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Assessing Determinants of Participation in Conservation Programs in the U.S.

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ASSESSING DETERMINANTS OF PARTICIPATION IN CONSERVATION PROGRAMS IN THE U.S.

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ASSESSING DETERMINANTS OF PARTICIPATION IN CONSERVATION PROGRAMS IN THE U.S.

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The United States Department of Agriculture (USDA) has implemented conservation programs through Natural Resources Conservation Service (NRCS) and Farm Service Agency (FSA). Conservation Reserve Program (CRP), Conservation Stewardship Program (CSP), and Environmental Quality Incentives Program (EQIP) are some of them. These programs provide financial and technical assistance to farmers and ranchers to adopt land management practices that generate environmental benefits. In this study, we explore the determinants of participation in conservation programs (CRP, CSP, EQIP) in Iowa, Kansas, and Nebraska. For this, we use a unique survey-based data set comprising observations from row crop farmers in these states. We are interested in this issue since participation in conservation programs is a complex decision driven by factors dependent upon the nature of the operation as well as the attributes of the operator. For example, current farming practices, the size of the farms, education, and income from farming are associated with the willingness to participate in conservation programs (Gladkikh et al., 2020; Gyawali et al., 2003; Wang et al., 2021). Additionally, Dessart et al., (2019) have emphasized the role of behavioral factors in influencing producers' adoption of sustainable land use practices. Gladkikh, et al. (2020) also suggest exploring environmental attitudes in future research. Therefore, in addition to

demographic and socio-economic variables, we investigate the impact of attitudinal and behavioral factors on the decision to participate in conservation programs. The non-attitudinal variables considered include age, size of owned and rented land acreage, education level of the operator, years of farming experience, income from the farm, gross annual income, participation in crop insurance, and past participation in any conservation program. The socio-behavioral and environmental variables include whether the operator prioritizes profit maximization or cost minimization as their main objective and the extent to which they prioritize environmental benefits or economic benefits generated from their choice of participation. Taken together, these variables are used to estimate a logistic regression model where the dependent variable takes a value of 1 if the respondent participated at the time of the survey in a conservation program and 0 otherwise. The logistic regression analysis was performed for three conservation programs individually. The results show that the farm size, level of income, economic benefits associated with participation, two personality traits, and current and past participation positively and significantly influences participation in a conservation program. Additionally, having crop insurance and farm successor has a negative and significant impact on the probability of participation in CRP with no impact on CSP and EQIP participation likelihood.

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1. INTRODUCTION

The increase in global demand for food production and more coverage of land for agriculture has generated many environmental problems. The application of pesticides and fertilizers for enhancing productivity ends up in water and air pollution through the runoff or volatility of chemicals harms the environment (Dowd et al., 2008; Reimer, 2012; Wang et al., 2019).

In order to address conservation-related issues and protect and generate ecosystem services (ES) from privately owned intensively managed agricultural land, the United States Department of Agriculture (USDA)'s Farm Service Agency (FSA) and Natural Resources Conservation Service (NRCS) implemented many conservation programs such as the Conservation Reserve Program (CRP), Conservation Stewardship Program (CSP), Environmental Quality Incentives Program (EQIP), Regional Conservation Partnership Program (RCPP), and so on. USDA planned a budget of around 4.5 billion dollars for Farm Bill Conservation programs in 2021 (USDA 2021). These programs provide financial and technical assistance to farmers and ranchers to adopt land management practices that generate ES.

Participation in these conservation programs depends on the utility gained from the participation. If the expected utility from participation is more than non-participation, then

farmers will participate (Konyar & Osborn, 1990). In the past, studies have evaluated farmers' different participation decision behavior and factors affecting participation in one specific conservation program (Ellis, 2019; Gyawali et al., 2003; Konyar & Osborn, 1990) and one specific county or state (Thompson et al., 2015; Young, 2014). This research is focused on assessing the determinants of participation in the three largest conservation programs of the U.S.: CRP, EQIP, and CSP in three states: Iowa, Kansas, and Nebraska in the U.S.

For this, we use a unique survey-based data set comprising observations from row crop farmers in these states. We are interested in this issue since participation in conservation programs is a complex decision driven by factors dependent upon the nature of the operation as well as the attributes of the operator. For example, current farming practices, the size of the farms, operator education level, and income from farming are associated with the willingness to participate in conservation programs (Gladkikh et al., 2020; Gyawali et al., 2003; Wang et al., 2021). Additionally, Dessart et al. (2019) have emphasized the role of behavioral factors in influencing producers' adoption of sustainable land use practices. Wang et al. (2019) suggested incorporating farmers' attitudes and their understanding of conservation practices to understand their conservation behavior. Similarly, Gladkikh, et al. (2020) also suggest exploring environmental attitudes in future research. Therefore, we investigated the impact of attitudinal variables and past and current participation in conservation programs on the decision to participate in other conservation programs in addition to non-attitudinal demographic variables.

The attitudinal variables we included were personality traits, risk-taking attitudes and respondents' perception on the statements provided. The personality traits are those characteristics of an individual that are determined by their beliefs, upbringing, and behavior. Scientists have categorized these characteristics of individuals into five types of traits which are commonly called the Big Five personality traits. Under the umbrella of the big 5 traits rest traits like openness, conscientiousness, extraversion, agreeableness, and neuroticism (Herzberg & Brähler, 2006; Liem & Martin, 2015; Milfont & Sibley, 2012). For example, conscientiousness refers to the ability of people to be well organized, diligent, and plan well. Again, openness refers to the tendency of people to seek out new experiences or be open to changes (Herzberg & Brähler, 2006; Liem & Martin, 2015; Milfont & Sibley, 2012).

The three conservation programs considered are different from each other in terms of the targeted land type, contract required or not, and lengths of contract. The procedure to apply for participation in these programs also varies among the programs. Thus, past participation in these programs might influence the producers' motivation to participate in any of these programs at present. In past studies, there is limited research looking at the impact of past participation in a program on the current participation decision of the program (Comerford, 2014; Ma et al., 2012). To my knowledge, there is not any research done to see the impact of past participation in CRP on the present participation in CSP and EQIP and vice-versa. Likewise, there is limited work on the influence of present participation in CRP to present participation in CSP and EQIP and vice-versa. Therefore, anticipating the possible influence

of these variables on the present participation, this research included “past participation” and “present participation” variables for the analysis.

Additionally, the non-attitudinal variables considered include age and education level of the operator, size of owned and rented land acreage, income from the farm, gross annual income, participation status in crop insurance programs, and past participation in multiple conservation program. The socio-behavioral and environmental variables include whether the operator prioritizes profit maximization or cost minimization as their main objective and the extent to which they prioritize environmental benefits or economic benefits generated from their choice of participation. Taken together, these variables are used to estimate a logistic regression model where the dependent variable takes a value of 1 if the respondent participated in a conservation program at the time of the survey and 0 otherwise. The logistic regression was performed for three conservation programs individually.

The result shows that farm size, level of income, economic benefits associated with participation, two personality traits, and current and past participation positively and significantly influence participation in a conservation program. Some key results suggest that with an increase of 100 acres of total owned land, the probability of participation in CRP increased by 0.9 percentage points. Similarly, lower income increases participation in EQIP, while higher income increases participation in CSP. Additionally, we see that CRP, CSP, and EQIP are complements not substitutes of each other.

2. DESCRIPTION OF CONSERVATION PROGRAMS

Conservation Reserve Program (CRP)

CRP is one of the land retirement programs administered by the FSA. Through this program, farmers and ranchers are compensated with annual rental payments for removing their environmentally sensitive agricultural land to provide environmental benefits from the land. CRP is the largest and oldest federal conservation program established in 1985. In 2021, CRP was allocated 2.3 billion dollars to protect approximately 25 million acres of environmentally sensitive agricultural and grassland (USDA 2021). CRP has a provision of contract agreements between the government and producers ranging from 10 to 15 years.

As of 2022, producers have enrolled close to 5 million acres of land in CRP in the U.S. (USDA/FSA, 2023). For enrollment in CRP, there are three types of signups: general signups, grassland sign-ups, and continuous sign-ups. The Environmental Benefits Index (EBI) determines the eligibility for enrollment in CRP through general signups. There are six components under EBI each of which is assigned a score. These components include wildlife habitat, water quality, soil erosion, other enduring benefits, air quality improvement, and cost of rental rate (Pratt & Wallander, 2022). Total enrollment in CRP was 1,705,188 acres in Iowa, 1,896,004 in Kansas, and 1,054,081 acres in Nebraska as of September 2020 (USDA/FSA, 2020).

Conservation Stewardship Program

CSP is the principle working-lands program implemented by USDA/NRCS to support existing or new conservation practices on farmland. The program provides both financial and technical assistance to the farmers interested in engaging in the program. The contract of the program can be for 5 years with the opportunity of extension based on the maintenance of the level of stewardship and additional conservation objectives. In 2023, the USDA has allocated 1 billion dollars in their budget for CSP (USDA, 2023). The total number of contracts enrolled in CSP was 370 in Iowa, 692 in Kansas, and 422 in Nebraska (NRCS, 2020)

Environmental Quality Incentives Program

EQIP is NRCS's leading program which helps farmers or ranchers by integrating conservation in their farming land to improve water or air quality, increase soil health, and solve other resource-related issues by providing technical and financial assistance. Under the conservation technical assistance program, producers are provided technical assistance free of cost through Technical Service Providers (TSP). USDA allocated total budget of $1.75 billion for EQIP in 2020. The total number of contracts enrolled in EQIP was 986 in Iowa, 942 in Kansas, and 844 in Nebraska (NRCS, 2020).

