Journal of Agricultural and Resource Economics 50(3):524–547 ISSN: 1068-5502 (Print); 2327-8285 (Online)

doi: 10.22004/ag.econ.356159

The Role of Spatially Varying Descriptive Norm Nudges on Public Valuation of Ecosystem Services Associated with Improved Soil Health

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This study examines public values for ecosystem services (ES) associated with soil health in agricultural lands. We use a choice experiment of Nebraska residents to investigate the effect of descriptive norm nudging on willingness-to-pay (WTP) for ES. Empirical results show an overall positive WTP for ES-generating policies but significant differences across treatment groups. Results show a higher WTP for a social norm nudge that refers to a relatively large geographic area (state versus county). Results also show that total WTP for state households would pay for conservation practice incentives on less than 10% of cropland.

Key words: choice experiment, Nebraska, nonmarket valuation, social norm nudging; willingness to pay

Introduction

Securing nutritious food for a growing world population, while addressing the contemporary challenges of agricultural sustainability amid projected climate change scenarios, has become the centerpiece of the global food policy agenda (Schulte et al., 2014; Food and Agriculture Organisation of the United Nations, 2021). Agricultural sustainability necessitates the efficient use of soil resources to enhance long-term agricultural productivity and to enable the simultaneous provision of vital ecosystem services (ES) associated with improved soil health (Koch et al., 2013; Lal, 2015). The response to this challenge is complex, given limited land resources, agricultural intensification, and ongoing soil degradation and erosion (Pimentel and Kounang, 1998; Koch et al., 2013; Amundson et al., 2015; Lal, 2015, 2001). Soil resources around the world are in fair to very poor condition, exacerbated by accelerated soil erosion (75 billion tonnes/year) due to land use change and nonsustainable management practices (Food and Agriculture Organization of the United Nations, 2015). Management of and impacts on soil resources will undoubtedly play a significant role in future generations' prosperity and security (Koch et al., 2013; Amundson et al., 2015).

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This research is a contribution of the Long-Term Agroecosystem Research (LTAR) network, which is supported by the U.S. Department of Agriculture. The authors gratefully acknowledge helpful comments from participants at the 2022 annual meeting of the AAEA. The authors acknowledge that Dr. Banerjee is a *JARE* editor and was an editor at the time of submission but was not involved in the selection or review process for this article.

Review coordinated by Vardges Hovhannisyan.

The multifunctional and prominent role of soil health in agricultural productivity, sustainability, and ecosystem resilience has been prioritized in the food policy agenda (Stevens, 2018). Enacting policies that incentivize the adoption of nature-based (e.g., cover crops, partial or no-till, agroforestry, and crop diversification) and technology-based (e.g., biotechnology, and precision agriculture) climate-smart agricultural production practices can reverse soil degradation and enhance ES, including improved productivity, water quality and quantity, and soil carbon sequestration (Lewis and Rudnick, 2019). Understanding the public's valuation of ES associated with improved soil health is important for informing and advancing such policies promoting sustainable management. This information is essential as lack of information on values that reflect social benefits of ES associated with improved soil health can result in market failures and underprovision of ES, creating a barrier to the advancement of agricultural sustainability. Recent work by Bartkowski et al. (2020) in Germany, Dimal and Jetten (2020) in the Philippines, and Eusse-Villa et al. (2021) in Italy and Australia sheds light on how the public values ES associated with soil improvements around the world. However, to the best of our knowledge, no studies have examined public valuation in the United States.

Additionally, the associated benefits of ES can vary considerably across spatial scales and are highly context specific. The social contexts in which values are determined also vary, complicating the valuation process. Given these complexities, the lack of empirical evidence regarding the preferences of individuals who will be affected by a specific soil health policy makes the policy-making process particularly challenging. In this context, the primary goal of this study is to estimate the public's valuation of ES associated with soil health improvement of farmland in Nebraska and calculate willingness-to-pay (WTP) for policies that provide ES benefits via improved soil health. A secondary goal is to answer a more methodologically relevant question regarding the extent to which knowledge about other people's support for environmental policies in general (and soil health improvement policies in particular) influences individuals' support for similar policies through their preferences for ES associated with those policies.

To address these goals, we designed and conducted a stated preference study, in which we collect and analyze discrete choice experiment (DCE) data on the stated WTP of the Nebraska public for implementation of sustainable production practices on Nebraska farmland that improve soil health and provide ES related to increased productivity, improved water quality, and soil carbon sequestration. We selected Nebraska for our survey sample because it is a major agricultural state: 89.4% of the total land area is devoted to farming, nearly 34% of business sales and 22% of gross state products come from agriculture, and soil health is increasingly important to farmers (Nebraska Farm Bureau, 2024). Additionally, Nebraska ranks third nationally in corn production and fourth in soybean production (Nebraska Department of Agriculture, 2022). Promoting practices that maintain or enhance soil health is important for both private benefits (e.g., improving water retention, reducing vulnerability to droughts) and enhancing resilience as well as public benefits (e.g., increased carbon sequestration and improved downstream water quality), all of which are critical given the current climate change context (Food and Agriculture Organisation of the United Nations, 2024). Therefore, in Nebraska and elsewhere in the United States, promoting environmental/agricultural policies related to soil health improvement (e.g., the USDA's Conservation Stewardship Program (CSP) or Regional Conservation Partnership Program) has been a focal point in recent years. However, there is limited research on the valuation of ES by Nebraskans in relation to improved soil health, a critical area that could provide substantial groundwork for the formulation, funding, and implementation of pertinent policies. It should be noted that our study not only estimates Nebraskans' WTP for policies aimed at improving soil health but also investigates the impact of behavioral interventions on public WTP for these policies. Specifically, we assess the public's WTP for three distinct ES and investigate the effect of norm-based nudging on this valuation using a between-subject experimental design. Additionally, we analyze variations in overall WTP among respondents, correlating these differences with various individual attributes and socioeconomic characteristics.

When people are asked to state their preferences associated with new policy proposals, they may feel like they do not have sufficient knowledge and understanding of all the environmental trade-offs associated with the new policy (Czajkowski, Hanley, and LaRiviere, 2015; Lienhoop and Völker, 2016). This challenge is greater if there are only a few or no comparable policies in place (or that respondents are aware of) against which which they can benchmark responses, as is the case generally with soil health improvement policies (Franceschinis et al., 2023). As a result, they may rely on other factors to determine their degree of support, one of which could be how their peer group behaves or their own personal norm regarding appropriate support. The importance of descriptive social norms (that provide information about the behaviors, beliefs, and actions of others), perceived social norms (that capture what individuals think others believe and do), and one's own sense of obligation has been established in contexts such as resource conservation and recycling (Cialdini, 2003; Abbott, Nandeibam, and O'Shea, 2013; Czajkowski, Hanley, and Nyborg, 2017). However, less is known about whether there are differences in policy support depending upon whose actions are incorporated into the social norm-based behavior. Moreover, the directional impact of such norm-based information (when compared to a baseline, no-norm-based information condition) is likely to be context dependent. In essence, we do not know whether information about a reference group's actions will matter to generate policy support by shaping preferences and matter in what way, in the current soil health improvement context, and specifically for our study area.

This article evaluates respondents' preferences under two descriptive social norm treatments that differ in their spatial scope of the peer group to assess the extent and direction of deviation relative to a group who was not norm nudged. We consider two treatment groups, one where the social norm refers to behaviors by other individuals in a similar county as the respondent, and one where the norm is associated with individuals in a similar state. We use results from Khanal et al. (2022) to define the level of the social norm. Our dataset also allows us to consider the role of perceived social norms and personal norms in influencing preferences.

Analytical results show that most survey respondents in Nebraska are willing to support policies that would require additional taxes to pay for one or more ES associated with soil health improvements. As with other studies (e.g., Bartkowski et al., 2020), our results show significant preference heterogeneity across attributes. We also find a strong preference for soil carbon sequestration across all treatment groups. Interestingly, we find mixed effects of social norm nudging on overall WTP for a conservation program; while those exposed to the State norm showed greater support (higher overall WTP) for policies that incentivize ES provision compared to those in the control group, those exposed to the *County* norm showed less support (lower overall WTP). Results also show a limited role of environmental attitudes and socioeconomic characteristics in explaining overall WTP variation across individuals.

Our study makes both policy-focused and methodological contributions. First, it provides WTP values for multiple ES associated with soil health improvements and contributes to an evidence base for valuation of ES derived from intensively managed agricultural landscapes (Khanal et al., 2022). The WTP estimates can serve as reference values to inform policy design related to soil health improvement in Nebraska and beyond that can lead to policies that will receive public support. Second, as behavioral interventions have been widely used as inexpensive means of motivating policy-relevant outcomes and can be particularly effective in remedying market failures (Madrian, 2014), our empirical results provide some evidence on the effectiveness of social norm-based nudging in influencing WTP values. Differences in minimum policy support and WTP values for the two norm treatments (relative to control) underscore the need to pay attention to the reference group, whose behavioral information can be used to assist the public to form priors about and support different policies. Policies to encourage the adoption of sustainable conservation practices often require public investment to fund appropriate incentive mechanisms (e.g., agri-environmental schemes); given limited tax dollars, it is imperative to understand how public support is affected by other groups whose behaviors are used to shape the norm rather than just focusing on the behavior itself.

Norm Nudges and Environmental Policy

The theory of social comparison indicates that individuals validate their abilities or opinions by comparing themselves to others (Festinger, 1954). Focusing on the environmental policy domain, such comparisons can be made by paying attention to social norms, which are descriptive information related to emulation-worthy behaviors of relevant others (e.g., neighbors, classmates). In fact, norms can play an important role in motivating preferences and behaviors, thus serving as an important behavioral mechanism (often low-cost compared to pecuniary interventions) to guide policy-making as long as enough people are familiar with the context within which the norm operates and are sufficiently compliant with the norm (Cialdini, 2003, 2005; Bicchieri, 2005; Ferraro, Miranda, and Price, 2011; Nolan et al., 2008; Nyborg et al., 2016; Cialdini and Jacobson, 2021).

The positive impact of social norms on natural resources conservation practices has been well-documented (Schultz et al., 2007; Nolan et al., 2008; Ferraro, Miranda, and Price, 2011; Ferraro and Miranda, 2013; Allcott and Rogers, 2014; Brent, Cook, and Olsen, 2015; Dwyer, Maki, and Rothman, 2015; Jaime Torres and Carlsson, 2018). Normative messages related to towel usage have been found to be effective in motivating participation in a hotel's environmental conservation program (Goldstein, Cialdini, and Griskevicius, 2008). In another study, energy report letters comparing customers' electricity consumption with that of their neighbors (the 100 nearest households with similar characteristics) reduce energy use, especially for high-usage residential customers (Allcott, 2011). However, studies have shown mixed impacts of information interventions and nudging as policy instruments on recycling and waste reduction. Some studies (Schultz, 1999; Nomura, John, and Cotterill, 2011; Wensing et al., 2020) find that social norm nudging increased recycling and reduced waste, while others (Viscusi, Huber, and Bell, 2011) find no statistically significant impact. Thus, there is value in exploring the role of norm-based nudging in new contexts such as our current focus on soil health. This research agenda is further substantiated by the fact that our goal differs from this cited body of work in that all of them focus on contexts other than soil health improvement and the role of norm nudging in influencing actual behaviors rather than underlying preferences guiding those behavioral changes.[1]

The study closest to our work is that by Franceschinis et al. (2023) who used a DCE to evaluate public preferences for improvement of soil health attributes in Italy and Australia while controlling for respondents' attitudes toward personal and perceived prosocial norms. Specifically, they found that (i) the role of respondents' own moral principles and value systems about conserving soil health and (ii) the opinions of others important to them or in their social networks had a positive impact on whether respondents would support any soil-health policy and on preferences for ES and policy support. We capture the impact of personal norms with the statements "Being a good steward of the natural environment is aligned with my religious and/or spiritual beliefs" and "Supporting environmental causes gives me a sense of self-respect." We capture any perceived social norm impacts by asking respondents to state their agreement with the following three statements: "People I respect believe it is important to implement policies that improve soil health"; "People who are like me believe that it is important to support policies that improve soil health"; and "I believe it is the duty of every person in my state to be involved in ensuring soil health and the long-term sustainability of agriculture." Last, we asked about people's willingness to make a payment toward a soil health improvement policy, incorporating both a personal norm "I would support it [one-time payment to support soil health improvement] regardless of what other people do" and a perceived social norm "I would support it [one-time payment to support soil health improvement] if others also supported it."

[1] While any behavior change induced by a norm nudge presupposes the influence of nudges on underlying preferences guiding that behavior, governments are likely to want information on public's preferences for a policy before allocating limited pecuniary resources to the policy, generated via taxes.

Finally, drawing from the body of work that shows the efficacy of descriptive norms in affecting behavior change, we evaluate whether the same is true for individuals' WTP for supporting funding for sustainable agricultural practices associated with improved soil health. In this regard, our work is aligned with that of Abbott, Nandeibam, and O'Shea (2013), who considered the extent to which recycling behavior of local authorities in the UK was impacted by norms in three similar peer local authorities—those with the same age, the same household ethnic profile, and the same regional average recycling performance—relative to the target authority. Their research reveals a positive impact of the social norm on recycling rates. Other work on recycling behavior evaluates resident families of two multifamily buildings in New York City (managed by the same company) when one group was provided information about recycling rates of the group's own building and another group received information about the group's own recycling rate and a comparison rate in a similar building (Hewitt et al., 2023). The authors found that norm nudging had a positive impact on behaviors, with the magnitude of the impact being higher for the group that received information about a neighboring building's rate.

In our study, we utilize two descriptive social norm-based nudges that incorporate policy support information for two peer groups that, while similar to the respondent group of Nebraska residents, differ in their geographical location. The first norm nudge informs study participants about the percentage of others in a county similar to theirs who support paying for an agricultural conservation program to improve soil health. The second nudge informs participants about the percentage of others in a state similar to the respondents. We consider these two peer groups for two reasons: First, these peer groups are motivated by the varying spatial scales over which benefits of ES provision are felt. First-order benefits of water quality improvements and increased crop yield are felt locally more strongly (although there are downstream impacts, at least for the former) than first-order benefits of higher carbon sequestration rates, which has consequences for global climate change mitigation. Second, according to Schultz (2022), norm-based information can be more effective if information in the norm pertains to a peer group that the respondent belongs to or at a minimum perceives similarities to instead of pertaining to another comparative group to which the respondent has only limited to no allegiance. This would suggest that respondents in the *County* treatment are more likely to pay attention to and thus be influenced by the norm than in the *State* treatment, and this would be reflected in their preference elicitations. However, other evidence suggests that the size of the reference group affects the impact of a social norm. Goldstein, Cialdini, and Griskevicius (2008) found that hotel guests were more likely to reuse towels when told that a large percentage of previous guests had done so (i.e., "the majority of guests reuse their towels") compared to when given a neutral environmental message, and Frey and Meier (2004) found in a field experiment that charitable contributions increase if people know that many others contribute. These results are consistent with Hewitt et al. (2023), who found that providing information about the behavior of residents in other buildings in addition to a respondent's own building (i.e., a larger peer group) generated greater recycling gains than the providing information about families in one's own building only (i.e., a smaller peer group).

In contrast to much of the literature, the social nudge that we use is based on a generic county or state ("county similar to yours" or "state similar to Nebraska") instead of clarifying which county or state provides the reference. Grelle et al. (2024) compared general societal framing with personal framing (e.g., "people earn more money when doing Y" versus "you earn more money when doing Y") and finds that personal framing is more effective at nudging behavior. Rabb et al. (2022) take a similar approach to our study, although they used self-assessed estimates of social norm values while we provide the social norm values. They evaluated the impact of perceived social norms regarding COVID-19 vaccination behavior and respondent-intended vaccination behavior. Specifically, the authors asked respondents about how many people in his/her social network he or she expected to get vaccinated. The social networks ranged from relatively small networks ("family and friends") to larger networks ("your state"). Results showed a significantly higher correlation between expected vaccination rates from a smaller network and own planned behavior than for larger networks. However, those results are for evaluating health behavior, not conservation practices. We do not know what the direction and magnitude of the impact would be, relative to a setting in which norm nudging is absent, in the current soil health context.

