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Farmer Preferences for a Working Wetlands Program

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List of Abbreviations

ACEP Agricultural Conservation Easement Program
BMP Best Management Practices
CSP Conservation Stewardship Program
CRP Conservation Reserve Program
DCE Discrete Choice Experiments
EPA Environmental Protection Agency
EQIP Environmental Quality Incentives Program
ERS Economic Research Service
FSA Farm Service Agency
FWP Farmable Wetlands Program
GRP Grassland Reserve Program
NASS National Agricultural Statistics Service
NRCS National Resources Conservation Services
PPR Prairie Pothole Region
UK United Kingdom
US United States
USDA United States Department of Agriculture
WRP Wetland Reserve Program
WWP Working Wetlands Program

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Abstract

Wetlands play an important role in the ecosystem and are a link between the land and water. This study investigates a voluntary working wetlands pilot program (WWP) in the Prairie Pothole Region of North Dakota focusing on small, temporary and seasonal wetlands within croplands. The program compensates farmers for maintaining wetlands on their land. Program-participant farmer preferences for program attributes and their perceptions and attitudes towards this and other conservation programs and practices were elicited. Respondents were apt to agree that producer participation in the wetland program development process is very important, promotion of healthy ecosystems is part of their responsibility as a steward of the land, the terms of the WWP are a good fit for their land in the long run, and conservation programs are effective. They strongly agreed that farmers should be compensated when their land use choices benefit the environment, including for maintenance of wetlands, and that land use decisions are their right as a land owner. Respondents disagreed that the conversion of wetlands must be stopped, wetland conservation should limit agricultural activities on private lands, there should be regulations to control the conservation of naturally-occurring wetlands to agricultural lands, and small wetlands benefit their operation. A choice experiment designed to consider hypothetical program attributes showed an increase in payment and absence of additional conservation production requirements in surrounding cropland increases the probability of enrollment. The parameter estimate for the length of contract attribute was negative indicating a preference for shorter contracts. Payment rate had an important influence in the expected direction. Ranchers were more responsive to increases in payment rate than were farmers without cows. Production requirements of no-till, planting of cover crops, and planting of winter cereals each had a relatively large negative impact on likelihood to enroll in a hypothetical version of the WWP. The negative effect of the no-till requirement was moderated for those who already used no-till at least to some extent in their operation; the same was true for cover crops, as the negative effect of a cover crops production requirement was moderated for those who already planted cover crops. However, among farmers already planning no-till, the negative effect of a cover crops or winter cereals requirement was even greater. Farmers living on their farm and those with small and large farms and those using no-till in some part of their operation were more likely to enroll in the program. Farmers who one might define as more conservation-minded with regards to wetlands as defined as more strongly agreeing that small wetlands benefit their operation and that it is important to protect wetlands and those who would drain none of their wetlands or less than 25% if allowed to do so without penalty were less likely to enroll in the program. As expected, those that consider more important the effect of a program on water quality, those that identified the WWP program as a good fit for their operation in the long run, and those who were satisfied with the maintenance requirements of the WWP program were more likely to enroll. The importance placed on water quality had a moderating effect on the positive influence of payment on likelihood to enroll and on the negative influence of each of the three production requirements (no-till, cover crops, and winter cereals). Recommendations include: (1) Work to understand the decision-maker and his decision-making process; (2) New policy development should focus on policy options with a targeted approach; one where high payoff acres are targeted with effective conservation measures *for those acres* and where the employment of conservation practices are less likely. Addition of production requirements under a working lands program should be carefully considered because they may substantially reduce farmer interest; (3) Continue to educate farmers about conservation and the conservation options available to them; Find means to

engage ‘productivist farmers’, those who are less inclined to adopt conservation practices if the benefits are not economically most efficient and benefits are largely off-farm; and (5) Consider a community approach to identifying and implementing conservation solutions.

Farmer Preferences for a Working Wetlands Program

"Voluntary conservation payment programs are the cornerstone of U.S. agricultural conservation policy."

Claassen, et al. (2014, p. 1)

1. Introduction

Wetlands play an important role in the environment, serving as a transition zone where the flow of water, cycling of nutrients, and the energy of the sun meet to produce a unique ecosystem characterized by its hydrology, soils, and vegetation. Wetlands are found on every continent except Antarctica and are grouped into two main categories: coastal or tidal wetlands and inland or non-tidal wetlands. Tidal wetlands are found along the Pacific, Atlantic, Alaskan and Gulf Coasts where land-based fresh water mixes with sea water, resulting in varying salinities (Environmental Protection Agency, undated). Non-tidal wetlands are common in overflow regions adjacent to moving water such as rivers and streams (riparian wetlands), near lakes or ponds, or within dry land areas (e.g. potholes, playas). Wetlands found in the United States fall into four general categories: marshes, swamps, bogs and fens. Marshes are wetlands dominated by soft-stemmed vegetation and are the predominant classification of what are more generally referred to in North Dakota as prairie pothole wetlands, or simply Prairie Potholes.

In recent years, there has been considerable focus on the conservation of wetlands (Yu and Belcher 2011) and for good reason. They provide a range of important ecological functions and services, including flood and water flow control, surface and groundwater recharge and discharge, water quality maintenance, nutrient retention, and nursery and habitat for biodiversity. Wetlands are home to more than one-third of the threatened and endangered species in the U.S., and many other animals and plants depend on wetlands for survival (Environmental Protection Agency 2006). Their ecological role can translate directly into economic benefits associated with flood protection, improved water quality and supply, and more or better recreational fishing and hunting (Birol and Cox 2007). A wealth of natural products originating from wetlands are used in the U.S. such as fish and shellfish, blueberries, cranberries, timber, and wild rice as well as medicines that are derived from wetland soils and plants.

Despite the productivity and usefulness of wetlands, they have been extensively degraded (Yu and Belcher 2011). Their presence on cropping lands and interference with yields has contributed to efforts to drain or fill them, reducing by almost half the number once present (North Dakota Game and Fish Department undated). This in turn has resulted in a number of programs in place for wetland conservation and restoration (Reimer 2012).

1.1. Conservation Programs

Conservation programs generally fall into two categories: land retirement and working lands programs (Lesch and Wachenheim 2014). Under the Agricultural Act of 2014, land conservation programs have been consolidated, reducing the number of federal programs from 23 to 13 (USDA 2014). The most prominent land retirement program remains the Conservation Reserve Program (CRP); albeit it has evolved since introduced in 1985. The program aims to re-establish

valuable land cover to help improve water quality, prevent soil erosion, and reduce loss of wildlife habitat. Environmentally sensitive lands are removed from agricultural production and replaced by plant species thought to contribute to environmental well-being. The CRP is a voluntary program with a fixed contract length of ten (general sign-up) or fifteen (continuous sign-up) years. Targeted specifically at wetlands, the Agricultural Conservation Easement Program (ACEP) replaces the long-running Wetland Reserve Program. Participants provide a permanent easement or 30-year easement or contract and enter into a restoration cost-share agreement. The Natural Resources Conservation Service (NRCS) pays a rental rate based on the terms of enrollment. Landowners pay taxes on the property and retain title to the land and thus the right to control access and recreational use. Both of these land retirement programs are long running and have generally held widespread support from farmers and ranchers as well as conservation groups.

Interest has remained and perhaps even increased for *working lands* programs which generally have shorter contract lengths and do not require lands be retired from agricultural use. Working lands programs are most always voluntary and often include a payment to help cover the cost for producers to employ a conservation practice that they otherwise would not find cost effective or consistent with their objectives. The Agricultural Act of 2014 has an increased emphasis on these programs (USDA 2014), including the Environmental Quality Incentives Program (EQIP) and the Conservation Stewardship Program (CSP). EQIP was introduced in 1996 to provide cost-share payments and technical assistance to promote adoption of conservation practices on active agricultural lands. Contracts are between one and ten years in length. CSP, introduced in 2002, provides annual payments to farmers to address resource concerns on their farms. Contracts are five years in length. Since 2002, expenditures on working lands programs have seen tremendous growth, especially the EQIP and CSP. In the 2014 Farm Bill, 2014 to 2018 expenditures for working lands programs is projected to be between $1.35 and $1.75 billion for EQIP and between $1.05 and $1.78 billion for CSP (USDA 2014). At the same time, some argue that these programs and other working lands and land retirement programs are not effective in addressing existing water quality problems; and call for new programs (Ribaudo 2015).

1.2. Pilot Working Wetlands Program

In the current work we investigate farmer-preferences for a new pilot program, the Working Wetlands Program (WWP). The program aim is conserving small wetlands in croplands through the introduction of a voluntary, incentive-based contract. The presence of wetlands on agricultural lands causes a decrease in seeded acres and yield, and can reduce the efficiency of farm operations. Landowners and operators, who are not allowed to drain or fill these wetlands as a condition to remain eligible for federal farm program payments, including federally-subsidized crop insurance, may otherwise thus choose to do so. In this case, maintenance of these wetlands can be in part attributed to incentivized regulation (i.e., conservation compliance). The WWP rather provides a direct incentive to producers in recognition that, by maintaining wetlands that could be drained or filled, producers are providing environmental benefits at the expense of increased productive capability; that is, they are providing a positive externality.

Under the current pilot program, producers are compensated according to the rental value of land on which their small wetlands reside as reported by the National Agricultural Statistics Service.

The program was first offered to qualifying producers in the Prairie Pothole Region (PPR) of North Dakota in 2015. The PPR has been referred to as the "duck factory" of North America. It includes parts of North Dakota, South Dakota, Montana, Minnesota, and Iowa and produces over half of the continent's waterfowl (figure 1). It is the most productive breeding habitat in North America for hundreds of other migratory bird species, and is claimed to have once held approximately 83 wetlands per square mile (U.S. Fish and Wildlife Service 2012). Study participants operated farms within twenty-four PPR counties of North Dakota.

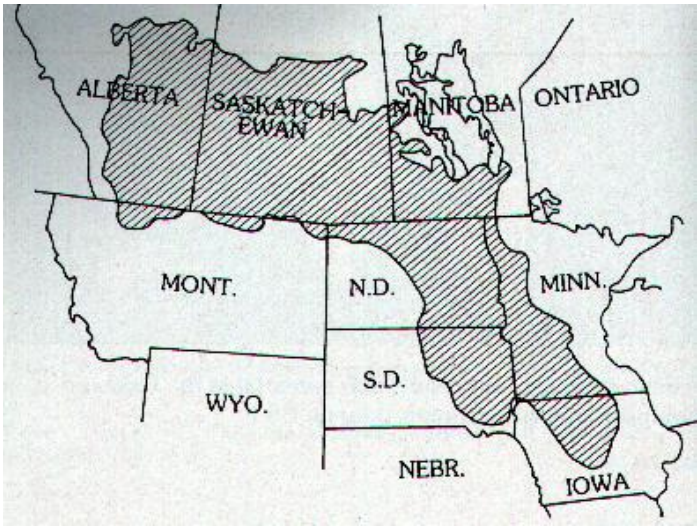

Figure 1: Map of the Prairie Pothole Regions in the U.S.A and Canada
Source: Towards the Wise Use of Wetlands: Report of the Ramsar Convention Wise Use Project, T.J. Davis, Editor, October, 1993, http://archive.ramsar.org/cda/en/ramsar-pubs-books-towards-wise-use-of-21381/main/ramsar/ (accessed June 1, 2016).