3. LITERATURE REVIEW

In the past, many studies have analyzed factors affecting the participation of farmers and ranchers in volunteering conservation programs. Gyawali et al. (2003) employed a logit model to analyze the participation behavior of limited-resource farmers[1] (LRF) in CRP in Alabama. The results of the study suggested that socio-demographic characteristics like gender, income from the farm, size of land owned, race, and part-time job influence the participation of LRF in CRP. Also, participation in other programs (other than cost-share ones) has impacted participation in CRP. In addition, no significant relationship was found between participation in CRP and age and full-time occupation.

Ma et al. (2012) adopted binary logistic regression to analyze the factors affecting participation in forest conservation programs. The result showed that income and age did not play roles in determining participation. However, larger acreage owned in a state and respondents' education level higher than college has a positive influence on the probability of participating in cost-share programs. In addition, the study suggested that receiving information on types of programs and sources of information plays an important role in participation in programs.

[1] Limited-resource farmers (LRF) are those farmers having marginalized, degraded, and erosion-prone lands (Gyawali, 2003).

Reimer et al. (2012) used a qualitative approach to understand the relationships between environmental attitudes or conservation behavior and farmers' decisions to adopt conservation practices. They found that farmers with attitudes supporting off-farm environmental benefits are more likely to adopt conservation than farmers with business attitudes. During their interview with farmers, they found that some farmers were adopting conservation practices not for environmental benefits but for economic benefits from production.

Lubell et al. (2013) used multinomial logit models to analyze the participation of ranchers in conservation programs for adaptive rangeland decision-making in California. They used mail survey data to determine the impact of independent variables like the nature of operation/operator, discount rate, social networks, and social values on participation decisions. They found that the larger size of operating land, access to information sources, and presence of succession plans have a positive impact on the increase in participation in conservation programs. The increase in the number of off-ranch income sources and the increase in education level increases the current participation in EQIP. However, operation/operator characteristics like public acres and income were not found to be statistically significant factors to impact participation in conservation programs in California.

Comerford (2014) explored reasons behind the participation or withdrawal from participation in conservation programs in Queensland, Australia. The author used conservation auction participants' data and qualitative data to analyze the factors affecting participation in

Vegetation Incentives Program, a covenant program[2]. The results of the study showed that financial consideration has the lowest motivation in participating in covenant programs. Likewise, previous experience participating in a conservation program, a higher level of education, and positive attitudes toward the environment motivate participation in conservation programs. Apart from socio-demographic characteristics, farm size, environmental motivation, and risk attitudes also play an important role in technology adoption or participation decisions.

Kang et al. (2019) employed multiple price list methodologies and choice experiments to assess the role of risk attitudes in participation decisions in payments for ecosystem services (PES) programs. They found that compared to risk-neutral or risk-seeking owners, risk-averse individuals were more likely to participate in PES programs for less payment.

In addition to individual risk preferences, individual personality traits are also important while assessing determinants of the decision to participate in conservation programs. The personality traits differ from one person to another and can influence their choices regarding participation in a program. Milfont & Sibley (2012) conducted three studies to explore the relationship between the big five personality traits and engagement in environmental

[2] Covenant program indicates a voluntary agreement between landowner and authorized scheme provider.

practices in New Zealand. The result showed that three personality traits: Agreeableness, Openness, and Conscientiousness were strongly associated with environmental engagement.

Soliño & Farizo (2014) analyzed the impact of the big five personality traits on the preferences for environmental programs through discrete choice experiments. The result showed that personality traits like openness and extraversion have a positive influence whereas agreeableness and neuroticism have a negative influence on the individuals' preferences for the development of forest management programs in Spain. Similarly, Erjavec et al. (2019) examined the effect of personality traits on the quality and confidence of decisions of participants in supply chain management. They used the big five personality model to test the personality and the partial least squares equation model to estimate the models. The results showed that lower levels of personality traits like agreeableness and extraversion, and higher levels of openness and conscientiousness were associated with better decision-making of the participants. In addition, participants with agreeableness, and neuroticism personalities had low confidence in their decisions. (Ellis, 2019)

Nigussie et al. (2020) conducted surveys to collect data and used univariate probit regressions to analyze the impact of personality traits on the decision to adopt agricultural technologies in the upper Blue Nile basin, Ethiopia. They found that there was a significant correlation of explanatory variables like participation in farmers' training, and environmental protection with personality traits. Finally, Rothermich et al. (2021) implemented the Pearson correlations to explore the relationship between personality traits and climate change

attitudes. They found that the Openness trait was strongly correlated with positive climate change attitudes among other big five personality traits.

4. DATA AND METHODS

4.1 STUDY AREA

The study was conducted in three states of the U.S. namely Iowa, Kansas, and Nebraska. These states were chosen based on a similar type of geography and agricultural land.

4.2 SURVEY AND SAMPLE

The total sample of 5499 farmers from counties of the above-mentioned states was generated through stratified random sampling from the Farm Market ID database. For each of the three states, 611 addresses were drawn for operations with sizes less than 250 acres, between 250 and 749 acres, and operations greater than 750 acres generating the total sample size who were reached with the survey instrument. This database is drawn from dozens of public and private sources, starting with common land unit (CLU) boundaries and then attributing data to those CLUs, including contact information and farm operation details.

Survey questionnaires were designed in consultation with the Bureau of Sociological Research at UNL[3]. The survey included questions related to their attitudes toward

[3] Bureau of Sociological Research: https://bosr.unl.edu

participation in conservation programs, environmental protection, reasons behind their participation or non-participation in conservation programs, whether they have crop insurance or not, their socio-demographic characteristics, and so on. The survey instrument is attached in the Appendix. The survey was conducted in both web-based and paper format. Four mailings of survey questions were sent to the sampled farmers; first to everyone in the sample and then next sent to only non-respondents. Each farmer had a unique identification number.

4.3 EXPLANATORY VARIABLES

We divided explanatory variables into non-attitudinal demographic variables, attitudinal, and participation variables based on questions that were asked in the survey. From the literature reviews of previous researches (Prokopy et al., 2019; Wang et al., 2021), we hypothesized that these variables could be determinants of factors affecting participation in conservation programs.

4.3.1 NON-ATTITUDINAL VARIABLES

For the non-attitudinal demographic variables, we selected the socio-economic, and demographic characteristics of respondents like acreage of owned and rented land which accounts for operation size, age of the respondents, farming years, level of education, annual gross income, percent of income from the farm, and whether farming is the only source of income or not. In addition, the purchase of crop insurance was also included under this variable category.

In the analysis, rented land, owned land, age of the respondent, and farming years were used as continuous variables. The level of education, annual gross income, percent of income from the farm, and whether farming is the only source of income or not were used as categorical variables. The level of education is divided into three categories each represented by a dummy variable. If the level of education is less than or equal to a high school degree or GED, then it is categorized as lower level of education. Likewise, if the level of education is equal to an associate degree and/or technical training, it is categorized as mid-level of education, and finally, if the level of education is equal to or higher than a bachelor's degree, then it is categorized as a higher level of education. In the analysis, mid-level of education was used as the base reference category.

The household's annual gross income was similarly categorized into three categories of income each represented by a dummy variable. If the annual gross income is equal to or less than $74,999, then it is categorized as low-income level, if it is equal to the range of $75,000 to $124,999, then it is categorized as mid-level income, likewise, if it is equal to the range of $125,000 to $ 150,000 or above, then it is categorized as high income. Three dummy variables are created to represent each category. In the analysis, the mid-level of income is considered as a base income.

In the survey, we asked what percentage of their income comes from farming and gave them options of choosing from 5 categories such as 1-19%, 20-39%, 40-59%, 60-79%, and 80-99%. These categories were divided into two dummy variables for our analysis purpose. If the percentage of the income from the farm was equal to or more than 60% then the variable took values of 1 and 0 otherwise. The variable was named as "High % of income from farming" in the regression table.

Finally, we asked respondents whether their household had sources of income other than that from farming, represented by one dummy variable in the analysis. This variable took a value of 1 for those respondents who answered No to this question and zero otherwise.

4.3.2 ATTITUDINAL VARIABLES

We have included various attitudinal variables in this research to capture behavioral and attitudinal factors of respondents that might explain the variation in the likelihood of participation of farmers in conservation programs. These include the perceived influence of various factors on the decision to participate, attitude towards environmental conservation, two personality traits out of the big five personality traits, and risk-taking attitudes.

Attitudinal Drivers of Participation

To assess individual attitudes, we asked respondents whether "*Increase in current commodity prices*", "*Cost savings and other benefits generated from participation in conservation programs*" and "*Presence of farm successors*" have positive, negative, or no influence on their decision to participate in conservation programs. Responses to these questions were used to create three dummy variables. The first variable was set equal to 1 for a negative influence of commodity price increase on participation likelihood, and 0 otherwise. Likewise, we assumed that the effect of cost savings and other benefits generated from participation in conservation programs and the presence of farm successors would have a positive influence on the participation in conservation programs, so included dummy variable equals 1 for positive influence and 0 otherwise.

Attitude toward environmental conservation and personality traits

To use information on the attitude toward environmental conservation and the openness trait of respondents, we used responses to the first eight statements of Question Block 25 (Appendix 1) in the survey. For this purpose, we followed the following steps. First, we generated a correlation matrix of these 8 variables and found a high correlation (equal to 0.5 or higher) between them as shown in Appendix 2. An exploratory factor analysis helps to describe the correlated relationships through fewer factors (Johnson and Wichern, 2007). Thus, in the next step, we implemented basic exploratory factor analysis with maximum likelihood methods of estimation (Wang et al., 2021) to determine the number of factors required to represent these 8 variables. We used "factanal ()" function in R to perform this factor analysis.