Diverging results from previous studies underscores the need for research that examines whether reference group size (e.g., *County*, with fewer people that are relatively more homogeneous, versus *State*, with more people that are relatively more heterogeneous) matters.

The Survey and Experimental Design

The survey was administered online by Qualtrics during the summer of 2021. The survey instrument uses a DCE to elicit choice responses to different conservation policies that provide three ES associated with improved soil health.[2] The first section of the survey assesses a baseline measure of respondents' familiarity with ES and their level of knowledge about agricultural conservation practices. The second section provides relevant information to familiarize respondents with concepts related to ES, soil health, methods to improve soil health and resultant benefits, and the impacts of good and poor soil health on ES. This includes information on various benefits of soil health and different types of ecosystem services as well as specific information on the three ecosystem services included in the survey (increased yield, reduced nitrate runoff, and increased soil carbon sequestration). The third section is designed to reduce the hypothetical bias that can occur with stated preference techniques by including the following text to establish the consequentiality of respondents' choices (Carson and Groves, 2007; Carson, Groves, and List, 2014; Johnston et al., 2017).

> Not all environmental programs provide the same level of ecosystem services, and by choosing optimal locations and other design features, policymakers can affect the ecosystem benefits provided by the program. Different features of the program can also lead to different costs. An analysis of the agricultural production patterns in the region has suggested that such a program would generate the greatest benefits if implemented in Nebraska. Due to the broad environmental benefits, funding for the program may come from areas outside of Nebraska.
>
> In this section, you will be asked to answer questions about features of conservation policies. Your responses will provide evidence to policymakers in the region about whether there is widespread public support for a taxpayer-funded program to improve soil health and generate ecosystem services from agricultural lands in Nebraska. If the results of the survey suggest that the majority of residents are in support of such a program, it will help policy makers choose the size and focus of such a program.
>
> Your responses are intended to provide guidance on establishing a statewide conservation program that focuses on sustainable and resilient agriculture for current and future generations. This new program would be financed by a one-time payment, which would be added once to your state income tax. The amount of the tax will depend on the policy most preferred by survey respondents. Funds will be put in a conservation fund with the requirement that it only be used to increase the provision of ecosystem services. By law, no additional payments would be required.

The social norm nudge was implemented as a between-subject treatment immediately prior to the DCE questions, which focus on Nebraska residents' stated WTP for funding the implementation of conservation practices associated with improved soil health on farmland in the state. The choice experiment focuses on ES related to improved water quality (via reduced nitrate runoff), increased soil carbon sequestration rates, and enhanced crop productivity (measured via yield improvements), all of which were included as attributes in the choice experiment. Our selection of the water quality

[2] A complete copy of the questionnaire is provided in the online supplement.

Table 1. Summary of Attributes and Levels Used for the Choice Experiment

Attribute in the Choice Experiment	Levels Considered
Nitrate runoff to streams and leaching to groundwater	20% less, 30% less, 40% less
Soil carbon sequestration	3% more (0.45 ton/acre), 4% more (0.60 ton/acre), 5% more (0.75 ton/acre)
Crop yield	5% more (5.5 bu/acre), 10% more (11 bu/acre), 15% more (16.5 bu/acre)
One-time cost per household	\$100, \$250, \$400

Notes: bu is a US bushel (or struck bushel) and is equal to 2,150.42 cubic inches or 0.03524 cubic meters.

Table 2. Example of a Choice Task

Features of Policy Impact	Policy A	Policy B	None
Nitrate runoff to streams and leaching to groundwater	20% less	40% less	No change
Soil carbon sequestration	4% more (0.60 ton/acre more)	3% more (0.45 ton/acre more)	No change
Crop yield	10% more (11 bu/acre more)	15% more (16.5 bu/acre more)	No change
One-time cost per household	\$100	\$250	\$0
My choice	□	□	□

improvement attribute for this study is primarily driven by the presence of multiple watersheds and the Ogallala Aquifer in Nebraska. In recent times, these water issues have captured public attention, as evidenced by significant media coverage and prioritization by local governments. This heightened visibility suggests that the public likely possesses varying levels of awareness and distinct preferences for addressing rising water quality issues. Moreover, focusing on water quality in Nebraska is crucial due to the state's extensive agricultural activities, which can significantly impact watershed health and, consequently, the sustainability and health of local communities and ecosystems (Nagengast, 2022). Carbon sequestration has global benefits in reducing the impacts of climate change, which are particularly relevant for agricultural production. Thus, efforts to increase soil carbon sequestration are expected to be valued in all Nebraska counties as well as in neighboring states. Finally, while there are many other dimensions to soil health enhancement (Food and Agriculture Organisation of the United Nations, 2024) and improved crop yield is more of a private good than the other ES, it was included in the DCE to reflect an attribute that is relevant to overall economic activity and production in the state. The last attribute is a one-time cost per household. Table 1 summarizes all attributes and levels in the choice experiment. The midpoint of the range for each attribute level is based on agronomic studies of the estimated impacts from incorporating cover crops into US croplands (Strock, Porter, and Russelle, 2004; Hanrahan et al., 2018; Tellatin and Myers, 2018; Sustainable Agriculture Research and Education, 2019). The range for each attribute was chosen to ensure that all included values were realistic and that they provided sufficient variation. Specifically, soil carbon sequestration, reduced nitrate runoff, and yield values were changed by 25%, 33%, and 50%, respectively, relative to the midpoint value. Soil carbon sequestration and crop yield effects were presented as percentages and mean values to improve respondent understanding.

Each DCE question includes two policy options and a status quo (no policy) option. The choice sets are based on a fractional factorial design and use a block design to reduce respondent fatigue. That is, 18 choice profiles (split into three blocks of six choice tasks each) are used to achieve a fully efficient design (100% D-efficiency in main effects). Each respondent was randomly assigned to one of the three blocks of six choice tasks. Table 2 presents an example of a choice task. The order of the six choice tasks and the order in which the ES attributes were presented were randomized between respondents to avoid ordering effects, although the attribute order remained the same for a single respondent to avoid confusion. Furthermore, to mitigate hypothetical bias in valuation, per standard practice, a cheap talk script was presented before the choice sets. This language is derived from a previously implemented DCE study with Iowa residents where authors elicited preferences for a government policy to improve the supply of multiple ES from agriculture (Khanal et al., 2022).

> The following choice sets consist of two policy alternatives and a 'no policy' option. In each case, you are asked to choose your most-preferred option. As you make your choice, please think about your budget and other things you might spend your money on instead of funding conservation practices in Nebraska. Remember that all responses to this survey are confidential and that the results of this study have the potential to inform public policy regarding a new publicly funded policy in Nebraska. Please read carefully and make your choice below. There are no wrong or right answers.

To avoid deception, information about the behavior of others came from a recent survey of Iowa households' WTP for an agricultural conservation program (see Khanal et al., 2022, for details).[3] Respondents were randomly assigned to a social norm-nudging treatment group (*County* norm treatment or *State* norm treatment) or to a control group (no nudging). To prime participants in the two treatment groups to consider social norm-based information, we asked them to answer two Likert questions that assessed their beliefs about others' support of policies that improve soil health (perceived social norms) before being exposed to their respective descriptive social norm treatment. For the two treatment groups, the descriptive social norm appeared on participants' screen as a written message informing them that "80% of the public [in a county similar to yours] or [in a state similar to Nebraska] support a one-time tax to fund agricultural conservation programs that benefit soil health."[4] The respondents in the control group were not provided any social norm-based nudge and responded to the perceived social norm statements after the choice experiment. Given this context, comparing the two treatment groups to the control group provides insights about the impact of both perceived and descriptive norms associated with two peer groups on WTP, relative to a no-norm activation setting.

The choice experiment section concluded with some questions that measured respondents' perceived difficulty in participating in the choice tasks, and some questions available only to "protesters" (i.e., respondents who select only the "none" policy option) to explain their lack of willingness to financially support policies associated with improved soil health in Nebraska. The last part of the survey used Likert or Likert-type questions/statements to assess respondents' beliefs and attitudes about soil health in Nebraska, perceived social norms/attitudes toward soil health, religiosity, and attitudes toward state environmental goals. Last, given the timing of our survey, we included questions to control for the potential impact of COVID-19 on survey respondents in addition to standard sociodemographic questions.

Data and Descriptive Statistics

Qualtrics collected the data online in the summer of 2021. Respondents had to be 19 years old or older, with sample selection based on age and gender. Respondent demographic profile is representative of the Nebraska population (US Census Bureau, 2019) (see Table S7 in the

[3] The cited study focused on public support to fund agricultural conservation practices that improve water quality in Iowa. While the study is in a different state, it is a neighboring state that also has a significant agricultural economy and thus, is relevant to the broader soil health improvement context. The use of actual results from previous work to create our norm can help reduce the degree of hypothetical bias associated with any DCE study.

[4] Text in the square brackets represents the different social-norm text presented to the two treatment groups. We should note that our *State* treatment could have used the alternate text [in a state similar to yours] instead of [in a state similar to Nebraska]. This would ensure maximal similarities in the language of the nudge. However, since the study was conducted in Nebraska, the use of our chosen text was done to ensure maximal respondent comprehension while still making comparison between the two treatments possible.

Table 3. Descriptive Statistics for Sample Groups (%)

		Treatment Groups	
Data Statistics	**Control** $N = 202$	***County* Norm** $N = 204$	***State* Norm** $N = 205$
Age			
18–24 years	15.3	12.7	11.2
25–34 years	15.8	20.6	22.9
35–44 years	20.3	18.6	22.9
45–54 years	13.4	13.7	11.7
55–64 years	15.8	18.1	14.6
65–74 years	14.9	12.7	13.7
75 years and over	4.5	3.4	2.9
Gender			
Male	47.5	49	47.8
Female	51.2	49.9	50.2
Non-binary, or prefer not to say	1.3	1.1	2
Education			
Less than high school diploma	2.5	2.5	1.5
High school graduate (includes equivalency)	36.6	36.8	41
Some college or associate degree	24.3	28.9	20
BachelorâĂŹs degree	25.2	20.6	21
Graduate or professional degree	11.4	11.3	16.6
Household Income			
Less than $25,000	25	22.8	19.6
$25,000–$49,999	26	28.2	31.2
$50,000–$74,999	15.8	20.8	21.1
$75,000–$99,999	16.3	9.4	11.6
$100,000–$149,999	11.7	13.9	13.6
Above $150,000	5.1	5	3
Race			
Black or African American	3.5	4.9	5.4
Other	10.4	12.3	12.7
White	86.1	82.8	82

online supplement, available at www.jareonline.org). Qualtrics removed inattentive participants ("speeders") who took less than half the median completion time to complete the survey. Several questions were repeated or required a specific text entry for a consistency/attention check and to avoid responses by computer bots. Responses that did not pass those checks were removed. The final dataset includes 611 respondents: 202 in the control group, 204 in the *County* norm treatment, and 205 in the *State* norm treatment.

Based on all survey responses, approximately 60% of participants report no prior farming experience, 71.5% report they are either "somewhat familiar" or "familiar" with the term ES and 74.1% have some awareness of the potential on-farm and off-farm benefits of soil health. However, more than 60% of the respondents have not received information about soil health in the news recently. Given this contextual background, about 80% of respondents stated an affirmative willingness to make a one-time payment to support soil health improvements. Specifically, 77.2% of the control group respondents, 78.9% of the *County* treatment respondents, and 83.4% of the *State* treatment respondents either answered that "I would support it if others also support it" or "I would support it regardless of what other people do." On average, self-evaluation of survey participants indicates a high comprehension level of the choice experiment questions as well as confidence in their responses.[5] Previous research (Champ, Moore, and Bishop, 2009; Loomis, 2014) suggests that incorporating respondent self-evaluation regarding confidence in hypothetical decisions can reduce bias in WTP estimates.

Individuals show positive attitudes toward soil health improvement and approximately 40% believe that too little money is spent on parks, recreation, and environmental goals by the state. Table 3 presents demographic variables across treatments. Age, gender, education, household income, and race distribution are similar across control and treatment groups.[6] Tables S1–S6 in the online supplement report detailed descriptive statistics that summarize characteristics and profiles of the survey respondents used in the analysis. Due to several Likert-scale survey questions, an exploratory factor analysis (based on the principal-component factor method) was utilized to identify and extract representative factors that can explain the variation of similar characteristics/concepts that are measured by all those variables.

Econometric Methods

The first part of our empirical analysis uses the random utility framework to model individual preferences for policies associated with improved soil health and provision of relevant ES. Random utility theory assumes that individuals (decision-makers) are utility maximizers; therefore, they select the alternative with the highest level of utility from an available choice set. This utility is only known to the decision-maker, but the researcher can specify a representative utility function that relates observed attributes to the decision-maker's utility. Given the existence of unobserved preference heterogeneity across decision-makers, many recent papers use the mixed logit model to capture individual preferences with discrete choice data. The mixed multinomial logit (MML) model can represent any random utility model and capture any form of correlation, including scale heterogeneity (Hess and Train, 2017; McFadden and Train, 2000). Specifically, we use a random coefficients model for the mixed logit estimation. Using random coefficients allows us to estimate the heterogeneity of individual respondent preferences.

Each survey respondent, labeled n, faces a choice among J scenarios (the two policy scenarios associated with improved soil health and the status quo/no policy option, implying three alternatives) across T choice tasks (six per individual respondent). Attribute $\theta \in \Theta$ has level $\chi_{j,\theta}$ in scenario $j \in J$. We also include a monetary cost, P_j, and an alternative specific constant (ASC) associated with scenario j. We set $ASC_j = 1$ for all policy change scenarios and $ASC_j = 0$ for the status quo (neither option) choice. Following Train (2009), the indirect utility for respondent n from scenario j is given by

$$(1) \qquad V_{n,j} = \beta_{n,ASC} ASC_{n,j} + \sum_{\theta=1}^{\Theta} \beta_{n,\theta} \chi_{j,\theta} + \alpha_{n,\mu} P_j + \varepsilon_{n,j},$$

where $\alpha_{n,\mu}$ is the marginal utility of income for individual n and $\varepsilon_{n,j}$ is the error term. We assume that the respondent knows his or her preferences (e.g., β_n and α_n) and that coefficients vary over respondents with density function $f(\beta)$.

The specification in equation (1) is parameterized in preference space (i.e., the distribution of coefficients $\beta_{n,\theta}$ is specified in utility space). Following Train (2009), the marginal willingness-to-

[5] About 66% either "agree" or "strongly agree" that "I fully understood the questions about different policy features" and 73% either "agree" or "strongly agree" that "I am confident about the choices I made between different policy options."