The purpose of the current research is to develop an understanding of the perspectives of producers that enrolled in the program, including a measure of their satisfaction with and preferences for the program. This information is important as direct customer feedback as a more permanent program is considered and will play a valuable role in adding to the small body of existing literature on how different conservation program features affect farmer participation (Ruto and Garrod 2009). The study assesses farm, demographic, attitudinal, and economic characteristics of participating farmers and their farms as well as preferences for program attributes. The focal objective is to determine preferences for the WWP among farmers and ranchers. Specific objectives to help achieve this include: (1) Identifying producers' attitudes towards wetlands and how they affect their farms and ranches and (2) Identifying contract attributes and other factors that influence their willingness to participate.

2. Literature Review

In this section, we consider literature related to farmers' and ranchers' attitudes about and behaviors regarding conservation practices and programs. Included is consideration of the determinants of farmer adoption of conservation practices and programs and producer

preferences for conservation programs in general, and a focused consideration of the same regarding wetlands.

2.1. Determinants of Farmer Adoption of Conservation Practices and Programs

A focal point for economists and others involved in evaluating and designing conservation programs is the degree to which financial incentives motivate landowner and operator participation. In the traditional model, choice of land use is based on maximizing net present value of subsequent net income streams. It includes consideration of comparative uses and benefits and costs, the latter including conversion cost. As Udagawa et al. (2014) and others have pointed out, it can be challenging to accurately estimate even costs associated with establishing, monitoring and maintaining land in production or conservation uses. Uncertainty in agricultural input and output markets and yields further complicate estimation. In spite of the complexity of considering decision-making within the narrow confines of financial considerations, over time, non-economic factors were added to the explanatory basket, contributing enhanced domain- as well as predictive-validity. This second paradigm more broadly considers "utility," i.e., the perceived value of a basket of factors including those non-monetary. Ryan et al. (2003) found a farmer's attachment to their land to be the primary motivator for adoption of conservation practices rather than financial compensation among farmers in a Michigan watershed. Farmers reported that they participate in conservation practices that help in the management of their farms and protect their streams. Ryan et al. concluded that the protection of riparian resources in agricultural watersheds required conservation strategies that respect farmers' attachment to their lands and their practice of good stewardship. Hua, Zulauf, and Sohngen (2004) considered factors influencing the decision to enter into government conservation programs among Ohio farmers. They found age and education to have ambiguous relationships with the adoption decision; differing from the standing literature of the time. Holding an off-farm job was associated with lower conservation program participation. Hua, Zulauf, and Sohngen hypothesized that an off-farm job increases the opportunity cost associated with learning about and enrolling in conservation programs. A job-holder's need for additional income may also be associated with a reduced willingness to enroll in part because conservation programs generally cover only a portion of adoption cost. Size and standing were also associated with enrollment. Larger acreage farms (both owned and rented land) were more likely to meet eligibility conditions. Farm lands operated by owners were more likely to be enrolled than lands operated by renters. Dolisca et al. (2006) investigated factors influencing farmers' participation in forestry management programs, identifying financial incentives and farmer characteristics of higher education and female gender to be associated with increased participation. Abdulla (2009) found that, among Iowa farmers, status as owning or renting land, age, education, place of residence of farmer, agricultural land, reasons for owning land and knowledge about cost-share programs contributed to program participation.

Prokopy et al. (2008), in a meta-analysis of 55 studies conducted in the United States, identified educational level, capital, income, farm size, access to information, positive environmental attitudes, environmental awareness, and utilization of social networks as factors that positively affect adoption of conservation practices. They concluded that younger farmers who often claim access to these factors were more likely to adopt. In a subsequent study, Tosakana et al. (2010) found that several of the human capital variables (educational level, management experience and

full time commitment to farming) identified by Prokopy et al. did not influence use of gully plugs and buffer strips among farmers in the U.S. Wheat and Range Region. Producer's perceived effectiveness of conservation practices had the greatest impact on adoption. Respondents with larger acreages were more likely to invest in gully plugs.

Baumgart-Getz, Prokopy, and Floress (2012) identified environmental awareness and attitudes as positive influences on Best Management Practices (BMP) adoption, drawing the conclusion that use of complementary social factors could increase their impact. They noted that the use of networks to implement extension efforts and disseminate information provides a logical way to extend the reach of factors found to impact BMP adoption. A more recent review of literature on the adoption of conservation practices conducted by Lesch and Wachenheim (2014) reported variables described from literature as inconsistent in their effect on conservation program adoption to be age, education, farm size, area planted, and income. Factors consistent in their influence among papers reviewed were reported to be experience, attitude towards conservation management, family labor, gross farm income, profitability, and information sources. They too stressed that not all factors influencing adoption are financial.

2.2. Producers Preferences for Conservation Programs

While growing, the amount of empirical evidence on how the design of conservation programs influences participation is still limited (Ruto and Garrod 2009). An ample amount of literature in this area is especially important because farmer preferences for programs are likely to be location and farm specific.

Some useful information is available from explicit considerations of farmer preferences for conservation programs, especially those farming in Europe. Birol et al. (2006) found farmers in Greece to prefer wetland management programs with higher levels of biodiversity, open water surface area, research and education opportunities and training of locals in conservation practices. Farmers in the U.K. were found to prefer shorter contracts; those with longer contracts required greater financial incentives (Ruto and Garrod 2009). Surveyed farmers also preferred contracts with flexibility where contract holders can decide on areas of their farms to include in a program, and preferred programs with less paperwork. Ruto and Garrod argued that, although participation in conservation programs is by general consensus in the literature positively influenced by farm size, education, and interest in conservation, but negatively related to age, that these factors are not of great interest to policy makers because they are inherent in the farmer. Wynn et al. (2001) concur in finding flexibility in programs important as did Espinosa-Goded et al. (2010) who found that allowing Spanish farmers to undertake maintenance and management activities on their farmland encouraged them to participate in programs even with lower compensation. Greiner (2016) found that pastoralists and grazers in Northern Australia required higher financial payments for longer contracts, and flexibility in contracts when participating in contractual biodiversity conservation, providing additional support to previous findings including those by Ruto and Garrod (2009), Espinosa-Goded et al. (2010), and Yu and Belcher (2011). Results from Greiner's study did not indicate any significant effect of demographic factors such as property size, farm as family operated or corporation-owned, age, education and previous experience with conservation programs on the decision to participate but rather concluded that contract attributes were the decisive factor. Falconer (2000) also argues

that we should focus less on demographics. He suggests there be instead more consideration of transactions costs to help explain why farmers require larger payments for longer contracts, those less flexible and those with more paperwork.

Parkhurst (2011) evaluated program attributes including payment level that encourage participation in ecosystem markets in California and Eastern North Carolina. Farm and ranch operators preferred programs with shorter contract lengths and higher payments and explicitly defined there to be a tradeoff. Farmers in California preferred programs managed by conservation organizations followed by private companies, federal agencies and state agencies while North Carolina respondents preferred state agencies.

Arbuckle (2013) argues that we can do a better job with our conservation programs by better targeting them to high-value farmland. He describes our current programs as following a "shotgun approach" and that we rather need to employ a "strategic, coordinated, proactive application" of various approaches (p. 626); in other words, that we need to employ context-relevant approaches where they do the most good. He provides the examples of the use of the Environmental Benefits Index as a targeting criterion for the CRP and conservation compliance as targeted approaches.

Arbuckle also makes the point that the political process discourages programs wherein the benefits are allocated unequally and that the general expectation is there will be more resistance when there is an unequal distribution of benefits. They tested this hypothesis and found out farmers are not overly concerned with fairness in conservation program application and generally accept a targeted approach. They also found that, in general, farmers do not mind being targeted and approached but are more neutral on whether the government should be using satellite imagery and GIS to map their private land to identify issues (30% agreed it was an invasion of privacy). Farmers who were more concerned about government interference in their business were less supportive of targeted programs. Those who were more aware of and concerned about conservation issues and who were enrolled in CRP supported more targeted programs.

2.3. *Producers' Attitudes/Perceptions and their Influence on Wetland Conservation*

Some research has focused more specifically on wetlands and waterway management programs and practices. Rispoli and Hambler (1999) well articulate the importance of identifying attitudes about wetlands, especially among those more likely to influence their maintenance, so we can figure out solutions to the trend of decreasing wetland acres and educate the public. They found most farmers to be mindful of the importance of wetlands for biodiversity and supportive of wetland restoration but that they were less enthusiastic about restoring wetlands than other groups. Women had more positive attitudes towards wetland conservation. Whitten and Bennett (1999) reported socio-economic factors including level of education and economic well-being, and physical constraints including wetland type and size affected perceptions about wetland management programs, in addition to financial incentives and associated costs.

Lockie and Rockloff (2005) considered landholder attitudes towards wetlands and wetland conservation programs concluding that existing programs and incentives were inadequate to represent the value and importance of wetlands to private landholders. Risk sharing, trust,

recognition of private investment, flexibility in programs, education and information sharing were core factors identified to increase participation in conservation programs. Among New Zealand farmers, Mcleod et al. (2006) found that most farmers were motivated to restore and protect wetlands because draining wetlands to make them productive was no longer accepted among farmers, and that wetland development could be motivated by aesthetic appreciation of wildlife and plant life found in wetlands. Burton, Marsh and Patterson (2007) investigated community attitudes towards water management in Western Australia, concluding that both rural and urban residents valued greatly environmental conservation. Both resident groups supported land use for agricultural purposes and were willing to support less damaging water management options and programs that contribute to enhancing agricultural production. Residents from both sides had little knowledge about the damage agricultural activities can have on the environment. Residents were of the view that the public should get involved in addressing environmental problems by compensating farmers who have to forgo some agricultural activities to avoid environmental damage. In a study on landowners' willingness to adopt wetlands conservation in Saskatchewan, Yu and Belcher (2011) found Willingness to Accept estimates and land rental rates to have similar distributions and not surprisingly concluded that landowners considered the opportunity cost of their land when making decisions on conservation programs. Those programs with a higher private benefit and reduced cost were found to be more likely adopted, as were programs targeted at farms with plans to handover to a successor and those operated by those with experience managing wetlands. They identified landowner experience, planning horizons and their perceptions of wetland values as influencers of participation in conservation programs.

Trenholm et al. (2013) conducted a study within the Credit River Watershed in Canada to investigate wetland management history and attitudes of landowners towards wetlands. Farmers considered ecosystem services originating from wetlands as important. Water purification was ranked as the most important service while recreation and education services fell under the least important among the five ecosystem services considered. Landowners were satisfied with the amount and quality of wetlands as well as accessibility to view wetlands of the Credit River Watershed. In terms of payment to participate in programs, one time payments were preferred to annual payments and providing information on how wetland loss affects participants was also considered essential. Wei, Guan and Zhu (2016) looked at factors that influence Chinese farmer's willingness to participate in wetland restoration in the Poyang Lake watershed in Jiangxi Province. Farmer characteristics influenced differently the decision to enroll in a program or not and how much land to enroll. Information about program payment rules affected the participation (enrollment) decision as well as how many acres to enroll along with other farmer and farm factors. The participation decision was influenced more by farmer characteristics and the decision of how much land to enroll than by production and income levels, with household income the only factor common to both decisions. Even in that case, the effect was different. Household income increased likelihood of participation but decreased acreage. Wei, Guan and Zhu attribute this finding to rich farmers being more likely to enroll but having less land to enroll.