We hypothesized that 3 factors are sufficient for the analysis, and we used "varimax" rotation which is a default rotation for the maximum likelihood estimation. The exploratory factor analysis generates many outputs like uniqueness, loadings, sum of squared (SS) loadings, proportion var, and cumulative var. Uniqueness helps to identify whether the variables taken for factor analysis fit into the hypothesized factor or not. If a variable has a higher than 0.5 uniqueness value, it doesn't fit into the hypothesized factors. Uniqueness ranges from 0 to 1 and our result shows lower uniqueness for all the variables except for the one corresponding to the statement related to crop insurance, meaning that all these variables fit neatly into our factors except for the crop insurance-focused question. The test of the hypothesis suggested 3 factors were sufficient for the model. For these factors, if SS loadings are greater than 1, then the factor is worth keeping (Ford, 2016). In our case, all these factors have SS loadings more than 1,

therefore, we kept all 3 factors. These three factors capture around 70% of the variance originally observed between the 8 variables which were shown by cumulative variance in Figure 1 (that represents the R-generated output of the factor analysis).

The loadings represent the correlations of variables with the unobserved factors. From Figure 1, we can see that Q25f (local environment), Q25g (global environment), and Q25h (local community) had high correlations with Factor 1. Likewise, Q25a (Profit) and Q25b (Cost) had high correlations with Factor 2. Finally, Q25c (land value) and Q25d (land profitability) had high correlations with Factor 3. Based on this correlation, the descriptive factor "Non-private benefit" represented Factor 1, the personality trait "Openness" represented Factor 2, and "Value for land" represented Factor 3. These three factors were included in the regression model for the analysis of determinants of participation in conservation programs.

The statement we used for "Non-private benefit" was "*I like to experiment with new conservation land management practices on my operation to benefit the local environment*". The statement we used for "Openness" was "*I like to experiment with new conservation land management practices to reduce the costs to my operation*". Finally, for "Value for land" variable, we used statement "*I am willing to adopt new conservation land management practices if they will increase the value of my land over time*". We asked respondents how much of these statements describes them and they had 4 scales "A lot", "Somewhat", "A little", and "Not at all" to choose from. "A lot" represented by a 4 in the analysis and "Not at all" as a 1. This variable was considered as a continuous variable in the analysis.

Another personality trait identified in this research was conscientiousness. In this research, conscientiousness represented traits of respondents who take lots of time and care in preparing conservation contract applications. In order to capture this trait, we used the responses to how closely statement "*I take a lot of time and care in preparing my conservation contract application*" describes them. They had 4 scales "A lot", "Somewhat", "A little", and "Not at all" to choose from with "A lot" represented by a 4 in the analysis and "Not at all" as a 1. This variable was considered as a continuous variable in the analysis.

```
## Call:
## factanal(x = m1, factors = 3, rotation = "varimax")
##
## Uniquenesses:
##             Q25a (Profit)               Q25b (cost)         Q25c (land value)
##                     0.044                     0.321                     0.269
## Q25d (land profitability)     Q25e (crop insurance)  Q25f (local environment)
##                     0.261                     0.826                     0.244
## Q25g (global environment)    Q25h (local community)
##                     0.154                     0.313
##
## Loadings:
##                           Factor1 Factor2 Factor3
## Q25a (Profit)              0.265   0.895   0.291
## Q25b (cost)               -0.284  -0.686  -0.358
## Q25c (land value)          0.282   0.294   0.751
## Q25d (land profitability)  0.272   0.318   0.751
## Q25e (crop insurance)      0.364   0.129   0.157
## Q25f (local environment)  -0.794  -0.281  -0.215
## Q25g (global environment)  0.886   0.204   0.139
## Q25h (local community)     0.748   0.154   0.323
##
##                Factor1 Factor2 Factor3
## SS loadings      2.412   1.619   1.536
## Proportion Var   0.302   0.202   0.192
## Cumulative Var   0.302   0.504   0.696
##
## Test of the hypothesis that 3 factors are sufficient.
## The chi square statistic is 3.97 on 7 degrees of freedom.
## The p-value is 0.783
```

FIGURE 1: OUTPUT GENERATED FROM EXPLORATORY FACTOR ANALYSIS.

Risk-taking attitudes

To understand the risk-taking attitudes of respondents, they were asked how much of the statement "*I am willing to take risks related to my operation to increase my operation's profitability*" describes them. For this question, there were also 4 scales "A lot", "Somewhat", "A little", and "Not at all". This variable was included as a continuous variable and was coded such that "1" represented "Not at all" and "4" represented "A lot". Doing so, it made easy to interpret the result in ascending order.

4.4 PARTICIPATION VARIABLES

The current participation in one conservation program might influence participation in another conservation program due to the benefits of combined participation or due to the preferred application scheme of one program over another program since the application procedures differ from one program to other. For example, a farmer who is participating in CRP and retiring their land for environmental benefits for 10 to 15 years might be attracted by the technical assistance and shorter duration of the contractual agreement under the CSP, hence increasing participation in CSP. To see the impact of current participation in CRP on the current participation of CSP and EQIP, we have taken current participation in CSP and EQIP as explanatory variables when current participation in CRP is a dependent variable. Similarly, we have taken CRP and EQIP as explanatory variables to explain the factors affecting current participation in CSP (dependent variable), and CRP and CSP as explanatory variables to explain factors affecting current

participation in EQIP (dependent variable). Additionally, familiarity with participation in one program especially if it is the same official(s) that farmers have to deal with at the same familiar locations for other programs can also explain why participation in one program influences participation in others.

As mentioned in the previous paragraph, familiarity with one program in the past might influence the current participation in another program. Therefore, we have included past participation in CSP and EQIP as explanatory variables when the current participation in CRP is a dependent variable in a model. Likewise, past participation in CRP and EQIP are included as explanatory variables when the current participation in CSP is a dependent variable, and past participation in CRP and CSP are included as explanatory variables when the current participation in EQIP is a dependent variable in a model.

5. THEORETICAL MODEL

We are adopting the expected utility model by Konyar and Osborn (1990). The expected utility from participation in a conservation program is given by:

$$U_p = V(x_p) + e(x_p)$$

where U_p= Expected utility from participation

$V(x_p)$= mean utility associated with participation

$e(x_p)$= Random component in utility from the participation

x_p= Vector of explanatory variables associated with participation

The expected utility of not participating in a conservation program is given by:

$$U_{np} = V(x_{np}) + e(x_{np})$$

where U_{np}= Expected utility from non-participation

$V(x_{np})$= mean utility associated with not participating in a conservation program

$e(x_{np})$= Random component in utility from not participating in a conservation program

x_{np}= Vector of explanatory variables associated with non-participation

If the expected utility of participating in a conservation program is greater than the expected utility of not participating in a conservation program, farmers will participate in a program (Konyar & Osborn, 1990). The dependent variables in the models used to analyze participation are binary and take two values (1 for current participation and 0 for current non-participation). Many researchers in the past have employed the logit model (Gyawali et al., 2003; Kauneckis & York, 2009; Wang et al., 2021) to determine the relationship between adoption decisions or conservation participation and independent variables. In this research, we employed logit models to examine the impacts of explanatory variables on participation decisions.

We are not using ordinary least squares (OLS) because, for the binary dependent variables, some assumptions of OLS are violated. For example, the nonlinear least square function in β_0 and β_i, and not normal distribution of error variance and the estimated values cannot be inferred

as probabilities (Gyawali et al., 2003). Therefore, the logit regression model is an appropriate method for the estimation of coefficients that contribute to explaining factors affecting participation in conservation programs.

For the estimation, the logistics regression model is given by:

$\log \frac{P(CP_i=1)}{1-P(CP_i=1)} = \beta_{0i}+\beta_{1i}$ (non-attitudinal variables) + β_{2i}(attitudinal variables) + β_{3i}(participation variables)

where, CP_i= conservation program i, where i=1, 2, 3, where 1= CRP, 2= CSP and 3= EQIP

$\beta_1, \beta_2,$ and β_3 are coefficient estimates of explanatory variables in the odds scale. The signs of estimates will indicate the positive or negative impact on the participation decisions but will not be able to explain by what amount or unit. For the interpretation of the model in probability scale, we have used marginal effects. The estimates themselves will not depict the marginal effects of explanatory variables on the dependent variables. We can calculate the marginal effects in two ways: computing density at the sample mean or at each observation (Wang et al., 2019). In this analysis, we computed average marginal effects at each observation using the "margins" function in R.

6. RESULTS AND DISCUSSION

6.1 COMPARISON OF SAMPLE DATA AND POPULATION-LEVEL DATA

In total, 1121 surveys were completed or partially completed giving a response rate of 20.4%. After the collection of data, descriptive statistics were generated to summarize and visualize the distribution of the sample data.

Although a stratified and not a random sample, in order to provide a general idea regarding the sample data, the summary statistics of some of the variables of the sample data were compared with the census of agricultural population data of USDA's National Agriculture Statistics Service (NASS). The magnitude of key demographic variables in sample data were higher compared to population data as shown in Table 1. One reason behind this outcome could be that the census targets owners and our survey targeted the operators.

TABLE 1: COMPARISON OF DEMOGRAPHIC CHARACTERISTICS OF SAMPLE DATA WITH POPULATION DATA

	Iowa		**Kansas**		**Nebraska**	
Characteristics	Average of Sample	Average in Population	Average of Sample	Average in Population	Average of Sample	Average in Population
Total farm size (acres)	966	359	1535	780	1238	1000
Age (years)	66.1	57.4	67.1	58.1	66	56.4
Farming years	42.9	27	41.8	25.6	43.2	26.8

We also compared the distribution of current participation of our sample with the current contracts in population data for each state. The distribution of our sample was similar to population distribution with the highest number of participations in CRP followed by EQIP and then CSP.