[6] See Tables S8 and S9 in the online supplement for statistical tests of differences across treatment groups. No statistically significant differences between the control and the two treatment groups are found for any of these variables.

pay (MWTP) of individual n for attribute θ is given by

$$MWTP_{n,\theta} = -\frac{\beta_{n,\theta}}{\alpha_{n,\mu}}, \tag{2}$$

while the overall WTP for the attributes in scenario j compared to the baseline status quo scenario is the compensating variation $\left(CV_{n,j0}\right)$, given by $CV_{n,j0} = \frac{1}{\alpha_{n,\mu}}\left(V_{n,j} - V_{n,0}\right)$. The term $\left(V_{n,j} - V_{n,0}\right)$ refers to the difference in the indirect utilities between scenario j and the status quo baseline. The probability that respondent n selects a scenario j over an alternative scenario k in a particular choice task is given by

$$\pi_{n,j,k} = \Pr\left[\begin{array}{c} \beta_{n,ASC}ASC_{n,j} + \sum_{\theta=1}^{\Theta}\beta_{n,\theta}\chi_{j,\theta} + \alpha_{n,\mu}P_j + \varepsilon_{n,j} \\ > \beta_{n,ASC}ASC_{n,k} + \sum_{\theta=1}^{\Theta}\beta_{n,\theta}\chi_{k,\theta} + \alpha_{n,\mu}P_k + \varepsilon_{n,k} \end{array}\right] \forall\, k \neq j. \tag{3}$$

We utilize a fully correlated MML model in preference space (in Stata with command *mixlogit*) with 1,000 Halton draws because of the possibility of correlation among the individual parameters (Hess and Train, 2017). We assume a normal distribution for the ASC and all policy attribute coefficients except for the coefficient of the monetary cost. Following Carson and Czajkowski (2019), we restrict the domain of the monetary cost parameter to be exclusively in the positive domain by restricting its distribution to be lognormal (the variable is multiplied by −1 before entering the model). Since the estimated mean and standard deviation parameters will be the natural logarithms of the coefficients, we recover the mean and standard deviation of the coefficients themselves as $\exp\left(b_\theta + \frac{s_\theta^2}{2}\right)$ and $\exp\left(b_\theta + \frac{s_\theta^2}{2}\right)\sqrt{\exp\left(s_\theta^2\right) - 1}$, respectively. Finally, we utilize the Krinsky–Robb method with 2,000 bootstrapped repetitions to derive MWTP estimates from the preference estimates (Krinsky and Robb, 1986). Results from this regression are used to estimate attribute WTP values for each individual, total WTP for each individual, differences in the distribution of WTP for each attribute by treatment, and differences in total WTP by treatment.

Factor Analysis, Individual Characteristics, and Overall WTP

We use exploratory factor analysis to reduce the dimensionality of several variables into representative factors for use in subsequent regression analysis. Factor analysis is a multivariate statistical procedure that enables the identification of interrelated variables explaining integrated concepts, which can be classified and represented by unifying variables called factors. In this study, we utilize factor analysis with the principal-component factor method to identify and extract representative factors that can explain the variation of similar characteristics/concepts (see the online supplement for details).

For κ variables and ω factors, the statistical factor model can be specified by a system of regression equations given by $\boldsymbol{\chi} = \boldsymbol{f}\boldsymbol{\Lambda}' + \boldsymbol{\varepsilon}$, where $\boldsymbol{\chi}$ is the standardized $1 \times \kappa$ vector of observed variables, $\boldsymbol{\Lambda}$ is the $\kappa \times \omega$ factor-loading matrix, $\boldsymbol{f}$ represents a $1 \times \omega$ vector of latent factors, and $\boldsymbol{\varepsilon}$ denotes a $1 \times \kappa$ vector of latent error terms (specific factors) that is independent of f. The vector $\boldsymbol{\varepsilon}$ has diagonal covariance equal to the $\boldsymbol{\kappa} \times \boldsymbol{\kappa}$ uniqueness matrix $\boldsymbol{\Omega}$. The correlation matrix of $\boldsymbol{\chi}$,$\boldsymbol{\Sigma}$, is given as $\boldsymbol{\Sigma} = \boldsymbol{\Lambda\Omega\Lambda}' + \boldsymbol{\Psi}$, where $\boldsymbol{\Omega}$ denotes the variance–covariance matrix of the latent factors. Under the assumption of $\boldsymbol{\Omega} = \boldsymbol{I}$, where $\boldsymbol{I}$ is the identity matrix, the factors are uncorrelated, and the matrix $\boldsymbol{\Sigma}$ can be further decomposed by an eigenvector calculation. We implement a multistep methodological approach of exploratory factor analysis that also incorporates elements of confirmatory and reliability analysis, consistent with several recommendations for best practices in the application of factor analysis procedures (Costello and Osborne, 2005; Beavers et al., 2013; Shrestha, 2021).

The factor analysis procedure focuses on identifying common factors of variables related to prior farming experience, familiarity with ES, awareness of the potential on-farm and off-farm benefits of soil health, prior information in the news about soil health, comprehension level of the survey questions, beliefs about soil health and environmental attitudes, attitudes to funding state environmental programs/goals, perceived norms and attitudes toward soil health, trust in different entities to deal with environmental challenges, religiosity beliefs/attitudes, and the effect of the COVID-19 pandemic on their environmental awareness. Our methodological approach is consistent with recommended best practices in the application of factor analysis procedures (Costello and Osborne, 2005; Beavers et al., 2013; Shrestha, 2021) and includes the following steps: (i) assessment of the suitability of the data; (ii) factor extraction; and (iii) implementation of reliability and validity tests. Table 4 lists the Likert-scale items (questions or statements) used to extract each factor and calculate their corresponding scores. More details on the determination of these factors can be found in Tables S12–S20 in the online supplement.

Assessing the suitability of the data for factor analysis requires analyzing the determinant of the correlation matrix tests for the possible existence of multicollinearity, the Kaiser–Meyer–Olkin (KMO) test measures sampling adequacy, and the Bartlett test of sphericity measures the adequacy of the correlation matrix (see Table S11 in the online supplement). For each construct, the determinant of the correlation matrix has a value greater than 0.00001, indicating absence of multicollinearity between the factors. The value of the KMO test ranges from acceptable (0.5–0.6) to satisfactory (> 0.6) for each construct. Finally, for each construct, the Bartlett test of sphericity rejects the hypothesis that the correlation matrix is an identity matrix (p-value < 0.001), indicating the existence of significant correlations among at least some of the variables.

The reliability and validity of each construct is evaluated by reliability (Cronbach's alpha), average variance extracted (AVE), and composite reliability (CR) tests (see Table S21 in the online supplement for details). The internal consistency in all factors is confirmed by Cronbach's alpha and CR values. While the Cronbach's alpha value is less than 0.7 for some factors, the corresponding CR values are greater than 0.6, establishing internal consistency. Convergent validity is also established by the AVE values. And, while the AVE for some factors is less than a standard threshold of 0.5, the corresponding CR value greater than 0.6 ensures convergent validity (Fornell and Larcker, 1981).

Using matrix notation, our empirical specification is given by

$$\boldsymbol{Y} = \boldsymbol{\alpha}_0 + \boldsymbol{T}_1\boldsymbol{\gamma} + \boldsymbol{T}_2\boldsymbol{\delta} + \boldsymbol{X\vartheta} + \boldsymbol{T}_1\boldsymbol{X\zeta} + \boldsymbol{T}_2\boldsymbol{X\varphi} + \boldsymbol{\varepsilon}, \tag{4}$$

where $\boldsymbol{Y}$ is a column vector representing the overall WTP; $\boldsymbol{\alpha}_0$ is a column vector for the constant terms; $\boldsymbol{T_1}$ is a column vector taking a value of 1 if the respondent belongs to treatment group 1, and 0 otherwise; $\boldsymbol{T_2}$ is a column vector taking a value of 1 if the respondent belongs to treatment group 2, and 0 otherwise; $\boldsymbol{X}$ is a matrix of explanatory variables; $\boldsymbol{T_1X}$ represents the interaction of treatment group 1 with matrix $\boldsymbol{X}$;$\boldsymbol{T_2X}$ represents the interaction of treatment group 2 with matrix $\boldsymbol{X}$;$\boldsymbol{\varepsilon}$ denotes the column vector for the error terms; and $\boldsymbol{\gamma}$,$\boldsymbol{\delta}$,$\boldsymbol{\vartheta}$,$\boldsymbol{\zeta}$, and $\boldsymbol{\varphi}$ are vectors of parameters to be estimated.

The matrix $\boldsymbol{X}$ of explanatory variables includes all derived score factors (comprehension, perception, reflection, awareness/concern, perceived norms, support of state goals, public trust, private trust, religiosity, covid, information, familiarity) and the following categorical variables representing individual sociodemographic characteristics: income level, residence type, education level, gender, political affiliation, and age group. These factors are presented in Table 4. We reduced the categories in the sociodemographic variables and excluded from the regression any variable that was causing multicollinearity.[7] We ended up with a mean variance inflation factor equal to 4.19, which is less than the conservative threshold of 5. We estimate equation (4) in Stata.

[7] The following variables were removed: people who live in your household (including yourself) at least 50% of the time; family members under the age of 18 who live with you at least 50% of the time; impact of COVID-19 on household income; race; willingness to fund programs associated with improved soil health in Nebraska.

Table 4. Likert-Scale Items Considered for Each Factor

Factor	Item Included
Support of state goals	State funding to improve and protect the environment
	State funding to improve parks and recreation
Comprehension	I fully understood the questions about different policy features
	I am confident about the choices I made between the different policy features
Public trust	Scientists and researchers at universities
	State and local government agencies
	Federal government agencies
Private trust	Agricultural companies
	Producers
Covid	The Covid-19 pandemic has made me more aware of the importance of protecting environmental quality for the future
	The Covid-19 pandemic has made me more concerned about local environmental quality
	The Covid-19 pandemic has made me more concerned about global environmental quality
Religiosity	My religious and/or spiritual beliefs are the basis for my approach to life
	Being a good steward of the natural environment is aligned with my religious and/or spiritual beliefs
Familiarity	Familiarity with term ecosystem services
	Awareness of the potential on-farm and off-farm benefits of soil health
Information	Read or heard about soil health in the news recently
	Knowledge about agricultural conservation practices
Perception	I believe it is the duty of every person in my state to be involved in ensuring soil health and the long-term sustainability of agriculture
	I believe soil erosion is a big problem for agricultural lands in my state
	Conservation practices that improve soil health are beneficial to my state
	Conservation practices that improve soil health benefit me personally
	I would financially support soil health improvement initiatives by the state government
	Poor soil health presents a risk to me personally
	Poor soil health presents a risk to future generations
Reflection	Supporting environmental causes gives me a sense of self-respect
	I feel badly about myself when I think about how my lifestyle hurts the environment
	Humans change nature for the worse
	Economic growth always harms the environment
Awareness and concern	The risks posed by poor soil health are acceptable
	I am able to control how much I am exposed to the negative effects of poor soil health
	We worry too much about the environment and too little about the economy
	Science will solve environmental problems
Perceived social norms	People I respect believe it is important to implement policies that improve soil health
	People who are like me believe that it is important to support policies that improve soil health

Table 5. Mixed Multinomial Logit Results on the Effect of Environmental Services Attributes on the Willingness to Support a Conservation Program

Variable	Pooled Data	Control Group	*County* Norm	*State* Norm
Mean				
Nitrate runoff to streams and	0.009*	0.019**	−0.002	0.015*
leaching to groundwater	(0.005)	(0.008)	(0.008)	(0.009)
Soil carbon sequestration	0.372***	0.476***	0.205**	0.388***
	(0.051)	(0.089)	(0.085)	(0.087)
Crop yield	0.021**	0.046**	0.026	−0.013
	(0.010)	(0.018)	(0.018)	(0.017)
One-time cost per household[a]	−5.404***	−5.292***	−5.788***	−5.212***
	(0.145)	(0.235)	(0.319)	(0.208)
Alternative specific constant	1.847***	0.661	2.833***	2.239***
(ASC)[b]	(0.305)	(0.548)	(0.524)	(0.518)
Standard Deviation				
Nitrate runoff to streams and	0.044***	0.041***	0.042***	0.049***
leaching to groundwater	(0.005)	(0.008)	(0.008)	(0.009)
Soil carbon sequestration	0.464***	0.458***	0.447***	0.427***
	(0.043)	(0.075)	(0.071)	(0.075)
Crop yield	0.057***	0.069***	0.072***	0.048**
	(0.011)	(0.021)	(0.018)	(0.019)
One-time cost per household[a]	2.500***	2.462***	2.932***	2.169***
	(0.144)	(0.248)	(0.326)	(0.191)
No. of obs.[c]	10,998	3,636	3,672	3,690
LR χ^2	1,740.67	588.45	605.65	546.19
McFadden ρ^2	0.262	0.254	0.269	0.27
Log-likelihood	−2,920.14	−984.89	−964.28	−955.62
LR χ^2_{15} [d]	30.7	–	–	–
Akaike information criterion[e]	5,870.29	1,999.79	1,958.56	1,941.25
Bayes information criterion[e]	5,963.39	2,076.29	2,035.20	2,017.97

Notes: Standard errors in parentheses. Single, double and triple asterisk (*, **, ***) indicate statistical significance at the 10%, 5%, and 1% level, respectively.
[a] The reported coefficient is the mean of the coefficient on the natural logarithm of the negative cost.
[b] Fixed parameter.
[c] The number of observations is defined as the product of individuals × choice tasks × alternatives.
[d] Likelihood-ratio test for the hypothesis of parameter (joint parameter and scale) stability among sample groups.
[e] AIC and BIC are based on total number of choices.

Estimation Results

Table 5 reports the results of the regression analysis for equation (3).[8] The standard deviation values are determined after correcting for the correlation between random coefficients. The first column reports estimated coefficients for pooled data observations, the second column reports estimated coefficients for the control group (no social norm nudging), and the last two columns report estimated coefficients for the two treatment groups. Most of the estimated coefficients are statistically significant and positive across all treatments.

Our results, combined with nearly 80% support for a payment scheme among survey respondents, show that survey respondents in Nebraska prefer one or more ES associated with

[8] See Table S10 in the online supplement for the full results of the mixed logit estimation with the correlation between random factors.

Table 6. Willingness-to-Pay (WTP) Estimates

Variable	Pooled Data	Control Group	*County* Norm	*State* Norm
Nitrate runoff to streams and leaching to groundwater ($/1% change)	0.09 [0.00, 0.18]	0.18 [0.03, 0.35]	-0.01 [-0.08, 0.06]	0.26 [-0.03, 0.59]
Soil carbon sequestration ($/1% change)	3.60 [2.67, 4.71]	4.55 [2.91, 6.51]	0.90 [0.21, 1.72]	6.75 [3.90, 10.11]
Crop yield ($/1% change)	0.21 [0.02, 0.40]	0.44 [0.10, 0.78]	0.11 [-0.04, 0.27]	−0.22 [-0.81, 0.36]
Alternative specific constant (ASC) ($)	18.03 [12.31, 23.67]	6.34 [-4.01, 16.30]	12.56 [8.02, 17.04]	39.12 [21.69, 56.22]
Total WTP ($)*	37.03	34.42	17.01	71.81

Notes: Single asterisks denote WTP in addition to ASC for 30% less nitrate runoff to streams and leaching to groundwater, 4% more soil carbon sequestration, and 10% more crop yield; 95% confidence intervals in brackets. Empirical distributions of WTP were calculated using the Krinsky–Robb method with 2,000 bootstrapped repetitions.

soil health improvements and are willing to support policies that would require additional taxes to pay for it. Focusing on the norm-nudging treatment, we find that the social norm nudging has differential impacts on ES valuation and that the impact depends on which reference group's behavior information the respondents are nudged with. The ASC is statistically significant in all cases except for the control group model. The positive sign of the ASC indicates that part of the preference for funding a conservation program cannot be directly attributed to the ES included. This could be due either to an overall preference for conservation programs or to a preference for other ES affected by soil health that are not included (e.g., grazing opportunities, habitat improvement).