2.4. *Summary*

The literature demonstrates that financial incentives are not always the sole reported or even main motivator for the adoption of conservation programs or practices. Farm size, education,

gender, age, capital, income, availability of programs providing financial incentives, participation cost, farmer awareness and understanding of programs, access to information, conservation attitudes, presence of a succession plan, and experience managing wetlands have also been identified as factors influencing adoption. Research in general supports the notion that farmers prefer conservation programs that have high level of biodiversity, provide research, education and training opportunities, and allow farmers to maintain and manage activities on their farm-land, even when compensation is lower. Also, shorter contract lengths are generally preferred while longer contract lengths, in general, must have higher financial incentives. Contracts are preferred that are flexible and allow farmers to decide areas of their land to include in the program.

3. Methods

This section provides the theoretical foundation for the choice experiment employed to assess farmer preferences for the WWP, and describes the design and implementation of the choice experiment. Details on the survey instrument, data collection approach, and background information about the survey area are provided.

3.1. Survey

The population of interest was North Dakota farmers and ranchers who had voluntarily signed up for participation in the pilot WWP. To qualify for the program, enrollees operated farms in the Prairie Pothole Region (PPR) in the eastern half of North Dakota with enrolled acres comprised of small wetlands. The survey was designed not only to evaluate farmer preferences for a working wetlands program, but also to set a baseline to evaluate participant feedback and its evolution over the course of the five-year program. While the survey population was limited to current enrollees, external validity for initial adopters within the Prairie Pothole Region (PPR) of North Dakota regarding preferences for a working wetlands program should not be outright excluded. Producers voluntarily chose to participate in the pilot program, a program which has almost complete flexibility. Further, there is some evidence that whether a farmer is a current participant or not in conservation program may not influence heterogeneity in preference for program attributes (Ruto and Garrod 2009). Identifying preference for these attributes is the primary objective of the current work.

Survey questionnaires were mailed to producers on October 21st, 2015. At this time, North Dakota crop prices had returned to at or below break-even in the region after three seasons of extraordinarily high prices. Mail surveys were used to reduce cost, avoid interviewer effects, and allow respondents to complete the survey according to their schedule. The latter was particularly important as it was distributed during the harvest season and the survey was voluntary. The initial mailing was followed by phone calls to producers who did not immediately return surveys to ensure they had received it and to ask if they had questions or needed a replacement survey. Other producer-respondents were only in the process of signing up for the program and were not on the initial mailing list, and others who were included in the initial survey mailing later proved ineligible for the program. Another set of questionnaires were mailed on February 5th, 2016 to new program applicants and those who did not respond to the initial mailing. A total of 92

questionnaires were mailed and responses were received from 46 producers, resulting in a 52% response rate.

The survey consisted of six parts. The first part contained questions about the farm and farm operations. The second part inquired about the types of conservation practices employed on the farm, and the next set of questions elicited farmer knowledge of and thoughts on conservation. The survey also elicited respondent thoughts about the WWP, including what motivated their participation and their expectations. The fifth set of questions elicited socio-demographic characteristics of the farmers and the last part consisted of the choice set questions.

3.2. Theoretical Framework

Discrete choice modelling is based on Lancaster's Consumer Theory and Random Utility Theory. Lancaster's Consumer Theory is based on the assumption that goods are consumed for the characteristics they possess and these characteristics are the objects of consumer preference or utility (Lancaster 1966). Random Utility Theory assumes the utility maximization principle; that is, the farmer/landowner knows his/her utility function with certainty and is a well informed decision maker capable of evaluating alternatives and choosing that which gives the greatest relative utility (Birol and Cox 2007; Greiner, Bliemer, and Ballweg 2014). Here, it is therefore assumed that a farmer will choose one contract (A) over another contract (B) if $U(X_A, Y) > U(X_B, Y)$ where U represents the consumer's indirect utility function where X_A represents the attributes of alternative A, X_B represents the attributes of B, and Y represents personal (e.g. socio-demographic and attitudinal) and property (e.g. size, land productivity, farm profitability, ownership structure) characteristics influencing utility[1].

A discrete choice experiment is a stated preference method that can be used to estimate ex ante the effect of program attributes on participation in a conservation program among targeted populations (Greiner 2016), including estimating participant-assigned trade-offs between attributes and the economic compensation required to motivate participation in programs with differing characteristics (Parkhurst 2011; Ruto and Garrod 2009). Considering the trade-off between program attributes and payment provides an estimate of the cost of compliance (Colen et al. 2016). The use of a choice experiment also allows for consideration of the effect of farm and farmer characteristics and farmer behaviors and attributes such as those towards the environment on likelihood of enrollment and trade-offs between attributes (Schulz, Breustedt, and Latacz-Lohmann 2014; Colen et al. 2016).

Discrete choice experiments are particularly useful in identifying likely problem areas with contract design and attributes that are most likely to entice farmer-participation (Colen et al. 2016). They can provide policymakers with insight and can help eliminate the dilution of program effect that can occur when enrollees in the program include those who would have

[11] A reviewer pointed out the potential for strategic bias in choice experiments. Burton (2010) links strategic bias and incentive compatibility. He identifies criteria for incentive compatibility to be consequentiality and lack of an incentive to reveal other than true preferences. He evaluated the influence of task complexity on strategic bias in response. He finds that complexity such as use of ranking of choice sets adds complexity that makes it more difficulty to employ strategic bias but cautions that such complexity may mask revealing of true preferences.

adopted the required practice(s) even in the absence of the program by providing information ex ante. While Claassen, et al. (2014) finds the latter is more important for programs that provide payments for structures and other fixed cost activities such as developing a manure management program, they estimate approximately half of conservation incentive payments go for farmland wherein the practice would have been adopted in the absence of the program. Finally, while choice experiments cost money to conduct because they require collecting new data, they are relatively inexpensive for the value they provide (Colen et al. 2016). The method has been used in a number of studies to help in the design of conservation programs, including those for wetlands (e.g., see Greiner 2016; Schulz, Breustedt, and Latacz-Lohmann 2014; Christensen et al. 2011; Espinosa-Goded, Barreiro-Hurle, and Ruto 2010; Ruto and Garrod 2009; Birol and Cox 2007; Birol, Karousakis and Koundouri 2006; and Carlsson, Frykblom, and Liljenstolpe 2003).

3.3. Empirical Framework

In designing a choice experiment, the initial step is to choose relevant attributes and appropriate levels for these attributes for a good or service such that the stated preferences address pertinent issues or concerns (Nganje et al. 2008). Focus group discussions and consultations with experts as well as extensive pre-testing procedures can be used to assist in determining the right attributes and levels to use (Birol and Cox 2007). For the current study, attributes and levels used in the choice experiment were identified through an extensive review of literature on studies related to conservation and wetland management programs, a pre-test exercise with local farmers and discussions with partners at private conservation agencies as well as with local NRCS and Farm Services Agency (FSA) personnel, and economists at the USDA. The resulting attributes and levels chosen include payment, length of contract, terms of payment (fixed or mid-term adjusted), and three conservation cropping requirements are to be applied to the tract within which the wetland resides (table 1).

Table 1: Working Wetland Program attributes and levels used in the choice experiment

Attribute	Levels
Length of contract	5, 10 or 15 years
Annual Rental Payment, percentage of country rental rate in year of contract entry (NASS)	70%, 85%, 100%, or 110%
Terms	Fixed for length of contract or readjusted at midterm.
Annual use of no-till	required or not required
Planting and maintaining a cover crop once every three years	required or not required
Planting a winter cereal crop every fourth year	required or not required

A linear D-optimal design procedure (Optex) in SAS was used to create choice sets. This design is from the collective factorial, where the collective factorial is an L^{AC} factorial, where C is the number of alternatives with each having A attributes with L levels. Through this procedure, thirty choice sets with mutually exclusive and collectively exhaustive levels within each attribute were derived. Each respondent was presented with all choice sets with each having three different options including two different contracts and an opt out option. Respondents were asked to rank choice sets. The subsequent examples were provided to aid understanding among participants.

Consider the choice set shown here.

ATTRIBUTES	*OPTION A*	*OPTION B*	*OPTION C*
Length	*15 years*	*10 years*	
Payment	*70%*	*100%*	
Terms	*adjusted mid-term*	*adjusted mid-term*	*Opt Out*
No-till required	*Yes*	*No*	
Cover crops required	*No*	*Yes*	
Winter cereal required	*No*	*Yes*	
RANK			

Option A includes an annual payment reflecting 70% of the local rental price at the time of enrollment. It is a 15-year contract with a mid-contract rental payment adjustment (after seven years). No-till must be used on the tract where the wetland resides. Option B includes a higher annual payment, that equal to the rental price at the time of enrollment. It is a 10-year contract, with payment readjusted after 5 years. Producers are required to plant a winter cereal crop every fourth year and a cover crop every third year. Option C is not to enroll in a Working Wetlands Program contract.

If you prefer Option B over Option A, but would enroll in both, your rankings would be:

ATTRIBUTES	*OPTION A*	*OPTION B*	*OPTION C*
RANK	*2*	*1*	*3*

If you would enroll in Option B, but not Option A, the "no contract" option would be your second choice and your rankings would be:

.

ATTRIBUTES	*OPTION A*	*OPTION B*	*OPTION C*
RANK	*3*	*1*	*2*

To evaluate the individual preferences indicated by respondents in relation to the different attributes and characteristics of the choice set, an exploded logit model with no ties in ranking was employed. The exploded logit model has been used extensively in marketing research. It is a generalization of the familiar conditional logit regression model introduced by McFadden (1974). The exploded logit model is also known as the rank-ordered logit model in the economic literature. It was proposed by Beggs, Cardell, and Hausman (1981) and further advanced by Hausman and Ruud (1987).

For this study, respondents' assigned unique ranks to each item. It is assumed they ranked the J choice sets with Y_{ij} denoting the rank assigned to choice Y by respondent i. There are J alternatives per choice so Y_{ij} can take on integer values from 1 to J where "1" is the most preferred and "J" is the least preferred choice. According to the Random Utility Model (RUM) (Luce 1959; McFadden 1974; Allison and Christakis 1994), it is assumed respondent i has a utility U_{ij} for each choice j. In general, J can differ across respondents, but in this case, it is

assumed to be constant. From utility theory, we assume respondent i will rank, for example, choice *j* higher than choice *k* whenever $U_{ij} > U_{ik}$. Each utility U_{ij} consists of a systematic component μ_{ij} and random component ε_{ij}:

$$U_{ij} = \mu_{ij} + \varepsilon_{ij} \quad (1)$$

Where the random error term ε_{ij} is assumed to be independent and identically distributed with an extreme value distribution also known as the Gumbel or double exponential distribution. The systematic component (μ_{ij}) represents the set of explanatory variables which can be represented in as a linear function:

$$\mu_{ij} = \beta_j x_i + \gamma z_j + \theta w_{ij} \quad (2)$$

Where x, z, and w are column vectors of measured variables and β, γ, *and* θ are row vectors of coefficients to be estimated. The x_i vector contains variables that describe respondents but do not vary over choices and one of the β_j vectors must be set equal zero to achieve identification. The choice of the reference item is arbitrary. The z_j vector contains variables that vary across choices but are the same for all respondents. The w_{ij} vector contains variables that describe the relation between choice *j* and respondent *i* (i.e. interaction between characteristics of contracts and respondent's variables) (Allison and Christakis, 1994).