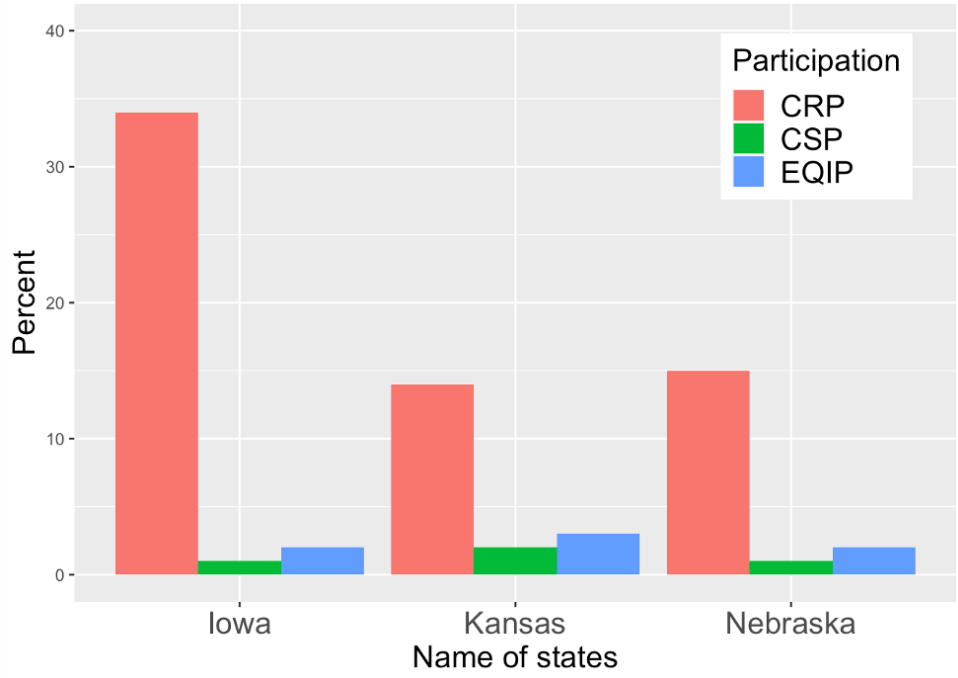

FIGURE 2: DISTRIBUTION OF PARTICIPATION IN CONSERVATION PROGRAMS IN OUR SAMPLE

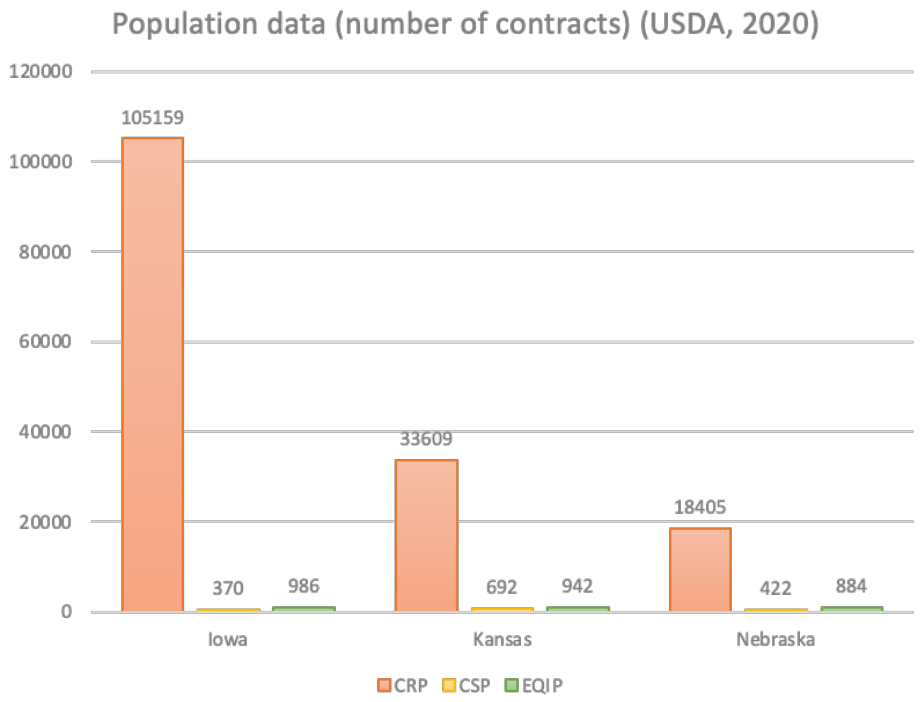

FIGURE 3: DISTRIBUTION OF PARTICIPATION IN CONSERVATION PROGRAMS IN POPULATION DATA

6.2 SUMMARY STATISTICS:

In this section, we summarize the variables used in the analysis including non-attitudinal, attitudinal, and participation variables. The analysis is done using the software "R"- R Markdown. The variables are summarized as mean, standard deviation, median, and total number of observations obtained in the survey for each variable as provided in Table 2.

6.2.1 SUMMARY OF NON-ATTITUDINAL VARIABLES:

The average farm sizes owned and rented by the respondents were 594 and 603 acres respectively. The average age of the sample respondents was 66 years ranging from 31 to 97 years. Likewise, the average farming year of respondents was 43 years.

Out of 805 respondents, 95.4% were male, 4.2% were female, and 0.4% were other. Out of 831, 87% of the respondents had crop insurance. Similarly, out of the total 807 respondents, 2.2% had the highest level of education less than high school, 35.7% had a high school degree or GED as their highest level of education, 22.9% had an associate degree and/or technical training as their highest level of education, 30.4% had bachelor's degree and 8.8% had a graduate degree as their highest level of education. Out of 680 respondents, 7.2% had less than $50,000, 14.71% had $50,000 to $74,999, 17.06% had $75,000 to $99,999, 15.44% had $100,000 to $124,999, 10.5% had $125,000 to $149,999, and finally 35% had $150,000 and above annual gross income in 2021. Likewise, for the variable measuring percentage of income coming from farming, the summary table shows that out of 556 respondents, 15.4% had 1-19%, 15.1% had 20-39%, 20.1% had 40-59%, 22.8% had 60-79%, and 26.4% had 80-99% of their income coming from farming. Likewise, the summary statistics shows that out of 771 respondents, 30% said that their gross annual income comes from farming only meaning they don't have an alternative income source.

6.2.2 SUMMARY OF ATTITUDINAL VARIABLES:

Perceived influence on the participation decision

We asked respondents whether an *increase in current commodity prices influence their decision to participate in conservation programs.* Out of 744 respondents, 19% said that it has a negative influence, 48% said no influence, 21.1% said positive influence, and 11% said the statement was not applicable to them. Similarly, we asked the respondents *whether cost savings and other benefits generated for the operation from participation in conservation programs influence their participation in conservation programs.* Out of 736 respondents, 2.2% said that it has a negative influence, 42.4% said it has no influence, 45% said it has a positive influence and 10.6% said that the context is not applicable to them. Next, we asked them, *whether having younger family or non-family members who will be managing the operation after them influence their decision to participate in conservation programs.* Out of 736 respondents, 3.5% said that it has a negative influence, 54.8% said it had no influence, 23.8% said it had a positive influence and 18% said the context is not applicable to them.

Attitude toward environmental conservation and personality traits

To understand the environmental conservation attitudes of respondents, they were asked how much of the statement "*I like to experiment with new conservation land management practices on my operation to benefit the local environment*" describes them. Out of 768 respondents, 13% said "A lot", 35% said "Somewhat", 34% said "A little" and 18% said "Not at all".

To analyze respondents' attitudes towards conservation practice based on the importance of the value of land, they were asked how much of the statement "*I am willing to adopt new conservation land management practices if they will increase the value of my land over time*" describes them. Out of 778 respondents, 23% said "A lot", 48% said "Somewhat", 21% said "A little" and 7.5% said "Not at all".

Similarly, to analyze respondents' openness personality trait, they were asked how much of the statement "*I like to experiment with new conservation land management practices to reduce the costs to my operation*" describes them. Out of 781 respondents, 14.2% said "A lot", 41.5% said "somewhat", 28.3% said, "A little" and 16 % said "Not at all".

To analyze the conscientiousness personality trait of respondents, they were asked how much of the statement "*I take a lot of time and care in preparing my conservation contract application*" describes them. Out of 748 respondents, 12% said "A lot", 32.6% said "Somewhat", 24% said, "A little" and 31% said "Not at all".

Risk-taking attitude

To examine the risk-taking attitudes of respondents, they were asked how much of the statement "*I am willing to take risks related to my operation to increase my operation's profitability*"

describes them. Out of 754 respondents, 11.7% said “A lot”, 51.2% said “Somewhat”, 28% said, “A little” and 9% said “Not at all”.

6.2.3 SUMMARY OF PARTICIPATION VARIABLES

The participation variables include participation in the past and current participation of the respondents. Out of 784 respondents, 17% participated in the past and 41% are currently participating in CRP. Likewise, out of 727 respondents, 18% participated in the past and 7% are currently participating in CSP. Finally, out of 729 respondents, 23% participated in the past and 7% are currently participating in EQIP.