The null hypothesis that all standard deviations are equal to 0 is rejected for all models, based on the reported likelihood-ratio test values for the joint significance of the standard deviations. We also reject the hypothesis of joint similarity in the parameters and scales among all sample groups based on a likelihood ratio test of joint parameter stability (LR χ^2_{15}). The magnitudes of the standard deviation and the mean coefficients indicate significant preference heterogeneity for all attributes. Since the distribution of individual WTP values varies for each attribute, it is useful to calculate the proportion of respondents with a positive WTP for attribute k in the pooled data and for each treatment and control group. This is determined by the normal CDF $\Phi\left(-\frac{\overline{\beta_k}}{\overline{s_k}}\right)$, where calculation is possible as $\overline{\beta_k}$ is the mean coefficient and $\overline{s_k}$ is the meanstandard deviation. Using this, we find that a higher percentage of respondents across all treatments have a positive WTP for soil carbon sequestration (85.1%, 67.6%, and 81.8% of the control, *County*, and *State* treatment respondents, respectively) than for other ES attributes.[9]

Table 6 reports the mean marginal willingness-to-pay (MWTP) values (see equation 2) for all attributes in the data sample (along with their 95% confidence intervals). The results indicate that, on average, respondents from the pooled dataset are willing to pay $0.09 for a 1% reduction in nitrate runoff to streams and leaching to groundwater, $3.60 for a 1% increase in soil carbon sequestration, $0.21 for a 1% increase in crop yield, and an additional $18.03 (the ASC) for financing a conservation program associated with improved soil health.

While each individual responds to six choice set questions, we assume that preferences are consistent across those responses and use the estimation to predict the set of the set of β_n, α_n, and $MWTP_n$ values for each individual (a total of 611 individuals). We estimate total WTP for a conservation policy by using values of 30% less nitrate runoff to streams and leaching to groundwater, 4% more soil carbon sequestration, 10% more crop yield, the presence or absence of

[9] For reduced nitrate runoff, 68.0%, 47.8%, and 62.1% of the control, *County* norm, and *State* norm treatments, respectively, have positive WTP. For crop yield benefits, the percentages are 74.5%, 64.1%, and 39.6%, respectively, for the corresponding groups.

Table 7. Statistical Significance in WTP Differences across Sample Groups

	[*County* Norm–Control Group WTP]	[*State* Norm–Control Group WTP]	[*State* Norm–County Norm WTP]
Nitrate runoff to streams and leaching to groundwater ($/1% change)	$-^{*}$	+	$+^{*}$
Soil carbon sequestration ($/1% change)	$-^{***}$	$+^{***}$	$+^{***}$
Crop yield ($/1% change)	$-^{**}$	$-^{***}$	$-^{***}$
Alternative specific constant (ASC) ($)	$+^{***}$	$+^{***}$	$+^{***}$
Overall WTP ($)	$-^{***}$	$+^{***}$	$+^{***}$

Notes: Single, double, and triple asterisks (*, **, ***) indicate significance at the 10%, 5%, and 1% level, respectively. The + and − signs represent the sign of the difference in estimated WTP between the treatment conditions.

ASC, and the individual-specific *MWTP* values. Specifically, we use the product of these expected benefit values and individual-specific *MWTP* to estimate the individual-specific value of total WTP. This calculation provides the *Y* values used in the estimation of equation (4). These values are based on estimated values of the benefit from cover crops in the agronomic literature (Strock, Porter, and Russelle, 2004; Hanrahan et al., 2018; Tellatin and Myers, 2018; Sustainable Agriculture Research and Education, 2019).[10] Based on these expected improvement levels and our regression results, we estimate an overall WTP of $37.03 for a soil health conservation program. The control group of respondents has corresponding average MWTP values of $0.18, $4.55, $0.44, and $6.34 and an overall mean WTP value of $34.42. The corresponding average MWTP values for the *County* norm treatment of respondents are −$0.01, $0.90, $0.11, and $12.56, with an overall mean WTP value of $17.01. Last, the *State* norm treatment respondents have average MWTP values of $0.26, $6.75, −$0.22, and $39.12 and an overall mean WTP value of $71.81. Thus, it is evident that overall mean WTP for the two treatments is at the two ends of the range within which WTP varies, with the value for the *County* norm treatment being the lower bound.

A large portion of total WTP is from the ASC, which, as noted earlier, measures a willingness to support conservation programs that cannot be attributed to the ES included in the analysis. We find that the ASC is positive in all results and significant in all except the control group.

Focusing on the norm-nudge treatment, it is important to note that the social norm nudge that we use does not refer to any particular ES and is based on general support for agricultural conservation programs. Thus, we have no *a priori* expectations on the general direction of the social norm nudge on WTP for different ES attributes. However, one might expect that since both the treatment (*State* versus *County* versus control) and ES are spatial in nature, the marginal effects of each treatment may differ by ES. For example, since carbon sequestration provides global environmental benefits, it is possible that the *State* norm would lead to a higher WTP for carbon sequestration than the *County* norm if individuals recognize global public good provision is most effective with a large support base.

Table 7 reports the statistical significance in the difference in mean WTP for all attributes and overall WTP, across all treatments, and indicates that the social norm nudging impacts the preferences for different ES as well as total WTP. Our results show that while nudging matters, the type of social norm information affects the nature of its effect (positive or negative relative to control) on WTP for ES provision. Thus, combining the findings of Tables 6 and 7, we can conclude that relative to the control group, people in the *County* norm treatment have a lower preference for all ES attributes (other than the ASC). With the *State* norm treatment, this effect is reversed (except for the ES crop yield, which is statistically insignificant). Also focusing on crop yield, the

[10] We recognize that spatial variability in soil, climate, and other characteristics will lead to heterogeneous impacts of conservation practice adoption on the range of ES benefits.

nudged groups have a lower (and both statistically and economically insignificant) WTP relative to the control group.

Relative to the control group, the overall impact of the treatment on total WTP is opposite for the *County* and *State* norms. One possible explanation is that when it is unclear whether the information about others' behavior refers to individuals in the respondent's own state or potentially outside their state, as in the *County* treatment, nudging leads to free riding; if others have contributed, the respondent does not have to contribute much even when they believe there is a problem that needs to be remedied. An additional reason for the difference in the impact of the two treatments on overall WTP could be the difference in the size of the reference groups; the perceived pressure to conform to the social norm can be greater when the reference group is larger (*State* treatment) rather than smaller (*County* treatment), regardless of whether the similar county is in the same or in a different state than the respondent and has comparable population size. If another county is considered a relatively small social network relative to another state, our results differ from Rabb et al. (2022), who find a higher correlation between individual planned behavior and expected behavior in a small social network relative to a large social network. However, it is not clear if the size of a generic geographical region would be interpreted in the same way as a personal social network. However, our results are consistent with the results in Goldstein, Cialdini, and Griskevicius (2008), who find that a larger group size increases the impact of a social norm nudge. The point estimates in Table 6 show that the mean WTP for increased carbon sequestration is highest with the *State* treatment, followed by the control group, with the *County* treatment having the lowest mean WTP. This difference may reflect the nature of climate change, where an effective policy requires commitment from a large proportion of the population. Another state may be a large enough area to induce increased participation and value, while another county may be considered too small to be effective in climate change mitigation. In contrast, both the local (water quality) and private (yield) ES have mean WTP values that are not significantly different from 0 in either social norm nudge. The relationship between the area affected by a public good and the size of the reference group that supports a conservation program is an area that needs further exploration in future research.

Our empirical approach also allows us to explain overall WTP variation across respondents based on different individual attributes and socioeconomic characteristics. Table 8 presents the results of the regression shown in equation (4), estimating the impact of different respondent characteristics on overall WTP. In contrast to the results in Tables 5–7, the regression results in Table 8 include one observation per person instead of 18 observations per person (six questions with three possible responses per question). Results are based on a single regression with interaction terms, although the interaction results are listed in separate columns for improved readability. The first two columns (overall WTP) show the overall impact of each factor and characteristic on the total household WTP. The baseline categories are factor values of 0, household income below \$50k, community with less than 100k residents, lower education level (less than a bachelor's degree), male or self-identified/prefer not to say, independent/other political affiliation, and age less than 40 years old. The second set of results (column set 2) shows the marginal impact of the *County* norm. The third set of results show the marginal impact of the *State* norm and should be interpreted in the same way as the *County* norm results. As an example, a 1-standard-deviation increase in the "Support of State Goals" factor is associated with a reduction in overall WTP by \$2.54. In contrast, a 1-standard-deviation increase in the "Support of State Goals" factor is associated with an increase in total WTP by \$2.30 for the *County* norm group relative to the "No treatment" baseline.[11] On average, a respondent with identical beliefs and characteristics from the *State* norm treatment is willing to pay \$36.36 more than a respondent from the control group, indicating the positive effect of nudging information ("In a state similar to Nebraska") in their valuation. Thus, exposure to information about behavior of others outside of the respondent's state make them more likely to support policies that incentivize

[11] While it is not computationally feasible to estimate a full mixed logit model with random coefficients and interaction effects for individual characteristics, we have included the conditional logit (fixed effects) regression of the factors that affect policy choice in Table S22 in the online supplement.

Table 8. Role of Factors and Individual Characteristics on Overall WTP (*N* = 611)

	Overall WTP (1)		Marginal Effect of *County* Norm Treatment (2)		Marginal Effect of *State* Norm Treatment (3)	
Factor/Demographic Variable	**Coeff.**	**SE**	**Coeff.**	**SE**	**Coeff.**	**SE**
Comprehension	3.02***	1.06	−1.64	1.20	−0.83	2.29
Perception	−4.01**	1.63	1.95	1.85	1.53	3.17
Reflection	−0.12	1.20	−0.86	1.37	−2.94	2.85
Awareness/concern	0.94	1.09	−1.65	1.22	4.07	2.49
Perceived norms	−1.19	1.17	0.92	1.39	3.79	3.07
Support of state goals	−2.54***	0.95	2.30**	1.16	2.66	2.21
Public trust	0.83	1.36	−1.19	1.54	−3.61	2.96
Private trust	−1.02	1.29	1.36	1.45	−0.81	2.92
Religiosity	−0.90	0.97	0.24	1.09	−2.01	2.40
Covid	−1.53	1.28	1.66	1.45	−0.86	2.67
Information	0.78	1.02	−1.46	1.18	−7.30***	2.36
Familiarity	−2.48***	0.81	1.84*	0.97	6.75***	2.24
Income level ($50,000 and above)	2.9	1.98	−1.62	2.30	0.47	5.03
Residence type (100,000 or more residents)	2.07	1.98	−2.30	2.25	3.84	4.52
Education level (high)	2.03	2.08	−2.63	2.36	−2.23	4.87
Gender (female)	3.04	2.02	−2.48	2.30	0.21	4.40
Political affiliation 2 (Democrat)	−0.60	2.86	1.06	3.17	−3.62	5.88
Political affiliation 3 (Republican)	1.49	2.17	−2.31	2.62	−12.22**	6.12
Age group 2 (40–59 years old)	0.70	2.38	0.89	2.69	8.24	5.31
Age group 3 (60 years old and above)	1.72	2.46	0.30	2.85	15.03**	5.95
Constant	28.24***	2.26	–	–	–	–
County norm treatment: "In a county similar to yours"	–	–	−12.70***	2.52	–	–
State norm treatment: "In a state similar to Nebraska"	–	–	–	–	36.36***	5.35
R^2	0.68					
F-test	22.27					
Prob > F	0					

Notes: Robust standard errors (SE) are reported. Single, double, and triple asterisks (*, **, ***) indicate significance at the 10%, 5%, and 1% level, respectively. Coefficients reflect a change in total WTP based on a change in the factor measure of 1 standard deviation.

ES provision in their own state (Nebraska). In contrast, an identical respondent from the *County* norm treatment is willing to pay $12.70 less than a respondent from the control group, indicating the negative effect of nudging information ("In a county similar to yours") in their valuation.

Respondent comprehension level of the survey questions corresponds to a positive effect in their overall WTP by $3.02, although no statistically significant differences were identified across all three groups. Along the same lines, individual perceptions related to the challenges of soil health reduced overall WTP by $4.01. Prior information and knowledge about conservation practices reduces overall WTP for the *State* norm treatment by $7.30 but was insignificant for the overall impact and the *County* norm. On the other hand, prior familiarity with the term of ES and the potential on-farm and off-farm benefits of soil health increased overall WTP for the *State* norm treatment by $6.75 relative to a $1.84 increase in overall WTP by the *County* norm treatment, while respondent overall WTP is reduced by $2.48 in the pooled data sample. Finally, the overall WTP is reduced by $12.22 for a respondent in the *State* norm treatment who self-identifies as Republican relative to independent/other political affiliation. This suggests that using norm nudging to encourage support of soil health programs would be more effective in more Democrat- or independent-leaning regions. For the same treatment group, the overall WTP is increased by $15.03 for a respondent above 59 years old compared to the reference group (less than 40 years old).

It is important to highlight that the overall WTP estimates indicate a potential for public contribution that could be significant in the adoption of conservation programs in Nebraska. The US Census estimates that there are about 773,000 households in Nebraska (US Census Bureau, 2020), suggesting a total one-time WTP for residents of approximately $28.6 million based on the pooled data WTP of $37.03 per household for a one-time payment. We illustrate the potential conservation funding using a rate of return of 10%, which would provide about $2.86 million per year for conservation. While a range of practices could be used to improve soil health, we focus on cover crops for illustrative purposes. The 2019 Natural Resources Conservation Service (NRCS) cover crop payment rates in Nebraska (see Sustainable Agriculture Research and Education, 2019) start at $26.96/acre for a single species of cover crop and increase to $33.97 for a multispecies cover crop (in some cases the payment can be as high as $52.88). In 2024, there were approximately 14.8 million acres of harvested cropland planted in corn or soybeans Nebraska (US Department of Agriculture, 2024). Based on the pooled data results, a fund based on mean WTP would support continued conservation efforts on approximately 106,000 acres of cropland at payment levels of about $27/acre, or about 0.7% of all cropland. This suggests that state-level public support is not sufficient to fund a statewide program. However, it is important to recognize that conservation practices such as cover crops have both private and public benefits. Thus, a producer may be willing to pay a portion of the total cost of practice adoption. With a fixed budget available for funding conservation, a lower per acre payment would increase the maximum total acreage in conservation practices. For example, the Bayer carbon program (Bayer, 2024) pays annual payments of $6/acre for approved practices such as no-till or cover crops. At a cost of $6 per acre per practice, and using the same budget of $2.86 million per year, public support in Nebraska would fund single practice conservation (e.g., no-till or cover crops) on approximately 477,000 acres, or about 3.2% of Nebraska cropland. Another voluntary program through Indigo Ag (Indigo Ag, 2024) will pay up to $20/acre for cover crops or $10/acre for no-till. Thus, the total WTP from the Nebraska public would fund voluntary conservation on 286,000 acres in no-till or 143,000 acres in cover crops. While using the voluntary carbon market increases the potential number of acres enrolled in conservation relative to fully paying the practice cost, total WTP is still not sufficient to enroll all cropland in the state. If social norm nudging can be effectively used to increase WTP to $71.81 per household (based on the *State* treatment), it could increase the total endowment for a conservation program to $55.5 million, which could support continued cover crop adoption on more than 200,000 acres based on the NRCS rates (or about 925,000 acres at the Bayer payment rate of $6). In contrast, results from the *County* treatment ($17.01 per household) would only provide a fund of about $13 million, which would fund continued cover crop use on less than 50,000 acres based on the NRCS rates (or about 219,000 at the Bayer payment rate of $6). The above estimated percentages show that descriptive norm nudging can have a positive or a negative impact on overall WTP depending on the design of the nudge. Thus, for descriptive norm nudging to play a positive role in encouraging support for policies that incentivize the adoption of ES provision, one must carefully consider the reference group associated with the social norm message. Nonetheless, as evidenced by the *State* treatment percentage rates, social norm-based nudging could serve as an effective and inexpensive policy instrument in future conservation policy design and implementation. As with the nonnudging totals, using incentive programs that pay a portion of practice adoption costs could increase the impact of a state-funded conservation program.