Equation (2) is a simple multinomial logit model if γ, θ are both 0 and a conditional logit model if θ is 0 and γ and β are nonzero. The exploded logit model is used here because an observed rank ordering of J choices may be regarded as an explosion into $J - 1$ independent observations such that $U_{i1} > U_{i2} > \ldots\ldots > U_{ij}$ gives rise to ($U_{i1} > U_{ij}$, $j=2,\ldots\ldots J$), ($U_{i2} > U_{ij}$, $j=3,\ldots J$),…($U_{i(J-1)} > U_{ij}$) (Salomon 2003). Data collected reflected this sequence where respondents were asked to rank choices with the highest preference chosen over other two choices, the second choice is chosen over the third after the first choice has been excluded from the choice set. The Independence from Irrelevant Alternatives (IIA) assumption implying that ε_{ij} terms are independent across choices makes this explosion possible (Allison and Christakis 1994). For a single respondent, the random utility model implies Equation 3.

$$L_i = \prod_{j=1}^{J} \left[\frac{exp\{\mu_{ij}\}}{\sum_{k=1}^{J} \delta_{ijk}\, exp\{\mu_{ik}\}} \right] \quad (3)$$

Where δ_{ijk}=1 if $Y_{ik} \geq Y_{ij}$, and 0 otherwise.

To estimate the exploded logit model, the maximum likelihood procedure for estimating proportional hazard models is employed (Allison and Christakis 1994). For a sample of n respondents, equation (3) implies a log likelihood of

$$\log L = \sum_{i=1}^{n} \sum_{j=1}^{Ji} \mu_{ij} - \sum_{i=1}^{n} \sum_{j=1}^{Ji} log \left[\sum_{k=1}^{Ji} \delta_{ijk}\, exp(\mu_{ik}) \right] \quad (4)$$

The linear model for μ_{ij} in equation (2) is substituted into equation (4) which is maximized with respect to the β_j coefficient vector. The likelihood is globally concave (Beggs, Cardell, and Hausman 1981). The PHREG procedure in SAS was used to estimate the model.

4. Results and Discussion

4.1. Farm Characteristics and Respondent Characteristics, Behaviors and Attitudes

Ninety-six individuals are enrolled in the Pilot WWP, covering 121 contracts. The 49 responses came from 30 unique zip codes. Seventy-four percent reported living on the farm and all but one indicated farming as their main occupation. USDA farm definitions used in the survey peak at what might consider a medium-sized North Dakota farm with 44% of respondents indicating a USDA-defined very large family farm (sales of $500,000 or more). Twenty-eight percent claimed sales of between $250,000 and $500,000. Most farmers (91.8%) reported owning at least part of the farm and being actively involved in operations. Twenty percent of total respondents rented some of their farmland. Ten percent owned the land enrolled in the program but were not actively involved in operations; six percent claimed participation in decision-making and four percent were not involved. Overall, 59% of respondents indicated they are the primary decision maker on the farm. Another 13.5% indicated they and another individual (either a relative or a renter) are the primary decision-makers.

Twenty-five percent of respondents reported running a cow/calf herd, with an average herd size of 201 cows, and a range of between 20 and 750 cows. Farmers were asked to indicate the primary crops raised on land containing their working wetlands. Most raise soybeans, wheat and corn. Barley is raised by 41%. Canola, sunflowers, flax, hay, field peas, edible beans, and oats are also raised by multiple respondents. The average farm size was 3,852 acres of which 1,731 are owned and 2,121 rented (table 2). The minimum for acres owned and acres rented in each category was zero, but the minimum number of acres overall was 470.

Table 2. Acreage and land use

	Acres owned		Acres rented	
	mean	percentage	mean	percentage
Crops and other non-hay commercial production	1,345	77.7	1,888	89.0
Pasture (grazed or hayed)	129	7.5	126	5.9
Pasture (idle)	9	0.5	0	0.0
CRP	101	5.8	17	0.8
Other Conservation Programs	39	2.3	25	1.2
Other idle land	108	6.2	65	3.1
Total Acres	1,731		2,121	

All but one respondent were male, and all but one respondent claimed white race. Respondent age categories in years by percentage are < 30 (12), 30 to 39 (26.5), 40 to 49 (16), 50 to 59 (31), 60 to 69 (20), and 70 or more (2). The average age is 48 years and the range is from 25 to 85 years. Eighty percent reported not working off the farm. Forty-nine percent of spouses do not work off the farm, 37% work full-time off the farm, and 15% work part-time off the farm. Average reported years until retirement was 16.3 although there was a range from 1 to 50. The percentages among the respondents are < 5 years (16.3); 5 to 9 years (16.3); 10 to 14 years (11.6); 15 to 19 years (7); and 20 years or more (48.8). Most respondents attended at least some college with 45% having obtained at least an Associate's Degree and 31% at least a Bachelor's Degree. Eighty percent of respondents claimed membership in Farmers Union, 38% in Farm Bureau, 22% in

Grain Growers and 7% in Stockman's Association.

Respondents indicated an average of 64 wetlands less than two acres in size and an average of 32 wetlands two acres or greater in size. The maximum number of reported wetlands was 356 (less than two acres) and 250 (two acres or greater in size). Farmers reported an average of 28% of their wetlands were dry in most years and 31% were generally not dry or never dry (table 3). They reported that an average of 44% of their wetlands were farmed, 41% were not used, 8% were grazed or hayed and 7% were used for other purposes. Among farmers who farm at least some of their wetlands, 82% of wetlands were farmed. Among those reporting not using at least some of their wetlands idle, the average percentage left idle is 80%.

Table 3. Disposition of working wetlands by respondents

	mean
Dry in most years	28
Dry in more years than not	12
Dry in about half of the years	15
Dry in less than half the years	14
Generally not dry or never dry	31

Farmers were asked about the specific conservation practices used on their farm. Most employ multiple practices from among the eight listed for their consideration, with an average of 3.4. Sixty-four percent practice minimum tillage and 62% percent practice no-till. Sixty-two percent plant cover crops and 58% used shelter belts. Wildlife food plots are planted by 19% and grass waterways are maintained by 19%. Farmers were also aware of conservation programs. A strong majority of respondents were aware of CRP general (98%) and continuous (93%) sign-up programs, EQIP (76%) and CSP (74%). A majority also reported being aware of CREP, FWP, and WRP. A fair number of producers reported participating in CRP general (39.5%) and continuous (34.9%) programs, EQIP (32.6%) and CSP (30.2%) during the past five years.

Twenty-two responding participants indicated they did not have an easement on their farm (50%). Eleven respondents (25%) indicated they had an easement and it had not changed the assessed farm value; and another eleven indicated they had an easement and it had decreased the assessed value of the farm (25%). No one responded they had an easement that increased assessed farm value.

We asked respondents to define in their own words what makes an area a wetland including mention of specific criteria in an open-ended question. Sixty-one percent mentioned the presence of water and 43% that it is an area wherein farming is restricted. Sixteen percent included vegetation (cattails) or particular soils and 11% a closed basin or depression. Seven percent said it was agency defined.

Respondents were asked to indicate the level of importance of a set of factors on their decision whether or not to participate in conservation programs in general where 1 = not very important; 5 = very important; and 0 indicates the factor does not affect their decision (table 4).

Table 4. Importance of factors influencing participation in conservation programs.

	Factor	Average	Not important	Least important	Neutral	Most important
Program Attributes	Level of payment received	4.8	0.0	0.0	2.1	97.9
	That payment is guaranteed	4.7	0.0	0.0	6.4	93.6
	Contract length	4.2	0.0	4.3	19.1	76.6
	Maintenance requirements	4.0	0.0	2.1	25.5	72.3
	Administrative process	2.9	8.9	20.0	40.0	31.1
Farm Specific	Machinery and equipment availability	3.1	11.6	11.6	39.5	37.2
	Preparation for transition out of farming	2.4	22.2	24.4	26.7	26.7
External Impact, Effect on:	Soil quality, erosion control	4.2	0.0	6.3	8.3	85.4
	Weed pressure	4.1	0.0	6.4	14.9	78.7
	Wildlife population	3.4	0.0	23.4	31.9	42.6
	Water quality	3.5	0.0	17.0	27.7	53.2
	Consistent with your views on land use	3.8	0.0	6.5	30.4	63.0
	Hunting opportunities	3.2	2.1	27.1	27.1	43.8
	Air quality	3.4	0.0	21.3	31.9	44.7
	Farm aesthetics	3.3	4.3	12.8	34.0	48.9
	Viability of the local area	3.0	2.2	32.6	34.8	30.4
	Neighbors	2.5	8.7	34.8	34.8	21.7

Nearly all *program attributes* were important including payment level, that payment is guaranteed, contract length and maintenance requirements. For each, a strong majority considered these factors most important. The administrative process was considered of average importance. Farm specific factors including machinery and equipment availability and preparation for transition out of farming were not considered as important to their decision. Importance of the external impacts of their participation were mixed. The two noted factors that most influence participation were related to productivity, including soil quality/erosion control and weed pressure. Considered of least (but average) importance were the effect on viability of the local area and neighbors.

We asked farmers to respond with their level of agreement to various statements about conservation (table 5). On average, farmers were in slight agreement that current conservation programs are effective. Regarding wetlands conservation, they were in slight agreement that information on wetland conservation is easily accessible. Seventy percent agreed that producer participation in the wetland program development process is very important; none disagreed. Regarding the Working Wetlands Program specifically, all agreed that they would not have enrolled in the program if they were not allowed to continue farming their wetlands when possible and two-thirds agreed that the terms of the program are a good fit for their land in the long run.

Table 5. Level of agreement with statements regarding conservation

	Average	Disagree	Neutral	Agree
Performance of Government Conservation Efforts				
Current conservation programs are effective.	3.5	6.5	30.4	63.0
Information on wetland conservation is easily accessible.	3.2	11.1	42.2	46.7
Working Wetlands Program				
I would not have enrolled in the Working Wetlands Program if I was not allowed to continue farming my wetlands when possible.	4.7	0.0	0.0	100.0
Producer participation in the wetland program development process is very important.	3.9	0.0	29.8	70.2
The terms of the Working Wetlands Program are a good fit for my land in the long run.	3.7	2.1	31.9	66.0
Regulation and Landowner Rights				
Farmers should be compensated when their land use choices benefit the environment.	4.3	0.0	8.5	91.5
The decision of how to use my land is my right as a landowner or farmer / rancher.	4.4	4.2	6.3	89.6
Landowners should be paid for maintaining wetlands.	4.3	0.0	12.8	87.2
There should be regulations to control the conversion of naturally-occurring wetlands to agricultural lands.	2.1	53.3	35.6	11.1
Wetland conservation should limit agricultural activities on private lands.	1.8	69.8	20.9	9.3
Landowner Responsibilities				
Promoting healthy ecosystems is part of my responsibility as a steward of the land.	4.1	0.0	18.4	81.6
Wetland Conservation				
The conservation of wetlands is very important.	3.3	10.6	42.6	46.8
It is important to protect wetlands on both private and public lands.	3.2	12.8	51.1	36.2
Conversion of wetlands must be stopped.	2.1	62.5	27.5	10.0
Role of Wetlands				
Wetlands are important to maintain wildlife in our area.	3.8	2.0	28.6	69.4
Small wetlands have benefits for my operation.	2.2	55.3	27.7	17.0

Most farmers agreed that the decision of how to use their land is their right and that they should be compensated when their land use choices benefit the environment, including maintaining wetlands. They also agreed that promoting healthy ecosystems is part of their responsibility as a steward of the land.

Agreement was moderate that the conservation of wetlands is very important with 47% agreeing and 43% neutral. Sixty-nine percent agreed that wetlands are important to maintain wildlife in their area. Only 36%, agreed that it is important to protect wetlands on both private and public lands (13% disagreed), 10% agreed that conversion of wetlands must be stopped (62.5% disagreed), and 17% agreed that small wetlands have benefits for their operation (55% disagreed).