The distribution of past and current participation of respondents in conservation programs varies from one conservation program to another and from one state to another as presented in Figures 4, 5, and 6:

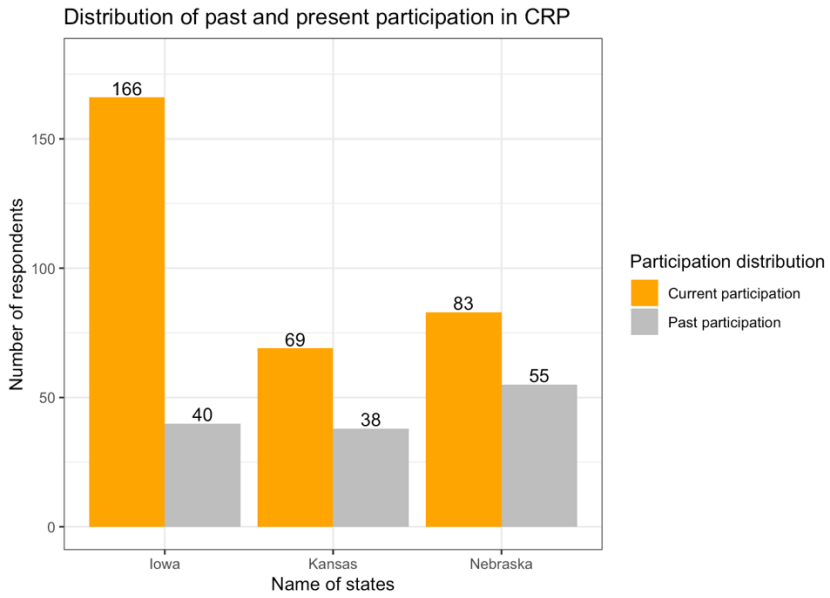

FIGURE 4: HISTOGRAM SHOWING CURRENT AND PAST PARTICIPATION IN CONSERVATION RESERVE PROGRAM

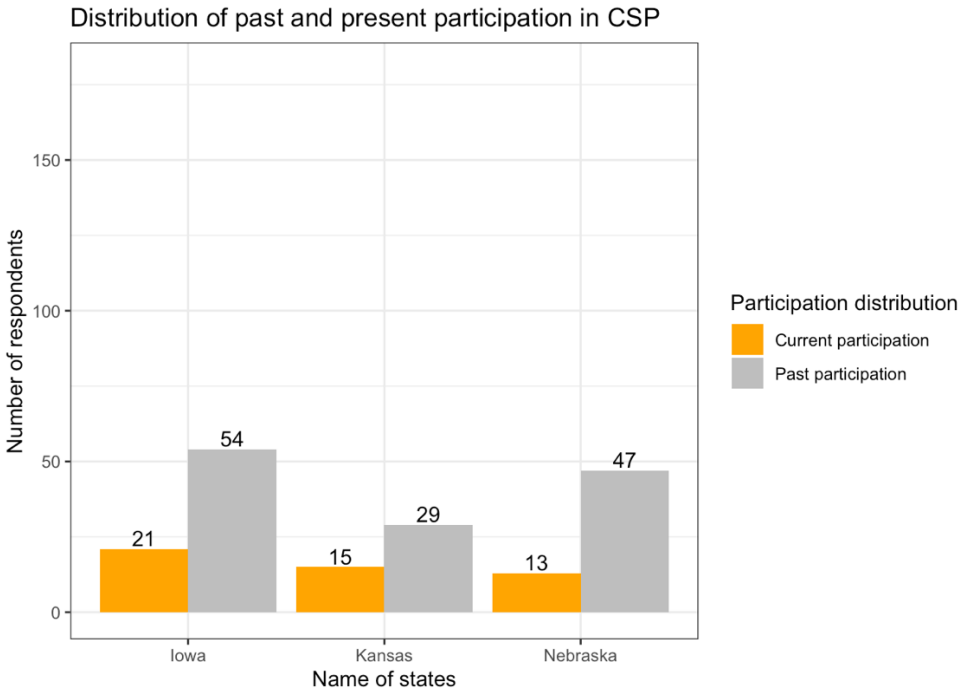

FIGURE 5: HISTOGRAM SHOWING CURRENT AND PAST PARTICIPATION IN CONSERVATION STEWARDSHIP PROGRAM

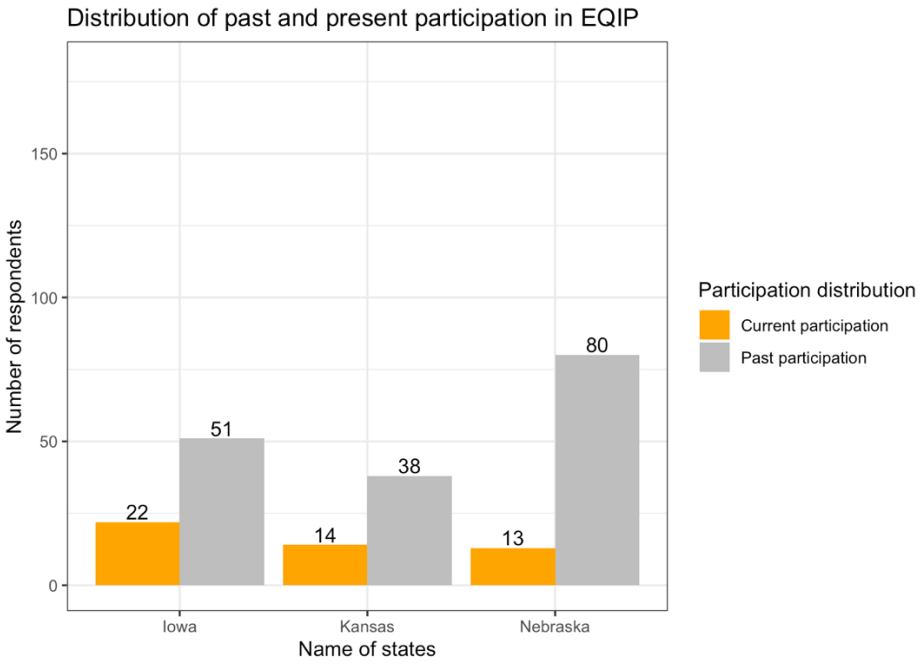

FIGURE 6: HISTOGRAM SHOWING CURRENT AND PAST PARTICIPATION IN ENVIRONMENTAL QUALITY INCENTIVES PROGRAM

The summary statistics of our variables of interest in this research are tabulated below:

TABLE 2: SUMMARY STATISTICS OF NON-ATTITUDINAL AND ATTITUDINAL VARIABLES

Variables	Mean	Standard Deviation	Median	Number of Observations	Variable Name in regression
Total owned land (Acres)	594.46	653.91	400	855	Total owned land
Total rented land (Acres)	603.19	799.52	310	855	Total rented land
Age (Years)	66.33	9.47	66	799	Age
Crop insurance (Yes =1, No =0)	0.872	0.33	1	831	Crop insurance
High level of education-categories 1. Less than high school 2. High school degree or GED 3. Associate degree and/or technical training 4. Bachelor's degree 5. Graduate degree	3.07	1.04	3	807	Lower education (if equals high school degree or GED or less) Higher education (if equals to bachelor's degree or graduate degree)
Gross annual income-categories 1. Less than $50,000 2. $50,000to $74,999 3. $75,000to $99,999 4. $100,000to$124,999 5. $125,000to$149,999 6. $150,000 and above	4.12	1.7	4	680	Low income (if the annual gross income is equal to or less than $74,999) High income (if the annual gross income is equal to $125,000 or more)
Income from farming-categories 1. 1-19% 2. 20-39% 3. 40-59% 4. 60-79% 5. 80-99%	3.29	1.40	3	556	High % of income coming from farming (if equal to 60% or more)
Income source other than farming (No=1, Yes=0)	0.29	0.45	0	771	Only farming as source of income

Influence of "Increase in current commodity prices" on decision to participate-categories 1. Negative influence 2. No influence 3. Positive influence 4. Not applicable	2.24	0.88	2	744	Current commodity price
Influence of "Cost savings and other benefits generated for the operation from participation in Conservation Programs" on decision to participate-categories 1. Negative influence 2. No influence 3. Positive influence 4. Not applicable	2.63	0.69	3	736	Economic benefits
Influence of "Having younger family or non-family members who will be managing the operation after me" on decision to participate-categories 1. Negative influence 2. No influence 3. Positive influence 4. Not applicable	2.56	0.82	2	781	Farm successor presence
Description of the statement "I like to experiment with new conservation land management practices to reduce the costs to my operation" 1. A lot 2. Somewhat 3. A little 4. Not at all	2.46	0.92	2	781	Openness
Description of the statement "I am willing to adopt new conservation land management practices if they will increase the value of my land over time" 1. A lot	2.12	0.85	2	778	Value for land

2. Somewhat 3. A little 4. Not at all					
Description of the statement " I like to experiment with new conservation land management practices on my operation to benefit the local environment" 1. A lot 2. Somewhat 3. A little 4. Not at all	2.57	0.92	3	768	Non-private benefit
Description of the statement "I take a lot of time and care in preparing my conservation contract application" 1. A lot 2. Somewhat 3. A little 4. Not at all	2.74	1.02	3	748	Conscientiousness
Description of the statement "I am willing to take risks related to my operation to increase my operation's profitability" 1. A lot 2. Somewhat 3. A little 4. Not at all	2.34	0.79	2	754	Risk taking attitude

7. LOGISTICS REGRESSION RESULTS

The result of logit regression is presented in Table 3 with both coefficient and marginal effect estimates for the three models. The total observations were 344, 345, and 346 each for the CRP, CSP, and EQIP models.

The results in the table show that out of 24 variables of interest, eight, eight, and four were found to be significantly contributing to participation in CRP, CSP, and EQIP respectively. The total owned land was positively significant at the 5% significance level for the CRP model. Ceteris paribus, a 100-acre increase in total owned land increased the probability of participation in CRP by 0.9 percentage points. However, for CSP and EQIP models, the results show an increase in total owned land had a negative relationship, though the effect was not significant. Thus, the results show that for different conservation programs, the role of owned land size is different (Knowler & Bradshaw, 2007; Wang et al., 2019).

Likewise, total rented land was positive and significant at the 5% level for CSP. Ceteris paribus, a 100-acre increase in total rented land increased the probability of participation in CSP by 0.3 percentage points. These results were similar to previous research that found with an increase in the size of land there will be an increase in the likelihood of participating in conservation programs (Ma et al., 2012).

