem on the land at all?
- I No. Not really, no.
- <Documents\3014> - § 1 reference coded [0.32% Coverage]
- Reference 1 - 0.32% Coverage

At the bottom of the interface, it indicates '449 Items | Sources: 10 References: 10'.

Figure 3.2 A screenshot of NVivo results obtained by coding producers' perceptions of soil erosion.

Specific Questions to Address Research Objectives

All questions in the interview guide had the potential to elicit themes and ideas regarding how personal characteristics of the producer affect the adoption decision.

However, some specific questions detailed below were designed to elicit these themes more intentionally.

Producer and Farm Characteristics

In order to analyze the effect of variables such as age, education, and farm size, specific statements producers made about how these variables affected their decisions regarding conservation practice adoption were considered. There were no specific interview questions asking for example “Did age play a role in your decision to adopt grassed waterways?” It was through the producers comments about themselves or others that these concepts were recognized.

Awareness, Attitudes and Perceptions

The attitudes of “profit orientation” and risk were elicited through many questions regarding producers’ reasons for use/non-use of conservation practices. Questions for the remaining awareness, attitude and perception characteristics are presented in Table 3.1.

Table 3.1 Questions to Elicit Awareness, Attitudes and Perceptions (Questions 2,3 and 4 were borrowed specifically from Henry (2007))

<i>Question</i>	<i>Targeted Personal Characteristic</i>
1. Do you expect your children or someone else to take over the operation?	Heritage Attitude
2. Do you consider yourself to be a conservationist?	Environmental Attitude
3. In your opinion why do some farmers undertake more conservation than others?	Attitudes and Awareness
4. What do you think is preventing farmers from doing more conservation?	Attitudes and Awareness
5. Do you consider soil erosion to be a problem on the land you operate?	Awareness and Perceptions
6. Do you consider water pollution to be a problem on the land you operate?	Awareness and Perceptions

Information and Institutional Factors

Located in table 3.2 are questions aimed at collecting information sources and institutional themes.

Table 3.2 Questions to Elicit Information Sources and Institutional Factors

<i>Question</i>	<i>Targeted Personal Characteristic</i>
1. Has anyone/any government agency approached you regarding adoption of any type of conservation practice?	Information Sources, Extension, and Institutional Characteristics
2. Where do you have received most of your information regarding conservation practices?	Information Sources, Education and Extension
3. Could you name three people you go to, to discuss any decisions regarding BMPs such as adoption, installation, or maintenance?	Information Sources
4. Are there any other non-human sources of information that you use to get information about BMPs?	Information Sources

Results and Discussion

General Characteristics of the Agricultural Producers

Thirty-two producers were interviewed in the Eagle Creek Watershed. They were all Caucasian males, ages 27-81 (mean 55), and all producers except one was at least a second generation farmer. Some of the producers had been operating up to 5 and 6 generations in that part of Indiana. Farm experience ranged from 5-50 years and averaged 30 years. The farms were all row crop operations mainly corn and soybeans; some farms were also raising wheat, hay, or alfalfa. Additionally two operations had dairy cattle, two farms had beef cattle, and one had a confined hog operation. The size of the operation

varied between 120 and 7000 acres. As far as operation structure, fourteen producers owned and operated their own acreage along with cash and share-renting additional acreage. One producer was operating only acreage he owned and five were operating only rented acreage. Finally there were two family owned corporations and ten family farm partnerships (e.g. fathers and sons, brothers) operating both owned and rented acres.

Producer and Farm Characteristics

1) Age

Age was mentioned as a positive and negative aspect in terms of ability to adopt conservation practices. One producer, when asked why some farmers undertake more conservation than others, replied, *“You may find some of your older farmers that aren’t carrying a lot of debt that own their land free and clear might tend to be more conservative [conservation oriented] knowing that they might have a little bit of yield lag versus the younger guy who’s out there that has got a lot of debt load and has to make every penny count.”* Other producers cited age as a limiting factor in their adoption decision, one said *“I just don’t want to spend a lot – at the age I’m at now, I don’t want to spend a lot of money on new equipment. You know I’m just kind of using what I have. I just do it that way.”* Another explained about not adopting grassed waterways, *“Oh I’ve got few enough years of farming left that I don’t care that much.”* One producer referred to an additional issue with the older generation, he said, *“Oh, there’s a real problem with an older generation staying around too long and being too old fashioned or too conservative, not changing with times fast enough.”* To the contrary, a producer commented on his father, *“My father was pretty good about, I don’t know how old he*

would have been but he was well past of the age of when they recommend anybody trying to switch to no-till and he switched willingly with me.” This quotation illustrates how age could be seen as a limitation by some, for instance conservation agencies, but in reality the producer was willing to use the conservation practice.

2) Part-time Farmers

Part-time farming was mentioned most often as a limitation in adoption. One producer commented on conservation in general, *“We do things from the stand point that two of us work off the farm. We don’t do this [farming] because we have to; we do it because we want to. We’re in it to make a little money, but were not in it to spend all the operating money we get from the bank plus all of our salaries to keep things afloat. It kind of depends, but we try and do as best we can with as little as possible.”* One of the beef cattle producers also mentioned off-farm employment as a limitation to adoption of rotational grazing, *“I actually have another job that I work about 100 hours a week at, and I just don’t have the time to set up and move cows every three days.”* A notable exception to part-time farming as a limitation is adoption of conservation tillage, because of the associated time and labor savings.

3) Education

There were only a few comments regarding education. One producer commented about grassed waterway adoption, *“Well, you know, it’s just common sense. When you farm what’s around you, you can see where all the water runs and you see the erosion....so let’s put in a [grassed waterway] here... You don’t have to be a Purdue*

graduate to understand that you got erosion.” Another producer who had multiple children attend Purdue University in addition to himself attending, said his pet peeve with them was, “The Purdue recommendation for fertilizer, they haven’t changed their recommendations for fertilizer and nitrogen requirement on the crops for sixty years. It’s the same recommendation with no increase in technology, reasoning, or anything. It’s the same science. And that’s what irritates me the most about Purdue recommendations.” It is interesting both of these comments allude to higher education not necessarily helping a producer to learn more about conservation. Only one of the producers mentioned college education as a factor in their adoption decision, he said this about switching to no-till, *“When I was going through Purdue one of the statements they made was, because they were beginning to push no till, it’s a management decision - you make the choice...And the economics they were selling was you could get as good if not larger crops [with] no till and you certainly had time savings so you could get a more timely planting done.”*

4) Farm Size

A large farm size was mentioned by producers as both a positive and negative in terms of adopting conservation practices. An operator of a 5000+ acre farm commented on adopting a no-tillage system versus their current strip-till, *“As farms get bigger and you plant with bigger equipment, if we miss 3 days of planting because the ground hasn’t warmed up well yet, we might miss planting almost a 1000 acres of corn...if you have that much corn out there that you didn’t get planted and when you do plant it’s 20 bushels less yield just because you’re a week or two behind, economics are just too big to*

lose that.” Another producer with 5000+ acres cited acreage as a limiting factor in adoption cover crops, *“I don’t have time to do that, I mean I am farming so many acres.”* A smaller producer explained what he thought the problem was with large operations and conservation adoption, *“You know, some of these larger ones, and I’m not going to say that as a general rule, some of them are just so big they don’t have time. They don’t want to take the time and they hire so much different help it probably wouldn’t do, you know these guys liable to run right through a waterway.”* However a couple of the producers testing cover crops were larger farms (2500 and 3300 acres). Larger operations can potentially have more resources, illustrated by this producer’s comments on nutrient management practices for his large operation, *“They’re pretty complex. We got a full time guy that is right here, and really is our tech person. And uh, spends most of the year in one way or another helping us apply technology to the field. And he does all our soil sampling and created all our maps for applications.”* A number of small producers had similar sentiments regarding nutrient management, one mentioned, *“It’d be different if we were farming 5000 acres and we owned our own spreader truck and we could afford all the fancy GPS stuff, but we can’t.”* From these comments it is easy to see that the relationship between farm size and adoption of conservation is more complex than the simple question: who is more likely to adopt, small or large operations.

5) Land Tenure

Land tenure was seen as a limitation to adoption in a number of the statements made by the producers, for example this comment, *“There’s this field here and another one up on 32 that could stand to have grass waterways but the landlords aren’t going to*

spend the money.” A number of producers mentioned how they felt the landlords did not understand about conservation or care in some cases, or that they “*just want the rent check.*” This is an obstacle especially for a producer who feels as this one does about filter strip adoption, “*They weren’t there when I started so...I feel that would be up to the landlord to decide if he wanted the filter strips.*” On the other hand landlords were sometimes the reason conservation was being done on their ground. One producer talked about getting the chance to rent a particular field, “*I think that’s the reason we had the opportunity to rent our ground because they [landlord] saw how we had put some grass waterways in and our no-till practices, it’s not growing up with weeds or whatever, and they like the way the practice was working, and they contacted us based on that.*” There were no instances of a landlord requiring conservation. However, there were two instances where producers gained rental contracts for additional farm acreage based on their use of conservation.

Awareness, Attitudes and Perceptions

1) Awareness

Producers seemed to be aware that soil erosion constituted a problem (their perception of it will be addressed later). However, many producers discussed how flat their land was and they appeared to be less aware of the potential that flat land has to erode. Producers were also aware that water pollution represented a problem, some were less aware of how big their role in water pollution is or the “big picture.” When asked if they thought water pollution was a problem on their land a number of producers said “*from what source?*” and would then describe other sources of water pollution (e.g. septic

systems). They are probably not fully aware of their contribution to water pollution. An illustration of the “big picture” concept was this producer’s comment regarding his adoption of nutrient management practices, *“When you [I] don’t over fertilize it doesn’t end up down the Mississippi, and down in the Gulf. I just read about the, I didn’t know there was a dead zone, did you know there was a dead zone? ... And I thought wow why didn’t I think about that before. I hadn’t, you live in a little small area right here, this little, this is our county right there you know and all these other counties around here are having, but all you’re concerned about is this one little spot.”* It wasn’t specifically asked but how many other producers are still unaware of hypoxia in the Gulf of Mexico?

Awareness of practices and programs were limitations to adoption of conservation practices in some cases. Many producers were not aware of available assistance, one commented regarding assistance for nutrient management, *“I didn’t know there was any [incentive money]. I just need to go up there and sign my name huh? So they’re giving money away huh? They’re not giving money away, but they’re just helping on everything.”* Their awareness of cost-share money for grassed waterways and filter strips was high, but for other practices it was not. For example, this included practices that the local watershed project was cost-sharing or more unique opportunities such as applying for carbon credits. Awareness of a practice in general was also a limitation in two instances, nutrient management plans for row crop operations and Integrated Pest Management (IPM). In both cases, but especially for IPM, producers were not aware of what the conservation practice entailed.

2) “Profit-Oriented” Attitude

Attitudes regarding the economics of the farm were very important in adoption decisions for many of the producers. One producer mentioned, *“Dollars and cents tend to drive people more than, regardless of what they think, more than the greater good.”* When asking the producers if there was anything preventing farmers from doing more conservation, nearly 40% mentioned something related to economics. Examples included land out of production, debt loads, commodity prices, and initial conservation investments. One producer talked about how economics could influence conservation behavior, *“Economy has probably forced more change than anything going in the last three or four years here, the cost of fuel and equipment is finally starting to make people more aware of no-till farming or reduced tillage.”* The notion of “time is money” is present in statements from producers who have a “profits oriented” attitude. With cover crops especially, lack of time was a limitation in their use, one producer said when asked if he would consider using them in the future, *“Oh, I might in some point in time, the problem is spring is pretty busy...this ryegrass, you got to get in and get it burnt down if not, it’s gonna go, I mean it grows very rapid. And it does help the tilth in the soil...you know if we had time.”* On the other hand the producers who have adopted ryegrass in this watershed as a cover crop are doing it mainly for financial reasons, *“We’re really using it more. It’s economics. It all comes back to economics, but we’re looking at it as we planted it after soybeans and uh we’re hoping to get a benefit in the corn crop next year through nitrogen and root development.”* Producers with a “profit oriented” attitude also adopted grassed waterways for financial reasons, *“If you think economics, if you don’t do something to keep those things from washing, you will, you’ll damage equipment, crops*

run, you know, there's good reason to have them established. Even besides conservation." For farmers with a "profit oriented" attitude, conservation decisions are like any management decision, you need to weigh the benefits and cost associated with the practice and make your decision.

3) "Yield is Not Everything" Attitude

There were some producers that displayed a "yield is not everything" attitude. When asked what is preventing farmers from doing more conservation this conservation-minded producer said, *"It's just their attitude. I'm sure that people laugh at me, but I don't really care cause I'm paying my bills, paying my farm off, and uh, my style of life is pretty good. Uh, yield's not everything."* Another producer talked about helping his landlords to get practices done on their land, *"I would rather put my money in paying part of their [conservation] cost as to raise the cash-rent up and be concerned about the cash-rent only and the ground still washes away or we still have the flooding because it's not handled right. It's really worth more to me."* This type of attitude is also beneficial to the producer, illustrated by this remark, *"I'm not going to go out there and rape the ground, I am not going to abuse it, I mean that's how I make my living, if I don't take care of how I make my living I am not going to be at it very long."* These producers are thinking long term about benefits in addition to profits.

4) Commitment Attitude

There appeared to be attitudes regarding commitment to conservation practices. Some producers tried a practice and even if they had problems stuck with it, whereas

others just kept trying new things if previous practices were not working or they were less committed in general to conservation. An example of a producer committed to conservation was this producer's explanation of switching to no-till, "*I thought man if this'll work this is really going to be good for us cause a lot of our ground rolls, and like I said it was a disaster, but I just decided you know it's going to be a learning process and I just, I can't do it on all my acres but I can do it on some every year and hopefully you know, it'll work if we stay with it. And it did.*" Other producers tried no-till, didn't see the advantages or had bad luck and switched back right away. Another example was how some producers talked about not maintaining their grassed waterways "the way they should." Commitment to conservation is important for practices to do what they are meant to.

5) Conservation Attitude

In order to gain some insight into producers' conservation attitudes, they were asked if they consider themselves to be conservationists. Responses to this question brought to light several themes. There were two producers who told me flat out "no," there was also a group that were a little unsure if they were conservationists because they were not doing conservation practices, for example one producer answered, "*Yeah a little bit, uh, yeah I'm gonna try no-till and do more of that kind of farming.*" Another producer was unsure of what a conservationist is, "*I don't know if I'm a conservationist or a good steward, I'd hope to be a good steward. I think I'm a good steward but I don't know if I'd fit the definition of a conservationist.*" There was also the attitude that you just do what needs to be done, "*I think that's more of a caretaker then a, then a conservationist*

to me it's common sense you know, so probably yea." There were quite a few producers who answered simply "yes," they didn't feel the need to explain. Others told me why they felt they were conservationists, *"Pretty much so. I worry about the environment and the kind of chemicals I use and that type of thing."* Producers seemed to think that a person's conservation attitude mattered also, evident by this comment answering the question why do some farmers undertake more conservation than others, *"I would say in my opinion for as far as water quality and conservation, I'd say some farmers sincerely care about it and others could care less, you know."* Another aspect of conservation attitude was the value producers placed on conservation such as enjoying seeing wildlife in conservation areas or being able to fish in a clean stream. Conservation attitude is of course related to other attitudes and factors and they work together to affect the producer's decisions regarding conservation adoption.

6) Heritage and Risk Attitudes

The heritage attitude encompassed both the passing knowledge and land in this research study. The theme of the "old fashioned way" emerged as an attitude about adopting conservation tillage specifically, one producer said, *"I'm more, I still do a lot of tillage, and uh, more the old fashioned way, the way my dad did it."* Going along with this theme, one producer stated why some producers undertake more conservation than others, *"But it's just so much fun to get out there and make circles in the dirt and I think that's why a lot of people resist it [no-till] some."* As far as passing their land on, ten producers said they were, seven were uncertain, three said most likely no, and twelve said definitely not. Encroaching urbanization from Indianapolis, Indiana is the reason there is

such a low percentage of land continuing in farm operations in this area. In some cases producers mentioned doing conservation for future generations, one said, *“I grew up here, this is home, I mean I grew up down the road and I have visions of the ghost of the little boy playing out in the hay mound when I was little. You know money is not everything, you know just other things. Doing things for people, not so much yourself anymore.”* Conserving for the future generation was an important aspect to the heritage attitude expressed by a number of the producers.

Tying in with heritage, but also displaying an attitude exemplifying risk aversion was this producers comment, *“I’ve been taught not to be foolish and not to be changing all the time you know, you kind of stay in-between the white lines and don’t be doing stupid things. Not stupid, that’s not right, I’m sorry. Don’t be risking, my dad would, my dad didn’t risk his neck for anything...And that’s how I was raised, and I’m not as much like my dad...but going no till was a big deal for us, because that was change.”* Risk aversion was a factor in a few cases for producers in the ECW, especially for conservation tillage and cover crop adoption.

7) Perceptions

Perceptions found to be important in this study were producers’ perception of a problem and therefore a need for change, perception of their role in environmental problems, and their perception regarding the solutions to these problems.