Respondents were asked what they would like to stay the same and what they would like to see changed *about the Working Wetlands Program in particular*? A strong majority indicated that the program features, including the administrative process (93.3%), the payment rate (81.8%), maintenance requirements (88.9%), and contract length (93.5%) were acceptable as designed. Agreement was unanimous regarding the acceptability of permitted land us options (including annual cropping).

Suggestions for improvement of the administrative process included improved identification of enrolled wetlands on maps and that easements should not disqualify the land. Seventeen percent of respondents indicated a preference for a higher payment or one more in line with local cash rental rates, and one indicated larger wetlands should be considered. Regarding maintenance, five respondents indicated a preference for permitted managed burning. Regarding contract length, one respondent noted a preference to renew after the five year lease and one suggested a variable contract length. Two respondents suggested including larger wetlands and another that non-crop wetlands that are adjacent to a cropped field should be considered.

When asked by open-ended question why they enrolled in the WWP, thirty-one (of 46) responses directly (17 stated income or money) or indirectly (get something out of land I cannot farm, e.g.) (14) noted the payment was the motivator (69%). Seven mentioned wildlife or environmental motivators. Seven noted that the program was either administratively easy, did not have regulations incompatible with farming, and / or was a good program.

Farmers were asked, if they could do so without penalty or loss of eligibility for any program, what percentage of their program-qualifying working wetlands they would consider draining for farming. The average response was 54%. Twenty-two percent indicated they would drain 100% of their wetlands, 29% more than 75% and another 9% at least half. Seven percent stated they would not drain any of their wetlands, and 24% indicated they would drain less than 25%. Respondents were also asked, under conditions of no penalty, what factors would influence the decision whether to drain a particular wetland. Only approximately one-third of respondents answered this question with an answer other than none or that they cannot drain wetlands (17). Several had multiple responses with six (29%) noting whether it would improve farming efficiency; six noting the cost (financial, work or time); six noting whether it would cause downstream problems or affect neighbors; four noting the characteristics of the wetland itself (e.g., length it holds water, weed pressure, area); and two noting the opportunity cost of its existence.

Respondents were asked to indicate the policy options they identified as appropriate for wetlands conservation. A strong majority (93.5%) agreed that incentives are effective. An incentive program was ranked as the best option from among regulation, incentivized regulation, incentives, easements, technical assistance and voluntary and educational programs by over three-fourths of respondents. 77%. Technical assistance (88%) and voluntary and educational programs (87%) were also widely accepted.

4.2. Model Estimation Results

Each respondent was asked to rank 30 choice sets, each consisting of three alternatives: two hypothetical WWP enrollment options with varied contract attributes, and an "opt out" or "no contract" option. A summary of estimation results of the exploded logit model is shown (table 6). A total of 3,045 observations were included in the final model. The model fit statistic shows a good fit with a McFadden Pseudo R^2 (ρ^2) of 0.269. The ρ^2 value tends to be lower than the R-squared because it cannot be calculated to minimize variance as in OLS models. Values between 0.2 and 0.4 are considered highly satisfactory. The logistic regression model estimates maximum likelihood coefficients and ρ^2 shows a proportion reduction in error variance (Louviere et al. 2010).

$$McFadden\ Pseudo\ R^2\ (\rho^2) = 1 - \frac{LnL}{LnLo} \quad (5)$$

Where L_nL is the log likelihood for the estimated model and L_nL_o is log likelihood of the model with only the intercept.

Working Wetlands Program contract Option A and Option B have negative and nearly equal parameter estimates indicating that farmers find a negative utility associated with signing a contract. The negative parameter estimates are, on the surface, counterintuitive because each of the respondents voluntarily enrolled in the WWP. However, the disutility from enrollment is generally overcome from the benefits provided as reflected in the estimate on contract attributes. Part of the negative utility may also be because including production requirements in the contract changed perceptions about the nature of the program from non-invasive to one that may evolve into one including production requirements. That is, including the possibility of regulation not currently associated with the program may have made it less attractive. While each of the production requirements are represented by independent attribute variables and their interaction terms in the estimation, subsequent discussions with producers indicate concern about a slippery-slope such that the very possibility / mention of multiple production requirements may discount the value of the program. That is a hypothesis that can be tested in later work by including only choice sets without production requirements in those presented to some participants.

The parameter estimate on the payment attribute is positive. As expected, farmers prefer a higher payment. The effect is greater for those with cow/calf herds as reflected in the positive parameter estimate on the interaction term between ranchers (COWS) and the payment attribute. The parameter estimate on the terms attribute is positive. Farmers find more utility with a mid-term adjusted payment than one with a fixed payment, presumably because, until most recently under low commodity prices, land rental rates traditionally increase but rarely decrease. The sign on the contract length parameter estimate is negative as is consistent with the literature. However, this was somewhat surprising because the design of the current program does not assign a penalty for early program exit. In this way, the program is like an option where it can be maintained to provide financial support if it is the best alternative, but is not binding as is the case for CRP which has a substantial penalty for early withdrawal.

Table 6: Maximum likelihood estimates

Parameter	Parameter Estimate	Standard Error	Chi-Square	Pr > ChiSq	Hazard Ratio
Option A	-2.8633	1.1936	5.7543	0.0164	0.0570
Option B	-2.2121	1.1963	3.4189	0.0645	0.1090
Attribute Years	-0.0449	0.0121	13.8987	0.0002	0.9560
Attribute Payment	0.0748	0.0099	56.6262	<.0001	1.0780
Attribute Terms	0.5123	0.2498	4.2067	0.0403	1.6690
Attribute No-till	-2.4475	0.3108	62.0142	<.0001	0.0870
Attribute Cover Crop	-1.5047	0.3037	24.5451	<.0001	0.2220
Attribute Winter Cereals	-2.4651	0.3312	55.4120	<.0001	0.0850
Cows*Attribute payment	0.0139	0.0025	30.5232	<.0001	1.0140
Live on Farm	1.0574	0.2389	19.5910	<.0001	2.8790
Small Farm	0.7279	0.3077	5.6735	0.0224	2.0785
Large Farm	0.9112	0.2445	13.8908	0.0002	2.4875
No-till	1.8528	0.2885	41.2769	<.0001	6.3875
Food Plot	-0.5345	0.2558	4.3653	0.0367	0.5860
Importance WQ	0.9822	0.2439	16.2322	0.0001	2.6725
Importance Neighbor	-0.2096	0.1016	4.2574	0.0392	0.8110
Small Wetlands Benefit	-0.7733	0.1310	34.8936	<.0001	0.4615
Program Good Fit	0.6265	0.1863	11.3033	0.0008	1.8710
Cons. Wetlands Import.	1.2566	0.2043	37.9556	<.0001	3.5275
Import. Protect Wetlands	-0.9758	0.2140	20.8412	<.0001	0.3775
Producer Partic. Import.	-1.6246	0.2167	56.3317	<.0001	0.1975
Maintenance Req. Good	0.6182	0.2995	4.3254	0.0456	1.8615
Drain 0	-2.1982	0.3586	37.6062	<.0001	0.1115
Drain Under 25%	-1.3258	0.2210	36.0743	<.0001	0.2665
Import WQ * Attribute payment	-0.0111	0.0026	18.4637	<.0001	0.9890
Import WQ * Attribute terms	-0.1262	0.0665	3.6033	0.0577	0.8810
Import WQ * Attribute no-till	0.3298	0.0791	17.3837	<.0001	1.3910
Import WQ * Attribute cover crops	0.1774	0.0759	5.4594	0.0195	1.1940
Import WQ * Attribute Winter cereals	0.4012	0.0849	22.3169	<.0001	1.4940
No-till * Attribute no-till	0.4960	0.1846	7.2208	0.0072	1.6420
No-till * Attribute cover crops	-0.2872	0.1769	2.6369	0.1044	0.7500
No till * Attribute winter cereals	-0.4002	0.1924	4.3249	0.0376	0.6700
Cover crops * Attribute cover crops	0.4336	0.1643	6.9638	0.0083	1.5430

Three attributes of the contracts depicted in the choice sets represented requirements for conservation farming within which wetlands reside. These include annual use of no-till, planting and maintaining a cover crop once every three years and planting a winter cereal crop every fourth year. These requirements are not part of the Pilot WWP. Each of the production requirement terms had a negative coefficient indicating that including these requirements reduces likelihood of enrollment.

Those farmers practicing no-till are more likely to participate in the program as indicated by the positive parameter estimate. However, the interaction term defining those farmers who practice no till and both the cover crops requirement and the winter cereals requirement is negative. That is, adding a conservation practice requirement to the contract other than no-till lessens the value of the contract for farmers already practicing no-till. However, the interaction term between the no-till attribute and no-till farmers and that between the cover crops requirement attribute and those farmers already growing cover crops both have positive parameter estimates, suggesting that the disutility associated with these practices as required is lessened if the farmer is already employing them on at least some of their acres.

As expected, farmers who more strongly agreed with the statement that the terms of the WWP are a good fit for their land and those who were satisfied with the maintenance requirements associated with the program were more likely to enroll in the program as were those who more strongly agreed that conservation of wetlands is very important.

Farm size affected utility associated with the WWP with those operating small farms (less than 1761 acres) and large farms (between 3,450 and 5,855 acres) more likely to participate in the program. Operators who live on the farm were more likely to choose the contract than those who lived either in town or rurally, but not on the farm.

Negative parameter estimates include those with food plots, who find more important the external impact on neighbors in their decision on participating in conservation programs in general, those who more strongly agree that small wetlands have benefits for their operations (RSWB), that it is important to protect wetlands on both private and public lands, and that producer participation in the program development process is very important. Those producers who would consider draining none or less than 25% of their working wetlands if they could do so without penalty are also less likely to enroll in the program. From these factors it can be generally stated that those farmers who assign more value to conservation efforts and who are less likely to drain their wetlands in the absence of foregoing government payments are less inclined to enroll in the program. The exception, as noted above, is that those who more strongly agreed that conservation of wetlands is very important were *more likely* to enroll.

The parameter estimate on the importance assigned to water quality is positive suggesting that farmers who find more important the impact on water quality in their decision about participating in conservation programs are more likely to enroll in the program. However, parameter estimates are negative for the interaction terms between the assigned importance of the impact on water quality in the decision to participate in conservation programs in general and both the Payment Attribute and the Terms Attribute. That is, the positive impact of a higher payment and mid-term adjustment was partially mitigated for those who considered the effect on water quality more important in their choice of conservation program participation. The parameter estimates associated with the interaction terms between the importance of the impact on water quality and each of the three conservation practice requirements attributes of the WWP, no-till, cover crops, and winter cereals was positive. This is also mitigating in that the negative utility associated with required conservation practices attributes of the contract was less for those farmers who consider more important the impact of conservation practices on water quality during the selection process.

4.3. Marginal Effects

Results from the estimate are used to examine the effect of program attributes, farm and farmer characteristics and farmer attitudes on the decision of a farm operator to enroll in the WWP. Marginal effects are estimated for the independent variables used in the model to explain the change in enrollment probability when independent variables increase by one unit (Torres-Rayna 2014) (table 7). Two base cases are defined by majority characteristics when the independent variable is a discrete qualifier (raise cows, live on the farm, have a small farm, have a large farm, use no-till or cover crops on at least some of their acreage, plant food plots, are satisfied with the maintenance requirement of the WWP, and would drain either zero or less than 25% of their wetlands if they were not restricted from doing so under conservation compliance). For continuous variables, the base case is defined by the average response. These variables include importance assigned by producer to factors when choosing whether to enroll in conservation program in general (effect on neighbors and on water quality) and level of agreement with various statements associated with conservation and conservation programs.