As expected, age had a negative relationship with CRP and CSP, but a positive relation with EQIP. The negative signs of age in CRP and CSP indicate that with the increment of age, respondent interest in participating in CRP and CSP decreased. Prokopy et al. (2019) found that age has a negative impact on predicting adoption. Negative signs in our analysis are most probably because of the requirement of signing a contract agreement for 10-15 years for participating in CRP and for 5 years for participating in CSP. With the increase in age, they may not be interested in retiring their land as they may or may not see the results of their decisions during their lifetime. Also, they may not have the patience and interest in following the complex application procedures to be part of CRP and CSP. This explanation is supported by findings of Comerford (2014) that noted that farmers who participated in covenant programs decided to withdraw their participation from the programs. The reasons behind this behavior were due to requirements of the programs, the complex process, and the disliking of the tender process.

The crop insurance and the decision to participate in CRP had a negative and significant relationship at a 5% significance level. The result shows that a 1-unit increase in crop insurance coverage decreased the probability of participating in CRP by 16.9 percentage points. This result was similar to the result found by researchers working on the impact of crop insurance on CRP participation. DeLay (2019) examined the impact of crop insurance on CRP by acreage and found that a 1-percent increase in crop insurance decreases CRP participation by 0.03 percent. Likewise, Claassen et al. (2017) simulated the impact of federal crop insurance on CRP acreage by using parcel-level data and results showed that the introduction of crop insurance decreases CRP acreage by 0.23 percent.

We did not include crop insurance variables for the CSP since there was low variability in data for CSP– only two people out of all the current participants of CSP did not have crop insurance. For the EQIP model, the result shows a positive impact of crop insurance in participation decisions to EQIP, though it was not significant. Fleckenstein et al. (2020) conducted mixed-methods research to see whether crop insurance is a barrier for Midwest corn producers in adopting conservation practices. They found that crop insurance is not a barrier to conservation practices and producers of the Midwest use both of them simultaneously.

The level of education did not have an impact on participation in CRP and CSP. However, there was a negative impact of a low level of education in participation decisions in the EQIP model at a 10% significance level relative to the base category of mid-level education which is associate degree and/or technical training. Thus, relative to the base category, the probability of participation in the EQIP decreased by 7.4 percentage points for farmers with lower educational levels. Interestingly, higher education also had a negative impact on the participation decision in the EQIP model, though it was not significant.

EQIP is a predominantly technical assistance program, and it might be the case that farmers with low educational level might not be interested in processing the information provided to them under this program and thus are not interested in participating. Again, although not significant, for the higher educational level farmers, it is possible that they might often know about the

information that will be provided so don't need to be part of a conservation program to get it, all relative to the people with medium level education.

In our analysis, we found that the lower income had a positive impact on participation decisions in the EQIP model at a 10% significance level relative to the base category of mid-level income which ranges from $75,000 to $124,999. Thus, relative to the base category there was an increase in the probability of participation in EQIP by 6.5 percentage points for farmers with lower income levels. Likewise, there was a positive impact of high income in the participation decisions in the CSP model at a 5% significance level relative to the base category of mid-level income. There was an increase in the probability of participation in CSP by 8.1 percentage points for farmers with higher income levels.

If farming income makes up a higher portion of the respondent's total income, the likelihood of participation in CRP and CSP will be lower. Though this result was not significant, it makes sense that farmers would not want to leave their land for environmental conservation if they are getting more economic returns from farming the land. The positive relation with EQIP shows that farmers receiving predominantly technical assistance for their farms under EQIP are more likely to participate in this program.

If the respondent had an income source coming from farming only then there will be positive and significant impacts on the increase in the participation in CSP at a 10% significance level relative

to respondents with other sources of income other than farming. With an increase of one unit of income from farming only, the probability of participating in CSP increased by 12.9 percentage points.

The economic benefits generated from participation in conservation programs had a positive and significant impact on the decision to participate in CRP at a 1% significance level. With 1% increase in degree of economic attitude, the probability of participating in CRP increased by 20 percentage point. However, for CSP, the impact was negative and for EQIP the impact was positive, though the results were not significant.

If we consider private economic benefits and non-private benefits associated with participation in conservation programs, we see from the result that the impact of private and non-private benefits had an inverse relationship in all three models. For example, non-private benefits had a negative impact on participation decisions in CRP, but we found a positive and significant impact on private economic benefits in participation decisions. Likewise, for CSP and EQIP models, the impact of private economic benefits and non-private benefits on participation decisions was contrasting. This indicates that if respondents were giving more priority to economic benefits, they were giving less priority to non-private benefits. In past research, it has been shown that in comparison to females, males hold less pro-environmental attitudes and are less concerned about conservation behavior (Milfont & Schultz, 2018). In our sample, we had around 95% of male respondents which might be the reason for negative signs and not significant impact of non-private benefits on participation decisions.

The presence of farm successor had a negative and significant impact at a 5% significance level on participation decisions in the CRP model. Relative to when no successor is present, the probability of participation in CRP decreased by around 14.0 percentage points. There was a negative relationship between farm successors and participation decisions in the CSP model too, though not significant. However, there was a positive impact of farm successor in EQIP, though not significant. These results show that in the case of CRP and CSP, the presence of the next generation of operators may deter the respondent from participating as they might be more interested in operating it for market returns when they are at the helm of the operation. In the case of EQIP, there is no need to sign a contract for certain fixed years which gives flexibility to the next generation in participating in the program which justifies the positive sign of the estimate.

In the case of personality traits, the results show that an increase in the degree of openness was associated with an increase in the probability of participating in conservation programs. For the CSP, a 1% increase in the degree of openness of the respondents led to 4.9 percentage points increase in the likelihood of participation. This result was significant at the 5% level. Though the positive impact of openness in the participation decisions in CRP and EQIP, the results were not statistically significant.

The conscientiousness personality trait of respondents had a positive and significant impact on participation decisions on CRP, CSP, and EQIP at 1%, 5%, and 10% significance levels

respectively. For the CRP, a 1% increase in the degree of conscientiousness of the respondents led to a 13.7 percentage points increase in the likelihood of participation. Likewise, for the CSP a 1% increase in the degree of conscientiousness of the respondents led to a 3.9 percentage points increase in the likelihood of participation. Finally, for the EQIP a 1% increase in the degree of conscientiousness of the respondents led to a 2.9 percentage points increase in the likelihood of participation. This shows that more the farmers or respondents are careful and time takers in preparing conservation contract applications, there will be a higher chance of them preparing applications which in turn increases their acceptance and participation in these programs.

The risk-taking attitudes of respondents were negatively related to the participation decisions in CRP and EQIP. The result was significant for CRP only at a 10% significance level. With an increase of 1% degree of risk-taking attitude, the probability of participation in CRP decreased by 5.9 percentage points. This indicates that if respondents were willing to take risks in order to increase their operation's profitability, they would not be interested in retiring their land for CRP which provides a fixed income capped at $50,000 per annum.

The result show that current participation of respondents in CRP increased the current participation in CSP by 14.6 percentage points. This complimentary relationship was significant at a 1% level. Likewise, the current participation in CSP was complimentary to current participation in CRP (at a 5% significance level) and EQIP (at a 1% significance level). The increase in one-unit current participation in CSP increased the probability of participation in CRP by 20.8 and in EQIP by 11.6 percentage points. Similarly, the current participation in EQIP

had a positive and significant impact on the increase in current participation in CSP at a 1% significance level. The increase in one-unit current participation in EQIP increased the probability of participation in CSP by 10.3 percentage points.

Similar to current participation, there was an impact of past participation in one program on another program's current participation decisions. The past participation in CRP had positive and significant impacts on the current participation decisions in CSP at a 10% significance level. With an increase in one unit of past participation in CRP, the probability of participation in CSP increased by 11.3 percentage points. However, there was a negative impact of past participation in CRP in current participation decisions in EQIP, though it was not significant.

The past participation in CSP had a negative impact on the current participation decisions in CRP and a positive impact on the current participation decisions in EQIP, though neither are significant. Likewise, past participation in EQIP had a positive and significant impact on the current participation in CRP at a 10% significance level. With an increase in one unit of past participation in EQIP, the probability of participation in CRP increased by 9.7 percentage points. However, the past participation in EQIP had a negative impact on the current participation in CSP, though it was not significant.