Producers were asked if they considered soil erosion and water pollution to be a problem on the land that they operate, and from this question some interesting ideas emerged. For soil erosion ten producers said, “not a problem,” additionally five more

said, “No because I have addressed it,” eight thought it was “on some parts,” seven believed “yes it’s a problem but I’m addressing it,” and the remaining two producers said soil erosion will always be a problem. The producers who said they were addressing the problem were using some kind of conservation practice. For the producers who did not think erosion was a problem it was usually due to the perception of flat land. A common response as to why a producer was not utilizing grassed waterways in the ECW was, “*I just don’t have any land that is hilly enough to use it on.*” One producer told me it depended on the “yardstick” you were using, that my yardstick for pollution and soil erosion was different than his yardstick. In regards to the perception of water pollution on their land, ten producers said it was “not a problem,” six said “no because I have addressed it,” two said “not that they were aware of,” three figured “probably not,” four thought it was “sometimes,” one believed only sediment was a problem and only one producer thought “yes” water pollution was a problem. The remaining four alluded to water pollution being a problem because of other sources besides agriculture. It is interesting that about 50% or more of the producers did not perceive soil erosion and water pollution to be problems although government and conservation agencies perceive them to be significant problems. There also seemed to be the idea of not wanting to be the person causing the problem and so they made sure to mention they were addressing it.

Related to the last concern, is producers’ perception of their role regarding environmental problems. Some producers such as the following, perceive the individuals role in water pollution, “*I like to do as much as possible within reason to make sure the surface water coming off this farm is fairly [clean] cause, I mean, you know, it starts with you. If you, the individual doesn’t do anything, I don’t care what you do, what programs*

are in place. If people don't do it themselves it isn't going to work." Other producers are not so sure of their role, *"There probably is some water pollution from farming practices we do."* Some producers possibly don't have as much knowledge about it as they should, *"Dumping a little bit of atrazine in the water doesn't hurt anything. Between algae and some other things it looks like, but because some might do some good does not mean a lot does more good."* Still other producers are willing to change, such as adopting filter strips, if they knew for sure that they were causing the pollution, *"We have such high ditch banks down here...it's hard for water to get there [into ditches]. But it still could be leaching through the ground and if you know somebody would do a study that I believed was fair and honest and not, and it was something we would look at things in some of our practices. I mean, I don't really want to be part of the problem."* If producers do not perceive themselves as being part of the problem then they are not going to take part in implementing the solutions.

Perception of the effectiveness or conservation value of a practice affects the producers' decision to use that practice also. Some producers perceive that practices are actually doing what they were meant to do, for example one producer told this story, *"I can think of one specific place where there's a man that's got a nice pond and uh, when we put in a grass waterway, he commented to us that it made a difference in how clean his pond was just in the way it looked. For the most part, there's cleaner water."* Other producers do not perceive the value of certain conservation practices, like this producers perception of filter strips, *"I just don't see that they're big of an advantage for the simple fact that you get a big flood and rain, the water is going to come off of the hills and it's going to go somewhere and it's going to go in that ditch whether the grass is there or not."*

That's my own opinion. If you got sides [on the] ditch and the banks are maintained and they're not washing in on it, I don't see much point in it." Perceptions are very important in decisions regarding adoption intuitively even more so than facts in some cases since producers are going to act on what they perceive to be true.

Information and Institutional Factors

1) Information Sources

The producers were asked where they have received most of their information regarding conservation practices. The results were interesting and pointed out the importance of information sources in conservation decisions. Government agencies were a top source, one person named the USDA in general, another the FSA, four said the county NRCS, and nine mentioned the local SWCD (with four having been on the boards). The former district conservationist (DC) was named specifically for this question in four cases but mentioned overall by 11 of the producers. The former DC seemed to be instrumental in getting conservation practices "on the ground" in this watershed. Three producers said they did research on the internet and six said they used farm magazines (e.g. No-Till Farmer). One producer mentioned Purdue Extension, another the FFA, two said other farmers, and the last said he only listens to himself. These were the information sources stated as answers to the question. However, sources that were not mentioned frequently for this question specifically became more important during discussions of specific conservation decisions. For instance a producer convinced his father to do filter strips through a government program. Another producer talked about his brother as an

information source, *“Well my brother that is a farmer and he no-tills and he’s no-tilled continuously every acre longer than I have. There really isn’t very many of us in our area that are no tillers so a lot of the information I gain is [from] my brother.”* Producer to producer influences were mentioned in many cases and sometimes were as simple as seeing what another producer was doing on their land, *“I remember about thirty, forty miles from here I saw a guy no tilling wheat in the bean stubble, after the beans were harvested, and I thought, wow, that’s neat you know, and I thought I’ve got to come back here and see what kind of stand he had. It was great.”* In other cases they were trying to model it, *“I think I’m trying to model myself after some of the people I really respect in the industry, who are doing a good job,”* Still additional producers were seeking knowledgeable producers out for help and advice, *“I talked to several people, other farmers...you actually have to talk to other farmers who actually do it to see what their problem was, so we can learn from each other.”* The concept of the “Early Adopter” was seen in this watershed with adoption of a ryegrass cover crop. Only six producers in the watershed were using it and two of them had sought out or were going to seek out the person who used it initially. Information sources played a significant role in adoption decisions.

2) Education and Outreach

Education and outreach were important for a number of the producers in the ECW. Concerning conservation education, some producers mentioned attending conferences, meetings, field tours, seminars, and being involved with research projects through a local university. A few producers had unique learning opportunities such as the

following, “*Well, um, I guess probably we had on our farm up North, we had twenty acres that, uh, we worked out a deal with [a company] at that particular time...And they’ve done all kinds of research on that twenty acres with corn and soybeans. There was probably, in the corn plot, 400 to 500 different plots in the ten acres...so we got to see a lot of different things.*” Some producers were looking for more education in order to make conservation decisions, one producer when asked why he wasn’t using cover crops said, “*Well probably lack of knowledge and knowing why I need it.*” Another producer talked about his process of switching to no-till, “*I tried the no-till corn in the early 1990s [I stopped] because I really didn’t have the support and the right knowledge of mainly my equipment of how to no-till...I was actually waiting for the person to show up to help educate me with it, and a guy just happened to cold call me and I’ve been working with him ever since, with another company. We had a really good relationship, and with his support and other farmers’ support, I learned to be a better no-till farmer.*”

Interestingly twelve of the thirty-two producers (38%) answered that no government agency had approached them regarding adoption of any type of conservation practice. Multiple producers said they had to seek out programs and assistance. Even a producer with 5000+ acres who is now involved in a lot of conservation remarked, “*Yeah, never had anybody come out and offer anything.*” At least two producers specifically mentioned wanting more from the local SWCD, one said, “*More meetings, more general meetings locally, get together gab sessions.*” Education and outreach are still important aspects of increasing farmer adoption of conservation practices.

3) Government Assistance

In a few cases factors associated with government conservation programs had a positive effect on conservation adoption, however, more often they were seen as a barrier. For some producers, conservation programs gave them a chance to take marginal land out of production and receive payment, one commented, *“You look at yield maps and things like that, you know, economically most of the areas that you’re gonna end up with trees you’re not gonna grow much anyway...And so we just feel like we can plant 30 or 60 foot of that wildlife buffer and get paid to do that and economically we’re gonna be better off in the long run.”* Some producers perceive the payments from the government to be pretty good, *“And they pay pretty well for that [grassed waterway]. Cash-rent, they pay pretty decent on, better than actually renting it out...Well in most cases, now you know you hear all kinds of stories on cash-rent, but reasonable cash-rent, I’d say it’s better.”* However, other producers do not think that the program payments are enough to cover what they are losing in productive ground, especially with commodity prices on the rise, *“With grain at the level that it’s at now normally you plant as much as possible from an economic standpoint.”*

There were many other limitations associated with government agencies and programs that were brought to light during the interviews. A significant issue within the ECW was the length, restrictions and requirements of programs for grassed waterway and filter strip adoption. In ECW the length of the contracts was commonly a problem because of development in the area, one producer said this about doing filter strips with a program, *“I have a hard time, uh, tying up mine up with the government. I know I could make tons of money off of it, but not for fifteen years. We just don’t want to tie something*

up for fifteen years.” Flexibility was important to the producers in this watershed.

Another producer summed up many of the additional issues that numerous producers had, in one long remark,

“I think that the government programs are intimidating, and they’re not well explained, they’re cumbersome, and people in general are resistant to signing a ten year contract with the government for anything...If you could bring those programs out to a farmer and lay it down in one page in simple terms what happens, you know –one, two, these steps, you go through these steps right here, you get paid this amount of dollars, you’re responsible for this...So, that’s part of my frustration and when we started this process [wildlife buffers] last year, been doing this over a year ago, and we actually left some ground where we didn’t plant it this spring expecting, cause we’d, we’d applied, we had the paper work in, we thought it was all gonna go through. We left some ground unplanted that we were gonna put these warm season grasses in the summer. We never got the paperwork back until about two weeks ago, and so we had ground that actually just sat there with nothing this year... the staffing is so tight that our guy that we talked to is in the office 1 or 2 days a week, you don’t really know when, it’s kinda hard to make an appointment with him, you really have to seek them out. And then you start the process, and it takes a long time and I, you know, it’s just cumbersome. And that’s the thing that’s frustrating to me about the programs, and why then I don’t think more people will do it.”

This producer hit on many of the issues producers in the ECW had with government agencies and programs. One final limitation for some producers was the fact that programs are set up for the landlord, one commented, *“Filter strips would benefit the landlord and not necessarily the tenant the way it’s set up right now. So in essence it’s gonna cost me farm land and I’m gonna end up having to maintain that filter strip or whatever and so I haven’t done that.”* Limitations associated with government programs constitute a significant barrier to adoption of practices for some producers.

Participation Spectrum

Based on a slight modification of Morris and Potters' (1995) classification, the five levels of conservation adoption in this study are developed as follows: 1) active adopters, who adopt conservation practices almost completely for environmental protection reasons 2) active adopters, who adopt conservation practices for both environmental protection and financial reasons; 3) passive adopters who adopt mainly for financial reasons with little inconvenience; 4) conditional non-adopters who would consider adoption under different circumstances; and 5) resistant non-adopters who are not using most conservation practices for multiple reasons and probably will not in the future. If a resistant producer had implemented a practice it was for mainly financial reasons. Summaries of the differences between each group are presented in Table 3.3. Each producer was analyzed holistically encompassing their personal characteristics, and their main motivations/limitations for adoption of specific conservation practices. Since the analysis focuses on their reasons for adoption of multiple conservation practices (cover crops, conservation tillage, grassed waterways, filter strips, nutrient and pest management practices) even resistant non-adopters might have implemented one or more of the practices. However, producers were categorized based on their overall motivations and attitudes toward conservation adoption. Outlined below are descriptions of main motivations for each group and personal characteristics that were found to affect the adoption decision. For the most, part these are summaries, in which themes regarding personal characteristics are illustrated and supported by quotations from the previous section, and not usually repeated here to avoid redundancy.

Table 3.3 Summarized differences between categories of producers (Env. = Environmental; inconv. = inconvenience; Conserv. = Conservation)

Characteristics	Resistant Non-adopter	Conditional Non-adopter	Passive Adopter	Active Adopter-Both Env. & Econ.	Active Adopter-Env.
Conservation History	Reject most conservation practices; May use one practice for economic reasons	Have rejected some conservation to this point but would adopt under different circumstances	Adopted practices with little inconv., reduced effort and for mostly financial reasons	Actively adopting practices for env. and financial reasons	Actively adopting many practices mainly for conservation and future gen. reasons
Main attitudes affecting decisions	Profit Orientation; Heritage	Profit Orientation; Heritage	Profit Orientation; Heritage;	Yield not everything; Profit Orientation Conserv.; Heritage	Yield is not everything; Conserv.; Commitment; Heritage
Conservation Attitude	Low	Variable	Medium	High	Very High
Majority Perception of Soil Erosion	Not a problem	Not a problem	Addressed or currently addressing	It's a problem their addressing	It's always problem or addressing it
Majority Perception of Water Pollution	Not a problem	Not a problem	Not a problem or addressed it	Sometimes	Not a problem
Other Limiting Issues	Government program payments; Age; Farm size; Land tenure	Information sources; Conservation Education; Program payment; Land tenure	Convenience of practices	Cost in only a couple cases	Low levels of outreach targeted towards them

Resistant Non-Adopters

Nine of the thirty-two producers (28%) were categorized as resistant non-adopters. Morris and Potter (1995) state that active adopters view conservation as a legitimate use of their time and resources. Resistant non-adopters in the ECW are quite the opposite. They are similar to passive adopters in that if they have adopted a practice it was for financial reasons. However, they differ in the number of practices adopted, and where passive adopters tended to appreciate conservation value of practices resistant non-adopters overall did not consider that in their decisions. Therefore, a producer was categorized as a resistant non-adopter based on all their conservation decisions and they rejected most conservation practices.

Resistant non-adopters are marked by a “profits oriented attitude” and are similar in their repeatedly financial reasons for non-adoption of conservation practices. Their reasons included taking land out of production, decreases in yield, cost of extra equipment, or simply the practice itself costs too much. There was also the notion of time required for many resistant non-adopters comments. It takes too long to realize the benefits (make money) from a practice, try new practices, or maintain conservation practices. A few producers in this group have adopted conservation tillage systems, but their reasons for doing so were primarily labor, time, and fuel savings, not conservation. A few other producers adopted nutrient and pest management practices only to save or make them more money. The few that have adopted a particular practice are not committed to it. In one case, a producer was considering changing to less no-till next season because he had gotten better yields on tilled ground in the past season. Hence he was thinking about switching back. A producer in this group will change if economics

dictates it, illustrated by this quotation, “*Fuel has made us conservative in lots of ways.*” What drives producers in this group is “Dollars and cents.”

Conservation, heritage and risk attitudes played a secondary role in conservation decisions. Only one producer considered himself a conservationist, with the rest answering the conservationist question with “pretty much so”, “Kind of/Somewhat”, “I try”, and “No.” Even though this group did not always consider themselves conservationists they still talked about taking care of the land in terms of keeping fertility up, or “*keeping the weeds down around their landlord’s places.*” Heritage in the sense of doing things “*the old fashioned way*” was important for some of the producers in this group. Ideas and ways of farming have been passed down through the generations. With conservation tillage, some producers are just not ready to give up tilling the soil; it amounted to, “*I just like to till my soil.*” Of the resistant non-adopters, only two were definitely passing their land on, the rest were uncertain or definitely not. The extreme thought regarding responsibility to future generations was one producers comment pertaining to pests gaining resistance to roundup, “*It’s [resistant beans are] going to last us as long as I need for it to do and the next generation can worry about it. Not necessarily a good attitude to have either but it is realistic.*” Additionally, some producers mentioned not wanting to take risks or make changes when it came to conservation adoption or farm management in general.

Perceptions were very important for this group of producers. Seven of the nine producers did not perceive soil erosion to be a problem on their land, and the other two said it was “just on parts.” Three producers did not perceive water pollution to be a problem, two “probably not”, one “I addressed it”, two “sometimes”. A common reason

for non-adoption for in this group was perceiving the lack of a problem and subsequently lack of need for conservation practices such as grassed waterways or filter strips. One producer talked about how water pollution came from other sources, leaving himself out of the problem, indicating he probably is not convinced that he contributes to water pollution with his practices. A number of producers in this group also did not perceive the conservation value or effectiveness of the practices.

Restrictions associated with government programs were a stated barrier to adoption for a number of the producers in the resistant non-adopters group. Seven of the nine producers had been approached by a government agency regarding adoption of conservation practices, so most were aware of programs available. They however did not want to “*tie up their land*,” they wanted to remain flexible in management decisions. Other restrictions that kept them from participating were length of contracts (especially with pending development in the watershed), time required to sign up, insufficient program payments, and the slow, unorganized, and complicated nature of the programs and associated agencies. One producer just didn’t want to “*fool with the government*,” others simply have a “no one is going to tell me what to do on my land” attitude.

As far as producer and farm characteristics, two producers specifically mentioned their older age as a major reason for not wanting to adopt conservation practices, now or in the future. They have too few years left to care or see the benefits. Farm size was stated as a limitation for small farmers in terms having less income and resources to invest in practices such as GPS for nutrient management. A large farm size and part-time farming were mentioned as a barrier in regards to time to do conservation practices. As far as land tenure, one producer mentioned specifically that a landlord did not want to

adopt a filter strip. However, most producers in this category say that they are in charge of conservation decisions and the landlords “*don’t care*” or “*just want their rent check.*” In summary, there were many reasons resistant non-adopters were not using conservation practices. The final characteristic that united this group is their not foreseeing themselves adopting these practices in the future. This also separates them from the conditional non-adopters.

Conditional Non-Adopters

According to Morris and Potter (1995) the reasons for non-participation among this group echo those of the resistant group. However, the conditional non-adopters would consider adoption in the future, subject to changes in payments, conservation practice characteristics, or farm and farm family situations. This was also true of the conditional non-adopters in this research study. There were 5 producers (16%) categorized as conditional non-adopters. The following is a brief description of the conditions that would need to change in order for these 5 producers to become adopters. For two producers information sources have made the difference in their conservation decisions. Each is using one conservation practice because they were persuaded to by another person to adopt that practice. Their personal characteristics indicated that if given the right information sources regarding additional conservation practices, they have the potential to adopt those practices. Another producer saw lack of conservation education and knowledge of programs to be his main barrier to adopting conservation practices in addition to his no-till system. He had a strong pro-conservation attitude and cared about future generations, but when asked what the local SWCD could do for him, he

specifically said more knowledge, meetings and monthly information. The last two conditional non-adopters constraints were regarding to economics and government programs. For one of these producers, information sources are also important as he does seek out advice from neighboring farmers on practices. However, his biggest limitation is current program payments. He says price of corn is too high to justify losing the acreage to conservation; government would need to “*pay more for an acre, you know, for the strips and everything*” in order for him to adopt them. The last producer in this category had 2.5 acres of his own land currently enrolled in CREP. By contrast, he is not using any filter strips or grassed waterways on his rented acres. The producer had requested that the district conservationist visit and take measurements and describe to the landlord options for putting in a grassed waterway. However, the landlord was not interested in tying the land up in a 10 year contract due to development in the area. For this producer a change in farm circumstances or restrictions of government programs would have to happen in order for him to adopt the waterways. It could be argued he could do them himself, however, this producer also had a strong “profit oriented” attitude and would not give up the land without payment or a reduction in cash-rent for the lost acres. All of the conditional non-adopters considered themselves conservationists to some degree, but there were certain barriers that needed to be overcome in order for them to move along the participation spectrum.