Table 7. Base case values

Parameter	Base Case Value
Constant	-2.8633
Attribute Years	10
Attribute Payment	100
Attribute Terms	1 (CASE 1), 0 (CASE 2)
Attribute No-till	1 (CASE 1), 0 (CASE 2)
Attribute Cover Crop	1 (CASE 1), 0 (CASE 2)
Attribute Winter Cereals	1 (CASE 1), 0 (CASE 2)
Cows	0
Live on Farm	1
Small Farm	0
Large Farm	0
No-till	1
Food Plot	0
Importance WQ	3.5
Importance Neighbor	2.5
Small Wetlands Benefit[1]	0.39
Program Good Fit[2]	0.73
Cons. Wetlands Import.	3.4
Import. Protect Wetlands	3.2
Producer Partic. Import.	3.9
Maintenance Req. Good	1
Drain 0	0
Drain Under 25%	0

[1.] Small wetlands have benefits for my operation was recoded to disagree=0, neutral=1, agree=2.
[2.] Terms of WWP are a good fit for my land was recoded to neutral=0, agree=1, strongly Agree=2.
Discrete change in the probability of enrolling in the WWP for dummy variables was determined by changing the dummy value from zero to one or one to zero, depending on the value in the base contract and changing continuous variables by 1 (year, payment) or 0.1 (attitudinal questions). Marginal effects were calculated using two base case scenarios. They differ only by assumptions for the program attribute 'terms' and the conservation practice requirements. The first starts with a 10-year contract including mid-term adjusted payments based on 100% of the NASS-reported annual rental rate and requiring each of the three conservation practices (no-till, cover crops and winter cereals). Under this base case (CASE 1), there is a 26.5% likelihood of enrollment for the farmer. Marginal effects are also calculated from a base case that includes fixed payments and no conservation requirements (CASE 2). For this base case, the likelihood of enrollment is 87.0%.

Equation 6 is used to estimate the probability of enrollment[2].

$$(P_{enroll}) = \frac{exp(Venroll)}{1+exp(Venroll)} \quad (6)$$

Marginal effects were determined using the Krinsky and Robb method (Krinsky and Robb 1986). This method is based on the assumption that the estimators of the model parameters are consistent and have an asymptotically normal multivariate distribution. Multiple vectors of β =

[2] Baseline if conservation attributes and terms are 0 = 0.870473233. Baseline if conservation attributes and terms are 1 = 0.265067227.

β_s, S = 1….S coefficients are drawn from the multivariate normal distribution that has a mean vector equal to the estimated coefficient vector $\hat{\beta}$ and the same estimated variance-covariance matrix as $\widehat{\epsilon}$. New vectors for each coefficient β_s are used to derive a new value of $f(x_i,\hat{\beta})$ (Dowd, Greene and Norton 2014).

4.3.1. Base Case 1

Under Case I, there is a 26.5% probability of enrollment for the farmer. Marginal effects of contract attributes are as expected given the parameter estimates (table 8). Around the base case, an additional year of the contract reduces likelihood of enrollment by 0.86%. A 1% increase in payment increases likelihood of participation by 1%. Changing the terms from a mid-term adjusted to a fixed payment contract did not affect likelihood of enrollment. When a conservation requirement was removed from the contact it increased the likelihood of enrollment as follows: no-till, 17.8%; cover crops, 16.3%, and winter cereals, 34.0%.

Regarding farm characteristics, those with cows are 32% more likely to enroll than a farmer without livestock, and those that do not live on the farm are 15% less likely to enroll. Those with small (16.2%) or large (20.6%) farms are more likely to enroll. Those who do not grow cover crops were 7.5% less likely to enroll and those not practicing no-till were 20.0% less likely to enroll. Farmers planting a food plot are 9.0% less likely to enroll than those not doing so.

Level of farmer-reported importance on a five-point Likert scale of two factors on their decision to enroll in conservation programs decreased likelihood of enrollment. A 0.1 increase in level of importance assigned to effect on water quality decreased likelihood of enrollment by 1.2%. A 0.1 increase in level of importance assigned to effect on neighbors decreased likelihood of enrollment by 0.4%.

Table 8. Marginal effects on the probability of enrollment (Base Case 1 defined with "1" for all three conservation requirements and mid-term adjusted payments).

Movement (from, to)	Variable	Average / levels	Base case	Marginal effect	0.025 upper	0.025 lower
0, 1	COWS	0.245	0	0.3226	0.4355	0.2024
10, 11	Attribute Years	5, 10, 15	10	-0.0086	-0.0038	-0.0139
100, 101	Attribute Payment	70, 85, 100, 110	100	0.0100	0.0089	0.0052
1, 0	Attribute Terms	0, 1	1	-0.0100	0.0179	-0.0462
1, 0	Attribute No-till	0, 1	1	0.1777	0.2272	0.1283
1, 0	Attribute Cover Crop	0, 1	1	0.1631	0.2177	0.1114
1, 0	Attribute Winter Cereals	0, 1	1	0.3401	0.3924	0.2866
1, 0	Live on Farm	0.73	1	-0.1500	-0.0908	-0.2253
0, 1	Small Farm	0.29	0	0.1621	0.2952	0.0372
0, 1	Large Farm	0.29	0	0.2065	0.3155	0.1020
1, 0	No-till	0.62	1	-0.2008	-0.1225	-0.2887
0, 1	Food Plot	0.19	0	-0.0896	-0.0151	-0.1642
3.5, 3.6	Importance WQ	3.5	3.5	-0.0124	-0.0076	-0.0177
2.5, 2.6	Importance Neighbor	2.5	2.5	-0.0040	-0.0005	-0.0079
0.39, 0.49	Small Wetlands Benefit	0.39	0.39	-0.0147	-0.0097	-0.0202
0.73, 0.83	Program Good Fit	0.73	0.73	0.0124	0.0206	0.0053
3.3, 3.4	Cons. Wetlands Import.	3.3	3.3	0.0251	0.0343	0.0164
3.2, 3.3	Import. Protect Wetlands	3.2	3.2	-0.0186	-0.0103	-0.0281
3.9, 4.0	Producer Partic. Import.	3.9	3.9	-0.0303	-0.0206	-0.0412
1, 0	Maintenance Req. Good	0.89	1	-0.1002	-0.0137	-0.1879
0, 1	Drain 0	0.06	0	-0.2269	-0.1547	-0.3089
0, 1	Drain Under 25%	0.39	0	-0.1781	-0.1145	-0.2520
1, 0	Cover Crops	0.62	1	-0.0752	-0.0205	-0.1321

Level of farmer-reported agreement with conservation statements affected likelihood of enrollment. Two statements were categorized with a three point scale. Regarding the statement small wetlands have benefits for my operation, the three Likert-scale categories were 0 to 2 reflecting disagree, neutral and agree. A 0.1 increase in agreement that small wetlands have benefits for my operation decreased likelihood of enrollment by 1.5%[3]. A 0.1 increase in level of agreement that the WWP is a good fit for my operation in the long run is associated with

[3] Regarding the statement small wetlands have benefits for my operation, the three Likert-scale categories were 0 to 2 reflecting disagree, neutral and agree. For the statement the WWP is a good fit for my operation, the three-point Likert-scale categories were 0 to 2 representing neutral, agree, and strongly agree, respectively.

increased enrollment likelihood of 1.2%. Farmers who were not satisfied with the maintenance requirements of the WWP were 10% less likely to enroll.

Three other statements are reflected on a five point Likert-scale. An increase of 0.1 in agreement that the conservation of wetlands is important increases likelihood of enrollment by 2.5%. An increase of 0.1 in agreement that it is important to protect wetlands on private and public lands decreases enrollment by 1.9%. An increase of 0.1 in agreement that producer participation is important in the development of programs decreases likelihood by 3%. Finally, farmers who reported that they would not drain any of their wetlands even if allowed were 22.7% less likely to enroll. Those who would drain some, but less than 25% were 17.8% less likely.

4.3.2. *Base Case 2*

Under Case 2, the probability of enrollment is 87.0%. Marginal changes in contract attributes have the expected effect given the parameter estimates (table 9). Around the base case, an additional year of the contract reduces likelihood of enrollment by 0.5% (slightly less than for Base Case 1). A 1% increase in payment increases the likelihood of participation by 0.4% (less). Changing the terms from a mid-term adjusted to a fixed payment contract did not affect likelihood of enrollment (same). When any one of the conservation requirements is added to the contact it decreases the likelihood of enrollment as follows: no-till, 11.9% (less); cover crops, 19.5% (more); and winter cereals, 26.0% (less).

Regarding farm characteristics, those with cows are 9.4% more likely to enroll than a farmer without livestock (much less), and those that do not live on the farm are 17.2% less likely to enroll (slightly more). Those with small (6.2%) (less) or large (7.3%) (much less) farms are more likely to enroll than those with very large farms. Those not practicing no-till were 35.6% (much more) less likely to enroll than those who did. Farmers planting a food plot are 7.5% (about same) less likely to enroll than those not doing so.

Level of farmer-reported importance on a five-point Likert scale of two factors on their decision to enroll in conservation programs decreased likelihood of enrollment. A 0.1 increase in level of importance assigned to effect on water quality decreased likelihood of enrollment by 0.14% (much, much less). A 0.1 increase in level of importance assigned to effect on neighbors decreased likelihood of enrollment by 0.24% (less). Level of farmer-reported agreement with conservation statements affected likelihood of enrollment. Two statements were categorized with a three-point scale as previously described. A 0.1 increase in agreement with the statement that small wetlands have benefits for my operation decreased likelihood of enrollment by 0.9% (less). For the statement the WWP is a good fit for my operation, a 0.1 increase in level of agreement is associated with increased enrollment likelihood of 0.69% (less). Farmers who were not satisfied with the maintenance requirements of the WWP were 8.7% less likely to enroll (slightly less).

Table 9. Marginal effects on the probability of enrollment (Base Case 2 defined with "0" for all three conservation requirements and mid-term adjusted payments).

Movement (from, to)	Variable	Average / levels	Base case	Marginal effect	0.025 upper bound	0.025 lower bound
0, 1	COWS	0.245	0	0.0940	0.1343	0.0608
10, 11	Attribute Years	5, 10, 15	10	-0.0052	-0.0022	-0.0088
100, 101	Attribute Payment	70, 85, 100, 110	100	0.0040	0.0054	0.0029
0, 1	Attribute Terms	0, 1	1	0.0077	0.0263	-0.0107
0, 1	Attribute No-till	0, 1	1	-0.1186	-0.0815	-0.1606
0, 1	Attribute Cover Crop	0, 1	1	-0.1954	-0.1293	-0.2724
0, 1	Attribute Winter Cereals	0, 1	1	-0.2604	-0.2034	-0.3204
1, 0	Live on Farm	0.73	1	-0.1717	-0.0917	-0.2619
0, 1	Small Farm	0.29	0	0.0618	0.1083	0.0171
0, 1	Large Farm	0.29	0	0.0732	0.1159	0.0376
1, 0	No-till	0.62	1	-0.3562	-0.2402	-0.4734
0, 1	Food Plot	0.19	0	-0.0751	-0.0107	-0.1548
3.5, 3.6	Importance WQ	3.5	3.5	-0.0014	0.0011	-0.0041
2.5, 2.6	Importance Neighbor	2.5	2.5	-0.0024	-0.0003	-0.0047
0.39, 0.49	Small Wetlands Benefit	0.39	0.39	-0.0090	-0.0056	-0.0132
0.73, 0.83	Program Good Fit	0.73	0.73	0.0069	0.0108	0.0034
3.3, 3.4	Cons. Wetlands Import.	3.3	3.3	0.0136	0.0195	0.0086
3.2, 3.3	Import. Protect Wetlands	3.2	3.2	-0.0114	-0.0070	-0.0166
3.9, 4.0	Producer Partic. Import.	3.9	3.9	-0.0194	-0.0135	-0.0264
1, 0	Maintenance Req. Good	0.89	1	-0.0875	-0.0103	-0.1781
0, 1	Drain 0	0.06	0	-0.4401	-0.2880	-0.5800
0, 1	Drain Under 25%	0.39	0	-0.2290	-0.1540	-0.3110

Three other statement statements are reflected on a five point Likert-scale. An increase of 0.1 in agreement that the conservation of wetlands is important increases likelihood of enrollment by 1.4% (less). An increase of 0.1 in agreement that it is important to protect wetlands on private and public lands decreases enrollment by 1.4% (less). An increase of 0.1 in agreement that producer participation is important in the development of programs decreases likelihood by 1.9% (less). Finally, farmers who reported that they would not drain any of their wetlands even if allowed were 44% less likely to enroll (much more). Those who would drain some, but less than 25% were 22.9% less likely (more).