Results suggest that having a larger reference group that supports conservation programs (i.e., a similar state) creates additional pressure to conform to that norm and support such programs.

A smaller reference group (i.e., a similar county) does not provide additional pressure but rather increases free-riding behavior (i.e., lack of willingness to support the policy) compared to the control group that received no information about others' preferences. This result has significant policy implications for when public messaging campaigns involving normative information. Depending on the type of norm used, reference-group behavior can be effective in increasing support for conservation policies or, alternatively, can lead to free riding and an overall reduction in support.

Policy Implications and Concluding Remarks

Soil health is fundamental to agricultural sustainability and the provision of ecosystem services. As society faces the dual challenges of soil degradation and rapid population growth, it is increasingly important to secure public support for conservation policies that promote improved soil health. Investing in soil health ensures the sustainable use of our agricultural lands and enhances the social and health benefits of ecosystem services. In addition, healthy soils have the ability to sequester carbon, offering a climate smart solution to mitigating climate change. Prioritizing soil health is key for sustainable agriculture and global environmental resilience.

Valuation of ES associated with improved soil health constitutes a high research and policy priority for establishing a roadmap to agricultural sustainability since the lack of values that reflect social benefits can result in market failures and under-provision of numerous ES. The availability of monetary values for different ES can inform policy design in promoting sustainable use of agricultural lands. Such a policy design should also aim to induce the socially desirable behavior of supporting sustainability policy initiatives. Motivating public financial contribution to conservation policies constitutes another important challenge in policy design.

To inform this issue, the current study analyzes the valuation of ES associated with improved soil health of farmlands in Nebraska by the public using a DCE to elicit public WTP for increased productivity, improved water quality, and soil carbon sequestration. Empirical findings show significant heterogeneity in WTP values across attributes with a strong preference for soil carbon sequestration. Adoption of sustainable conservation practices often requires public investment to fund appropriate incentive mechanisms (e.g., incentive payments). Our WTP values could be used as reference values to inform the design of future cost-effective conservation policies that incentivize the adoption of sustainable production practices associated with improved soil health and provision of relevant ES, such as soil carbon sequestration.

Additional results highlight the role of socioeconomic characteristics, perceptions, and prior information and awareness in the WTP for ES. We find differences in WTP due to individual perceptions related to the challenges of soil health, individual awareness regarding the risks of poor soil health and solutions to environmental problems, prior information about conservation practices, and familiarity with the concept of ES. This information can assist policy-makers in the design of targeted campaigns for individuals with limited familiarity or awareness and other important factors and can enable the more effective use of funds aimed at supporting environmental conservation goals.

Our empirical findings indicate that properly designed social norm-based nudging could have a positive impact on public WTP for ES associated with improved soil health in Nebraska's farmland. In this regard, nudging can play a prominent future role in increasing public financial support for conservation programs in Nebraska and beyond.

[First submitted July 2024; accepted for publication March 2025.]

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Journal of Agricultural and Resource Economics 50(3):S1–S42 ISSN: 1068-5502 (Print); 2327-8285 (Online)

doi: 10.22004/ag.econ.356159

Online Supplement: The Role of Spatially Varying Descriptive Norm Nudges on Public Valuation of Ecosystem Services Associated with Improved Soil Health

Charalampos Mavroutsikos, Karina Schoengold, Amalia Yiannaka, Simanti Banerjee, Konstantinos Giannakas, and Tala Awada

Soil Health and Ecosystem Services

Thank you for participating in this survey! We are researchers at [redacted], and we would like to ask you some questions about ecosystem services derived from the management of agricultural lands. Your responses are very important as they can inform the design of policies that can enhance the provision of ecosystem services from agriculture. Please answer the following questions. There are no right or wrong answers.

1. First, we would like you to tell us about yourself. What is your state of residence? (*dropdown menu*)
2. What is your county of residence? *(dropdown menu)*
3. How many people live in your household (including yourself) at least 50% of the time? ____________________
4. Are you familiar with the term 'ecosystem services'?

   ❑ Yes ❑ No ❑ Somewhat

5. Are you aware of the potential on-farm and off-farm benefits of soil health?

   ❑ Yes ❑ No ❑ Somewhat

6. Have you read or heard about soil health in the news recently?

   ❑ Yes ❑ No ❑ Not Sure

5.a. You answered 'Yes' in the previous question, where have you read or heard about soil health?

❑ Television ❑ Internet/Social Media ❑ Radio

❑ Brochures, flyers, pamphlets ❑ Family or Friends ❑ Not Sure

7. Please indicate your level of agreement/disagreement with the following statements

	Strongly Disagree	**Disagree**	**Neither Agree nor Disagree**	**Agree**	**Strongly Agree**
I am knowledgeable about agricultural conservation practices such as cover crops, zero tillage, and windbreaks	❑	❑	❑	❑	❑

The material contained herein is supplementary to the article named in the title and published in the *Journal of Agricultural and Resource Economics* (*JARE*).

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Here is some information that is relevant to the questions in the survey. Please read the following information carefully.

Background

An ecosystem is a dynamic complex of plants, animals and micro-organisms that interact with each other and with the physical environment they live in. There is a direct linkage between ecosystems and human well-being, through our dependence on ecosystem services. Ecosystem services are the benefits that people obtain from ecosystems. These ecosystem services can be classified into four categories: Economic, Ecological, Regulating, and Cultural (see picture below).

Categories and Types of Ecosystem Services

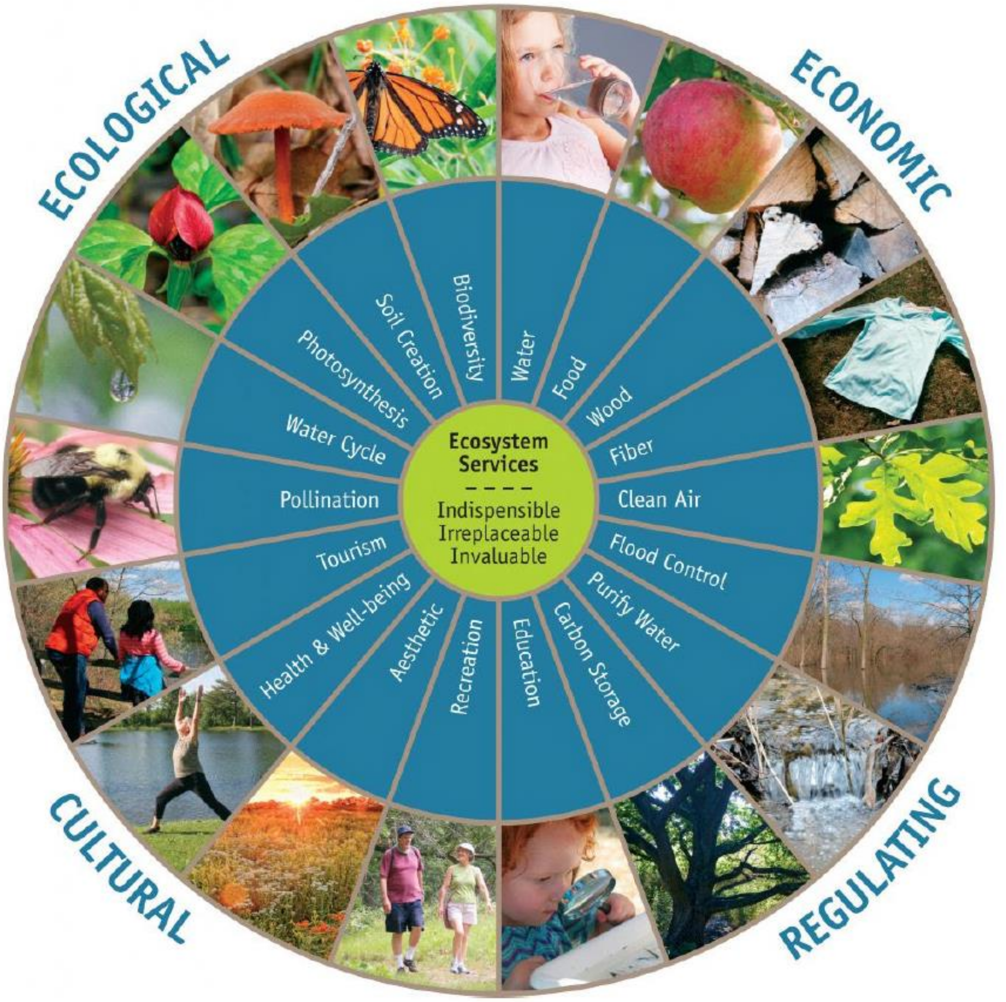

Image Credit: www.winnebagoforest.org

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Working agricultural lands are a dominant form of an ecosystem (agroecosystems) that provide us with the above benefits, which are essential to our well-being. Maintaining and restoring our agroecosystems ensures a clear path to biofuel, feed, fiber, and food security, economic prosperity and well-being.

- We need to feed over 9 billion people by 2050 without negatively impacting our ecosystems.
- Soil is the fundamental element of our farmlands. Increasing the production of food and raw materials depends on the productivity and quality of our farmlands' soils. Soil health is key to feeding the world and critical for food quantity and quality, healthy crops, farms, agroecosystems, and humans.

What is soil health?

Soil health is the ability of soils to sustain productivity, maintain the quality of air and water, and promote plant, animal, and human health.

Importance of Soil Health

Image Credit: www.nature.org

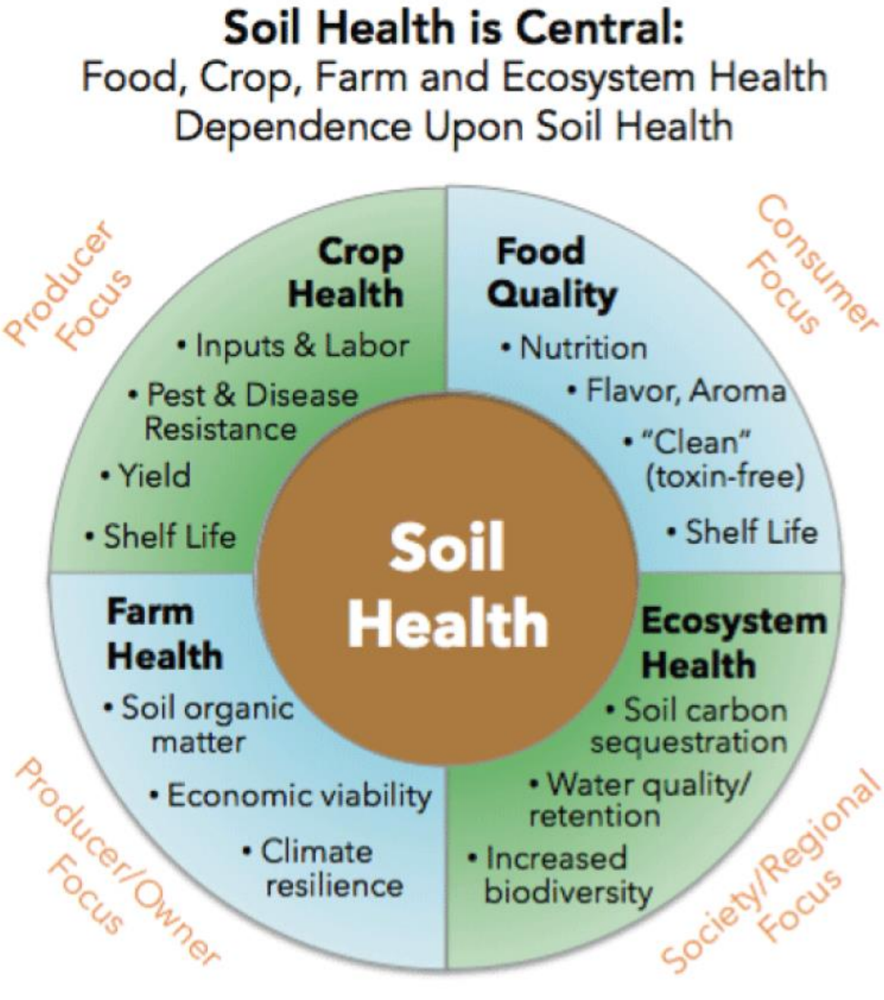

Image Credit: www.bionutrient.org

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What can be done to improve soil health?

Improvement of soil health requires adoption of soil conservation practices such as:

- Cover crops (plants grown in the same fields as commercial crops to reduce soil erosion and protect soil health)
- Reduced tillage (allowing crop residue to remain on the ground instead of being tilled into the soil)
- Rotational planting (rotating crop choice on the same land to preserve the productive capacity of the soil)

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The Impact of Conservation Practices on Soil Health

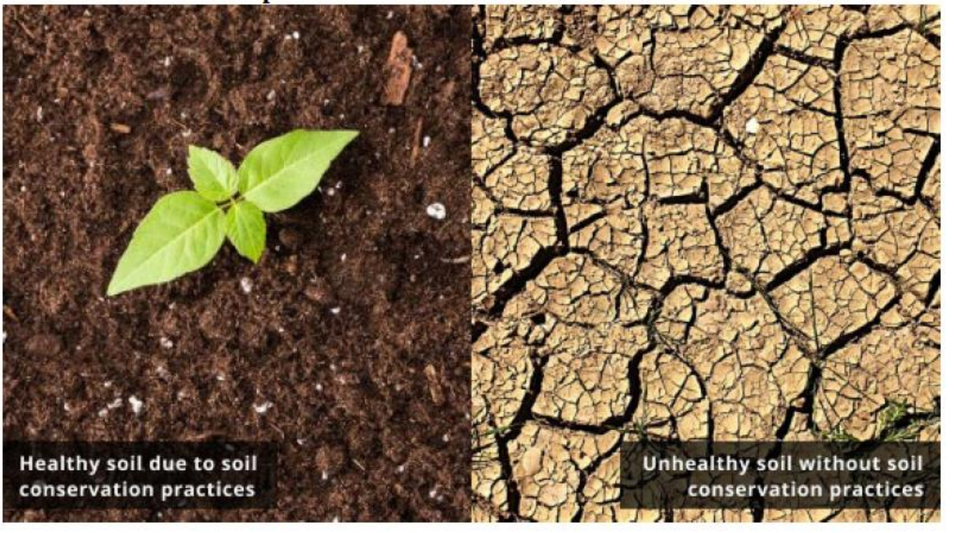

Image Credit: www.eos.com

What are the benefits of improved soil health for society now and into the future?

Using conservation practices jointly with agricultural production will:

- Conserve soil
- Reduce land degradation
- Improve soil microbe (key to soil function)
- Reduce soil erosion and sediment loss
- Increase carbon sequestration (capturing atmospheric *carbon dioxide* and storing it in the soil)
- Reduce nitrate surface runoff and leaching to groundwater
- Improve water quality

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Crop production: The direct positive impact of soil health on crop production and on-farm crop benefits can be summarized by:

- Increased crop yields
- Long-term sustainability in crop productivity
- Weed suppression
- Cost savings from reduced fertilizer and chemical use

Examples of the Positive Effects of Soil Health on Crop Production

Image Credit: www.humicgrowth.com

Image Credit: www.regenerationinternational.org

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Poor soil management and poor soil health can lead to negative impacts like land degradation with a direct negative impact on crop productivity and long-term sustainability. The following images show examples of land degradation due to soil erosion, sediment loss, and nitrate (fertilizers) runoff and leaching.

Examples of land degradation due to soil erosion, sediment loss, and nitrate leaching

Image Credit: www.nrcs.usda.gov

Image Credit: www. slideshare.net

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Clean water: Conservation practices can improve water quality by reducing nitrate runoff, soil erosion, and sediment loss. The following pictures show examples of good water quality. Good water quality is less prone to environmental problems like algae blooms and provides better wildlife habitat than poor water quality. Good water quality also improves environmental outcomes and reduces water treatment costs for water users.