Passive Adopters

Morris and Potter (1995) point out that adoption appears to be a matter of degree. Producers described as passively adopting conservation practices are doing so primarily

for financial reasons and at little inconvenience. There were eight (25%) producers in the Eagle Creek Watershed categorized as passive adopters, based primarily on their conservation effort and reasons for participation. Two of the producers considered themselves conservationists, two “somewhat”, and two “I try.” There was also the idea from the remaining two of being pragmatic or being a caretaker. Typical of how this group feels might be, *“I would like to take the long term consequences in consideration, not just the short term consequences which means I’m probably going to be somewhat of a conservationist compared to a lot of other people. But I, I have to look at how capitalism works.”* The producers in this group also have a strong “profits oriented” attitude and they are utilizing conservation practices for financial reasons mainly. Nutrient and pest management practices especially were being adopted for their associated cost savings and yield advantages. Some producers in this group did mention environmental reasons for adopting conservation practices but they were secondary to economics. Producers were using practices as long as they made sense economically, and the practices they were not using, they were open to if it made sense economically. Profit oriented attitudes were illustrated by their adoption of conservation tillage for input savings and grassed waterways for ease of farming. One producer mentioned using conservation due to sensibility and efficiency. These are economically related ideas but conservation practices can contribute to them.

What sets this group apart from the active adopters is their level of conservation effort. For the most part, they are using conservation practices with a minimal amount of effort. Morris and Potter (1995) indicate that passive adopters use conservation opportunistically, this was also the case in the ECW. Producers were using practices

because of reasons such as the land was “not suitable” for farming anyway, using a filter strip to provide grass for grazing cattle, or using cover crops over the winter as a place to haul manure. Some producers were simply using the practice because it was there before they started farming the ground. Convenience was an idea expressed often with this group, their attitude is exemplified by this quotation, “*If there’s a financial incentive and it’s convenient for us to do it that way and it’s gonna be on ground [that is] not productive anyhow... Then I’d consider that is a possibility.*” There were instances where these producers were using practices such as grassed waterways or filter strips not enrolled in programs. However, their effort in installing these showed they might not have been up to the quality expected by, for example, the SWCD. One producer had some “*old junk seed*” he used for a waterway. Level of effort was important for the passive adopters in the ECW.

Heritage was an issue in two cases in the ECW for this group. A producer was using some conservation practices for financial reasons, but was not going to enroll in programs because he did not want to tie up the land with regulations because he would be passing it onto his sons. In another case a producer’s father had accomplished a significant amount of conservation and enrolled in programs. After the father passed on the land, the son maintained some practices but was not seeking new programs or actively engaged. In some cases he couldn’t remember if they were still receiving payments. The son was a passive adopter due to taking over his father’s active adoption operation. In this group, five producers said they would not be passing the land on, one was uncertain, and two said they would be.

Perception of a problem was also a factor in the passive group's adoption decisions. They were using conservation practices to address a perceived need or problem. For example, grassed waterways made it easier for producers to farm by reducing the amount of broken equipment and addressing soil erosion. Four of the producers felt they had addressed soil erosion on the land, therefore it was not a problem. Two felt it was a problem on some parts, and the other two producers said soil erosion was a problem and they were currently addressing it. Four producers felt water pollution was not a problem, two felt they had addressed it, one said soil was the only pollutant, and the last said pollution was coming from other sources. Producers in this group seemed to be more likely to feel once they used a practice that the problem was "fixed." This was a somewhat different attitude than that shown by the active adopters. Producers in this group were less likely to question the effectiveness of conservation practices, however, a perceived need still kept some in this group from adopting all conservation practices.

An additional aspect separating this group from the active group is they do not seek out government programs and assistance. All of the producers except one had been approached by a conservation agency and some had enrolled. If they had enrolled it was for the money usually and with little expressed effort. Again "tying up the land" in contracts was an issue some cases, but I feel that this reflects the development pressure as much or more than the underlying perceived program limitations. Still this shows that addressing this policy limitation, especially for developing areas is important.

As far as producer characteristics, farm size increased producer's adoption because they were a large, well known operator and received much more outreach and

conservation pressure. He had a “just haven’t gotten around to it” attitude but now is enrolling because it has been made convenient enough for him to do so. Convenience was also important for an additional part-time producer because he felt he did not have the time to do a lot of extra practices. Overall this group has some environmental but mainly financial motivations for adopting conservation practices. They are also highly motivated by the associated convenience or inconvenience of the practice.

Active Adopters

Ten out of the thirty-two (31%) producers were categorized as active adopters. They are marked by their high level of conservation effort. I modify Morris and Potter’s (1995) classification slightly and further break active adopters into groups based on whether the producers were motivated almost completely by environmental reasons for adoption, or if it was a combination of environmental and financial reasons. There were four (13%) producers that had mainly environmental motivations and 6 (19%) that had a combination of financial and environmental motivations. The financially motivated producers in this group are different from the passive adopter group based on their level of effort in adopting conservation practices and seeking out advice and assistance. As “active” implies, they take an active role in conservation.

Active Adopters – Environmental

The mainly environmental group was using conservation because “*it is the right thing to do,*” and because of motivations associated with “*pride,*” and “*taking care of the land.*” They all answered the conservationist question with a “yes.” They are more likely

to have a “yield is not everything” attitude and see the “bigger picture” for doing conservation. They often mentioned not liking to see the effects of a lack of conservation, such as their soil washing away or the presence of “*snirt [snow+dirt]*.” They also talk about utilizing conservation for wildlife and clean water for fishing. This group is committed to doing conservation practices and they have a “stick with it” attitude. Heritage was also important to them, a quotation exemplary of this group’s attitude was, “*Some farmers are operating for cash; others for future generations.*” Of the four producers, two were passing their farms on. As far as the effect of their perceptions, one producer talked about how he believes conservation starts with the individual, these producers all saw their role as affecting the environment in some way. They all believe soil erosion is a problem, two of them specifically said they are addressing it although the others are too. A finding contrary to their overall attitude is that three believe that water pollution is not a problem on their land and the other producer believes it comes from other sources. However, out of the thirty two producers, only one stated that water pollution was a problem, and four said it was sometimes. Asking about water pollution was interesting in that producers perceived and participated in “*finger pointing*” associated with water quality impairment, even if they were actively trying to mitigate it.

One producer in this group had an interesting information source that probably made a difference. His wife’s job involved soil conservation work for a local university. Three of the four producers had been or were involved with government conservation programs. Interestingly, three of the four producers also said they had not been approached regarding conservation and that they had sought out programs. However, two of these producers experienced bad results when participating in government programs.

This did not deter them in particular, but definitely would have done so to others. Regarding many of their conservation practices the producers were not involved in programs, because they were willing to incur the cost because it is the right thing to do. This is a different attitude than that of the passive adopters using practices without programs. Active adopters were investing significant time and money, for example, not using “junk seed” to sow a waterway. In some cases they had hired out the work on grassed waterway construction and implementation of other practices.

There were noteworthy findings regarding to land tenure with this group and adoption. These producers were more likely to be angry with other producers for not doing conservation. In fact a retiring producer told me, he had talked to his neighbor about using grassed waterways because water was running off the neighbor’s land and causing problems. The neighbor did not take the advice. So when it was time to decide who to rent his land to, the producer didn’t rent it to the neighbor for that reason. Another important concept related to land tenure was this groups’ willingness to pay cash-rent for land in conservation, when this was a limiting factor for other producers. Producers in this group work with landlords to get practices “on the ground” and in some cases helped them pay for them.

Active Adopters- Environmental and Economic

The combined environmental and financial group had many attitudes in common with the purely environmental group, with the addition of being more “profit oriented.” They state that economics matter, and they might be somewhat less committed than the purely environmental group. For instance, a no-till producer said he needed to till the

ground a little this year because of compaction. Two producers said they were conservationists, three “I try” and one who considers himself more of an environmental steward. However, this group seemed to exemplify Rogers’ (2003) “Early Innovators.” They were some of the first to try certain conservation practices in their area. For example, of the six producers using ryegrass cover crops in the ECW, four of these were producers in this group. They were using the cover crops as a potential nitrogen source and secondarily for conservation. However, they were actively trying new practices for the area which is important. This group attended many meetings and used the NRCS and SWCD for conservation information, whereas the environmental group said they used the internet and farm publications. They seem to be more socially involved than the environmental group for this. They also take the time to be in the programs, even though half of them had to seek out the programs themselves. Additionally, one producer had an extensive list regarding the limitations and restrictions associated with the programs. However, he still takes the time to participate and had many recommendations as to how programs should be changed. This quotation is included in the preceding section on institutional factors. These producers also apply for unique programs such as carbon credits. This group, like the environmental, talked about conservation for the next generation. Two were passing their operations on, two were uncertain, and two did not have anyone to take over. They perceived the problems associated with lack of conservation. Only one said soil erosion was not a problem because he had addressed it, the other 5 said it was a problem and three specifically mentioned they were currently addressing it. In this groups’ opinion water pollution was a problem “sometimes” and one producer mentioned there should be a study to show that pollution was coming from his

land. Overall the active adopters appreciate the significance of conservation adoption and are willing to invest their time and resources in it.

Summary and Conclusions

Darnhofer et al. (2005) stated that qualitatively oriented studies of farmers' decision-making can offer additional insights and help interpret the findings of normative surveys. This qualitative analysis accomplished that. In regard to producer and farm characteristics, age, part-time farming, education, farm size and land tenure were found to effect producer's conservation decisions. It is important to note, these characteristics are often used in statistical analysis due to their importance and likely their ease of survey collection. However, the relationships in many cases are more complex than simply who is more likely to adopt (e.g. large versus small operation). Hopefully, this analysis can illustrate some of the issues and encourage future research to collect and analyze these variables in a more meaningful way, in order to provide predictive ability in the future. For example, studies such as Kim et al. (2005), have found education to be positively correlated with greater adoption of BMPs. However, this study illustrates that education is important, but its effect is going to vary depending on factors such as the type of degree earned, and school attended instead of simply how many years of schooling were completed. Conservation promoters can use these socio-demographic variables as guidelines in extension and outreach. However, care needs to be taken as illustrated by the example of the older farmer willing to switch to no-till when he was "past the

recommended age.” One on one contact is still the best way to determine someone’s willingness to adoption conservation practices.

Conservation promoters need to work to increase awareness of the “big picture.” Whereas it makes no difference for some producers it might make an important difference for others. McCann et al. (1997) found that government programs to increase awareness of soil erosion have been effective among the sample of producers they interviewed. To the contrary, this study found that nearly 50% of producers in the ECW watershed do not believe that soil erosion or water pollution are problems on the land they operate. Where it is present, conservation promoters need to address this likely misconception. It can be argued that this research project did not ground truth the data, but intuitively these issues are always somewhat of a problem. Producers’ perceptions of their role in environmental problems are also a limitation. Producers are similar to the scientific community in that they want to prove it to themselves or have it proven to them that something is factual. They do not want to simply take someone’s word for it. Conservation promoters should take the advice given to me by one producer, “*If you become a NRCS person...you gotta look for ways to be creative in how you, how you talk to people and work with them. Yeah, you gotta market it [conservation].*” Gamon et al. (1994) concluded in their study that new delivery methods and educational approaches are vital. I agree with this finding and add to it that conservation promoters need to think of new and creative ways to show concepts such as how soil erosion can be present on flat land, or how agriculture contributes to water pollution. However, instinctively there is line that could be crossed very easily and bring us back to “finger pointing.” Education approaches should consider the sensitive nature of the problem. An interesting approach

would be to use the research plot idea mentioned by the one producer (20 acres with 400 plots). Forte-Gardner et al. (2004) found planning and execution of field research plays a significant and influential role in transferring more complex and high-risk conservation based farm technology. This research also points out that field research could play a role in demonstrating simple conservation concepts and practices also. Is it possible for the SWCD purchase acres and do research plots to trial new conservation practices and demonstrate concepts related to conservation? The local university does some of this, but as it seems to work, this would likely be a good use of additional resources.

Based on the results of this study challenges exist for policy makers regarding perceived limitations. Policy makers also need to be creative and keep improving policies to work with changing farm structures. A major issue for the ECW is what to do with land that will potentially be developed: do we do nothing? What if it is not developed for 15 or 20 years? Another issue is land tenure, how do we address one person owning land and another presumably making decisions regarding management of that land? Conservation promoters need to get out and talk to people whenever possible, 38% of producers in the ECW stated they had not been approached regarding conservation adoption. Additionally, conservation promoters need to work on functionality and simplicity of program participation in order to attract additional producers to the programs.

Categorization based on the "Participation Spectrum Model" (Morris and Potter 1995) offers some interesting observations. The resistant non-adopters are less likely to perceive soil erosion and water pollution to be a problem on their land and they do not necessarily consider themselves to be conservationists or perceive the effectiveness of

conservation practices. These are all significant limitations. Education and outreach as discussed earlier can be used to increase awareness and change perceptions. One on one contact is probably crucial with this group. However, policy changes and increases in payments may be the only way to increase adoption among this group of producers.

Conditional non-adopters may also require much more one on one contact to determine their reasons for non-adoption and to address them. The important issues for the conditional non-adopters in the ECW were information sources, education, government program limitations, and issues with land tenure.

Passive adopters were utilizing conservation practices at little inconvenience and for mainly financial reasons. According to Morris and Potter (1995) the goal is to move people along the participation spectrum to where they appreciate the larger significance of conservation, they become “countryside stewards.” Again education regarding perceptions and the importance of commitment to conservation are essential. It is important to talk to producers even after they have adopted conservation practices to help instill a conservation ethic (Morris and Potter 1995). Intuitively, the more producers talk about conservation with others and get excited about it, the more effort they will put into it. Since this group does not seek government assistance they need to be sought out by conservation promoters.

Finally an interesting finding observed with the category of active adopters was the presence of “Early Adopters” in the watershed. The positive affect that other producers have as information sources was demonstrated in this research project. Active adopters should be utilized if possible to outreach to other producers in watershed through field tours, meetings, and “*general gab sessions.*” Using and possibly

compensating active adopters to identify the other groups of adopters would also seem to be a good use of resources. Certain education and outreach approaches work for certain people so promoters should try to cover all the avenues.

Personal characteristics of producers have a significant effect on conservation adoption. It is critical to educate producers regarding perceptions of environmental problems and their role in them in order to move them towards active adoption. Using other producers as information sources is essential as is the one on one contact from conservation promoters. Now the challenge of future research is to build a new theoretical perspective, possibly incorporating the findings of this research. There is also an opportunity and challenge for policymakers and conservation promoters' to overcome limitations associated with personal characteristics. This is accomplished through new and creative policies, education, outreach, and networking strategies.

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CHAPTER IV

LAND TENURE: HOW DOES IT AFFECT THE ADOPTION DECISION?

Abstract

Numerous studies have examined what factors affect agricultural best management practice or conservation practice adoption decisions. Most of these studies analyze this issue from the perspective of the agricultural producer. However, in the case that a piece of farmland is rented, who actually makes the decisions about what conservation practices should be used on that land? Numerous statistical models of adoption decisions have included land tenure variables; however, these studies usually only analyze whether or not the land in question is owned by the producer and how that affects their decisions. There is a group of studies evaluating specifically the relationship of land tenure and adoption decisions. Again many are analyzing the issue from the point of view of the producer. This research study incorporates both the views of 45 producers in three watersheds in Indiana and eight non-operating landlords in a qualitative analysis of how land tenure affects adoption decisions. Results indicate that a majority of both groups conclude that they are responsible for decisions regarding conservation adoption on the land. However, through further analysis it is determined that decisions vary based on the person and the conservation practice. Producers are generally responsible for decisions regarding practices they will be financially responsible for, for example,

nutrient and pest management practices. Landlords are involved in decisions regarding structural practices such as grassed waterways and filter strips. None of the producers or landlords had lease agreements that stipulated conservation use, however, two producers had gained rental contracts for additional farmland, based on the use of conservation, and one landlord took that into consideration when deciding who would be renting his land. It is determined that targeting education and outreach towards non-operating landlords is crucial. If landlords are aware of the value of conservation, they are more likely to base their rental decision at least in some part on conservation use. With increased competition for rental acreage, this should increase overall conservation use.

Introduction

Decisions regarding land management have a significant effect on water quality. Concern about environmental degradation caused by agriculture, has gained increased attention recently. This is because its associated costs to society (e.g. soil erosion, health hazards and groundwater pollution) have become better known and documented (Traore 1998). To mitigate this impact, more resources and attention have been allocated to locate agricultural best management practices (BMPs) or conservation practices “on the ground.” BMPs are defined as actions to keep soil and other pollutants out of streams and lakes. Agricultural producers are usually the target of outreach and education regarding adoption of conservation practices. However, when the land is rented, is the decision to adopt BMPs made by the producer or not? Furthermore, does the decision maker vary based on the type of conservation practice? Intuitively, issues will arise regarding management decisions on a piece of land, when the land is owned by one person and operated by another.

There is a relatively large literature exploring the factors that affect an agricultural producer’s voluntary adoption of best management practices. Many studies utilize a multiple regression analysis exploring the role of variables like age, education, farm size in models of conservation adoption decisions. Land tenure has been a variable in many statistical studies on conservation adoption. It has been modeled as “% acres owned or rented” (e.g. Belknap and Saupe; Daberkow and McBride 2003, Rahm and Huffman 1984); “ratio of land rented to operated” (e.g. Norris and Batie 1987); and as dummy variables representing owned and rented land (e.g. Bosch et al. 1995; Caswell et al.