4.3.3. *Trade-offs*

Estimating the marginal effect allows us to determine the tradeoff between payment and other program attributes. Trade-off indicates what percentage increase in payment is required to adjust the contract so that likelihood of enrollment does not change. The independent addition of a conservation practice requirement increases required payment as a percentage of the local NASS rental rate for like soil profile land. For Base Case 2, for the no-till conservation requirement, payment would need to increase 22%; for cover crops, 20.5%; and for winter cereals, 40.5%. If contract length was reduced by one year, the payment could decrease to 99% of its level. If terms were changed from fixed payment to mid-term adjusted payment, a payment of 98% of the base level would result in an equal likelihood of enrollment.

5. Discussion and Implications

Given the number of available farm and farmer characteristics and the literature which identifies several of them as important in making conservation program or practice decisions, we were surprised that only residence of farmer, farm size, whether the farmer was a rancher, and production practices of no-till, cover crops and planting a food plot significantly contributed to the model. The remaining variables specified the contract or were attitudinal or behavioral in nature including factors important when the farmer makes conservation program enrollment decisions, their thoughts on conservation and conservation programs, and what percentage of their wetlands they would drain if allowed to do so without penalty.

There were two base-case models estimated. This was because the marginal effects of the conservation requirement attributes were quite large, there were several interactive terms including the contract attributes representing conservation production requirements that were significant in the model, and the resulting condition was that the likelihood of enrollment was very different between a base case including a contract that began with the conservation requirements and one that did not. While the estimates are different for most of the variables and considerably so for the farmer characteristic of rancher and for the conservation practice requirements, the signs of the marginal effects are the same for each model.

Starting with contract attributes, previous literature in general finds that farmers prefer shorter contracts. However, we expected farmers would prefer longer contracts in the case of the WWP. The pilot program as currently offered provides annual payments and the opportunity to opt out of the program at any time without penalty. There was no additional / revised contract information to indicate this would be different in the hypothetical program options. As such, the contract serves as an option for its length. However, here, as in the literature, likelihood of enrollment increases with shorter contract lengths. There are at least two possible explanations for this in the current case. One is that the program is still in its pilot phase and, because of other differences that resulted in a stricter contract, i.e., the conservation practice requirements, farmers assumed this program would have an enforced length-of-contract (with penalty). Another is that, because this was during their first year of enrollment, they otherwise are not convinced the program will bring them long-run benefit. We hypothesize the former because the latter is inconsistent with respondents' general level of agreement that the WWP is a good fit for their land in the long run.

As expected, payment has a positive effect on the likelihood of enrollment. We expected that providing farmers a payment option that allows re-adjustment to reflect changes in local rental rates would also increase the probability of enrollment. The parameter estimate on Terms, indicating a change from a fixed payment to a mid-term adjusted payment, was significant and of the expected sign, but the marginal effect was not significant. The positive effect is consistent with a general belief that land values and rental rates will only move upwards, but not with the reality of decreasing farmland values recently under lower commodity prices in the pilot state of North Dakota. The timing of the survey may have tempered what otherwise would be a generally bullish outlook on land prices and hence rental rates.

Additional conservation production requirements have relatively large negative effects on the probability of enrollment, implying that farm operators enrolled in the WWP are not interested in contractually-required adoption of these practices. Sixty-two percent of respondents indicated they practice no-till on at least part of their acres; 62% reported using cover crops; and 64% reported using minimum till, i.e., conservation tillage and cover practices are used on a majority of participant farms. The specific tracts on which the wetlands lie may not, however, be well amenable to these practices. It is vital to understand the source of producer resistance should production requirements be considered for inclusion in the program at any point. For example, it would be useful to understand if the aversion is to regulation associated with how to farm in general or due to equipment misalignment or other farm-specific situations. The negative effect of the no-till requirement was moderated for those who already used no-till at least to some extent in their operation; the same was true for cover crops, as the negative effect of a cover crops production requirement was moderated for those who already planted cover crops. However, among farmers already planting no-till, there was an even greater negative effect associated with a cover crops or winter cereals requirement.

As noted, the only farmer-specific characteristic selected for final inclusion in the model is whether the farmer lives on the farm. Age, education level, participation in agricultural or conservation interest groups, off-farm employment, and years to retirement were not significant and their inclusion did not change parameter estimates. From the literature which in general shows that older farmers are less responsive to changes and a broad range of conservation practices, we expected that age would be significant in some form or as part of an interaction term. Onianwa, Wheelock, and Hendrix (1999) attributes older farmers being less interested in conservation adoption in part to higher educational levels, better understanding of practices and lower levels of risk aversion among younger farmers. We also expected education level to affect likelihood of enrollment or the marginal effect of program attributes. Several individual studies, a meta-study, and two published summary literature reviews identified education as positively associated with conservation practice and program adoption rates (e.g., see Prokopy et al. 2008; Tosakana et al. 2010; Abdulla 2009 and Parkhurst 2011; Lesch and Wachenheim 2014). Abdulla (2011) hypothesized the positive impact of education to be due to an associated increased ability to obtain, analyze and use available information about conservation technologies. In the current study, however, education was not a significant factor. Race and gender were not included in the current model because there was only one farmer who was not a member of the majority category for each.

Those with small and large farms and those who used no-till to some extent were more likely to enroll in the program[4]. Farmers who one might define as more conservation-minded with regards to wetlands as defined as more strongly agreeing that small wetlands benefit their operation and that it is important to protect wetlands, and those who would drain none of their wetlands or less than 25% if allowed to do so without penalty were less likely to enroll in the program. If this applies more generally to farmers throughout the PPR, this would be welcome news from a budgetary perspective because it would allow for a more targeted conservation program wherein payments would accrue to those acres that are in greater danger of contributing to wetland loss but where the producer would not adopt the conservation practice if not for program incentives. As such, it fits the targeted wetland philosophy described by Arbuckle (2012), Ribaudo (2015), and Claassen, et al. (2014) wherein the goal of conservation funding would be to target funding to prompt adoption of conservation practices.

As expected, those that consider more important the effect of a program on water quality, those that identified the program as a good fit for their operation in the long run, and those who were satisfied with the maintenance requirements of the program were more likely to enroll. The importance placed on water quality had a moderating effect on the positive influence of payment on likelihood to enroll and on the negative influence of each of the three production requirements (no-till, cover crops, and winter cereals). In other words, those who rated the importance of effect on water quality in their conservation decisions had less of a positive response to increases in price, and less of a negative response to conservation practice requirements as part of the contract design.

6. Summary, Conclusion and Recommendations

6.1. Summary

Conservation programs have been an evolving part of U.S farm legislation since the 1930s. They are traditionally grouped into two categories: land retirement programs (e.g. CRP, WRP) and working lands programs (e.g. EQIP, CSP). Focus has concentrated on land retirement programs where land is removed more or less completely from agricultural production to reduce the supply of agricultural commodities and meet conservation objectives. These programs are voluntary with fixed contract length or permanent easements, allow farmers to retain land ownership, support commodity prices and contribute towards wildlife habitat. Overtime, attention has gradually shifted to working lands programs. These programs provide cost-share, payments and / or technical assistance to farmers in exchange for adopting conservation practices on active agricultural lands. They bridge the gap between environmental protection and agricultural production.

Land retirement programs have remained as the predominant policy solution to wetland presentation. Wetlands are a vital part of the American landscape, providing many valuable services through the recharge and purification of groundwater, recreational opportunities, protection from flooding and as source of food and wildlife habitat. USDA and other government agencies, and non-government organizations have partnered with one another and with

[4] Note that percentages are: small (21.7%), medium (32.6%), large (32.6%) and very large (13%)

landowners to help restore and maintain these wetlands as well as promote their usage in ways that best support the environment; yet wetlands continue to be degraded by human activity. The main objective of this study was to investigate farmer preferences for a pilot working lands program introduced in the PPR of North Dakota. The program, referred to as the Pilot Working Wetlands Program, was designed to test a new concept in the conservation of small wetlands existing within croplands. The program recognizes that the targeted small temporary wetlands are important elements in duck production, provide habitat for species and reduce flooding in North Dakota. It also affirms that their presence on agricultural lands can decrease seeded acres and yield and many producers retaining wetlands are providing a positive externality as they accept lower farm income or higher input costs so as to maintain wetlands on their private lands. The WWP compensates producers for this societal benefit. This study was designed to gauge farmer preferences for the program and help us understand producer perception and attitudes towards conservation programs in general and how they make their adoption decisions regarding conservation practices and programs. This information is of considerable use to policy makers as they evaluate and refine the program.

Questionnaires were mailed to 96 farmer-participants in the Pilot WWP. Forty-nine responded, representing 52% response rate. Participant farmers are in general aware of most federal conservation programs but their participation in these programs is not extraordinary. Farmers attributed a high level of importance to program specific factors including level of payment, that the payment is guaranteed, contract length and maintenance requirements and external factors likely to impact farmland quality (soil quality and erosion control, weed pressure) when deciding whether to participate in conservation programs. All participants agreed that they would not have enrolled in the WWP if they were not allowed to continue to farm their wetlands when possible. This is coupled with a low level of agreement that small wetlands have benefits to their operation (only 17% agreed) and only moderate agreement that it is important to protect wetlands on both public and private lands (36% agreed). Further, participants resoundingly agreed that landowners should hold the right to decide how to use their private lands and should be compensated when their land use choices benefit the environment, including maintaining wetlands. In general, respondents disagreed it is necessary to stop the conversion of wetlands and that wetland conservation should limit agricultural activities on private lands.

Regarding the WWP, most farmers were satisfied with the current administrative process, payment rate, maintenance requirement, permitted land use options and contract length. One in five participants had input regarding the program. Some recommendations included increased payments, allowance for occasional burning, consideration of larger wetlands for eligibility, and changes in the maps used to identify enrolled wetlands. Seventy-percent agreed producer participation in the WWP development process is important.