TABLE 3: LOGIT REGRESSION MODEL ESTIMATES FOR PARTICIPATION DETERMINANTS IN CRP, CSP, AND EQIP

Independent variables	CRP model		CSP model		EQIP model	
	Coefficient	Marginal effect	Coefficient	Marginal effect	Coefficient	Marginal effect
Total owned land	0.054**	0.009**	-0.008	0.000	-0.019	-0.001
	(0.022)	(0.004)	(0.035)	(0.002)	(0.041)	(0.002)
Total rented land	0.019	0.003	0.059**	0.003**	-0.011	-0.001
	(0.018)	(0.003)	(0.027)	(0.001)	(0.029)	(0.002)
Age	-0.006	-0.001	-0.033	-0.001	0.029	0.002
	(0.015)	(0.003)	(0.028)	(0.001)	(0.025)	(0.001)
Crop insurance	-1.017**	-0.169**			0.412	0.024
	(0.436)	(0.07)			(0.886)	(0.051)
Lower education	-0.192	-0.032	0.957	0.043	-1.269*	-0.074*
	(0.384)	(0.064)	(0.923)	(0.042)	(0.728)	(0.042)
Higher education	-0.009	-0.001	0.911	0.041	-0.261	-0.015
	(0.376)	(0.063)	(0.829)	(0.037)	(0.581)	(0.034)
Low income	-0.115	−0.019	1.541	0.07	1.116*	0.065*
	(0.402)	(0.067)	(0.981)	(0.044)	(0.661)	(0.038)
High income	-0.14	−0.023	1.782**	0.081**	0.372	0.022
	(0.32)	(0.053)	(0.767)	(0.034)	(0.598)	(0.035)
High % of income from farming	-0.271	-0.045	-0.572	-0.026	0.531	0.031
	(0.303)	(0.05)	(0.599)	(0.027)	(0.531)	(0.031)
Only farming as source of income	0.302	0.05	2.836*	0.129*		
	(0.912)	(0.151)	(1.698)	(0.076)		
Current commodity price	0.089	0.015	0.246	0.011	0.169	0.01
	(0.341)	(0.057)	(0.675)	(0.031)	(0.56)	(0.033)
Non-private benefits	-0.09	-0.015	0.201	0.009	-0.407	-0.024
	(0.191)	(0.032)	(0.377)	(0.017)	(0.351)	(0.02)
Economic benefits	1.204***	0.200***	-0.065	-0.003	0.783	0.045
	(0.301)	(0.046)	(0.676)	(0.031)	(0.607)	(0.035)
Farm successor presence	-0.845**	-0.139**	-0.006	0.000	0.331	0.019
	(0.351)	(0.057)	(0.688)	(0.031)	(0.54)	(0.031)
Value for land	0.04	0.007	-0.725	-0.033	-0.212	-0.012
	(0.219)	(0.036)	(0.515)	(0.023)	(0.411)	(0.024)
Openness	0.113	0.019	1.087**	0.049**	0.349	0.02
	(0.194)	(0.032)	(0.495)	(0.022)	(0.361)	(0.021)
Conscientiousness	0.823***	0.137***	0.859**	0.039**	0.498*	0.029*
	(0.157)	(0.022)	(0.355)	(0.016)	(0.283)	(0.017)
	-0.356*	-0.059*	0.218	0.01	-0.181	-0.011

Risk taking attitude	(0.209)	(0.034)	(0.431)	(0.019)	(0.346)	(0.02)
Current participation in CRP			3.230*** (1.184)	0.146*** (0.053)	0.045 (0.624)	0.003 (0.036)
Current participation in CSP	1.249** (0.595)	0.208** (0.096)			1.992*** (0.693)	0.116*** (0.036)
Current participation in EQIP	0.387 (0.526)	0.064 (0.087)	2.263*** (0.735)	0.103*** (0.032)		
Past participation in CRP			2.499* (1.307)	0.113* (0.059)	-0.632 (0.829)	-0.037 (0.048)
Past participation in CSP	-0.161 (0.368)	-0.027 (0.061)			0.743 (0.648)	0.043 (0.038)
Past participation in EQIP	0.585* (0.333)	0.097* (0.055)	-0.291 (0.694)	-0.013 (0.031)		
Num.Obs.	344	344	345	345	346	346
Log.Lik.	-173.044	-173.044	-53.429	-53.429	-72.257	-72.257
FE: State	Yes	Yes	Yes	Yes	Yes	Yes
* p < 0.1, ** p < 0.05, *** p < 0.01, **** p < 0						

Notes: Numbers in parenthesis are standard error

8. CONCLUSION, IMPLICATIONS, AND FUTURE DIRECTIONS

In this study, we assessed the determinants of participation in conservation programs in Iowa, Kansas, and Nebraska. We compared the factors affecting participation in CRP, CSP, and EQIP. Data was collected through farmers' surveys (mail and web-based). Farm size, income, economic benefits associated with participation, farming as the only source of income, conscientiousness, openness, current participation in conservation programs, and past participation in conservation programs had positive significant impacts on participation decisions. Having crop insurance, the presence of a farm successor, and a risk-averse attitude had a negative and significant impact on participation in CRP.

Our findings provide additional information to the existing literature on the factors affecting participation decisions in conservation programs. The results have provided a better understanding of the association between farm and farmer's characteristics with the participation decisions. The results showed that these conservation programs are complements to each other suggesting that outreach efforts to promote participation in these programs might be implemented through a suitable coordinate strategy which leverages such interdependencies.

We also found that most of the respondents are aware of CRP which has increased the participation in CRP. However, some of the respondents were not familiar with CSP and EQIP which explains their lower participation. Out of 727 respondents, 35% were not familiar with CSP, and out of 729, 29% were not familiar with EQIP. This could be because that CRP is an oldest and well-known conservation programs relative to CSP and EQIP. Therefore, in the future, it is important to understand the barrier to information regarding these programs and examine the information-seeking and utilizing behavior of the respondents. Moreover, it is important to update the farmers or ranchers on the changed policies or application procedures of the programs to avoid confusion in applications and enhance participation in the conservation programs.

After the assessment of factors affecting participation in conservation programs, we were also interested in understanding the barrier to participation in these programs. Apart from

participation reasons, our survey also inquired about the reasons behind not participating currently in any conservation programs. Participation in other farm bill programs like crop insurance, receiving lower income returns from conservation programs, and complex program applications were some of the major reasons for their non-participation in conservation programs. This shows that simplification in the application procedures and higher economic benefits from participation will enhance the number of participants in these conservation programs.

Finally, while collecting data on socio-demographic characteristics, we suggest collecting data including socially disadvantaged, limited-resource, beginning, and veteran farmers and ranchers since EQIP can provide up to 90% cost-share rates for these groups. In addition, they can also claim 50% of the total cost in advance to start the planning, designing, or starting of conservation practices (EQIP, 2019). The behavior of this group might play a major role in determining participation in EQIP; therefore, it is crucial to include these limited resource groups in the data.

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APPENDIX 1: SURVEY QUESTIONNAIRE

Conservation Program and Risk Management Decisions in Agriculture

Your Operation

1. **Do you operate or manage cropland?**
   - ○ **Yes**
   - ○ **No → Please return the survey in the stamped self-addressed envelope.**

2. **In which county and state is most of the cropland that you operate located?**
   - _____ county
   - _____ state

3. **What is the total size of your operation that you managed in 2021 (in acres)?**
   - _____ acres owned
   - _____ acres rented from others

4. **Of your <u>total crop acreage</u> for 2021 (both owned and rented from others), what percent of your acres were utilized for the following crops?**

	Percentage of acres	If you had this crop, in how many counties are the acres for each crop located?
a. Corn	_____ %	_____ counties
b. Soybean	_____ %	_____ counties
c. Wheat	_____ %	_____ counties
d. Sorghum	_____ %	_____ counties
e. Other, please specify: _____	_____ %	_____ counties

5. **Please rank the following priorities for your operation. Rank from 1 to 6 with 1 being "most important" and 6 being "least important." If you add another option, please rank from 1 to 7.**

a. Covering fixed costs (depreciation, land rent etc.) every growing season	_____
b. Covering variable costs (cost of fertilizer, seeds etc.) every growing season	_____
c. Increasing yield every growing season	_____
d. Keeping costs low	_____
e. Maximizing revenue	_____
f. Maximizing profit	_____
g. Other, please specify and rank: _____	_____

6. How much have each of the following changed on your operation in the last 5 years?

	Increased	Decreased	No change
a. The average crop yield	○	○	○
b. The variability of crop yield	○	○	○
c. The average costs of managing your operation	○	○	○

7. How would you describe the impact of COVID-19 on your operation?

- ○ High positive impact
- ○ Moderate positive impact
- ○ Low positive impact
- ○ No impact
- ○ Low negative impact
- ○ Moderate negative impact
- ○ High negative impact

8. Did you receive funding from the Coronavirus Food Assistance Program (CFAP)?

- ○ Yes
- ○ No → **Go to Q12**

9. How many rounds of CFAP funding did you receive?

☐ Number of rounds

10. Were the funds used for each of the following?

	Yes	No
a. Maintaining employee salary and benefits	○	○
b. Maintaining your owned equipment	○	○
c. Investing in new equipment	○	○
d. Paying off existing debt	○	○
e. Covering other pandemic related losses	○	○
f. Other, please specify:	○	○

☐

11. How difficult or easy was it for you to complete paperwork to enroll in the CFAP?

- ○ Very difficult
- ○ Somewhat difficult
- ○ Neither difficult nor easy
- ○ Somewhat easy
- ○ Very easy
- ○ I was automatically enrolled

Conservation Program Participation

12. Which of the following best describes your participation in a Conservation Program?

	Not familiar with the program	Don't believe my land is eligible to participate	Never participated & do not plan to	Never Participated but want to in the future	Participated in the past	I Currently participate	What percentage of your operation's acres are participating?
a. Conservation Reserve Program (CRP)	○	○	○	○	○	○	____ %
b. Conservation Stewardship Program (CSP)	○	○	○	○	○	○	____ %
c. Environmental Quality Incentives Program (EQIP)	○	○	○	○	○	○	____ %
d. Regional Conservation Partnership Program	○	○	○	○	○	○	____ %
e. Other, please specify:	○	○	○	○	○	○	____ %

13. How much of a difference would it make in your Conservation Program participation decision if you knew that, as a result of your and other's participation decisions, the government would invest some funds for projects that would benefit everyone in your community?

- ○ A big difference
- ○ Some difference
- ○ Little difference
- ○ No difference

14. If you currently participate in any Conservation Program, are each of the following a reason for your participation?

	Yes	No
a. I do not currently participate	○	○
b. Participation provides me an additional income source	○	○
c. Participation helps me to diversify my income risk from managing my operation	○	○
d. It is the right thing to do for the environment	○	○
e. I participate because other producers in my community participate	○	○
f. Participation prevents my operation from going bankrupt	○	○
g. Other, please specify:	○	○

15. If you currently do <u>not</u> participate in any Conservation Program, are each of the following a reason for you not participating?