2001). These studies display mixed results regarding the effect of land tenure. Producers' ownership of land has been found to negatively influence adoption (e.g. Caswell et al. 2001, Khanna 2001); positively influence adoption (Belknap and Saupe 1988; Kim et al. 2005) or not significantly influence adoption (Bosch et al. 1995; Lynne et al. 1988). In addition, Prokopy et al. (In Press) conducted a vote count analysis of adoption related variables (e.g. age, education, environmental awareness) in 55 United States based research articles pertaining to conservation adoption. They found the role of land tenure to be very mixed and suggested studies with more nuances are needed to further explore the role of this variable.

A number of past research studies have specifically evaluated issues regarding land tenure and adoption decisions. Lee and Stewart (1983) found that full-owner operators and landowners with small holdings have lower minimum tillage adoption rates on cultivated cropland than other groups. Interesting to note, the full-owner operator finding was contrary to other findings. The authors concluded that this was reflective of the way the survey question was designed to collect information for the land tenure variable. (Lee and Stewart 1983). Related to ownership, Esseks and Kraft (1989) stated that operators who farm both owned and rented acres tended to apply more conservation exclusively to their owned land. Soule et al. (2000) distinguished renters according to lease type (cash and share contracts) and separated practices by timing of costs and returns. They found significant differences regarding lease type and adoption of practices with benefits in the short term (conservation tillage) and long term (grassed waterways). Soule et al. (2000) found cash-renters are less likely than owner-operators to use

conservation tillage, but share-renters are not. Also both types of renters are less likely to adopt long-term practices. In another study, Van Vuuren et al. (1995) found a relationship between increasing contract lengths and the probability of performing annual erosion control practices. In studying conservation incentives, Hinman et al. (1983) concluded both the interests of operators and landlords must be considered when designing programs that involve incentives to practice conservation. The above reviewed studies concentrated on how land tenure affects producer decisions; a few additional studies have focused a little more on the non-operating landowner. Skelton et al. (2005) conducted an interesting study looking at adoption of riparian forest buffers by non-farming agricultural landowners and producers. They found the non-farming landowners to be as likely to adopt the buffers as producers. They also noted that in previous studies, “adopters” have been defined as producers without assessing whether non-producers were actually making conservation decisions in the study areas (Skelton et al. 2005). Lichtenberg (2007) stated that the literature to date has not considered the possibility of landlords undertaking direct actions that physically limit the ability of the tenants to overexploit the soil. A landlord can invest in conservation structures or stipulate that tenants use soil conservation practices. Lichtenberg (2007) found with a risk neutral tenant and share-contract, economically first-best levels of output and protection against land degradation can be achieved. These studies illustrate some of the many issues that arise from land tenure relationships and their effect on conservation adoption decisions.

With farm operators leasing 38% of their total farmland in 2002 (Hoppe 2006) it is important to understand how these issues affect conservation adoption decisions.

Parker et al. (2007) state that land tenure is often omitted when trying to understand farmer participation in conservation projects. They conclude “watershed planners who understand land tenure relationships may be more effective in catalyzing local participation” (Parker et al. 2007, pg 815). It is easy to realize that the relationship between land tenure issues and adoption decisions is very complex and not fully understood. Many of the statistical studies have only examined the relationship between owning land and adoption. Of the studies analyzing land tenure issues specifically, only a few studies have included a consideration of non-operating landowners. This research study examines issues associated with conservation adoption decisions from the point of view of both the non-operating landowner and agricultural producer. In doing this I hope to illuminate the complexities associated with the effect of land tenure to provide recommendations for education and outreach, and help future research studies to better incorporate these issues when analyzing conservation adoption.

Methods

To reiterate the objective of this research study was to analyze the ways land tenure affects conservation adoption on farmland. The purpose was to more fully examine this issue, as opposed to an analysis using “ratio of land owned” or “acres rented” and their significance in an adoption decision model. In order to gain better understanding, it was important to analyze the issue from both the perspective of the non-operating landowner (landlord) and the agricultural producer (tenant). Face to face interviews, with in depth qualitative analysis, were the methods chosen for this research study to accomplish the objectives. In addition, an interview is a useful way to quickly

obtain large amounts of data (Marshall and Rossman 1999). The aim of this research was to gather significant amounts of new data and information regarding the effect of land tenure on the adoption of BMPs.

Project Background

This research study is a component of a larger Conservation Effects Assessment Project (CEAP) evaluating watershed scale BMP effectiveness and acceptability in the Eagle Creek Watershed, Indiana. The social component of the CEAP project seeks to build our understanding of the social factors influencing implementation of best management practices. During pre-testing the interview guide in different watersheds in Indiana it became apparent that land tenure was a significant factor in decisions regarding conservation practices. Subsequently, research was conducted and questions added to the final interview guide used for interviews in the Eagle Creek Watershed. This process is further discussed in the following sections on interview questions, procedure, response rate, and data analysis method.

The Interview Questions

A thorough description of research methods and a copy of the interview guide are presented in Appendix A. The complete interview guide was developed based on an extensive review of conservation adoption and social acceptability literature. In order to allow interviewees to explore the topics fully, mostly open-ended questioning was used to collect information. Interview questions for non-operating landowners and agricultural producers were basically the same except for minor work changes. The interview was

structured such that participants were asked personal and land characteristic questions initially, followed by general conservation, environmental awareness, and attitude questions. The next part of the interview dealt with questions regarding land tenure issues, and ended with questions on use of specific conservation practices. For example participants were asked if they had heard of grassed waterways and if they are currently using them, and then for what specific reasons. Additionally both groups were questioned regarding the logistics of conservation adoption, for example who specifically was making the decisions. The conservation practices selected for this study were cover crops, conservation tillage, grassed waterways, filter strips, and nutrient and pest management practices. These were chosen by the local watershed projects as most critical and applicable to the area.

Interview Procedure and Response Rate

Interviews were conducted in three Indiana watersheds. The first round of interviews was completed in summer of 2007 in the South Fork Wildcat Creek-Blinn Ditch & Kilmore Creek-Boyle's Ditch Watersheds (SFWC-BD & KC-BD) and the final round was conducted in winter 2007-2008 in the Eagle Creek Watershed (ECW). Between interview periods, the land tenure questions were added to the guide along with a few minor changes. Addresses were provided by local Soil and Water Conservation Districts (SWCDs) for potential land owners/managers in the watersheds. Advance letters were sent before the land owners/managers were contacted by telephone to arrange the interview times.

For the (SFWC-BD & KC-BD) watershed, 16 interviews were completed out of a 26 person sample for a response rate of 61.5%. There were 5 people on the list that were never reached by telephone, one refusal obtained from the wife of a producer who had just had surgery, two people not interested in getting interviewed and 2 people that were not reached until the last day of calling when it was too close to harvest to conduct an interview. The sample of interviews included 13 agricultural producers, 2 non-operating landowners, and one person with a small livestock operation who 50/50 share-rented their land.

For the Eagle Creek Watershed 37 interviews were completed out of a 59 person sample, for a response rate of 62.7%. There were 9 people that were unreachable by telephone, 1 who had a recent death in the family, two producers whose wives said no for them, and 10 people not interested or with not enough time. The second set of interviews resulted in interviews with 32 agricultural producers and 6 non-operating landowners. One interview is counted both as a producer and a non-operating landowner because the person fit in both categories and was asked both sets of questions.

Research Locations

South Fork Wildcat Creek-Blinn Ditch & Kilmore Creek-Boyle's Ditch Watersheds (Information from their Watershed Management Plan 2008)

The SFWC-BD & KC-BD Watersheds (Figure 4.1) are located within the larger Wildcat Creek Watershed in Clinton County, Indiana. The land use of the watersheds is predominately agricultural. Over 12,649 acres of the total 17,943 combined watershed acreage (71%) is in row crops, primarily corn and soybeans. The north-west portion of

the City of Frankfort and the small community of Kilmore comprise the urban and residential areas of the watersheds. The waterways in the SFWC-BD & KC-BD Watersheds are small streams or drainage ditches. Several stream reaches in the watersheds are listed on the Indiana Department of Environmental Management's 303(d) List of Impaired Waterbodies, and the South Fork of Wildcat Creek is designated as one of three State Scenic Rivers. The topography of the SFWC-BL Watershed varies greatly from that of the KC-BD Watershed. Within the SFWC-BL Watershed, the southern portion is relatively flat, but moving into the middle to northern regions of the watershed rolling hills prevail. The hills primarily follow the South Fork Wildcat Creek. However, along Kilmore Creek the land is less rolling and the entire watershed is more flat.

Eagle Creek Watershed (Information from their Watershed Management Plan 2005)

The Eagle Creek Watershed is located in Central Indiana approximately 10 miles northwest of downtown Indianapolis (Figure 4.1). The watershed is relatively flat and has a 162 square mile drainage area upstream of the Eagle Creek Reservoir dam (located at the very southern tip of the watershed). The Eagle Creek Reservoir, which is used as a public drinking water supply for the City of Indianapolis, is located completely within Marion County, whereas the rest of Eagle Creek Watershed runs through parts of Marion, Hendricks, Boone, and Hamilton counties. In 2000, 52% of the watershed land cover was agriculture (corn and soybeans), 29.9% was herbaceous land cover, 9.3% was forested, and 4.3% was high and low density development. Agriculture and herbaceous land cover has since declined. The greatest percent of agricultural land is located in the northern portions of the watershed whereas the portions closer to Eagle Creek Reservoir

are undergoing significant urbanization. The watershed is located in the Tipton Till Plain Section, which is described as topographically uniform and of very low relief with slope angles of mostly 1-2°, with some 2-6° slopes.

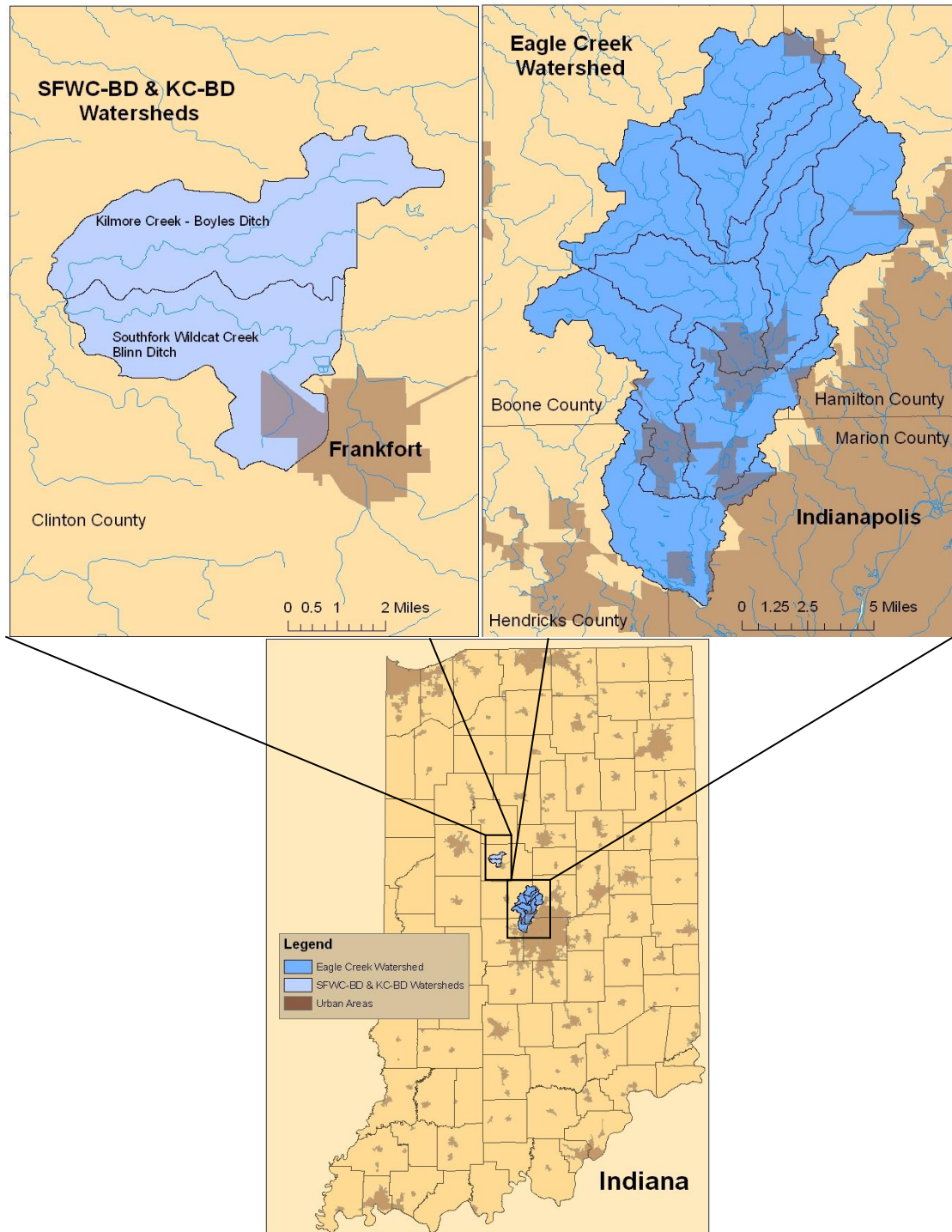


Figure 4.1 Locations of the two study areas in Indiana

Data Analysis Method

The useable data set consisted of 52 transcribed interviews; 900 pages and approximately 304,000 words. One non-operating landowner interviews from ECW was not recorded due to tape recorder malfunctions, however notes were kept on the interviews and incorporated into the overall analysis. Grounded theory method was applied in analyzing the interviews. Grounded theory can be used with “received” theories or variables if the purpose is to open these up and to find new meaning in them (Strauss and Corbin 1990). The researcher attempted to “open up” the variable of land tenure and its effect on conservation adoption. Open coding is the first step in the process of grounded theory and entails breaking down, examining, comparing, conceptualizing, and categorizing data (Strauss and Corbin 1990). The next step is axial coding; a set of procedures whereby the data are put back together in new ways after open coding, and connections can be made between the categories (Strauss and Corbin 1990). Coding was accomplished using QSR NVivo 7, a qualitative research analysis tool (Figure 4.2). The example illustrated in Figure 4.2 shows the results of the coding process. In this case the researcher analyzed all producer statements as to whether or not the landowner was involved in decisions, and then examined the text for common themes, patterns and relationships. Under this category there were statements pertaining to it being the producers’ decision to use conservation practices because the landlords live out of state. These statements could be connected as a theme illustrating the effect of absentee landownership on farmland conservation implementation. Non-operating landowners’ and producers’ comments illustrating the effect of land tenure on conservation adoption were coded and analyzed in the above outlined process.

The screenshot displays the NVivo interface for a project named 'Eagle Creek Interviews.nvp'. The main window shows a 'Tree Nodes' table with the following data:

Name	Sources	References	Created
Landlord is involved	0	0	2/28/2008 12:26 PM
Landlord not involved	4	4	2/28/2008 12:24 PM
Absentee Landlords	7	7	3/27/2008 12:55 PM
Age	4	5	4/7/2008 10:29 AM
Do short term practice not long contr	1	1	2/28/2008 10:22 AM
Farmer is financially responsible	4	4	2/27/2008 3:38 PM
Landlord are involved in other things	1	1	2/27/2008 3:40 PM
Landlord is family member	4	4	3/19/2008 11:06 AM
Landlord skeptical at first	1	2	4/8/2008 11:55 AM
Landlords don't understand or care	8	11	2/27/2008 3:39 PM
Only want money, investment only	6	7	2/27/2008 3:34 PM
Transplant residents	1	1	3/31/2008 3:20 PM
Trust farmer to make decision	0	10	2/28/2008 12:12 PM

Below the table, the 'Absentee Landlords' node is expanded to show two references:

- <Documents\3011> - § 1 reference coded [0.93% Coverage]**
 Reference 1 - 0.93% Coverage
 Here are some questions about the land that you rent. On the land that you rent, do you feel that you are primarily responsible for decisions regarding adoption of conservation practices or do you feel that the landlord
 No I'm totally responsible, because my landlords are mostly elderly, more elderly than I am, and some of them are absentee owners. Anything that is done, is done on my watch, I suppose.
- <Documents\3018> - § 1 reference coded [1.08% Coverage]**
 Reference 1 - 1.08% Coverage
 We'll just start, um, so I guess when you were farming on the land that you rented did you feel that you were primarily responsible for decisions regarding adoption of conservation or is it the landlord's responsible?
 I Um, I always felt I was, you know. In this particular area a lot of the ground is owned by absentee landowners. Ok, they live either out of, out of this general area, they live in a another city, or they live out of state, so you know, it, it's pretty much up to me.

The bottom status bar indicates: 449 Items | Sources: 7 | References: 7

Figure 4.2. A screenshot of NVivo results obtained through coding land tenure themes.

Specific Questions- Land Tenure

Any question in the interview guide had the potential to elicit themes and ideas regarding the affect of land tenure on adoption decisions. However, some specific questions listed below were designed to intentionally address some specific land tenure themes. These questions were developed from issues brought up during the pre-test

interviews and research into past studies on land tenure. Additionally the section of questions on the reasons for use/non-use of specific conservation practices also tended to draw out land tenure themes.

1. On the land, do you feel that you are primarily responsible for decisions regarding adoption of conservation practices or that the landlord/tenant is responsible?
2. Do you think there is a difference in the decision based on the type of conservation practice?
3. Have you ever had any difference of opinion when it comes to conservation practices with any of your landlords/tenants?
4. Do any of your lease agreements stipulate that you use/(Do you stipulate use of) certain conservation practices?
5. Have you acquired any landlords/ (Have you decided to rent to someone) based on use of conservation practices?
6. (Producers Only) In general is there a difference between what conservation practices you have implemented on your owned vs. rented acres?