A stated preference discrete choice experiment involving hypothetical program choice sets was used to elicit information about the value of program attributes among farmers who voluntarily signed up to participate in the pilot WWP. Respondents were asked to rank the choice sets as per their preference. Choices were analyzed using an exploded logit model. The contract attribute terms, indicating a fixed or mid-term adjusted contract, had the expected positive parameter estimate (preference for mid-term adjustment), but the marginal effect at either base case considered was not significant. The parameter estimate on years was negative as is consistent

with the literature, but not our ex ante expectation. We expected an increase in contract length to increase likelihood of enrollment because the program does not impose a penalty for early termination of the contract by the participants. Payment rate had an important influence in the expected direction. Farmers require a relatively high financial incentive to participate in the program. This was surprising given lack of production constraints associated with the current contract. Ranchers were more responsive to increases in payment rate than were farmers without cows. Production requirements of no-till, planting of cover crops, and planting of winter cereals each had a relatively large negative impact on likelihood to enroll in a hypothetical version of the WWP. The negative effect of the no-till requirement was moderated for those who already used no-till at least to some extent in their operation; the same was true for cover crops, as the negative effect of a cover crops production requirement was moderated for those who already planted cover crops. However, among farmers already planning no-till, the negative effect of a cover crops or winter cereals requirement was even greater.

Farmers living on their farm and those with small and large farms and those using no-till in some part of their operation were more likely to enroll in the program. Farmers who one might define as more conservation-minded with regards to wetlands as defined as more strongly agreeing that small wetlands benefit their operation and that it is important to protect wetlands, and those who would drain none of their wetlands or less than 25% if allowed to do so without penalty were less likely to enroll in the program. If this applies more generally to farmers throughout the PPR, this would be welcome news from a budgetary perspective because it would allow for a more targeted conservation program wherein payments would accrue to those acres that are in greater danger of contributing to wetland loss (e.g., see Arbuckle 2012).

As expected, those that consider more important the effect of a program on water quality, those that identified the WWP program as a good fit for their operation in the long run, and those who were satisfied with the maintenance requirements of the WWP program were more likely to enroll. The importance placed on water quality had a moderating effect on the positive influence of payment on likelihood to enroll and on the negative influence of each of the three production requirements (no-till, cover crops, and winter cereals).

6.2. Recommendations

From the literature and as supported by the current study, several recommendations arise.

First, it is important to understand the decision-maker and his decision-making process. Conservation practice or program enrollment will be influenced by a number of factors in addition to financial impact. Those involved in the policy-making process and those who influence them are wise to understand them and how they influence the attractiveness of various policy alternatives under particular conditions. While farmer preferences will be context dependent, i.e., individual studies like the current one may be of somewhat limited value when considered alone (Ruto and Garrod 2009), information in this area is still generally at least additive in its value for conservation policy consideration. See more about this below in the discussion about productivist farmers.

Second, new policy development should focus on policy options with a targeted approach; one where high payoff acres are targeted with effective conservation measures *for those acres* and where the employment of conservation practices are less likely. The latter, the concept of additionality; that the payment will cause a change in behavior, is particularly difficult to predict because once a payment is provided, it becomes impossible to determine what the farmer would have done in the absence of such (Claassen, et al. 2014). Arbuckle's (2013) research supports that farmers are accepting of a targeted approach, especially those who are aware of and concerned about conservation issues and who are already in a longer-term program (in that case, CRP). It will take additional political capital to move any novel program to fruition, and this will be especially true when it provides for some and not others (i.e., is targeted). However, as the steward of the volume of taxpayer dollars designated to benefit the environment through conservation agriculture, we are responsible in as much as we can cost-effectively do so to make sure we at least understand its highest and best use. The role of equity in distribution remains a normative question that will be answered politically, but we can ensure our policymakers have good information by which to do so. The proposed Working Wetlands Program is one that deserves consideration.

Third, continue to educate farmers about conservation and the conservation options available to them. The literature supports that farmers who are better informed about conservation practices and their influence on the environment and on their own operation are more likely to adopt. Consider novel means to distribute information and enhance knowledge including social media, demonstration acres by farmers who have high visibility, and making every effort to reward conservation behavior. The literature is particularly supportive of the demonstration effect (Claassen, et al. 2014). By financially or otherwise encouraging a visible, accessible farmer to adopt a conservation practice that can be done profitability, other local farmers will better understand how doing likewise may positively impact their own operation while helping them meet their own and / or societal conservation goals.

Fourth, find means to reach what Ribaudo (2015) terms 'productivist farmers', those who are less inclined to adopt conservation practices if the benefits are not economically most efficient and benefits are largely off-farm. Most water quality issues cannot be observed on the farm so they are especially difficult to motivate among productivists (Ribaudo; Arbuckle 2013; and Reimer, Thompson and Prokopy 2012). Knowing that productivist farmers tend to care about how their farm looks (no weeds, e.g.) and other factors that folks use to judge their farming ability, and about yields and profits is an important first step. From the literature, it seems productivist farmers are in the majority, although as an economist I might also argue that this may be out of necessity, especially in tight economic times in agriculture (Burton and Wilson 2006; Chouinard et al. 2008; Sulemana and James 2014).

Without large financial incentives, how might we motivate these farmers? What are potentially high-value activities / policies that might help engage productivists and thereby impact their conservation-important land? Ribaudo presents practical approaches to doing so including increasing strength of conservation values in the decision-maker. He further notes that, because if a program rewards practice and not effect and therefore there is no reason among productivists to do more than they have to do, it is especially important to investigate program approaches which provide financial incentives based on impact; and to allow this impact to be known by

productivists and publically recognized (e.g., awards, social media) so others will be able to see their contributions.

Although there is not strong evidence regarding their effectiveness, awards and other recognitions are very inexpensive and our own personal experience provides plenty of anecdotal evidence they have potential. For example, there are plenty of teenagers that spend hours pushing buttons on their mobile device to earn virtual coins which have no intrinsic value; if only to be recognized for beating another or even their former score. Burke (2014) terms this use of non-intrinsic rewards to motivate behavior gamification. For any non-intrinsic reward system to work and be widely accepted, however, we must develop rubrics by which to measure performance (de Snoo, et al. 2013); that is, we must develop an easy to apply rubric to accurately assess the impact of a conservation practice in a context-dependent situation.

Fifth, consider lessons from the theory of planned behavior that tells us that behavior is guided by our beliefs, societal norms, and behavioral control. Advocated by Ribaudo (2015) is the idea of community conservation where farmers together work on solutions to conservation challenges, in a sense changing both societal norms and their perceived level of control over behavior. McGuire, Morton and Cast (2013) found evidence community conservation teams work in Iowa and that between-neighbors sharing of information is more important than more traditional means such as through extension programming. de Snoo et al. (2013) suggest tapping into the existing social networks in the local farming community, and this would be an effective means to develop core groups for teams. With a rubric that accurately measures the results of a farmer's conservation efforts, farmers will also be able to benchmark their performance against that of others in their community. This would not only be motivating as described in a previous recommendation, but would provide farmers the means to recognize what has worked in the community and hence facilitate the sharing of ideas and experiences (de Snoo et al. 2013)

In sum, this study contributes to the limited literature on wetland conservation programs especially in that it considers a working conservation program. The study took place early in the project implementation process, when the administration process was still on-going for some producers. Further, participants are fairly new to the program. Another (planned) limitation of the study is that the population of interest included only those voluntarily enrolled in the program although as articulated in this paper and supported by literature, this does not exclude external validity. That said, it is recommended a more general study be undertaken with randomized survey participants throughout PPR counties in the five-state region.

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Variable Definitions

Attribute Years (5, 10, 15)

Attribute Payment (70, 85, 100, 110)

Attribute Terms (0 = fixed contract payment, 1 = mid-term adjusted payment)

Attribute No-till (0 = not required, 1 = required)

Attribute Cover Crops (0 = not required, 1 = required)

Attribute Winter Cereals (0 = not required, 1 = required)

Cows * Attribute Payment: Have cow/calf herd (0 = no, 1 = yes)

Live on Farm: Live on farm (0 = no, 1 = yes). Other options included city/town or rural area, but not on the farm.

Small Farm: Overall farm size (owned and rented) is small as defined as < 1,561 acres

Large Farm: Overall farm size (owned and rented) is large as defined as between 3,450 and 5,855 acres

No-till: Farmer practices no-till

Food Plots: Farmer has wildlife food plots

Importance WQ: Importance of water quality on decision of whether or not to participate in conservation programs in general (0 = does not impact decision, 1 = not very important, 5 = very important)

Importance Neighbor: Importance of effect on Neighbors on decision of whether or not to participate in conservation programs in general (0 = does not impact decision, 1 = not very important, 5 = very important)

Small Wetlands Benefit: Level of agreement with statement “Small wetlands have benefits for my operation” (0 = disagree, 1 = neutral, 2 = agree)

Program Good Fit: Level of agreement with statement “Terms of WWP are a good fit for my land” (0 = neutral, 1 = agree, 2 = strongly agree)

Cons. Wetlands Import: Level of agreement with statement “Conservation of wetlands is very important” (1 = strongly disagree, 5 = strongly agree)

Import Protect Wetlands: Level of agreement with statement “Important to protect wetlands on both private and public lands” (1 = strongly disagree, 5 = strongly agree)

Producer Partic. Import: Level of agreement with statement “Producer participation in the program development process is very important” (1 = strongly disagree, 5 = strongly agree)

Maintenance Req. Good: Maintenance requirement of the WWP is good (0 = proposed change, 1 = agree)

If you could do so without penalty or loss of eligibility for any program, what percentage of your working wetlands (those that qualify for this program) would you consider draining for farming?

Drain 0: Would drain zero working wetlands (0 = false, 1 = true)

Drain Under 25%: Would drain positive percentage but less than 25% of working wetlands (0 = false, 1 = true)

Import WQ * Attribute Payment: Interaction term between importance of effect on wetland to decision regarding conservation program enrollment (0 to 5) and Payment Attribute

Import WQ * Attribute Terms: Interaction term between importance of effect on wetland to decision regarding conservation program enrollment (0 to 5) and Terms Attribute

Import WQ * Attribute No-till: Interaction term between importance of effect on wetland to decision regarding conservation program enrollment (0 to 5) and No-till Requirement Attribute

Import WQ * Attribute Cover crops: Interaction term between importance of effect on wetland to decision regarding conservation program enrollment (0 to 5) and Cover Crops Requirement Attribute

Import WQ * Attribute Winter cereals: Interaction term between importance of effect on wetland to decision regarding conservation program enrollment (0 to 5) and Winter cereals Requirement Attribute

No-till * Attribute No-till: Interaction term between farmer using no-till and No-till Requirement Attribute

No-till * Attribute Cover crops: Interaction term between farmer using no-till and Cover Crops Requirement Attribute

No-till * Attribute Winter cereals: Interaction term between farmer using no-till and Winter Cereals Requirement Attribute

Cover crops * Attribute Cover crops: Interaction term between farmer using cover crop and Cover Crops Requirement Attribute

Marginal Effects as Percentage Change

Variable	Base Case	BASE CASE 1		BASE CASE 2	
		Marginal Effect	Percent, decimal	Marginal Effect	Percent, decimal
Importance WQ	3.5	-0.0124	-0.0043	-0.0014	-0.0004
Importance Neighbor	2.5	-0.0040	-0.0010	-0.0024	-0.0010
Small Wetlands Benefit	0.39	-0.0147	-0.0006	-0.0090	-0.0231
Program Good Fit	0.73	0.0124	0.0009	0.0069	0.0095
Cons. Wetlands Import.	3.4	0.0251	0.0083	0.0136	0.0041
Import. Protect Wetlands	3.2	-0.0186	-0.0060	-0.0114	-0.0036
Producer Partic. Import.	3.9	-0.0303	-0.0118	-0.0194	-0.0050