Soil Health and Good Water Quality

Image Credit: www.asla.org

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Poor Water Quality due to Poor Soil Health

Poor soil health results in sediment and nutrient loss from farmland/cropland to surface waters leading to poor water quality. Poor water quality threatens human and environmental well-being by limiting access to clean and safe drinking water. Exposure to chemicals and other harmful substances may result in life-threatening waterborne diseases.

Poor Soil Health can lead to Poor Water Quality

Image Credit: www.mprnews.org

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Soil carbon sequestration

Soil carbon sequestration is the process of capturing atmospheric *carbon dioxide* (CO_2) and storing it in organic form (organic matter) in the soil. It is one way of reducing the amount of *carbon dioxide* in the atmosphere with the goal of improving soil health and mitigating global climate change. **For reference, the average per-person carbon emission rate in the United States is about 16 tons per year**.

- Increase in carbon sequestration and soil organic matter lead to reduction in greenhouse gases that contribute to global climate change in the atmosphere
- Increasing carbon sequestration reduces the negative environmental impacts of global climate change

The regenerative effect of soil carbon sequestration

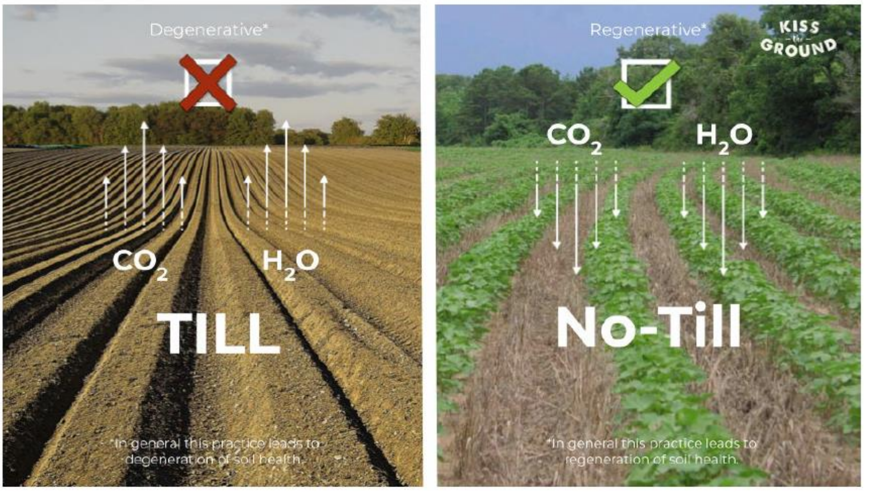
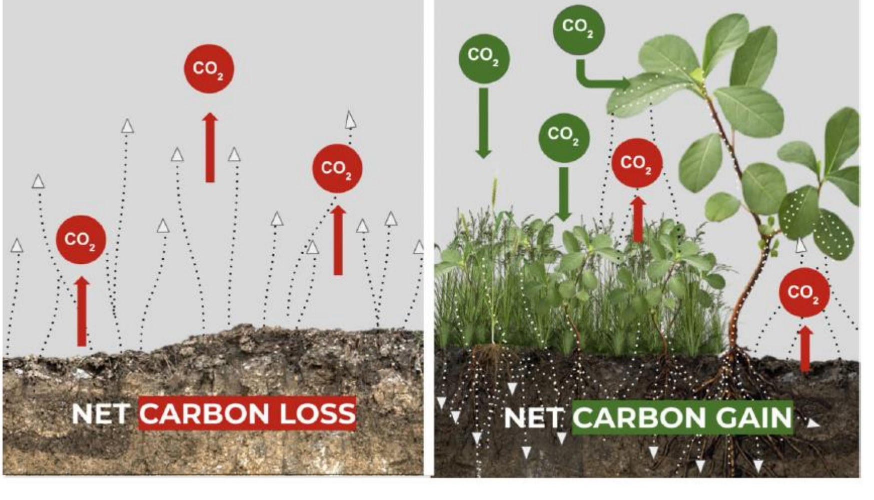


Image Credit: www.noharm-europe.org



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Poor soil health and management lead to soil carbon loss, resulting in higher risk to agricultural production due to global climate change. Climate change can have an irreversible impact on agricultural sustainability from frequent weather extremes like flooding and drought, which affect both crop and livestock production.

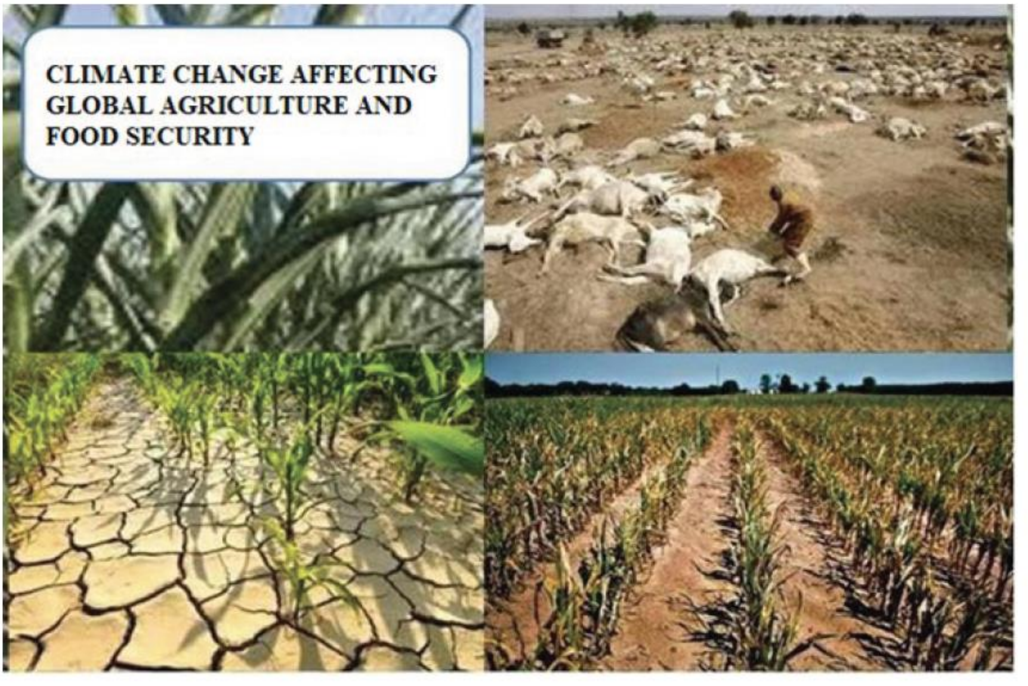

Image Credit: www.wikipedia.org

Image Credit: www.guardian.ng

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Your Response will Inform Policy Design

Not all environmental programs provide the same level of ecosystem services, and by choosing optimal locations and other design features, policymakers can affect the ecosystem benefits provided by the program. Designing a program with different features can also lead to different costs. An analysis of the agricultural production patterns in the region has suggested that a new program designed to improve soil health would generate the greatest benefits if implemented in Nebraska. Due to the broad environmental benefits, funding for the program may come from areas outside of Nebraska.

In this section, you will be asked to answer questions about features of conservation policies. Your responses will provide evidence to policymakers in the region about whether there is widespread public support for a taxpayer-funded program to improve soil health and generate ecosystem services from agricultural lands in Nebraska. If the results of the survey suggest that the majority of residents are in support of such a program, it will help policy makers choose the size and focus of such a program.

Your responses are intended to provide guidance on establishing a new conservation program that focuses on a sustainable and resilient agriculture for current and future generations. This new program would be financed by a one-time payment, which would be added once to your Nebraska state income tax. The amount of the tax will depend on the policy most preferred by survey respondents. Funds will be put in a conservation fund with the requirement that it only be used to increase the provision of ecosystem services. By law, no additional payments would be required.

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8. Before you answer questions about features of conservation policies please rate each of the following statements by checking the option that is most relevant to you. There are no right or wrong answers. **[DESIGN NOTE: CONTROL GROUP ANSWERS THESE QUESTIONS AFTER THE CHOICE EXPERIMENT]**

	Strongly Disagree	**Disagree**	**Neither Agree nor Disagree**	**Agree**	**Strongly Agree**
People I respect believe it is important to implement policies that improve soil health	❑	❑	❑	❑	❑
People who are like me believe that it is important to support policies that improve soil health	❑	❑	❑	❑	❑

Normative Information Section

[TREATMENT STATEMENT: 1/3 RECEIVE EACH TREATMENT; 1/3 SEE NO STATEMENT]

We would like to bring to your attention that a previous study found that 80% of respondents [in a county similar to yours] [in a state similar to Nebraska] are willing to pay a one-time tax to fund agricultural conservation programs that benefit soil health.

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9. The following choice sets consist of two policy alternatives and a 'no policy' option. In each case, you are asked to choose your most-preferred option. As you make your choice, please think about your budget and other things you might spend your money on instead of funding conservation practices in Nebraska. Remember that all responses to this survey are confidential and that the results of this study have the potential to inform public policy regarding a new publicly-funded policy in Nebraska. Please read carefully and make your choice below. There are no wrong or right answers.

[[Design note: new page for each question]]

[[Design note: Order of questions in the set and order of features are randomized between respondents]]

Question Set 1

3.1.1: Which of the three policy options below would you support?

Features of Policy Impact	Policy A	Policy B	None
Nitrate Runoff to Streams and Leaching to Groundwater	20% Less	40% Less	No change
Soil Carbon Sequestration	4% More (0.60 ton/acre More)	3% More (0.45 ton/acre More)	No change
Crop Yield	10% More (11 bu/acre More)	15% More (16.5 bu/acre More)	No change
One Time Cost per Household	$100	$250	$0
My Choice	❑	❑	❑

3.1.2: Which of the three policy options below would you support?

Features of Policy Impact	Policy A	Policy B	None
Nitrate Runoff to Streams and Leaching to Groundwater	40% Less	30% Less	No change
Soil Carbon Sequestration	5% More (0.75 ton/acre More)	4% More (0.60 ton/acre More)	No change
Crop Yield	10% More (11 bu/acre More)	5% More (5.5 bu/acre More)	No change
One Time Cost per Household	$400	$100	$0
My Choice	❑	❑	❑

3.1.3: Which of the three policy options below would you support?

Features of Policy Impact	Policy A	Policy B	None
Nitrate Runoff to Streams and Leaching to Groundwater	40% Less	20% Less	No change
Soil Carbon Sequestration	4% More (0.60 ton/acre More)	5% More (0.75 ton/acre More)	No change
Crop Yield	15% More (16.5 bu/acre More)	10% More (11 bu/acre More)	No change
One Time Cost per Household	$400	$250	$0
My Choice	❑	❑	❑

3.1.4: Which of the three policy options below would you support?

Features of Policy Impact	Policy A	Policy B	None
Nitrate Runoff to Streams and Leaching to Groundwater	30% Less	40% Less	No change
Soil Carbon Sequestration	3% More (0.45 ton/acre More)	5% More (0.75 ton/acre More)	No change
Crop Yield	15% More (16.5 bu/acre More)	5% More (5.5 bu/acre More)	No change
One Time Cost per Household	$100	$250	$0
My Choice	❑	❑	❑

3.1.5: Which of the three policy options below would you support?

Features of Policy Impact	Policy A	Policy B	None
Nitrate Runoff to Streams and Leaching to Groundwater	30% Less	40% Less	No change
Soil Carbon Sequestration	3% More (0.45 ton/acre More)	4% More (0.60 ton/acre More)	No change
Crop Yield	10% More (11 bu/acre More)	15% More (16.5 bu/acre More)	No change
One Time Cost per Household	$250	$400	$0
My Choice	❑	❑	❑

3.1.6: Which of the three policy options below would you support?

Features of Policy Impact	Policy A	Policy B	None
Nitrate Runoff to Streams and Leaching to Groundwater	20% Less	30% Less	No change
Soil Carbon Sequestration	5% More (0.75 ton/acre More)	4% More (0.60 ton/acre More)	No change
Crop Yield	15% More (16.5 bu/acre More)	10% More (11 bu/acre More)	No change
One Time Cost per Household	$250	$400	$0
My Choice	❑	❑	❑

<u>Question Set 2</u>

3.2.1: Which of the three policy options below would you support?

Features of Policy Impact	Policy A	Policy B	None
Nitrate Runoff to Streams and Leaching to Groundwater	20% Less	40% Less	No change
Soil Carbon Sequestration	5% More (0.75 ton/acre More)	3% More (0.45 ton/acre More)	No change
Crop Yield	15% More (16.5 bu/acre More)	10% More (11 bu/acre More)	No change
One Time Cost per Household	$250	$100	$0
My Choice	❑	❑	❑

3.2.2: Which of the three policy options below would you support?

Features of Policy Impact	Policy A	Policy B	None
Nitrate Runoff to Streams and Leaching to Groundwater	40% Less	30% Less	No change
Soil Carbon Sequestration	5% More (0.75 ton/acre More)	4% More (0.60 ton/acre More)	No change
Crop Yield	5% More (5.5 bu/acre More)	15% More (16.5 bu/acre More)	No change
One Time Cost per Household	$100	$400	$0
My Choice	❑	❑	❑

3.2.3: Which of the three policy options below would you support?

Features of Policy Impact	Policy A	Policy B	None
Nitrate Runoff to Streams and Leaching to Groundwater	30% Less	20% Less	No change
Soil Carbon Sequestration	3% More (0.45 ton/acre More)	5% More (0.75 ton/acre More)	No change
Crop Yield	10% More (11 bu/acre More)	15% More (16.5 bu/acre More)	No change
One Time Cost per Household	$250	$100	$0
My Choice	❑	❑	❑

3.2.4: Which of the three policy options below would you support?

Features of Policy Impact	Policy A	Policy B	None
Nitrate Runoff to Streams and Leaching to Groundwater	20% Less	30% Less	No change
Soil Carbon Sequestration	4% More (0.60 ton/acre More)	5% More (0.75 ton/acre More)	No change
Crop Yield	10% More (11 bu/acre More)	5% More (5.5 bu/acre More)	No change
One Time Cost per Household	$250	$100	$0
My Choice	❑	❑	❑

3.2.5: Which of the three policy options below would you support?

Features of Policy Impact	Policy A	Policy B	None
Nitrate Runoff to Streams and Leaching to Groundwater	30% Less	40% Less	No change
Soil Carbon Sequestration	5% More (0.75 ton/acre More)	4% More (0.60 ton/acre More)	No change
Crop Yield	15% More (16.5 bu/acre More)	5% More (5.5 bu/acre More)	No change
One Time Cost per Household	$400	$250	$0
My Choice	❑	❑	❑

3.2.6: Which of the three policy options below would you support?

Features of Policy Impact	Policy A	Policy B	None
Nitrate Runoff to Streams and Leaching to Groundwater	40% Less	30% Less	No change
Soil Carbon Sequestration	4% More (0.60 ton/acre More)	5% More (0.75 ton/acre More)	No change
Crop Yield	5% More (5.5 bu/acre More)	10% More (11 bu/acre More)	No change
One Time Cost per Household	$100	$400	$0
My Choice	❑	❑	❑

Question Set 3

3.3.1: Which of the three policy options below would you support?

Features of Policy Impact	Policy A	Policy B	None
Nitrate Runoff to Streams and Leaching to Groundwater	20% Less	30% Less	No change
Soil Carbon Sequestration	4% More (0.60 ton/acre More)	5% More (0.75 ton/acre More)	No change
Crop Yield	10% More (11 bu/acre More)	5% More (5.5 bu/acre More)	No change
One Time Cost per Household	$250	$100	$0
My Choice	❑	❑	❑

3.3.2: Which of the three policy options below would you support?