Results and Discussion

Characteristics of Agricultural Producers in the Watersheds

Thirteen agricultural producers were interviewed in the SFWC-BD & KC-BD Watersheds. They were all Caucasian males, ages 34-72 (mean 50), with every producer

being at least a second generation farmer, some had been operating as many as 5 or 6 generations. Farm experience ranged from 11 to 49 years with 31 being the average. The farms were all row crop operations, mainly corn and soybean. Two additional operations had hogs and one had beef cattle. The size of the operation ranged from 160 to 3500 acres. There were two operations run by sole owner/operators, operating both owned and rented ground. One family farm partnership (e.g. fathers and sons, brothers) that operated only their own acres and one that operated only rented acres. There was also one family corporation operating both owned and rented acres. The remaining eight operations were family farm partnerships operating ground that was owned and rented.

Thirty-two producers were interviewed in the Eagle Creek Watershed. They were all Caucasian males, ages 27-81 (mean 55), again with every producer except one being at least a second generation farmer, with some operating for 5 or 6 generations. Farm experience ranged from 5-50 years and averaged 30 years. The farms were all row crop operations mainly corn and soybeans, also some were raising wheat, hay, or alfalfa. Additionally, two operations had dairy cattle, two with beef cattle, and one with a confined hog operation. Farm operations ranged between 120 and 7000 acres. Fourteen producers owned and operated their own acres along with cash and share-renting additional acreage. One producer was operating only his own acres and five were operating only rented acres. Finally there were two family owned corporations and ten family farm partnerships operating both owned and rented acres.

Characteristics of Non-Operating Landowners in the Watersheds

There were three non-operating landowners interviewed in the SFWC-BD & KC-BD Watersheds. One landowner was a Caucasian male age 59 that had a small livestock operation in addition to the 50 acres he was share-renting for growing row crops. Another producer was a Caucasian male age 51 who had employment off the farm. Farming was in his family, but he did not personally grow up on a farm. He was cash-renting 60 acres for a row crop operation. The last landowner was also a Caucasian male age 43 that owned two farms. One was 80 acres cash-rent with a hog operation and the other was a 35 acre share-rented row crop operation. This landowner grew up in the country but was not from an agricultural background, he had purchased the farms because he is a “*big outdoors man.*”

There were six non-operating landowners interviewed in the ECW. The interview that was not able to be transcribed was a Caucasian male around 50 that lived in Indianapolis, IN. He had purchased 300 acres in the watershed for investment purposes hoping to make money off of the urbanization taking place. Another producer was a 50 year old Caucasian female with 80 acres, 60 of it tillable and being share-rented by her brother. She did grow up on a farm and enjoys owning a lot of land in the country. The next landlord was a Caucasian male and retired agricultural producer that had been farming for his entire life. Five years ago he started share-renting his 420 acres to his grandson for row crop farming. The next landowner was a Caucasian male cash-renting 920 acres to two tenants for the purpose of row crop farming. He came from a farming family and had experience farming himself. A Caucasian male, was the next landlord, he

was cash-renting 111 acres for the purpose of row crop farming. He had 20 years experience in farming the land and got out of the business due to development pressure in the area. The last landowner was a producer who farmed in 2007, but was retiring at the time he was interviewed. He had already chosen the new producer that would cash-rent his 300 acres for row crop farming.

Land Tenure Questions

Answers to the six questions meant to elicit land tenure themes are summarized in Table 4.1. The summaries reflect only the non-operating landowners and producers in the ECW as the questions were added after the pre-test. In the SFWC-BD & KC-BD Watersheds the question that initially drew out themes was: “How much control over land management decisions do you have on your rented land, for example whether or not to install BMPs on the land?” Every theme brought out by the SFWC-BD & KC-BD Watersheds interviews is included in the detailed descriptions of land tenure issues below. The summaries to the land tenure questions (Table 4.1) by themselves offer some interesting results. The majority of producers believe that decisions regarding conservation adoption are theirs to make. Most of the remaining producers said they would discuss conservation issues with their landlords and only one mentioned initially that the decision is ultimately up to the landlord. Two of the landlords agreed that it was the producers’ decision and the other three landlords felt it was their decision. Not a single producer or landlord had a lease agreement that stipulated the use of conservation practices. Only two producers had acquired land to rent based on their use of conservation practices and only one landlord took that into consideration when deciding

to whom to rent their land. The following sections detail further the themes that were highlighted regarding the complexities of land tenure and its relationship to conservation adoption decisions.

Table 4.1 Questions meant to elicit land tenure themes and summarized answers from agricultural producers and non-operating landowners.

Question	Producer Response	Landlord Response
On the land, do you feel that you are primarily responsible for decisions regarding adoption of conservation practices or that the landlord/tenant is responsible?	20- "I am" 6- "I initiate discussion" 3- "Both of us" 2- "Varies by landlord" 1- "Ultimately up to landlord"	3- "I am" 2- "Tenant"
Do you think there is a difference in the decision based on the type of conservation practice?	16- "No" 8- "Yes" 7- "Discuss based on type" 1- "Somewhat"	3- "Yes" 2- "No"
Have you ever had any difference of opinion when it comes to conservation practices with any of your landlords/tenants?	30- "No" 2- "Yes"	3- "No" 1- "Slight" 1- "Not Applicable"
Do any of your lease agreements stipulate that you use/(Do you stipulate use of) certain conservation practices?	32- "No"	5- "No"
Have you acquired any landlords/ (Have you decided to rent to someone) based on use of conservation practices?	24- "No" 3- "Don't know" 3- "Possibly" 2- "Yes"	4- "No" 1- "Yes"
In general is there a difference between what conservation practices you have implemented on your owned vs. rented acres?	22- "No" 5- "Yes" 5- "Not Applicable"	Not Applicable

Whose Decision Is It? – The Producers' Point of View

Determining who makes conservation decisions is probably the most complicated aspect of how land tenure plays a part in getting conservation practices implemented. There are already many factors that contribute to a conservation decision. The fact that on rented land two different parties are ultimately making decisions adds even more complexity and brings up many issues. From the perspective of 63% of ECW producers, they are the one responsible for conservation decisions. They state many reasons for believing this, as one producer pointed out, *“I pay the rent, they don't really care. I had one landowner that said why aren't you plowing? I go, well I don't do that anymore because I'm conserving your soil. He goes, “Oh”. He is an absentee owner. He's got another business.”* This remark illustrates several of the more commonly stated reasons producers mentioned: they are paying for the land, landlords don't care, are absent, or are involved in other businesses. The idea that the land was just an investment for the landlord was mentioned sometimes also, one producer remarked, *“No, I wouldn't talk to the landlord, they don't care, they want the money...It's an investment for him. He'll sell that land someday.”* In the ECW, 60% of the producers stating it was their decision, attributed it to the landlord not caring, understanding, or *“just wanting the rent check.”* Landlords being uneducated regarding conservation was another reason producers felt they were responsible, for instance one simply said, *“No,[the landlord is] not as informed, he wouldn't be as informed.”* Additionally producers mentioned that the landlords left the decisions up to them owing to the landlords' age, a producer explained, *“Most all landlords in this area are all in the 75 to 90 year old range okay, so they're leaving this world so they are not looking at decisions for the next forty years, they're*

looking just at how am I gonna live for the next ten years its, its I want some income... that's what they're looking at." There were a couple of cases where a producer was cash or share-renting ground from a family member, in these cases the producers usually felt they made decisions, illustrated by this remark, *"My two primary landlords are my two sisters...so I'm the farmer and they're not. So, [they're] depending on my experience."* Finally many producers just simply stated that the landlord *"trusts me with the decision,"* or *"leaves the decision up to me."*

In the ECW, nine of the thirty-two producers (31%) said that they would discuss conservation decisions with the landlords. Of those, 67% felt they would be the ones to initiate the conservation discussion mostly because they are more experienced, one producer explained, *"Well, when we put in these waterways, I was the one that asked my landlords. In each case it took quite a bit of explanation and quite a bit of consideration before they decided to do it."* Another producer said, *"We're more responsible than the landlords. They have to always sign everything, but I always feel like we have to, we will push it. The landlords don't ever come to us with an idea of doing this or whatever."* The other three producers in this group felt initially that it was both of their decisions, for instance one producer answered, *"I'd say joint, and we discuss what we're going to do. Like if there needs to be any place left...a place we're having a wash or something we'll leave a place. Not till it."*

Only two producers specifically mentioned that it varied based on the landlord, however, other producers made statements to that effect also. One producer summarized the variation in landlords, *"Each [landlord] is very different, each one has very different goals. Each one has very different opinions. You can't treat them as a group. They're*

each individuals. Each one wants to be, wants certain things and you have, you might not instantly be aware of what things they want. You have to try to figure that out to make sure that you give it to them. Even without them asking for it sometimes. Some of them are a lot easier to deal with than others. It's just a lot of variability." The interests of the landlord were a contributing factor in some cases, such as this one, *"One of my landlords is a Pheasants Forever type of person, so we put a extra wide filter strip and grassed waterway for him."* To go along with the concept of decisions varying based on landlord is the issue of land getting passed through generations, one producer explained, *"I had one farm I farmed on shares that when the original owner, older gentleman, owned it before he died. I worked pretty close with him on what we wanted to do and he installed quite a bit of tile and sediment basins and paid for those. Then it was up to me to make sure everything was maintained right, but then when he passed away his daughters inherited it and they pretty much just wanted to see what the farm could make."* With 63% of the producers in ECW watershed having 5 or more landlords, it is easy to see how things could get complicated with variations in landlords.

Additionally there was one producer who initially said, *"Ultimately, it's their [the landlords'] decision, but if it is something that needs to be done I'll approach them...or they come to me with something like that, I got no problem with that."* This producer initially recognized that it was ultimately the landlords' decision, although other producers displayed this sentiment when discussing specific conservation practice adoption. Sometimes this was contrary to them initially saying it was their decision. An example of a producer alluding to it ultimately being the landlords' decision was when he stated why he had not adopted filter strips, *"Landlord acceptability. I mean wondering*

why we are taking land out for protection, I farm[ed] this for the last 40 years, why do we need to take it out, that type of thing.” Many producers said landlord acceptability was the reason they were unable to do a particular practice on the ground. This also works in the opposite direction where the landlord is the one doing the conservation, illustrated by this producer, *“I’ve got a couple of [landlords] who have put in some CRP ground, you know taking ground I’ve been renting out of production. So I personally don’t have anything in CRP, but they’ve done it themselves.”* Even though the decision is ultimately up to the landlord in some cases, the producer can stand in the way, like in this situation, *“They [landlords] get stuff in the mail from the USDA and they call us asking, “What’s this all about? Maybe we could look at doing this and maybe we’d get a little extra income off of it.” I say, “Well that’s fine, but you’re going to have to take that income to pay me for the expense we’ve incurred.”*” This producer goes on to say the landlord would need to reimburse him for the acres he applied fertilizer on in the fall because he was not going to get any benefit from them. In many cases this would probably keep the landlord from investigating the program further.

A final issue that complicates who is responsible for conservation decision making is the complexities and limitations of government programs and payments. One producer talked about how the structure of program payments has changed, *“Some of those 10, 15 year contracts, we’re getting pretty close on some of them. And when we started out, we could take the payment on it, and then it came to a point where it had to go to a landlord and so it’s kinda fluxed on who gets the payment. But, for the most part it hasn’t been an issue if we wanted to put a buffer strip in one way or another, whether the landlord took the payment, we took it off our rent, or whether we got payment and*

paid him rent. We [have] been able to make it work. So, we've got stuff [conservation] on rent[ed] land." For this producer-landlord relationship they have been able to make it work, however, for others the payment-cash-rent issue is the thing stopping them from adopting conservation practices. When producers mentioned landlords did not want to do certain practices many times it was because the producer felt the landlord would not want to be in the government program. Urbanization in the ECW presented another issue for producers persuading landlords to use conservation programs, a producer explained, *"We actually had [District Conservationist] come out and do all the work and tell them [landlord] what it costs for cost-sharing and all that. The problem is putting it into that for ten years, they have the problem with developers coming along and buying the land. They wouldn't be able to buy the land so around here most of the landlords are reluctant."*

Whose Decision Is It? – The Landlords' Point of View

Two of the five landlords in ECW and two of three in the SFWC-BD & KC_BD Watersheds agreed with the majority of producers and felt producers were responsible for decisions regarding conservation implementation, one said, *"I don't get that involved with it. They live right up there and they farm 4000 acres, so I don't worry too much about their decisions."* Interestingly, the two producers in ECW that were in this group were landlords that were formerly producers, and the one landlord from SFWC-BD & KC-BD Watersheds was the person involved in the small livestock operation. This landlord gave another reason it was the producers' decision, *"But, you know, it's his bank account that's bankrolling the farming operation so I can't exactly tell him what to do."*

The one landlord talked about how he let the tenant do less conservation than he used to do, *“In my 19 years I did a combination on no till and ridge till, on about twelve or thirteen years of it. Uh, totally wiped out any real serious soil erosion situations...one tenant came back in and did no till soybeans and was doing conventional corn.”* He was what the producers described as a landlord that “trusted” the producer to make the decision. Additionally, one landlord in the SFWC-BD & KC-BD Watersheds answered that he usually was not responsible for conservation decisions, but talked about the exception of trying to implement a grassed waterway, *“We had to fight tooth and nail with the person [producer] – we used to do a 50/50 with the guy; and I wanted grass waterways to put there...We’ve got aerial photos where it looks like a river came through here. Anyways, it took me 4 years before I could finally get one done. He was even on the board, the Soil and Water Conservation Board...The first year, he went to put it out he put out old seed... it didn’t work. The next year, I give him 100 pounds of some real good, acceptable seed...He used only 40 pounds. Then, we barely got it established and then AgMax sprayed it all and killed it all, then took it all out. So finally, I caught him in early spring when he had his disk; had him rip it all up. Then, I just went out with every bit of grass seed I had on the farm and bag seeded it. That’s what it took to finally get them.”*

Three landlords in the ECW stated it was their decision as to what conservation practices should be used on their ground. Two were former producers and the other one was the woman landlord interviewed for the study. These landlords overall displayed the sentiment that I own the land so I am responsible. One landlord discussed how she had done conservation on her own and what the tenant thought about it, *“I’m sure when we*

took all the field edges and planted trees and shrubs around them, they [tenant] thought "why are they doing that", but they never said anything about it." Although these landlords said it was their decision, it usually came out later that it was more a combination of them and the producer making the decisions.

Just as the producers mentioned, the decisions for this group of landlords varied person to person, just as they do producer to producer. Important to note was the one woman landlord, one former producer landlord in ECW, and one landlord in SFWC-BD & KC-BD Watersheds, that were actively doing their own conservation on the land. One had started because, *"Probably just for soil conservation and then also because it was just more of an area for wildlife to inhabit, primarily birds."* The landlord in SFWC-BD & KC-BD Watersheds had 30 acres enrolled in CRP and talked about his reasons for doing so, *"Since we like to hunt and fish and those kinds of things, to improve what we like to do with the land, CRP is great; that's awesome. Like if it's a bottom-field that floods every 30 years, I mean, you get zero out of it anyway. There's no need to farm it if you're only going to get 2/3 of a crop."* Finally, the former producer from the ECW had done a lot of conservation on his own acreage and was retiring this year and had just become a landlord.

To summarize it is concluded that from both points of view for the producer and the landlord the decision to adopt conservation practices ultimately lies with both of them and the interplay between the wants and needs of each.

Does the Type of Conservation Practice Matter?

Although 50% of both producers and landlords in the ECW stated that the type of conservation practice does not matter, it was discovered through further questioning into decisions regarding each specific conservation practice that it really does matter. In general there was the idea of short versus long term practices and how that affected the decision, one producer explained, *“On the rented land... only short term conservation practices. You know, I wouldn't do something... only annual practices for conservation, not anything longer than that, nothing permanent; I might, however, suggest on fields that are subject to erosion, that are threatened by some need for conservation, we'll just address what is a threatened area. I'll suggest that and put the land owner in contact with Soil and Water or the NRCS. I've got one farm... the guy put about a quarter of it into trees and permanent grass, wildlife habitat, and that type of thing.”* Nutrient and pest management decisions in particular are left up to the producers in most cases. The landlords varied from knowing nothing at all about what was being done on the land as far as nutrient and pest management to them knowing quite a bit but still not taking part in the decisions. Decisions regarding conservation tillage were also generally the producers to make, however, landlords in some cases liked to promote adoption of a particular practice, for instance this comment, *“I've told him [tenant], I said well, I'm in favor of no till and as a matter of fact his dad and his uncle that's all they do. But for some reason he's not yet so I don't know...But I've been trying to encourage him to give it a try anyway.”* The landlords who were not producers didn't really know anything about cover crops or the reasons for using them. Some of the former producer landlords were aware, but it would be the current producer paying the bill so they did not take part

in the decision. In one case the landlord was letting his tenant try an annual ryegrass cover crop and had this to say about it, *“On two of my fields this year, they’ve tried rye and I think it’s probably a waste of money...I wouldn’t do it, but it’s ok to me if they do it.”* Filter strips and grassed waterways were practices that the landlord was more involved with the decision due to the fact they require structural changes, possibly changes in cash-rent acreage, and program enrollment requiring multi-year commitments. As illustrated earlier in the section on whose decision it is, having the landlord more involved with the decision can yield both a positive and negative effect for getting conservation on the ground.