	Yes	No
a. I currently participate.	○	○
b. Program application is complex and time consuming.	○	○
c. The income and returns to participate are not worth it.	○	○
d. I lost interest to participate as I was not accepted in the previous signup.	○	○
e. I am currently ineligible to participate.	○	○
f. I lost interest to participate as people in my social network are not participating in the program.	○	○
g. I participate in other Farm Bill Programs, such as Crop Insurance and Disaster Insurance Programs, so do not participate in Conservation Programs.	○	○
h. Other, please specify:	○	○

16. Have you participated in one or more Conservation Programs in which you had to coordinate your choice of land management practices with other producers in your community?

○ Yes
○ No

17. How much do you agree or disagree with each of the following statements regarding participation in the CRP?

	Strongly agree	Agree	Neutral	Disagree	Strongly disagree	Unfamiliar with CRP so unable to respond
a. During the signup process, the CRP application procedure should allow farmers to revise and resubmit bids before the final winners are determined.	○	○	○	○	○	○
b. Signups for other Conservation Programs should involve bidding, like the CRP.	○	○	○	○	○	○
c. Providing more information about environmental benefits of conservation land management practices would simplify CRP application preparation.	○	○	○	○	○	○
d. I consult with my friends and neighbors about the CRP application prior to submission to the Farm Services Agency (FSA).	○	○	○	○	○	○
e. I am willing to work with my neighbor(s) to submit a bid jointly under the CRP if that would mean a greater chance of being selected in the program.	○	○	○	○	○	○
f. I am willing to work with my neighbor(s) to submit a bid jointly under the CRP if that would mean greater benefits for the environment.	○	○	○	○	○	○

Crop Insurance

18. Do you currently have crop insurance?

- ○ Yes
- ○ No → **Go to #21**

19. Are each of the following a reason for participating in Crop Insurance Programs?

	Yes	No
a. Participation helps diversify my income risk from managing my operation	○	○
b. Participation helps manage the downside risk of crop price and/or yield decline	○	○
c. Participation prevents my operation from going bankrupt	○	○
d. I participate because other producers in my community participate	○	○
e. I participate because my lender/banker or landowner requires it	○	○
f. Other, please specify:	○	○

20. Tell us about your coverage for crops that you grew in 2021 growing season.

Crop Type	Coverage Level	Yield or Revenue Protection	Did you insure all acres?
a. Corn	○ 50% ○ 70% ○ 55% ○ 75% ○ 60% ○ 80% ○ 65% ○ 85%	○ Yield ○ Revenue ○ Other	○ Yes ○ No
b. Soybean	○ 50% ○ 70% ○ 55% ○ 75% ○ 60% ○ 80% ○ 65% ○ 85%	○ Yield ○ Revenue ○ Other	○ Yes ○ No
c. Wheat	○ 50% ○ 70% ○ 55% ○ 75% ○ 60% ○ 80% ○ 65% ○ 85%	○ Yield ○ Revenue ○ Other	○ Yes ○ No
d. Sorghum	○ 50% ○ 70% ○ 55% ○ 75% ○ 60% ○ 80% ○ 65% ○ 85%	○ Yield ○ Revenue ○ Other	○ Yes ○ No
e. Other, please specify:	○ 50% ○ 70% ○ 55% ○ 75% ○ 60% ○ 80% ○ 65% ○ 85%	○ Yield ○ Revenue ○ Other	○ Yes ○ No

→ **Go to Question 22**

21. Are each of the following a reason for your decision to <u>not</u> have crop insurance during the 2021 growing season?

	Yes	No
a. Program application is complex and time consuming.	○	○
b. I have paid crop insurance premiums but have not received payouts in the past so decided not to buy this season.	○	○
c. I did not want to continue doing business with my current insurance agent.	○	○
d. I lost interest in participating since others in my community are not currently participating in the program.	○	○
e. I participate in other USDA Government Programs such as Conservation Programs, so decided not to buy any crop insurance this season.	○	○
f. Other, please specify:	○	○

Your Attitiudes

22. Do each of the following factors have a negative, positive or no influence on your decision to participate in Conservation Programs?

	Negative influence	No influence	Positive influence	Not applicable
a. Increase in crop insurance coverage	○	○	○	○
b. Increase in the annual property tax paid for my owned acres	○	○	○	○
c. Increase in the number of landowners I have to consult with to complete the paperwork for a program	○	○	○	○
d. Increase in current commodity prices	○	○	○	○
e. Expectations that future commodity prices will be higher	○	○	○	○
f. Increased willingness of other producers in my community to participate in Conservation Programs	○	○	○	○
g. Increase in my social standing from participating in Conservation Programs	○	○	○	○
h. Increase in benefits to the environment from participation in Conservation Programs	○	○	○	○
i. Cost savings and other benefits generated for the operation from participation in Conservation Programs	○	○	○	○
j. Having younger family or non-family members who will be managing the operation after me	○	○	○	○

23. If you had the option to select how you receive conservation payments during every year of the contract period, which of the following options would be the BEST one for you? ***Please note that regardless of the option you choose, the total amount paid to you at the end of the contract period under each option would be the same.***

- ○ The highest payment upfront in the first year followed by a decreasing payment every year till the end of the contract.
- ○ An increasing payment schedule with the highest payment in the last year of the contract period.
- ○ The same amount of money paid in every year of the contract period.

24. How much do you agree or disagree with the following statements?

	Strongly disagree	Disagree	Neither agree nor disagree	Agree	Strongly agree
a. The Covid-19 pandemic has made me more aware of the importance of protecting the environment.	○	○	○	○	○
b. The Covid-19 pandemic has made me more willing to participate in Conservation Programs.	○	○	○	○	○

25. How much do each of the following describe you?

	A lot	Somewhat	A little	Not at all
a. I like to experiment with new conservation land management practices to increase the profitability of my operation.	○	○	○	○
b. I like to experiment with new conservation land management practices to reduce the costs to my operation.	○	○	○	○
c. I am willing to adopt new conservation land management practices if they will increase the value of my land over time.	○	○	○	○
d. I am willing to adopt new conservation land management practices if they will improve my land's productivity.	○	○	○	○
e. I am willing to adopt new conservation land management practices since I have purchased crop insurance.	○	○	○	○
f. I like to experiment with new conservation land management practices on my operation to benefit the local environment.	○	○	○	○
g. I like to experiment with new conservation land management practices on my operation to benefit the global environment.	○	○	○	○
h. I am willing to adopt new conservation land management practices on my operation if they are going to benefit my local community.	○	○	○	○
i. I like to consult with other producers in the community before adopting new conservation land management practices.	○	○	○	○

26. How much do each of the following describe you?

	A lot	Somewhat	A little	Not at all
a. I take a lot of time and care in preparing my conservation contract application.	○	○	○	○
b. I am willing to take risks related to my operation to increase my operation's profitability.	○	○	○	○

27. Which of the following options BEST describes you regarding your decisions in any growing season?

- ○ I only give attention to decisions in the current growing season when I am making decisions about my operation.
- ○ I give more attention to what has already happened in previous growing seasons when making decisions about my operation.
- ○ I give more attention to what events may occur in future growing seasons when making decisions about my operation.

Demographics

28. In what year were you born?

☐☐☐☐

29. Are you:

- ◯ Male
- ◯ Female
- ◯ ☐

30. What is your relationship to the farm operator?

- ◯ Self
- ◯ Spouse
- ◯ Other family member
- ◯ Farm employee and not family member

31. For how many years have you been farming in total?

☐ Years

32. What is your highest level of education?

- ◯ Less than high school
- ◯ High school degree or GED
- ◯ Associate degree and/or technical training
- ◯ Bachelor's degree
- ◯ Graduate degree

33. Do you have a cordial relationship with the majority of the other operators in your local area or neighborhood?

- ◯ Yes
- ◯ No

34. What was your household's annual gross income in 2021? Include pretax income from all sources (farm net income, salary, wages, social security, rental properties, and investment income). This number can be found on IRS Form 1040 on Line 9.

- ◯ Less than $50,000
- ◯ $50,000 to $74,999
- ◯ $75,000 to $99,999
- ◯ $100,000 to $124,999
- ◯ $125,000 to $149,999
- ◯ $150,000 and above

35. Does your household have other sources of income other than from farming?

- ◯ Yes
- ◯ No → **Go to #37**

36. What percentage of your income comes from farming?

- ◯ 1-19%
- ◯ 20-39%
- ◯ 40-59%
- ◯ 60-79%
- ◯ 80-99%

37. Please use the space below for any additional comments.

Thank you!

We greatly appreciate the time you have taken to complete this survey. For your convenience, please use the postage-paid return envelope included in your survey packet to return your questionnaire.

Questions or requests from this survey can be directed to:
Bureau of Sociological Research
University of Nebraska-Lincoln
907 Oldfather Hall
PO Box 880325
Lincoln, NE 68588-0325

Phone: 1-800-480-4549 (toll free) E-mail: bosr@unl.edu

APPENDIX 2: CORRELATION MATRIX OF ATTITUDINAL VARIABLES

	Q25a Profit	Q25b Cost	Q25c Land value	Q25d Land profitability	Q25e Have crop insurance	Q25f Local environment	Q25g Global environment	Q25h Local community
Q25a Profit	1.00	0.80	0.56	0.56	0.25	0.52	0.46	0.43
Q25b Cost	0.80	1.00	0.54	0.56	0.27	0.49	0.44	0.43
Q25c Land value	0.56	0.54	1.00	0.73	0.26	0.47	0.40	0.49
Q25d Land profitability	0.56	0.56	0.73	1.00	0.24	0.46	0.41	0.48
Q25e Have crop insurance	0.25	0.27	0.26	0.24	1.00	0.35	0.36	0.32
Q25f Local environment	0.52	0.49	0.47	0.46	0.35	1.00	0.79	0.70
Q25g Global environment	0.46	0.44	0.40	0.41	0.36	0.79	1.00	0.73
Q25h Local community	0.43	0.43	0.49	0.48	0.32	0.70	0.73	1.00