Features of Policy Impact	Policy A	Policy B	None
Nitrate Runoff to Streams and Leaching to Groundwater	20% Less	40% Less	No change
Soil Carbon Sequestration	4% More (0.60 ton/acre More)	5% More (0.75 ton/acre More)	No change
Crop Yield	15% More (16.5 bu/acre More)	10% More (11 bu/acre More)	No change
One Time Cost per Household	$100	$400	$0
My Choice	❑	❑	❑

3.3.3: Which of the three policy options below would you support?

Features of Policy Impact	Policy A	Policy B	None
Nitrate Runoff to Streams and Leaching to Groundwater	30% Less	40% Less	No change
Soil Carbon Sequestration	5% More (0.75 ton/acre More)	3% More (0.45 ton/acre More)	No change
Crop Yield	5% More (5.5 bu/acre More)	15% More (16.5 bu/acre More)	No change
One Time Cost per Household	$250	$100	$0
My Choice	❑	❑	❑

3.3.4: Which of the three policy options below would you support?

Features of Policy Impact	Policy A	Policy B	None
Nitrate Runoff to Streams and Leaching to Groundwater	40% Less	30% Less	No change
Soil Carbon Sequestration	4% More (0.60 ton/acre More)	3% More (0.45 ton/acre More)	No change
Crop Yield	10% More (11 bu/acre More)	15% More (16.5 bu/acre More)	No change
One Time Cost per Household	$400	$250	$0
My Choice	❑	❑	❑

3.3.5: Which of the three policy options below would you support?

Features of Policy Impact	Policy A	Policy B	None
Nitrate Runoff to Streams and Leaching to Groundwater	20% Less	40% Less	No change
Soil Carbon Sequestration	5% More (0.75 ton/acre More)	3% More (0.45 ton/acre More)	No change
Crop Yield	10% More (11 bu/acre More)	15% More (16.5 bu/acre More)	No change
One Time Cost per Household	$100	$250	$0
My Choice	❑	❑	❑

3.3.6: Which of the three policy options below would you support?

Features of Policy Impact	Policy A	Policy B	None
Nitrate Runoff to Streams and Leaching to Groundwater	40% Less	30% Less	No change
Soil Carbon Sequestration	3% More (0.45 ton/acre More)	4% More (0.60 ton/acre More)	No change
Crop Yield	10% More (11 bu/acre More)	5% More (5.5 bu/acre More)	No change
One Time Cost per Household	$100	$250	$0
My Choice	❑	❑	❑

10. You chose not to support a one-time payment for a program that would improve soil health and the ecosystem services generated from it. Please rate your agreement with each of the following statements. There are no right or wrong answers.

	Strongly Disagree	Disagree	Neither Agree nor Disagree	Agree	Strongly Agree
It is not fair that I have to financially contribute to such a program	❑	❑	❑	❑	❑
Soil health is important, but I cannot afford the payment	❑	❑	❑	❑	❑
Taxpayers should not have to pay for these programs	❑	❑	❑	❑	❑
I do not believe that such a program would have any positive impact on soil health	❑	❑	❑	❑	❑

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[[Design note: Order of ecosystem services are randomized between respondents]]

11. Please rank the ecosystem services in order of importance to you, where (1) is the most important and (3) is the least important.

Ecosystem Services	**Rank (1-3)**
Reduced Nitrate Runoff to Streams and Leaching to Groundwater	
Increased Soil Carbon Sequestration	
Increased Crop Yields	

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12. Please rate each of the following statements by checking the option that is most relevant to you. There are no right or wrong answers.

	Strongly Disagree	**Disagree**	**Neither Agree nor Disagree**	**Agree**	**Strongly Agree**
It was difficult for me to answer the questions related to different policy features	❑	❑	❑	❑	❑
I fully understood the questions about different policy features	❑	❑	❑	❑	❑
I am confident about the choices I made between the different policy features	❑	❑	❑	❑	❑

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13. Please rate each of the following statements by checking the option that is most relevant to you. There are no right or wrong answers.

	Strongly Disagree	**Disagree**	**Neither Agree nor Disagree**	**Agree**	**Strongly Agree**
I believe it is the duty of every person in my state to be involved in ensuring soil health and the long-term sustainability of agriculture	❑	❑	❑	❑	❑
I believe soil erosion is a big problem for agricultural lands in my state	❑	❑	❑	❑	❑
Conservation practices that improve soil health are beneficial to my state	❑	❑	❑	❑	❑
Conservation practices that improve soil health benefit me personally	❑	❑	❑	❑	❑
I would financially support soil health improvement initiatives by the state government	❑	❑	❑	❑	❑

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[[Design note: the following question ONLY appears for the control group who did not answer it earlier]]

14. Please rate each of the following statements by checking the option that is most relevant to you. There are no right or wrong answers.

	Strongly Disagree	Disagree	Neither Agree nor Disagree	Agree	Strongly Agree
People I respect believe it is important to implement policies that improve soil health	❑	❑	❑	❑	❑
People who are like me believe that it is important to support policies that improve soil health	❑	❑	❑	❑	❑

15. I would be willing to make a one-time payment to support soil health improvement in Nebraska if others like me would do the same.

    ❑ Yes, I would support it if others also supported it

    ❑ I would support it regardless of what other people do

    ❑ No, I would not support it

16. How do you feel about the funds currently allocated on each of the following goals in your state?

Goal	Too little money is spent on this goal	About the right amount of money is spent on this goal	Too much money is spent on this goal	Unsure
Improve and protect the environment	❑	❑	❑	❑
Improve parks and recreation	❑	❑	❑	❑

[[Design note: new page]]

[[Design note: Order of questions in the set is randomized]]

17. Please indicate the extent to which you agree/disagree with the following statements.

	Strongly Disagree	**Disagree**	**Neither Agree nor Disagree**	**Agree**	**Strongly Agree**
The risks posed by poor soil health are acceptable	❑	❑	❑	❑	❑
Poor soil health presents a risk to me personally	❑	❑	❑	❑	❑
Poor soil health presents a risk to future generations	❑	❑	❑	❑	❑
I am able to control how much I am exposed to the negative effects of poor soil health	❑	❑	❑	❑	❑
Supporting environmental causes gives me a sense of self-respect	❑	❑	❑	❑	❑
I feel badly about myself when I think about how my lifestyle hurts the environment	❑	❑	❑	❑	❑
We worry too much about the environment and too little about the economy	❑	❑	❑	❑	❑
Science will solve environmental problems	❑	❑	❑	❑	❑
Humans change nature for the worse	❑	❑	❑	❑	❑
Economic growth always harms the environment	❑	❑	❑	❑	❑

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[[Design note: Order of individuals in the set is randomized]]

18. How much trust do you have in the following entities or persons in ensuring the long-term sustainability of agriculture?

	No Trust at all	Very Low Trust	Rather Low Trust	Rather High Trust	Very High Trust
University Scientists and Researchers	❑	❑	❑	❑	❑
State and Local Government Agencies (e.g. county government, state Department of Agriculture)	❑	❑	❑	❑	❑
Federal Government Agencies (e.g., US Department of Agriculture, Environmental Protection Agency)	❑	❑	❑	❑	❑
Agricultural Companies	❑	❑	❑	❑	❑
Producers	❑	❑	❑	❑	❑

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19. Please mark the extent to which each of the following statements is true or not true for you.

	Not True	Somewhat True	True	Very True	Not Applicable
My religious and/or spiritual beliefs are the basis for my approach to life	❑	❑	❑	❑	❑
Being a good steward of the natural environment is aligned with my religious and/or spiritual beliefs	❑	❑	❑	❑	❑

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Before completing the survey, we would like you to answer some questions about yourself.

20. Which best describes your place of residence?
    - ❑ Rural
    - ❑ Town under 10,000 residents
    - ❑ City between 10,000 and 49,999 residents
    - ❑ City between 50,000 and 99,999 residents
    - ❑ City with 100,000 or more residents
21. What year were you born? (*dropdown menu*) ___________
22. What is your gender? (*select one*):
    - ❑ Female
    - ❑ Male
    - ❑ Non-binary
    - ❑ Prefer not to say
    - ❑ I prefer to state it myself: ______________________
23. From the categories below please choose the ones that best describe you (*select all that apply*).
    - ❑ Black or African American
    - ❑ Asian
    - ❑ Hispanic, Latino or Spanish origin
    - ❑ Native American
    - ❑ White
    - ❑ Native Hawaiian or other Pacific Islander
    - ❑ Middle Eastern or North African
    - ❑ Other
    - ❑ Prefer not to say

24. How many people live in your household (including yourself) at least 50% of the time?

    ____

25. How many family members under the age of 18 live with you at least 50% of the time?

    ____

26. What is your highest level of education completed? (*select one*):

    - ❑ Less than high school degree
    - ❑ High school degree or equivalent degree
    - ❑ Technical or trade school graduate
    - ❑ Two-year college degree
    - ❑ Four-year college degree (BA, BS)
    - ❑ Advanced degree (MA, MS, PhD, JD, MBA, etc.)

27. Please indicate the income bracket that best describes your annual household income from all sources (before taxes) (*select one*):

    - ❑ Less than $25,000
    - ❑ $25,000-$49,999
    - ❑ $50,000-$74,999
    - ❑ $75,000-$99,999
    - ❑ $100,000-$124,999
    - ❑ $125,000-$149,999
    - ❑ Above $150,000
    - ❑ Prefer not to say

28. Do you or anyone in your household have any farming experience? (*select one*):

    - ❑ Yes
    - ❑ No
    - ❑ Prefer not to say

29. In politics, you consider yourself (*select one*):

- ❑ Democrat
- ❑ Republican
- ❑ Independent, no party affiliation
- ❑ Other: ____________________
- ❑ I would rather not say

30. How would you describe the impact of COVID-19 on your household income? (*select one*):

- ❑ Positive impact
- ❑ No impact
- ❑ Low negative impact
- ❑ Moderate negative impact
- ❑ Severe negative impact
- ❑ Prefer not to say

31. Please choose the extent to which you agree/disagree with the following statements.

	Strongly Disagree	**Disagree**	**Neither Agree nor Disagree**	**Agree**	**Strongly Agree**
The Covid-19 pandemic has made me more aware of the importance of protecting environmental quality for the future	❑	❑	❑	❑	❑
The Covid-19 pandemic has made me more concerned about local environmental quality	❑	❑	❑	❑	❑
The Covid-19 pandemic has made me more concerned about global environmental quality	❑	❑	❑	❑	❑

Thank you very much for taking the time to complete this survey!

If you have any thoughts or comments about this survey, please feel free to enter them below. If you don't have comments, please enter 'None' in the text box.

Table S1: Additional Respondent Information (Percentages)

Place of Residence	**Percent**
Rural	18.99
Town under 10,000 residents	11.62
City between 10,000 and 49,999 residents	22.59
City between 50,000 and 99,999 residents	6.55
City with 100,000 or more residents	40.26

In politics, you consider yourself (*select one*):	**Percent**
Democrat	29.62
I would rather not say	6.06
Independent, no party affiliation	30.44
Other	2.45
Republican	31.42

Are you familiar with the term 'ecosystem services'?	**Percent**
Yes	31.42
Somewhat	40.1
No	28.48

Are you aware of the potential on-farm and off-farm benefits of soil health?	**Percent**
Yes	42.39
Somewhat	31.75
No	25.86

Have you read or heard about soil health in the news recently?	**Percent**
Yes	23.24
Not Sure	14.4
No	62.36

I am knowledgeable about agricultural conservation practices such as cover crops, zero tillage, and windbreaks	**Percent**
Strongly Disagree	8.67
Disagree	17.84
Neither Agree nor Disagree	27.5
Agree	36.5
Strongly Agree	9.49

Table S2: Comprehension Rating

Comprehension	**Mean**	**SD**
It was difficult for me to answer the questions related to different policy features	2.71	1.04
I fully understood the questions about different policy features	3.70	0.92
I am confident about the choices I made between the different policy features	3.85	0.81

Scale: 1 = Strongly Disagree to 5 = Strongly Agree

Table S3: Beliefs about Soil Health

Soil health belief	Mean	SD
I believe it is the duty of every person in my state to be involved in ensuring soil health and the long-term sustainability of agriculture	3.81	0.93
I believe soil erosion is a big problem for agricultural lands in my state	3.76	0.90
Conservation practices that improve soil health are beneficial to my state	4.20	0.77
Conservation practices that improve soil health benefit me personally	3.87	0.84
I would financially support soil health improvement initiatives by the state government	3.53	0.99

Scale: 1 = Strongly Disagree to 5 = Strongly Agree

Table S4: Perceived Norms/Attitudes towards Soil Health

Soil attitude	Mean	SD
People I respect believe it is important to implement policies that improve soil health	3.73	0.91
People who are like me believe that it is important to support policies that improve soil health	3.94	0.85

Scale: 1 = Strongly Disagree to 5 = Strongly Agree

Table S5: Environmental Attitudes

Environmental attitude	Mean	SD
The risks posed by poor soil health are acceptable	2.39	1.01
Poor soil health presents a risk to me personally	3.47	0.99
Poor soil health presents a risk to future generations	4.09	0.84
I am able to control how much I am exposed to the negative effects of poor soil health	2.98	0.93
Supporting environmental causes gives me a sense of self-respect	3.57	0.90
I feel badly about myself when I think about how my lifestyle hurts the environment	3.00	1.07
We worry too much about the environment and too little about the economy	2.54	1.15
Science will solve environmental problems	3.23	0.98
Humans change nature for the worse	3.65	0.96
Economic growth always harms the environment	2.95	1.02

Scale: 1 = Strongly Disagree to 5 = Strongly Agree

Table S6: Rating of Trust in Public and Private Entities*

Trust	Mean	SD
Scientists and Researchers at Universities	3.72	0.98
State and Local Government Agencies (e.g., county government, state Department of Agriculture)	3.00	1.05
Federal Government Agencies (e.g., US Department of Agriculture, Environmental Protection Agency)	2.80	1.13
Agricultural Companies	3.03	1.05
Producers	3.39	0.96

Scale: 1 = No Trust at all to 5 = Very High Trust
*This is based on the answer to the question: “How much trust do you have in the following entities or persons in ensuring the long-term sustainability of agriculture?”