Differences of Opinion

There were only a few instances in which producers and landlords had a stated difference of opinion when it came to conservation practices. One producer mentioned, *“Oh yeah, in fact I had one landlord who bought the farm and I was farming the farm and he bought the land and he bought it all like a four year contract and if it wasn’t for that four year contract I probably wouldn’t farm for that farmer today because he did not like no-till whatsoever. That four year period of time gave me a chance to prove myself that it would do as well. He has admittedly wished it had failed and it just never happened and so he is a no-till landlord now, he believes in it, but he would not have if he hadn’t been forced into it.”* A landlord who was a former producer represented the other side of the spectrum when answering if he had ever had a difference of opinion with a tenant, he said, *“A slight amount...I just think I did more conservation than they did...But, they’re the ones with the bill so I can only say so much.”* Although not many

producers or landlords answered this question with a “yes” and an example, there were instances from each stating the other person as the reason they were not able to use a conservation practice. For example this producer wanted to adopt a filter strip, *“I talked to him [landlord] about it, and he was not in favor of it, so I didn’t push it.”* It seemed in some cases that the desire on the part of the person wanting to adopt a practice was not enough to constitute a “difference of opinion” in discussing implementing it. For whatever reason people tended to back down in a lot of cases.

Lease Agreements Stipulating Conservation Use

There were no instances of a producer or landlord having a lease agreement that stipulated the use of any certain conservation practices. There were two landlords who preferred certain tillage practices, one was mentioned earlier, another remarked regarding this question, *“I don’t require them to, I mean I don’t say you have to do this or you have to do that, but I prefer it to be no tilled, you know, the tillage kept to a minimum and I want to keep the tile up [interviewer asks about grassed waterways landlord had put in] ...Ya, they keep those up. Actually, actually I maintain them, but you know I always tell them don’t spray them, you can plant through them but don’t spray, you need to keep them.”* There were also some producers who talked about their landlords wanting certain tillage practices, for example an answer to this question was, *“I’ve got a couple of that don’t want heavy tillage.”* Another interesting aspect was one conservation-minded producer who talked about the future of his land and what would happen when his son possibly took it over, *“And if he ever farms if he did or rented out the ground, he would probably insist upon the farmer having, you know, some type of conservation farming.”*

The possibility of requiring conservation use is there, but as of right now is definitely not the norm.

Gaining Rental Contracts

Two producers said they had gained rental contracts for additional farmland based on their use of conservation practices, one answered, “*We've actually been able to rent some farms because people have seen that we believe in waterways and reduced/minimum tillage. So, that has helped us some.*” There is a significant amount of competition for ground in the ECW, one producer described the situation this way, “*I'd like to grow a little bit, but it's so competitive around here. And cash-rent, you know with \$4 corn, our interest went sky high and consequently cash-rents went up, and you know, if somebody will give another person more money for their land they'll take it and give it to somebody else.*” However another producer described how he had won the bid for cash-rent land over producers who had outbid him, “*I've got a couple of friends that no-till and we rented a farm and we stipulated in a written letter, it was a bidding, cash-rent bid deal, and we stipulated that we would be taking care of the ground and doing it through no-till and how we were doing it and we rented the ground for less money than what was the high bid. They came back and asked for a little more than what we offered but they also took a lot less than what they had been offered just because we were going to be no-tilling. I think that it's becoming more of a benefit.*” The retiring producer turned recent landlord said he took conservation adoption into consideration when deciding who to rent his land to, he told this story, “*I get all the surface water from the farms above me and if they don't fill a waterway or do something to slow the water down*

or put in a practice that won't, you know, to conserve it. I get all that water and by the time it gets on me it's like a river...As a matter of fact that's why he [my neighbor] didn't rent this farm when I retired, cause he wanted to rent it really bad and I said I'm not going to rent it to you cause, you've never did a thing to help us, never sowed a waterway, which we've asked you numerous times to do and I said I'm not going to rent it to you."

A couple of additional producers were unsure if they had acquired land based on their use of conservation, they would say it's possible because they take care of the ground, for example one producer mentioned, *"I don't know that anybody's said that specifically. You get comments sometimes about whether you're responsible and whether they do things right or not. But I don't know that anybody's ever said."* Interesting to note, one of the main reasons producers were acquiring land in their opinion was based on having a personal connection with the landlord, for example, *"We got a neighbor up here that retired. He and grandpa had been buddies forever. He milked cows and he just let us farm his place on shares with him."* The reasons that came up when the landlords were asked what they took into consideration when deciding who to rent their ground to were: it was a family member, highest bid, knew the family, producer is compatible with goals, and the producer was a *"straight shooter."* It was interesting that there were not more instances of conservation use playing a role in land acquisition.

Producer Conservation Decisions on Owned vs. Rented Acreage

Of the producers in the ECW with both owned and rented acreage, 81% said there was not a difference between what conservation they practiced on their own acres versus

the acres they were renting. The sentiment expressed by a lot of the landlords was they were going to treat rented ground like it was theirs, one producer talked about how doing conservation on rented acreage benefits everyone, *“I feel like it helps me as much as and hopefully it helps them, it will help their land, it will help their value of the land.”*

However, as with the other questions it was determined later that there is a difference in adoption on owned versus rented acreage in a number of cases. An important aspect that keeps producers from implementing certain practices on their rented acreage is cost, illustrated by this producer’s reasons for not grid sampling his rented ground, *“It costs me so much, 6 or 8 dollars an acre, and I’ve got to do that at least twice to attain results, and I just haven’t. I could make an agreement with the landlord, if they wanted to change renters, if they want to reimburse me pro-rated. I just haven’t done that.”* Conservation programs that financially benefited the landlord posed problems for some producers, one mentioned, *“Filter strips are basically set up for the landlords, to collect from those and the tenants gonna be maintaining it...and it’s just going to take away from my income and cost me on top of that.”* The uncertainty of how long a producer will be farming a rented piece of ground was another issue, one producer explained, *“So there would be a little difference between the rented land and the land that I own. Because, you know, our ground is a long term, where the landlords might be temporarily, I don’t know. I’d say there would be just based on cost.”* Finally there was also the idea that the producer wanted to try the practice out on his own acreage before trying it on rented acreage, one producer said this was the way he had to no-till, *“I did [no-tilled] my own before we did the landlord and I told them I said look we’re going in to this, we’ve had good luck with it.”* It is intuitive that it will be easier for producers to implement practices on their own acreage because as illustrated by preceding sections, having one person make the decision is simpler.

Supplementary Case Study

An additional interview was conducted in a southern Indiana watershed. This interview was with a very active landlord and is summarized here as a possibility for the future or a best case scenario. The landlord had formerly been a producer and describes himself as a “*very conservation minded*” person. He was the first in his area to implement filter strips and wildlife habitat areas. His brother and he are receiving the most money of anyone in their county for conservation projects. Neighbors would see what he was doing and ask his advice; he often sent them to the local SWCD to get signed up for programs also. Even while he was a producer he was cash-renting some land out, because of the amount he owned, but after he retired he needed to find more renters, he said “*Anyway I went out and looked for a tenant that was very, that no tilled, that I sort of had a lot of respect for.*” After finding a tenant, he told the story of how it took them 14 tries to get one farm into CRP, he commented, “*See that’s how dedicated we are.*” When the now landlord learned of the Conservation Security Program (CSP), he went to several meetings about it even though he recognized it was designed for operators. After he had learned more, he went around to his landlords and told them it was something they needed to look into and some of producers did get involved. Finally this landlord explained how he was different from a lot of landlords in the area, “*I don’t know what percentage of the property here in the state of Indiana is owned by absentee farmers or absentee landlords but you got a tenant out here and he wants to farm so he’ll get just as close to that creek as he can because that’s maybe one or two more ears of corn... You see I’m an unusual situation because I sort of dictate a little bit. That’s not very common. My former wife she didn’t dictate to them what they can do or not. No she trusted them to*

do their thing. And they want to plow and plant and harvest. They don't want this thing over here that's got grass growing on it that helps the wildlife and keeps the sediment and the nasties out of the creek, pesticides."

The landlord recently got involved in the local watershed project because he thought, "*Hey maybe I could influence some of their decisions, what directions that they go, it's a good cause, and I've probably could help them along with some of the things.*" This landlord illustrates how landlords have the option of being more involved in the decisions on their land. They can work with the producers to get conservation practices implemented.

Summary and Conclusions

This study sought to better understand some of the issues regarding land tenure relationships and their affect on conservation adoption decisions. Both the non-operating landowner and agricultural producers' points of view were considered in this analysis which revealed the complexity of decisions on a piece of rented farmland. In general, producers believe they are responsible for conservation decisions because of absentee ownership, landlord age, renting from a family member, landlords "*do not care*", or landlords are uneducated regarding conservation. Some producers felt they would discuss conservation decisions with the landlords but that they would have to initiate the discussion. Some landlords agreed with the producers that it was the producer's decision because they were "*bankrolling the operation*" and have the experience; however, a majority of landlords interviewed in ECW felt it was their decision due to the fact that

they owned the land. Although only one producer stated initially that the decision was ultimately up to the landlord it was shown through further questioning on reasons for use of specific practices, that producers thought landlords were the reason they were not using a practice and vice versa. A conclusion in line with Soule et al. (2000) was that the decision is greatly influenced by the type of conservation practice. Landlords were involved in structural practice decisions and somewhat with tillage decisions. Cover crops, nutrient and pest management decisions were all left up to the producer. There were few cases of parties having a difference of opinion when it came to conservation. However, in some situations, both parties cited the other as the reason they were not doing certain conservation practices. In these cases the person who wanted conservation “did not push it,” probably resulting in conversations that did not warrant a “yes” answer to the difference of opinion question. Lichtenberg (2007) concluded the literature to date has not considered landlords directly stipulating use of conservation practices. However, this could be due to the fact that it is not at all common practice. This study found no instances of either a producer or landlord having a lease agreement that stipulated use of a certain conservation practice. However, there were a few instances where conservation played a role in a producer obtaining rental contracts or a landlord taking that into consideration when deciding to whom to rent their land. Consistent with Esseks and Kraft (1989), producers in this study applied more conservation practices to their owned acreage as opposed to rented acreage. Reasons for a difference were cost of conservation and not knowing how long they will be farming a piece of land. However, an interesting finding was that 81% of producers answered that they practice conservation equally on their land. It was only upon further questioning that it was determined they do not.

Results from this study indicate that land tenure relationships are important in conservation adoption decisions. As long ago as Hinman et al. (1983) it was concluded that both the interests of operators and landlords must be considered when designing programs that involve incentives to practice conservation. Policy makers must continue to address this issue as it is a perceived limitation in getting conservation on the ground. Conservation promoters are unable to influence contract lengths to make producers feel more secure in doing conservation on rented acreage. However, as Esseks and Kraft (1989) point out we should be promoting the use of rental arrangements that provide for owner and tenant sharing both the costs and benefits of conservation practices. How does the producer who is maintaining the filter strip and not receiving the payments get compensated for his lost income and time?

The main finding from this research was that targeting and education of landlords is a key area for conservation promoters to work on in the future. It should be mentioned that there is an effort underway to target absentee landowners. More information can be found at www.absenteelandowners.org. The issue of landlords not caring or knowing about conservation is an important limitation in getting more conservation practices implemented. If landlords understand conservation better and the reasons behind it they would possibly be more likely to take that into consideration in deciding who is going to rent their land. This might be the only way landlords can influence the decision for practices like cover crops, nutrient and pest management practices since the producer is paying the bill (in cash-rent cases). It may never come to pass when conservation is required by a landlord. But with heightened competition for rental acreage if landlords

are renting based on use of conservation practices, conservation use is bound to increase. There is a good chance that landlords who live out in the county simply because they enjoy being there, are great targets for implementing more conservation. However, if they did not come from an agricultural background they most likely do not know too much about conservation. As this landlord said he did not, *“When we bought the farm, highly erodible meant zero to me.”* This landlord was uneducated in this regard, but has since learned more and enrolled 30 acres in CRP. Another interesting aspect for this case was how he learned about the program, *“There was a guy at the ASCS office at the time that I met through Ducks Unlimited. He was very good, he said ‘hey, if you’ve got any ground, there are programs out there’. He was instrumental in introducing us to timber stand improvement. He said ‘These programs exist and people don’t know to ask’ and he said ‘this is the kind of things that we do.’ And we did timber stand improvement on both farms; he was excellent at showing us what was available.”* This example illustrates the importance of new opportunities for outreach and education. Conservation promoters should plan to attend to the meetings of groups like Ducks Unlimited to speak about conservation practices to landlords that are in attendance. Landlord education is especially important when the producer is not conservation minded. If the landlord is leaving the decisions up to the producer, then the landlord might not ever learn of conservation opportunities and their importance. Education can take the form of environmental benefits of conservation, however, it should focus on on-farm benefits, how conservation helps the landlord or producer in particular. By targeting both producers and landlords chances are increased for conservation adoption.

This study sought to understand some of the issues regarding land tenure and conservation adoption and their significance. Future research should incorporate the issues of the non-operating landowners and producers and study a larger sample size. Answers to questions meant to elicit land tenure details were sometimes contrary to what was found when asking about adoption of specific conservation practices. It was also observed that land tenure issues are complex and the analysis of “acres owned” does not address the complexity of this variable. It is important to note the results of this study in designing questions and choosing levels of measurement for variables collected through survey procedures and subsequently analyzed statistically. Hopefully this study can be used as a starting point to build a new theoretical perspective regarding land tenure and adoption decisions that will in the future have predictive ability.

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CHAPTER V

CONCLUSIONS

The previous chapters outline the complexity of conservation adoption decision making. The success of getting conservation practices “on the ground,” will depend on the involvement and interaction of policymakers, conservation promoters, researchers, agricultural producers, and non-operating landowners. The results of this study show that characteristics of the conservation practice and characteristics of the decision maker are important in affecting conservation adoption. Additionally, determining who actually makes decisions on rented acreage adds another level of complexity to the process. By incorporating the results of this research study, recommendations can be made for targeting education, policy, and outreach, and future research methods and directions.

What Affects the BMP Adoption Decision?

Characteristics of conservation practices play a significant role in their adoption. Chapter II illustrated the importance of the relative advantage, compatibility and observability of a given conservation practice. Conservation promoters should focus on raising awareness of the benefits, necessity, and ways to increase compatibility of conservation practices. Producers are concerned mainly with on-farm economic costs and

benefits of practices. In many cases these are the deciding factor in conservation practice adoption, and therefore should be the focus of conservation promotion efforts. Perceived necessity was also important in conservation decisions. This limitation needs to be addressed through one-on-one contact with producers to determine their needs and address any gaps in knowledge regarding conservation. Visually demonstrating that practices are necessary and effective at preventing pollution and providing on-farm benefits are important aspects of outreach and education in this area. The use of new and creative education and outreach efforts is important in reaching as many people as possible, and appealing to different wants and needs. Finally researchers need to keep discovering new practices and refining old ones in order for them to be more compatible with the goals and needs of producers.

In the words of one producer, *“Each is very different, each one has very different goals. Each one has very different opinions. You can’t treat them as a group. They’re each individuals. Each one wants certain things...you might not instantly be aware of what things they want. You have to try to figure that out to make sure that you give it to them. Even without them asking for it sometimes. Some of them are a lot easier to deal with than others. It’s just a lot of variability.”* This producer was speaking of his landlords, however, this comment applies to potential conservation adopters in general.

Chapter III illustrated the significance of characteristics of agricultural producers in conservation decision making. In an ideal world the resources would be available to easily contact all potential adopters one on one to determine their goals, opinions, and wants. However, that is usually not the case. This research study grouped producers into five categories based on their motivations for adoption and the personal characteristics

that affected their adoption decisions. The results indicate that making generalizations based on characteristics such as age can lead to problems. Instead policymakers and promoters should be targeting categories of producers with the hope that they share information within their groups. For resistant non-adopters specifically, but all producers to some degree, this research study found it was important for conservation promoters to address producers' perceptions of soil erosion and water pollution. If they do not perceive they have a problem then they are not likely to try to address it. Conditional non-adopters would participate in conservation programs with a change in some circumstance, for instance, information sources, education, or program payment increases. Although there are limited resources for high levels of one on one contact, directing those resources at conditional non-adopters would probably be a good use of time and money. The purpose is to determine what circumstances need to be changed in order for them to decide to use a practice. Passive adopters were utilizing practices with small inconvenience and mainly for financial reasons. They should be targeted for future conservation use, keeping in mind that practices and programs need to present as little inconvenience as possible. It is important to recruit active adopters to demonstrate conservation practices and to provide advice to potential adopters. Social data and personal characteristics should be used as guidelines to target education and outreach strategies, followed by as much one-on-one contact as possible to increase adoption.

Chapter IV analyzes in-depth the issues surrounding land tenure and its effect on conservation adoption decisions. Results show producers are mostly responsible for decisions regarding conservation practices they will be paying for, such as, conservation tillage, cover crops, and nutrient and pest management practices. Non-operating landlords

are more likely to be involved in decisions concerning grassed waterway and filter strip adoption. Landlords were mentioned as barriers to adoption on the part of the producer regarding these practices. It is important to consider the interests of both of these groups. Chapter IV also illustrates the importance of improved education and outreach aimed at non-operating landlords. The issue of landlords not caring or knowing about conservation is an area that conservation promoters have the ability to influence. If landlords better understand the reasons behind conservation they may be more likely to consider this when deciding to whom to rent their land. This is a significant way landlords can become more a part of the decision making process and strongly influence the conservation practices used on their land. With increased competition for rental acreage, landlords' preference for certain conservation practices should definitely increase overall conservation use. Again, conservation promoters need creative education and outreach strategies to reach all potential conservation adopters. Targeting groups such as Ducks Unlimited is one avenue for outreach expansion. Intuitively, targeting both producers and non-operating landlords increases the chances for conservation adoption.

It was highlighted in all three chapters how certain limitations of government programs were a barrier to conservation practice adoption. Overall, government programs are found to be intimidating, slow, disorganized, cumbersome, and complex. At this juncture, people participate in programs on a voluntary basis. Therefore, policymakers need to address the nature of government programs and strive to make them as compatible as possible with the needs of potential conservation adopters. Both conservation promoters and policymakers need to work on simplifying the enrollment and implementation process for conservation programs. We need to find new approaches

to conservation, one producer recommended, “*You gotta look for ways to be creative in how you talk to people and work with them. You gotta market it [conservation].*”

Policymakers also need to address limitations associated with contract lengths and urbanizing watersheds. Additionally, the issue of land tenure and conservation program enrollment should be addressed. For example, conflicts currently arise when non-operating landlords receive payment for a certain practice, but the producer has to take the time to maintain that practice. Conservation programs need to have more built in flexibility, as flexibility is ultimately reduced when people enroll their land into programs. Finally it may seem that producers are inundated with conservation information, however, it was found some are still unaware of available programs, especially for nutrient and pest management practices. Conservation promoters need to address this limitation. Most important is to work with people to make the process as easy and beneficial to them as possible.

Future Research

It has been shown throughout this research study that conservation adoption decisions are still not fully understood. This thesis attempted to provide increased understanding through in-depth analysis of reasons participants were using or not using conservation practices. Future research should incorporate the findings of this research into larger scale studies. This would accomplish as Napier (2001) suggested to try to build a new theoretical perspective that may have predictive ability in the future. Future statistical studies in particular should incorporate the results obtained from analysis of commonly used variables (e.g. age, education, perceptions, and land tenure). By

understanding more fully how these variables influence adoption, better questions can be constructed and levels of measurement considered in developing surveys to further analyze adoption decisions. It may be possible through more inclusive questions to be able to explain more of the variance in adoption decisions.

Overall this research effort sought to understand conservation adoption by questioning people who make the decisions regarding adoption. Both characteristics of the conservation practice and characteristics of the decision makers, including who actually makes decisions on rented ground, influence adoption decisions. In general results of this study illustrate the importance of considering individual circumstances and perceptions when working with potential conservation adopters.

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APPENDICIES

Appendix A

Complete Methods and Interview Guide

This appendix contains the complete description of the methods followed for the initial interviews in the South Fork Wildcat Creek-Blinn Ditch & Kilmore Creek-Boyle's Ditch Watersheds and final round of interviews in the Eagle Creek Watershed. Following the methods description is a copy of the interview guide with the complete set of questions that were asked of each agricultural producer. The interview guide used for the non-operating landowners had almost identical questions with only a few wording differences. Therefore it was not included in the appendix.

Complete Methods

The Pre-test - Obtaining a Contact List and Sampling

The interviews for this thesis were conducted for a Conservation Effects Assessment Project (CEAP) in the Eagle Creek Watershed (ECW), Indiana. A pre-test was done in the South Fork Wildcat-Blinn Ditch & Kilmore Creek-Boyle's Ditch (SFWC-BD & KC-BD) Watersheds in Indiana the summer of 2007 prior to interviews in the ECW, which took place in winter 2007-2008.

For the pre-test, addresses were provided by the Clinton County Soil and Water Conservation District (CCSWCD). The list was divided into Livestock producers, and "other" residents. The "other" residents category was residents that owned more than five acres of land. The CCSWCD was able to obtain the livestock addresses from a GIS layer that was provided to them by the Clinton County Cooperative Extension Agent. The agent took GPS points of all (that they were able to see or knew of) Animal Feeding Operations (AFOs) in the county and then also included their address and contact information. "Other" residents were obtained by using the county GIS website and highlighting the rural areas of the watershed. This then provides a list of all of each of the parcels and their taxpayer. That list was combined with the list that they had created using a Plat book and deleted the duplicates. The SWCD used that list for the "others" category.

The lab group used the "other" residents category to determine agricultural landowners in the area. We found all "other" residents' telephone numbers by using Whitepages.com. We were able to get numbers for 198 out of 233 people. In order to narrow down the list to just producers, four researchers were in charge of contacting the residents to inquire if they had row crops or livestock on their land. Ninety people

indicated they were not producers and did not own farmland. Nineteen numbers were a combination of disconnected numbers, people who had moved, and people who were not interested in talking to us; these were taken out of the sample all together. We got a hold of 72 confirmed producers. For the people we did not get a hold of, we used Google maps aerial photography to find their location and made a best guess as to whether or not they were located on farmland. Seventeen producers were added to the list of 72 for a total of 89 producers. A random sample of 30 producers was drawn from the list of 89 producers, combined with a random sample of 25 producers drawn from the list of livestock producers for a total of 55.

Contacting the Landowners

Advance letters were sent to the producers the week of July 2nd, 2007. These letters contained signatures from relevant people at the SWCD, to show we were working in cooperation with them. I began calling the landowners the week of July 9th, 2007 with the first interview taking place on July 12th, 2007 and the last on August 16th, 2007. When calling the landowner I introduced myself and indicated the affiliation with the local watershed project and asked them if they had received the letter requesting an interview with the primary farm operator. I asked them if they would do the interview and set up a convenient time to meet them. The producers tended to want to schedule within the week or sometimes the next day. They usually did not want to schedule far in advance. In the case the landowner was not the primary farm operator I asked for contact information for the person who was cash-renting the land. After they agreed to interviews I would ask the producer what kind of operation they had and whether or not they had a creek or stream running through their land to inform the type of BMPs I would ask them about. There were some landowners I was not able to reach on the phone, so the week of August 6th, 2007 I sent them another letter requesting an interview and a postcard to fill out. The postcard asked what for the best day, time and phone number to reach them at, and also if they cash-rented their land the contact information for their tenant. I left final messages the week of September 3rd, 2007 stating I was wrapping up the interviews and if the landowner was interested in doing an interview to give me a call and left my phone number.

Response Rate

Twenty-four landowners were taken out of the sample for various reasons. These included, livestock farms with only 2-3 animals, additional non-producers not found during calling, deceased landowners, or land was cash-rented and the tenant was already on the interview list. The total sample size then became 31. I conducted 17 interviews for a response rate of 54.8%. There were 5 people on the list that I was never able to reach on the telephone and did not return the postcards sent to them. There were 4 people who did not feel comfortable giving me the name or contact information for their cash-renter. I had one refusal from the wife of a producer who had just had surgery, 2 people not interested in getting interviewed and 2 people I was not able to get a hold until the very last day I called. The last day was September 5th, and producers had started early harvest

this year so for the two producers' wives I reached on the last day they said the producers would not have time. I initially set out to interview only farm operators; however I unintentionally interviewed 2 people who were non-operating landowners, and one additional person who had a small livestock operation, and 50/50 share-rented their land.

The Interviews

For a typical interview I reserved a Purdue University vehicle to drive to the producer's house or place of employment in Clinton County. I had an undergrad assistant with me on all of the interviews to take notes, we both wore picture ID cards stating our affiliation with Purdue University. I tape recorded the interviews (with consent of the interviewee), which the undergrad assistant later transcribed. The producer signed an Institutional Review Board (IRB) approved consent form to participate in the interview. Interviews ranged from 30 minutes to a couple of hours depending on how talkative the producer was and if they wanted to take us on a tour of their farm.

The Interview Guide and Initial Pre-test

The interview guide was developed based on an extensive review of producer adoption and social acceptability literature. When possible authors were contacted to request copies of their survey and interview instruments. Intramethod mixing was the data collection method used in these interviews. Intramethod mixing is defined by Johnson and Turner (2002) as simultaneous use of a single data collection method that includes both qualitative and quantitative components. Some variables addressing producer demographics, attitudes and beliefs along with farm characteristics were collected using a close-ended quantitative approach as I wanted to compare across interviewees. Open-ended questioning was used to collect information regarding the characteristics of acceptability for each specific BMP. This allowed interviewees to explore the topic fully. The guide was written to address as many as possible of the social, cultural, economic, and structural factors shown to influence adoption of BMPs. The BMP acceptability section of the interview was structured such that the owner or operator was asked whether or not they used a particular BMP and for what specific reasons they were or were not using it. Then they were asked to comment on the complexity, compatibility, financial and environmental advantages/disadvantages, associated risk, ability to be tried on a small portion of land, and the observability of the advantages of each BMP. At the end of the interview each person filled out an additional survey regarding their general water quality attitudes, types and sources of water pollutants, challenges associated with improving water quality, and demographic information.

I pre-tested the interview guide on graduate students studying similar topics in social sciences and natural resource management. The interview was also pre-tested on a very active and knowledgeable producer outside the Kilmore Creek Watershed. This producer was able to complete the interview and suggest how better to ask questions and gave other general advice. The interview was not pre-tested more vigorously than this

due to the fact that the SFWC-BD & KC-BD Watersheds interviews were to serve as a pre-test of the interview for the CEAP project in the Eagle Creek Watershed, IN.

Data Analysis

My data consisted of transcribed interviews. Four interviews overall were not able to be transcribed, however, notes were kept on these interviews and they were incorporated when possible. Grounded theory method was applied to code the interviews. Grounded theory can be used with “received” theories or variables if your purpose is to open these up and to find new meaning in them. (Strauss and Corbin 1990). I attempted to follow the “received” theories when coding the interviews. I began by open coding each entire interview. Open coding is the process of breaking down, examining, comparing, conceptualizing, and categorizing data (Strauss and Corbin 1990). This was done using QSR NVivo 7, a qualitative research analysis tool. The categories that emerged through coding were ideas about changing farm operations, personal characteristics of producers influencing their decisions, characteristics of government programs, heritage of the farm, motivations/limitations in general to conservation adoption, networking relationships, perceptions of the land and pollution, tenure issues, and a separate section for each BMP studied. The BMPs analyzed in this study were cover crops, conservation tillage, grassed waterways, filter strips, and nutrient and pest management practices. Livestock BMPs were asked of relevant producers however that information is not reported in this thesis. Using axial coding, a set of procedures whereby the data are put back together in new ways after open coding, connections can be made between the categories (Strauss and Corbin 1990). Since the sample size was small statistical analysis was not conducted using producer and farm characteristics as independent variables.

In between Interview Periods

Through analysis of the interviews from the SFWC-BD & KC-BD Watersheds a theme pertaining to the importance of land tenure was noted. To address this, questions were added to the interview guide to look at these themes. The only other significant change was in regards to asking about each specific BMP. For the SFWC-BD & KC-BD Watersheds, the interviewer asked specifically about the six acceptability characteristics of each practice. In the ECW interviews asking about the characteristics was used more as prompting questions if the producers did not give enough information when asked “Why specifically do you use/not use this practice?”

Eagle Creek Watershed – The Final Round of Interviews

Obtaining a Contact List

Again lists were obtained from the local SWCDs, Hamilton County SWCD and Boone County SWCD. The lists had some non-operating landowners and producers. They did not provide the details regarding how the lists were compiled.

Contacting the Landowners

Advance letters were sent to the producers in Hendricks County (3) the week of November 19th, 2007. An additional 16 letters were sent the week of November 26th, 2007. The third round was sent the week of January 31st, 2008 and the last round was mailed the week of February 4th, 2008. This process was used due to the Holiday Season and the amount of names on the list. There was only one interviewer and there were 30-35 letters sent in the last two rounds. Again, the letters contained signatures from relevant people at Indianapolis University-Purdue University Indianapolis and the Eagle Creek Watershed Project Coordinator, to show we were working in cooperation with them. I began calling the landowners the week after their advance letter was sent. When calling the landowner I introduced myself and indicated the affiliation with the local watershed project and asked them if they had received the letter requesting an interview with the primary farm operator. I asked them if they would do the interview and set up a convenient time to meet them. I left final messages the week of March 4th, 2008 stating I was wrapping up the interviews and if the landowner was interested in doing an interview to give me a call and left my phone number.

Response Rate

Twenty-four landowners were taken out of the sample for various reasons. These included livestock farms with only 2-3 animals, non-producers who preferred I talked to tenant, deceased landowners, and people having nothing to do with agriculture. The total sample size became 61. I conducted 39 interviews for a response rate of 63.9%. There were 9 people on the list that I was never able to reach on the telephone, 1 that his wife had just passed, two producers whose wives said no for them, and 10 people who were not interested or not enough time. For the ECW interviews I set up interviews with non-operating landowners on purpose. Logistics of getting through all the producer interviews, which were the main focus of the project, kept the interviewer from obtaining a significant amount of interviews with non-operating landowners. Telephone interviews were done with two of the non-operating landowners to cut down on time. The breakdown of interviews was 32 agricultural producers and 7 non-operating landowners. Unfortunately 2 of the non-operating landowner interviews were not transcribed due to the tape inside the micro-cassette snapping.

The Interviews, Interview Guide, and Data Analysis

The same interview procedure and data analysis methods were used as in the SFWC-BD & KC-BD Watersheds. Basically the same interview guide was used for the ECW interviews, with the significant changes noted earlier.

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8. Is this your primary residence attached to farmland that you rent or own?
 a. How often do you visit your farms not attached to your residence?
9. How many years have you been operating your farm? _____years
10. When did your family move to this area?
11. Did a family member own and operate the farm before you did? _____
 a. Were your parents, grandparents, great-grandparent farmers?
 b. If yes what is the total years it has been in the family? _____ years
 c. Did you grow up on a farm?
 d. Has it always been the same amount of land or has some been gained or sold as various time?
12. I would like to get an idea of the people that working for you. So how many...

Members of your family are paid permanent employees _____

Members of your family are paid seasonal employees _____

How many other paid permanent employees do you have _____

How many other paid seasonal employees do you have _____

13. How long do you expect to be working this farm? _____

14. Do you expect your kids or some other person to take over the operation when you are done, including the rented land?

If yes:

When do you think they might take over?

Has knowing that your son/daughter will take over the operation influenced the way you manage your operation?

In what ways do you think they might change the operation of this place?

If no:

Why do you think they chose not to take this career path?

How has believing that no one plans to take over the farm influenced the way you manage the operation?

If uncertain:

What factors do you think will determine whether or not they will take over the business (or maintain operation as hobby)?

Would you manage the operation differently if you had someone interested in taking over?

15. In five years from now, which of the following statements will best describe your farm operation? (if they choose e then skip next two questions)
- Farm operation about the same size as it is today
 - Farm operation with larger herd size/more crops
 - Farm operation with smaller herd size/less crops
 - Farm operation with no livestock/crops
 - No longer a farm operation

16. Do you expect this farm operation to still be active in 20 years? _____

If you had to pick which would be single most important factor that will determine whether or not this farm will continue in operation 20 years from now?

- Personal or family desire to keep farming
- Personal or family ability to keep farming
- Economic competitiveness for the farm

If they don't think it will be active give these choices also:

- Economic competitiveness for the farm
- Housing or development pressure
- Government regulations
- Other _____

17. If they don't think that the land you operate now will still be in agriculture in 15-20 years or they won't be operating it? Ask question below:

If you had to pick which would be single most important factor that will determine why this farm will not continue in operation 20 years from now?

- Economic competitiveness for the farm
- Housing or development pressure
- Government regulations
- Other _____

BMP Questions - The next set of questions are general conservation questions.

1. How far from your farm operation is the nearest water body (river, ditch, lake)?
Do they have names, sizes? _____miles
2. How would you describe the slope on your land?
Generally Flat, Generally Hilly, Generally Steep
3. Which of the following soil textures best describes the soil makeup of your land?
Mostly sandy, Mostly silt or loam, Mostly clay, Don't know
4. Do you have a conservation plan for your farm operation? _____
When was it last updated? _____
5. Do you plan to put any of your land into conservation easements or suggest your tenants do so?
6. Do you consider soil erosion to be a problem on the land that you own? How about the land you rent?
7. Do you believe that water pollution is a problem on the land that you own? How about the land you rent?
8. Do you consider yourself to be a conservationist?
9. In your opinion why do some farmers undertake more conservation than others?
10. What do you think is preventing farmers from doing more conservation?

Social Network Questions -In this section I am looking at who you talk to about BMPs. I want to remind you even though you are giving names, I will not be publishing the names.

1. Has anyone/any government agency approached you regarding adoption of any type of conservation practice? Did you take their advice/help why or why not?
2. Where do you have received most of your information regarding conservation practices?
3. Could you name three people you go to, to discuss any decisions regarding BMPs such as adoption, installation, or maintenance? And their relationship to you?
4. Are there any other non-humans sources of information that you use get information about BMPs?
5. Your local SWCD also would like me to ask in what ways they could be of better assistance to you?

General Tenure Questions

On the land that you rent, do you feel that you are primarily responsible for decision regarding adoption of conservation practices or that the landlord is responsible?

Do you think there is a difference based on the type of conservation practice?

How would you describe the relationship between yourself and your landlords?

Have you ever had any difference of opinion when it comes to conservation practices with any of your landlords?

Do any of your lease agreements stipulate that you use certain conservation practices?

Have you acquired any landlords based on your use of conservation practices?

In general is there a difference between what conservation practices you have implemented on your owned vs. rented acres?

COVER CROPS

A crop of close-growing grasses, legumes, or small grain grown for seasonal soil protection and improvement.

Have you heard of this practice? _____

Do you currently use this practice?

If not applicable: Ask why and if they would use it under any conditions?

If no:

1. Have you used this practice sometime in the past? If so when and for how long?
2. For what specific reasons have you decided not to use (or continue using) this practice?
3. Under what conditions would you be willing to use this practice in the future?
 - a. Would you consider using this practice if it was cost-shared or you received incentive payments?
 - b. Are you aware of any cost-share or incentive money available for this practice?
 - c. Would you do it different if you owned the land?