Table S7: Sample Descriptive Statistics compared to Census Average Statistics (%)

Data Statistics	Census Data	Survey Data
Age		
18 to 24 years	12.85	13.10
25 to 34 years	17.62	19.80
35 to 44 years	16.69	20.60
45 to 54 years	14.83	12.90
55 to 64 years	16.56	16.20
65 to 74 years	12.32	13.70
75 years and over	9.14	3.60
Age by Gender		
Male 18-34	51.20	44.60
Female 18-34	48.80	55.40
Male 35-64	50.40	47.70
Female 35-64	49.60	52.30
Male 65 and over	45.00	60.60
Female 65 and over	55.00	39.40
Gender		
Male	49.50	48.90
Female	50.50	51.10
Education		
Less than high school diploma	8.00	2.10
High school graduate (includes equivalency)	25.70	38.10
Some college or associate degree	33.10	24.40
Bachelor’s degree	21.80	22.30
Graduate or professional degree	11.40	13.10
Education by Gender		
High school graduate or higher	92.00	97.90
Male, high school graduate or higher	91.40	98.00
Female, high school graduate or higher	92.70	97.70
Bachelor's degree or higher	33.20	35.40
Male, bachelor's degree or higher	31.60	36.70
Female, bachelor's degree or higher	34.80	33.90
Household Income		
Less than $25,000	16.70	22.40
$25,000 - $49,999	22.00	28.50
$50,000 - $74,999	19.50	19.30
$75,000 - $99,999	14.40	12.40
$100,000 - $149,999	15.90	13.10
Above $150,000	11.50	4.40
Race		
Black or African American	4.89	4.60
Other	8.94	11.80
White	86.16	83.60

Table S8: Pearson Chi-square Test for Differences among Control and Treatment Groups

Variable	Chi-square statistic	P-value
Income	10.714	0.38
Race	1.443	0.486
Education	7.795	0.253
Gender	0.947	0.918

Table S9: One-way Analysis of Variance for Age Differences among Control and Treatment Groups

Variable	Source	F-test Value	Prob > F
Age	Between Groups	0.360	0.698

Table S10: Full Regression Results with Correlation Values

	Pooled Data			**Control Group**			**County Norm**			**State Norm**		
	Coef.	**Std. Error**	**Sig**	**Coef.**	**Std. Error**	**Sig**	**Coef.**	**Std. Error**	**Sig**	**Coef.**	**Std. Error**	**Sig**
ASC	1.847	0.305***		0.661	0.548		2.833	0.524	***	2.239	0.518	***
Water	0.009	0.005***	*	0.019	0.008	**	-0.002	0.008		0.015	0.009	*
Carbon	0.372	0.051	***	0.476	0.089	***	0.205	0.085	**	0.388	0.087	***
Yield	0.021	0.010**	**	0.046	0.018	**	0.026	0.018		-0.013	0.017	
Price	-5.404	0.145***	***	-5.292	0.235	***	-5.788	0.319	***	-5.212	0.208	***
Water (SD)	0.044	0.005***	***	0.041	0.008	***	-0.042	0.008	***	0.049	0.009	***
Water*Carbon	-0.041	0.048		-0.117	0.079		0.012	0.080		0.104	0.083	
Water*Yield	-0.056	0.011***	***	-0.055	0.021	***	0.069	0.019	***	-0.047	0.019	**
Water*Price	-0.098	0.129		-0.622	0.221	***	0.061	0.214		0.969	0.145	***
Carbon (SD)	0.462	0.043***	***	0.443	0.073	***	0.447	0.071	***	0.414	0.076	***
Carbon*Yield	0.005	0.011		0.005	0.021		0.021	0.020		-0.008	0.017	
Carbon*Price	2.491	0.143***	***	2.371	0.234	***	2.886	0.325	***	1.822	0.201	***
Yield (SD)	-0.009	0.026		-0.042	0.024	*	-0.003	0.030		-0.003	0.022	
Yield*Price	0.087	0.140		0.107	0.157		0.225	0.204		0.540	0.155	***
Price (SD)	-0.162	0.194		0.206	0.263		0.461	0.199	**	-0.391	0.177	**
N	10998			3636			3672			3690		
Log-likelihood	-2920.145			-984.892			-964.278			-955.623		

Single, double and triple asterisk (*, **, ***) indicate statistical significance at the 10%, 5%, and 1% level, respectively

Table S11: Assessment of Data Suitability for Factor Analysis

Constructs	Determinant of the correlation matrix	Kaiser-Meyer-Olkin Measure of Sampling Adequacy	Bartlett test of sphericity		
			Chi-square	Degrees of freedom	p-value
Comprehension	0.619	0.500	292.27	1	0.00
Support of State Goals	0.961	0.500	24.49	1	0.00
Perceived Norms	0.544	0.500	370.19	1	0.00
Beliefs about Soil Health and Environmental Attitudes	0.009	0.870	2848.09	105	0.00
Public Trust	0.514	0.624	405.33	3	0.00
Private Trust	0.784	0.500	147.73	1	0.00
Religiosity	0.717	0.500	202.73	1	0.00
Covid	0.101	0.760	1394.01	3	0.00
Knowledge	0.856	0.537	94.46	6	0.00

Table 11 presents the different utilized tests for each construct to assess the suitability of data for factor analysis. The determinant of the correlation matrix tests for possible existence of multicollinearity, the Kaiser-Meyer-Olkin (KMO) test measures sampling adequacy, and the Bartlett test of sphericity measures the adequacy of the correlation matrix. For each construct, the determinant of the correlation matrix has value greater than 0.00001, indicating absence of multicollinearity. The value of the KMO test ranges from acceptable (0.5-0.6) to satisfactory (>0.6) for each construct. Finally, for each construct, the Bartlett test of sphericity rejects the hypothesis that the correlation matrix is an identity matrix (p-value < 0.001), indicating the existence of significant correlations among, at least some of, the variables.

Tables S12-S20 show the extracted factors and their corresponding loadings for each construct. The factor extraction is based on factor analysis with the principal-component factor method (the communalities are assumed to be 1) and the orthogonal varimax rotation with Kaiser normalization method (Kaiser, 1958). The optimal number of extracted factors was based on Kaiser's eigenvalue criterion (eigenvalue greater than 1). One factor was extracted to represent each of the following concepts: level of respondents' comprehension, their beliefs about others' support of policies that improve soil health (perceived social norms), their general support of state environmental goals, trust in government agencies and scientists, trust in the private agricultural industry, their religiosity beliefs/and attitudes, and the COVID-19 effect in their environmental awareness. These factors are named Comprehension, Norms, Support of State Goals, Public Trust, Private Trust, Religiosity, and Covid, respectively. Two factors are extracted for representing respondent knowledge about conservation practices, ecosystem services, and soil health benefits. Given their loadings, the two factors are named Information and Familiarity. The application of factor analysis on the variables related to beliefs about soil health and environmental attitudes results in three factors. These factors include Perception that captures individual perceptions related to the challenges of soil health, Reflection that indicates individual reflection on their environmental attitudes/beliefs, and Awareness that captures individual awareness regarding the risks of poor soil health and solutions to environmental problems.

Table S12: Extracted Factors and Loadings for Level of Comprehension

Level of Comprehension	Factor1
	Comprehension
I fully understood the questions about different policy features	0.8993
I am confident about the choices I made between the different policy features	0.8993
Eigenvalue	1.6176
Variance explained	0.8088

Table S13: Extracted Factors and Loadings for Perceived Norms/Attitudes towards Soil Health

Perceived Norms/Attitudes towards Soil Health	Factor1
	Norms
People I respect believe it is important to implement policies that improve soil health	0.9152
People who are like me believe that it is important to support policies that improve soil health	0.9152
Eigenvalue	1.6751
Variance explained	0.8376

Table S14: Extracted Factors and Loadings for Attitudes towards State Environmental Goals

Attitudes toward Supporting State Environmental Goals	Factor1
	Support of State Goals
Improve and protect the environment	0.7742
Improve parks and recreation	0.7742
Eigenvalue	1.1986
Variance explained	0.5993

The following is the text of the question that provides this information: "*How do you feel about the funds currently allocated on each of the following goals in your state?*", where Goal 1 is Improve and protect the environment, and Goal 2 is Improve parks and recreation. Options include the following answers: 1) "Too little money is spent on this goal", 2) "About the right amount of money is spent on this goal", 3) "Too much money is spent on this goal", and 4) "Unsure".

Table S15: Extracted Factors and Loadings for Trust in Public Entities

Trust in Public Entities	**Factor1**
	Public Trust
Scientists and Researchers at Universities	0.6770
State and Local Government Agencies (e.g., county government, state Department of Agriculture)	0.8478
Federal Government Agencies (e.g., US Department of Agriculture, Environmental Protection Agency)	0.8560
Eigenvalue	1.9098
Variance explained	0.6366

Table S16: Extracted Factors and Loadings for Trust in Private Entities

Trust in Private Entities	**Factor1**
	Private Trust
Agricultural Companies	0.8557
Producers	0.8557
Eigenvalue	1.4643
Variance explained	0.7321

Table S17: Extracted Factors and Loadings for Religiosity Beliefs/Attitudes

Religiosity Beliefs/Attitudes	**Factor1**
	Religiosity
My religious and/or spiritual beliefs are the basis for my approach to life	0.8753
Being a good steward of the natural environment is aligned with my religious and/or spiritual beliefs	0.8753
Eigenvalue	1.5323
Variance explained	0.7662

Table S18: Extracted Factors and Loadings for Covid-19 effect in Environmental Awareness

COVID-19 Impact	**Factor1**
	Covid
The Covid-19 pandemic has made me more aware of the importance of protecting environmental quality for the future	0.9257
The Covid-19 pandemic has made me more concerned about local environmental quality	0.9414
The Covid-19 pandemic has made me more concerned about global environmental quality	0.9270
Eigenvalue	2.6024
Variance explained	0.8675

Table S19: Extracted Factors and Loadings for Knowledge level

Knowledge level	**Factor 1**	**Factor 2**
	Information	*Familiarity*
Familiarity with term Ecosystem Services		0.8785
Awareness of the potential on-farm and off-farm benefits of soil health		0.6661
If read or heard about soil health in the news recently	0.6621	
Knowledge about agricultural conservation practices	0.7996	
Eigenvalue	1.4373	1.0329
Variance explained	0.3593	0.2582
Cumulative variance explained	0.3593	0.6176

Table S20: Extracted Factors and Loadings for Beliefs about Soil Health and Environmental Attitudes

Beliefs about Soil Health and Environmental Attitudes	**Factor1**	**Factor2**	**Factor3**
	Perception	*Reflection*	*Awareness*
I believe it is the duty of every person in my state to be involved in ensuring soil health and the long-term sustainability of agriculture	0.7254		
I believe soil erosion is a big problem for agricultural lands in my state	0.6690		
Conservation practices that improve soil health are beneficial to my state	0.7704		
Conservation practices that improve soil health benefit me personally	0.8144		
I would financially support soil health improvement initiatives by the state government	0.6908		
The risks posed by poor soil health are acceptable			0.7488
Poor soil health presents a risk to me personally	0.6146		
Poor soil health presents a risk to future generations	0.6392		
I am able to control how much I am exposed to the negative effects of poor soil health			0.6221
Supporting environmental causes gives me a sense of self-respect		0.5038	
I feel badly about myself when I think about how my lifestyle hurts the environment		0.6704	
We worry too much about the environment and too little about the economy			0.7399
Science will solve environmental problems			0.4604
Humans change nature for the worse		0.7245	
Economic growth always harms the environment		0.7005	
Eigenvalue	4.8086	2.1178	1.1690
Variance explained	0.3206	0.1412	0.0779
Cumulative variance explained	0.3206	0.4618	0.5397

Table S21: Reliability, Average Variance Extracted (AVE), and Composite Reliability (CR)

Constructs	Reliability (Cronbach's alpha)	AVE	CR
Comprehension	0.76	0.81	0.89
Beliefs about Soil Health and Environmental Attitudes			
Factor 1: Perception	0.85	0.53	0.89
Factor 2: Reflection	0.66	0.50	0.80
Factor 3: Awareness	0.58	0.45	0.76
Perceived Norms	0.81	0.84	0.91
Support of State Goals	0.33	0.60	0.75
Trust to public and private entities			
(a) Public Trust	0.71	0.64	0.84
(b) Private Trust	0.63	0.73	0.85
Religiosity	0.69	0.77	0.87
Covid	0.92	0.87	0.95
Knowledge			
Factor 1: Information	0.27	0.59	0.74
Factor 2: Familiarity	0.39	0.62	0.77

Notes: The reliability and validity of each construct is evaluated by Reliability (Cronbach's alpha), Average Variance Extracted (AVE), and Composite Reliability (CR) tests. The internal consistency in all factors is confirmed by Cronbach's alpha and CR values. Although for some factors Cronbach alpha value is less than 0.7, the corresponding CR values are greater than 0.6 establishing internal consistency. Convergent validity is also established by the AVE values. Note that, even though for some factors AVE presents value less than the threshold 0.5 value, the convergent validity of each factor is ensured since the corresponding CR value is greater than 0.6 (Fornell and Larcker, 1981).

Table S22: Conditional (Fixed Effects) Logit Model with Interaction Effects (Dependent Variable: Choice = Yes)

Explanatory Variables	Coef.	Std. Error	Sig.	Explanatory Variables	Coef.	Std. Error	Sig.
ASC	0.999	0.256	***				
Carbon	0.003	0.059		Yield	-0.008	0.015	
Carbon*Awareness	-0.079	0.021	***	Yield*Awareness	-0.001	0.006	
Carbon*Belief	-0.038	0.026		Yield*Belief	0.012	0.008	
Carbon*Comprehension	-0.021	0.021		Yield*Comprehension	0.004	0.006	
Carbon*Covid	0.010	0.023		Yield*Covid	0.006	0.007	
Carbon*Familiarity	-0.004	0.019		Yield*Familiarity	0.008	0.006	
Carbon*StateGoals	-0.048	0.020	**	Yield*StateGoals	-0.004	0.006	
Carbon*Information	0.008	0.021		Yield*Information	-0.006	0.006	
Carbon*Perception	0.148	0.028	***	Yield*Perception	0.014	0.008	*
Carbon*PrivateTrust	0.003	0.025		Yield*PrivateTrust	0.013	0.008	*
Carbon*PublicTrust	0.039	0.025		Yield*PublicTrust	-0.009	0.008	
Carbon*Reflection	0.036	0.022	*	Yield*Reflection	0.002	0.007	
Carbon*Religiosity	0.005	0.019		Yield*Religiosity	0.007	0.006	
Carbon*CountyTreat	0.012	0.045		Yield*CountyTreat	0.010	0.013	
Carbon*StateTreat	0.129	0.047	***	Yield*StateTreat	-0.007	0.014	
Carbon*Male	0.029	0.038		Yield*Male	0.003	0.011	
Carbon*Income>50k	0.026	0.039		Yield*Income>50k	-0.012	0.012	
Carbon*Age40-59	-0.056	0.045		Yield*Age40-59	0.009	0.013	
Carbon*Age>60	-0.044	0.050		Yield*Age>60	0.024	0.015	
Carbon*Democrat	0.085	0.048	*	Yield*Democrat	0.021	0.014	
Carbon*Republican	0.078	0.048		Yield*Republican	0.024	0.014	*
Water	0.014	0.007	**	Price	-0.002	0.001	***
Water*Awareness	-0.008	0.003	***	Price*Awareness	0.001	0.000	***
Water*Belief	-0.001	0.003		Price*Belief	0.000	0.000	
Water*Comprehension	-0.006	0.003	**	Price*Comprehension	0.000	0.000	
Water*Covid	-0.002	0.003		Price*Covid	0.000	0.000	
Water*Familiarity	0.002	0.002		Price*Familiarity	0.000	0.000	
Water*StateGoals	0.001	0.003		Price*StateGoals	0.001	0.000	***
Water*Information	0.001	0.003		Price*Information	0.001	0.000	***
Water*Perception	0.015	0.003	***	Price*Perception	-0.001	0.000	**
Water*PrivateTrust	-0.006	0.003	**	Price*PrivateTrust	0.000	0.000	
Water*PublicTrust	0.010	0.003	***	Price*PublicTrust	0.000	0.000	
Water*Reflection	0.001	0.003		Price*Reflection	0.001	0.000	***
Water*Religiosity	0.001	0.002		Price*Religiosity	0.000	0.000	
Water*CountyTreat	0.005	0.006		Price*CountyTreat	-0.001	0.001	
Water*StateTreat	0.006	0.006		Price*StateTreat	-0.002	0.001	***
Water*Male	-0.002	0.005		Price*Male	0.000	0.000	
Water*Income>50k	0.005	0.005		Price*Income>50k	-0.001	0.000	
Water*Age40-59	-0.012	0.006	**	Price*Age40-59	-0.001	0.001	
Water*Age>60	-0.015	0.007	**	Price*Age>60	-0.001	0.001	
Water*Democrat	-0.016	0.006	***	Price*Democrat	-0.001	0.001	
Water*Republican	-0.014	0.006	**	Price*Republican	-0.001	0.001	
No. of Observations	10566						
Log-likelihood	-3161.93						
Pseudo R2	0.183						

Single, double and triple asterisk (*, **, ***) indicate statistical significance at the 10%, 5%, and 1% level, respectively.