If yes (ask questions that apply):

1. For what specific reasons have you decided to use this practice?
2. On how many acres are you using this practice? Rented vs Owned? Do you believe you are using the practice everywhere it is necessary? Is there anything preventing you from using it in any other places?
3. When did you install/start this BMP? Who installed this BMP; did you receive help from anyone or any government agency?
4. Are you receiving cost-share or incentive payments?
 - a. If they did: How did you learn of the available money?
5. Did you consult the landlord before adopting this practice? Was it stipulated in the lease that you use this practice?
6. Are you using it on all fields? Is there a difference between rented fields and owned fields in its adoption and use?
7. Do you feel that the conservation practice has been maintained?

These questions are probing questions only asked if I feel they are not providing enough information regarding motivations/limitations above:

From what you know can you comment on:

1. How complex is this practice? Why?
2. When you began the practice, how compatible was it with your farming system at the time?
3. Are there financial advantages/disadvantages to using this practice? What are they?
4. Are there environmental advantages to using this practice? What are they?
5. How observable are the advantages of using this practice?
6. What is the risk associated with the practice?
7. How easily this practice is able to be tried on a small portion of land before implementation on the whole farming system?

CONSERVATION TILLAGE (Reduced Till, No-Till, Strip-Till)

Can you please describe your current tillage practices?

If not completely no-till:

1. On how many acres are you using no-till practices? Rented vs Owned?
2. Have you ever tried no-till in the past? If so when and for how long?
3. For what specific reasons have you decided not to use (or continue using) completely no-till practices?
4. Under what conditions would you be willing to use this practice in the future?
 - a. Would you consider using this practice if it was cost-shared or you received incentive payments?
 - b. Are you aware of any cost-share or incentive money available for this practice?
 - c. Would you do it different if you owned the land?

If yes:

1. For what specific reasons have you decided to use this practice?
2. When did you start using no-till? Did you receive help/advice from anyone or any government agency?
3. Are you receiving cost-share or incentive payments for this practice?
 - a. If they did: How did you learn of the available money?
4. Did you consult the landlord before adopting this practice? Was it stipulated in the lease that you use this practice?
5. Are you using it on all fields? Is there a difference between rented fields and owned fields in its adoption?

These questions are probing questions only asked if I feel they are not providing enough information regarding motivations/limitations above:

From what you know can you comment on:

1. How complex is this practice? Why?
2. When you began the practice, how compatible was it with your farming system at the time?
3. Are there financial advantages/disadvantages to using this practice? What are they?
4. Are there environmental advantages to using this practice? What are they?
5. How observable are the advantages of using this practice?
6. What is the risk associated with the practice?
7. How easily this practice is able to be tried on a small portion of land before implementation on the whole farming system?

STREAMSIDE PRACTICES (Filter Strips, Buffer Zones)

Can you please describe what is located in the 60 feet adjacent to each side of the creek, stream, river running through your land? Asked about filter strips for open ditches and riparian buffers for larger streams.

Did you personally install or have someone install any type of filter strip or buffer system next to your water body? Have you installed any type of rip rap or other practice to reduce erosion on the banks of the water body?

If they are not doing anything, ask if they have heard of planting grass strips or trees next to stream and then ask:

1. For what specific reasons have you decided not to use these practices along your creek/stream?
2. Do you think there is any benefit in using this practice along the water body?
3. Under what conditions would you be willing to use this practice in the future?
 - a. Would you consider using this practice if it was cost-shared?
 - b. Are you aware of any cost-share money available for this practice?
 - c. Would you do it different if you owned the land?

If they have had filter strips or buffers put in ask:

1. For what specific reasons have you decided to use this practice?
2. Do you believe you are using the practice everywhere it is necessary?
Is there anything preventing you from using it in any other places?
3. When was the BMP installed? Who installed this BMP; did you receive help from anyone or any government agency?
4. Are you receiving cost-share or incentive payments for this practice?
 - a. If they did: How did you learn of the available money?
5. Were the practices on the land before you started renting it?
 - a. If not: Did you consult the landlord before adopting this practice? Was it stipulated in the lease that you use this practice?
6. Are you using it on all fields? Is there a difference between rented fields and owned fields in its adoption?
7. How well do you feel this conservation practice has been maintained?

These questions are probing questions only asked if I feel they are not providing enough information regarding motivations/limitations above:

From what you know can you comment on:

1. How complex is this practice? Why?
2. When you began the practice, how compatible was it with your farming system at the time?
3. Are there financial advantages/disadvantages to using this practice? What are they?
4. Are there environmental advantages to using this practice? What are they?
5. How observable are the advantages of using this practice?
6. What is the risk associated with the practice?
7. How easily this practice is able to be tried on a small portion of land before implementation on the whole farming system?

GRASSED WATERWAYS

Are you using the practice of grassed waterways?

If no:

1. Have you tried this practice in the past?
2. For what specific reasons have you decided not to use or continue using this practice?
3. Under what conditions would you be willing to use this practice in the future?
 - a. Would you consider using this practice if it was cost-shared?
 - b. Are you aware of any cost-share money available for this practice?
 - c. Would you do it differently if you owned the land?

If yes:

1. For what specific reasons have you decided to use this practice?
2. Do you believe you are using the practice everywhere it is necessary? Is there anything preventing you from using it in any other places?
3. Installation
 - a. When was the BMP installed?
 - b. Who installed your grassed waterways? Did you receive help from anyone or any government agency?
 - c. Are you receiving cost-share or incentive payments for this practice?
 - i. If they did: How did you learn of the available money?
4. On your rented land: Were the grassed waterways there before you started renting the land?
 - a. If not: Did you consult the landlord before adopting this practice? Was it stipulated in the lease that you use this practice?
5. Are you using it on all fields? Is there a difference between rented fields and owned fields in its adoption?
6. How well do you feel this conservation practice has been maintained?

These questions are probing questions only asked if I feel they are not providing enough information regarding motivations/limitations above:

From what you know can you comment on:

1. How complex is this practice? Why?
2. When you began the practice, how compatible was it with your farming system at the time?
3. Are there financial advantages/disadvantages to using this practice? What are they?
4. Are there environmental advantages to using this practice? What are they?
5. How observable are the advantages of using this practice?
6. What is the risk associated with the practice?
7. How easily this practice is able to be tried on a small portion of land before implementation on the whole farming system?

NUTRIENT MANAGEMENT PRACTICES

This is described as managing the amount, source, placement, form and timing of the application of nutrients and soil amendments.

1. Can you please describe your nutrient management strategies?
2. Do you know what rates your fertilizers and/or manure is applied at?
3. Are you doing anything innovative when it comes to your nutrient management strategies?
 - a. Crop Rotation
 - b. Soil Testing and Basing application on soil test results
 - c. Nutrient Management plans for fertilizer and manure application (CNMP)
 - d. Are they using any technology to keep track of these things (GPS)
 - e. Grid Sampling and variable rate application

If they are not using one of the above ask these questions regarding each:

1. Have you heard of using...?
2. Have you ever used this in the past? If so when and for how long?
3. For what specific reasons have you decided not to use (or continue using) this practice?
4. Under what conditions would you be willing to use this practice in the future?
 - a. Would you consider using this practice if it was cost-shared?
 - b. Are you aware of any cost-share money available for this practice?
 - c. Would you do it differently if you owned the land?

For the practices they are using ask:

1. Are you using the practices equally on all land or just some acres?
2. For what specific reasons have you decided to use this practice?
3. When did you start using these practices? Did you receive help from anyone or any government agency?
4. Are you receiving cost-share or incentive payments for this practice?
 - a. If they did: How did you learn of the available money?
5. Did you consult the landlord before adopting this practice? Was it stipulated in the lease that you use this practice?
6. Are you using it on all fields? Is there a difference between rented fields and owned fields in its adoption?

These questions are probing questions only asked if I feel they are not providing enough information regarding motivations/limitations above:

From what you know can you comment on:

1. How complex these practices are? Why?
2. When you began, how compatible was it with your farming system at the time?
3. Are there financial advantages/disadvantages to using this practice? What are they?
4. Are there environmental advantages to using this practice? What are they?
5. How observable are the advantages of using this practice?
6. What is the risk associated with the practice?
7. How easily this practice is able to be tried on a small portion of land before implementation on the whole farming system?

PEST MANAGEMENT PRACTICES

Described as utilizing environmentally sensitive prevention, monitoring and suppression strategies, to manage weeds, insects, diseases, animals and other organisms

1. Can you please describe your pest management strategies for weeds? For insects?
2. Are you using fungicides at all for pest management?
3. Are you using atrazine for pest management? Do you know at what average rate it is applied?
4. Are you doing anything innovative when it comes to your pest management strategies?
 - a. Integrated Pest Management (Have they heard of this?)
 - b. Pest Resistant Corn Varieties
 - c. Scouting for Pests, and utilizing economic thresholds
 - d. Using any technology for keeping track of things (GPS)

If they are not using one of the above ask these questions regarding each:

1. Have you heard of using...?
2. Have you ever used this in the past? If so when and for how long?
3. For what specific reasons have you decided not to use or continue this practice?
4. Under what conditions would you be willing to use this practice in the future?
 - a. Would you consider using this practice if it was cost-shared?
 - b. Are you aware of any cost-share money available for this practice?
 - c. Would you do anything different if you owned the land?

For the practices they are using ask:

1. Are you using the practices equally on all land or just some acres? Quantify?
2. For what specific reasons have you decided to use this practice?
3. When did you start using these practices? Did you receive help from anyone or any government agency?
4. Are you receiving cost-share or incentive payments for this practice?
 - a. If they did: How did you learn of the available money?
5. Did you consult the landlord before adopting this practice? Was it stipulated in the lease that you use this practice?
6. Are you using it on all fields? Is there a difference between rented fields and owned fields in its adoption?
7. How well do you feel this conservation practice has been maintained?

These questions are probing questions only asked if I feel they are not providing enough information regarding motivations/limitations above:

From what you know can you comment on:

1. How complex these practices are? Why?
2. When you began, how compatible was it with your farming system at the time?
3. Are there financial advantages/disadvantages to using this practice? What are they?
4. Are there environmental advantages to using this practice? What are they?
5. How observable are the advantages of using this practice?
6. What is the risk associated with the practice?
7. How easily this practice is able to be tried on a small portion of land before implementation on the whole farming system?

TILE DRAIN QUESTIONS

1. Do you know if your farm fields (both rented and owned) contain tile drains?
2. Are the drains regularly spaced or do they just target low spots?
 - a. If regularly spaced, any idea what the spacing is?
 - b. Do you know the approximate depth of the tile drains?
3. In the future, do you plan to expand your tile drain system?
4. Are you aware of any surface inlets providing input into the tile drain system?
5. Do the drains discharge directly into a surface ditch or into a larger subsurface (i.e. county-maintained) drain?

Appendix B

Acceptability Findings by Conservation Practice

This appendix outlines aspects of the six acceptability characteristics that were important for each of the six conservation practices. * denotes the most important aspects of the acceptability characteristics in either motivating or limiting adoption of that particular practice.

GRASSED WATERWAYS – Motivations for Adoption

Relative Advantages (Soil, Economic, and Environmental)

- *Soil conservation (Soil benefit)
- Protection of equipment (Economic advantage through input savings)
- Program payments (Economic advantage)
- Increased land value (Economic advantage)
- Protecting creeks, being good stewards, and wildlife habitat (Environmental advantages)

Compatibility

- *Perceived need for practice (Compatibility with needs)
- *Not suitable for crops anyway (Compatibility with needs)
- Easier to farm (Compatibility by providing conveniences)
- Need them because of no-till system (Compatibility with current system)

Observability

- Add value/attractiveness (Observability of advantages)
- Seeing wildlife (Observability of advantages)
- Everybody is doing practice (Observability of other producer's actions)
- It has been proven to work (Observability of results)

GRASSED WATERWAYS – Limitations in Adoption

Relative Disadvantages (Economic)

- Cost of installation (Economic disadvantage through input increases)
- Time to farm around them (Economic disadvantage through input increases)

Incompatibility

- *No perceived need for practice (Incompatibility with needs)
-The difference in adoption rates between the two study areas for grassed waterways can be attributed to this aspect. It was a significant barrier for the Eagle Creek Watershed.
- *Government program requirements especially time commitment (Incompatibility with needs)
- *Land ownership restrictions (Incompatibility with needs of producer)
- Having to maneuver around the waterway (Incompatibility with needs)

Complexity

- Implementation and maintenance of practice (Complexity)

FILTER STRIPS – Motivations for Adoption

Relative Advantages (Soil, Economic, and Environmental)

- Soil conservation (Soil benefit)
- Program payments (Economic advantage)
- Doing the right thing and wildlife habitat (Environmental advantages)

Compatibility

- *Also useful as a maintenance area (Compatibility with needs)
- *Area not suitable for crops (Compatibility with current system)

Observability

- Cleaner looking waterways (Observability of results)
- Wildlife habitat (Observability of advantages)

FILTER STRIPS – Limitations in Adoption

Relative Disadvantages (Economic and Perceiving Value)

- *Loss of Productive Land (Economic disadvantage)
- Cost of installation (Economic disadvantage through input increases)
- Do not perceive value of potential advantages

Incompatibility

- *Government programs- payments not enough and time commitment (Incompatibility with needs)
-The difference in adoption rates between the two study areas for filter strips can be attributed to this aspect. It was a significant barrier for the Eagle Creek Watershed.

- *Land ownership restrictions (Incompatibility with needs of producer)
- No perceived need for practice (Incompatibility with needs)

Observability

- Practice looks bad (Observability of disadvantages)
- Need proof of their contribution to problem requiring filter strips (Observability of pollution problem)
- Need proof practice works (Observability of results)

Complexity

- Implementation and maintenance of practice (Complexity)

COVER CROPS – Motivations for Adoption

Relative Advantages (Soil and Economic)

- *Improve soil structure (Soil benefit)
- *Improve soil fertility (Soil benefit and Economic advantage through input decreases)
- *Potential yield increases (Economic advantage)
- Soil Conservation (Soil benefit)

Compatibility

- Compatibility with no-till (Compatibility with current system)

Observability

- Practice looks nice (Observability of advantages)
- Seeing others do it (Observability of other producer's actions)

Trialability

- Practice is able to be tried on limited acreage (Trialability)

COVER CROPS – Limitations in Adoption

Relative Disadvantages (Economic and Knowing the Advantages)

- *Cost of implementation (Economic disadvantage through input increases)
- *Labor and time (Economic disadvantage through input increases)
- *Knowing the advantages and perceiving value

Incompatibility

- *No perceived need for practice (Compatibility with needs)
- Perceived incompatibility with no-till (Compatibility with current system)

Observability

- Do not see anybody using it (Observability of other producer's actions)
- Neighbors' bad experience (Observability of other producer's actions)

Risk

- *Getting it killed off, insect pressure, competition with crop (Risks associated with use of the practice)

CONSERVATION TILLAGE – Motivations for Adoption

Relative Advantages (Soil, Economic, and Environmental)

- *Soil Conservation (Soil benefit)
- *Input savings – time, fuel, labor (Economic advantage)
- Improved drainage, decreased compaction (Soil benefits)
- Potential yield increase (Economic advantage)
- Being able to pass the land on in “good shape” (Environmental advantage)

Compatibility

- Necessity because of lack of time or labor (Compatibility with needs)

Observability

- The look of the land without conservation tillage (Observability of advantages)
- Seeing others do practice (Observability of other producer's actions)

Trialability

- Practice is able to be tried on limited acreage (Trialability)

CONSERVATION TILLAGE – Limitations in Adoption

Relative Disadvantages (Economic and Immediacy of Rewards)

- *Decrease in yield (Economic disadvantage)
- Cost of increased chemicals (Economic disadvantage through input increases)
- Immediacy of rewards from practicing conservation tillage

Incompatibility

- *No perceived need for practice (Incompatibility with needs)
- Need additional equipment and education (Incompatibility with current system)

Observability

- Perceive the crop or land to look “bad” with use of practice (Observability of disadvantages)
- Like to till the way dad did it or old fashioned way (Observability of other producer’s actions)

Risk

- *Uncertainty if practice works or if there will be reduced yields (Risk associated with use)
- Uncertainty regarding spring weather and how that affects planting dates (Risk associated with use)

Nutrient management entailed asking about written nutrient management plans, using soil testing and basing application on the results, using grid sampling, using variable rate technology, and using any other technology.

NUTRIENT MANAGEMENT – Motivations for Adoption

Relative Advantages (Soil and Economic)

- *Cost savings (Economic advantage through input decreases)
- Improve fertility (Soil benefit)

NUTRIENT MANAGEMENT – Limitations in Adoption

Relative Disadvantages (Economic)

- *Cost (Economic disadvantage through input increases)
- Immediacy of rewards from use

Incompatibility

- *Do not know of available programs (Incompatibility with current knowledge system)
- Need additional equipment (Incompatibility with current system)

Risk

- Uncertainty of effectiveness and when benefits would be realized (Risk associated with use)

Pest Management entailed asking about knowledge of Integrated Pest Management (IPM), use of pest resistant corn varieties, and scouting for pests and utilizing economic thresholds.

PEST MANAGEMENT – Motivations for Adoption

Relative Advantages (Economic and Environmental)

- *Cost savings in chemical applications for weeds and insects (Economic advantage through input decreases)
- Potential to have yield increases (Economic advantage)
- Personal safety is increased through not having to handle chemicals (Environmental advantage)

PEST MANAGEMENT – Limitations in Adoption

Relative Disadvantages (Economic)

- Increased management level (Economic disadvantage through input increases)

Incompatibility

- Specialty crops cannot use genetically modified seed (Incompatibility with current system)

Risk

- Crops gaining resistance to chemicals “volunteer corn fear: (Risk associated with use)