Ranchers' Preferences for Payment for Ecosystem Services Programs

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SCHOOL OF NATURAL RESOURCES
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Executive Summary

Grasslands are considered one of the widest spread vegetation types in the world but are one of the most altered and least protected. The conversion of grasslands has many undesirable consequences. Chiefly, soil erosion, the impairment of water resources, and loss of grassland dependent species. There is also an emotional toll exacted on communities as rural economies attempt to adapt and the quality of life begins to change.

A range of strategies have been used to influence land use in grasslands. Direct payments to agricultural practitioners for the conservation of landscapes are a longstanding policy instrument. While there are numerous programs for "the conservation of goods and services" across grasslands, evidence shows that the rate of conversion in remaining temperate grassland is occurring five times faster than what can be protected (Lipsey et al., 2015).

A plausible reason for the shortcomings of grassland conservation programs relate to people and productivity. Conservation programs do not adequately appraise the non-agricultural benefits and services grasslands provide, and the current offerings do not sufficiently understand the requisites of people who may volunteer to participate.

This research study helps bridge these gaps by measuring ranchers' preferences for conservation practices through an emerging policy program known as payment for ecosystem services (PES).

Ranchers' Preferences for Payment for Ecosystem Services Programs

Introduction

Figure 1. Grazing animals can play an important role in maintaining the health and ecological characteristics of native grasslands. (Courtesy: Center for Grassland Studies)

Voluntary conservation programs have existed for decades in the United States. Many of these programs incentivize farm-level management that reflects broader conservation objectives, such as conserving soil, water, or wildlife habitat. Collectively, these individual management actions can play a major role shaping how a given landscape functions as part of the broader ecosystem. However, funding levels and acre enrollment targets for Farm Bill conservation programs—the premier conservation offering in the US—have been in steady decline for nearly 15 years.

The dynamics of how natural systems interact with urban or agricultural uses have not always been well understood. To bridge this gap, the concept of ecosystem services emerged to help detect and measure the benefits natural systems directly or indirectly provide to people. These services fall into four major categories: provisioning, regulating, supporting, and cultural (Table 1).

As research sheds new light on the value and accrual of ecosystem services, there is growing recognition that current markets and conservation strategies may not be sufficient to safeguard the array of benefits well-managed landscapes provide to society. Because many of these services are also considered free public goods (e.g., clean water), there is a convincing argument that it is in the national interest to ensure the continued supply and safeguarding of ecosystem services.

Developing a marketplace, where payments for providing ecosystem services (i.e., PES programs) are made to participating landowners, is seen as one approach to increasing environmental stewardship in agricultural landscapes.

Table 1: Ecosystem Service Examples

SERVICE	EXAMPLES
PROVISIONING	Delivery of food, fiber, and/or fresh water
REGULATING	Carbon sequestration
SUPPORTING	Soil formation
CULTURAL	Recreation

Research Summary

Nebraska is home to one of the largest remaining grasslands in the world, and it is almost entirely stewarded by private landowners. The public benefits derived from such a large, intact landscape are staggering (carbon sequestration, nutrient cycling, water purification and aquifer recharge, wildlife habitat). However, grazing cattle as a livelihood is far from easy.

Increasing operational costs, extreme environmental conditions, and shifting socioeconomic trends in rural areas can make ranching a challenging occupation. Despite the uncertainties, there is an expectation that ranchers continue to provide ecosystem services as public goods without compensation—in addition to their core business activities.

Given the importance of ecosystem services to agriculture and society, the question then becomes how can we make land stewardship more profitable and compatible with traditional agriculture? To help answer this question, we used an ecosystem services approach to see not only if ranchers were still interested in incentivized conservation programs, but to also learn if a payment for ecosystem services program (PES) was plausible in the farms and ranches of the future.

Figure 2. Conservation programs of the future must do more to account for the needs/goals of participating landowners. (Courtesy: Center for Grassland Studies)

The variables that were tested in these hypothetical PES programs were based on the structure of those found in USDA conservation programs. Offerings such as the Conservation Stewardship Program are contractual, encompassing a management activity, compensatory payment, and a length of time for which the arrangement is valid. The contract length and payment level attributes used were based on previous research and a feasibility analysis with ranchers, natural resource professionals, and farm policy experts. The specific management programs we tested were derived from recommendations put forth in the state's wildlife management plan: the Nebraska Natural Legacy Project (Schneider et al., 2011).

Recruitment of Participants

Limitations to in-person gatherings during the COVID-19 pandemic increased our reliance on stakeholder-based organizations such as Nebraska Cattlemen to assist with rancher recruitment for the study. Based on their membership information, we sent invitations to participate in the survey through email, text, and postcard mailings to ranchers operating cow/calf pairs in the state (n=1,548) during two outreach attempts.

Additionally, we procured a mailing list from a third-party vendor. Parameters of ranchers engaged in cow/calf operations, on improved pasture or grasslands, of at least 50 acres or more (n=5,743) were selected. These individuals received two postcards requesting their participation in the study. We also disseminated invitations for participation through social media, electronic newsletters, and media outlets. With the information that was quantifiable, we determined our study sample to represent 7,291 ranchers in Nebraska.

Design and Implementation

As noted above, the PES programs we tested were based on management action/programs outlined in the Nebraska Natural Legacy Project, commonly found contract features in USDA Farm Bill conservation offerings, and the direct insight of ranchers, farm-policy experts, and conservation professionals. In all, we tested 128 possible program combinations.

This allowed us the ability to examine how three attributes (payment, contract length, and management action) affected ranchers' decisions on whether to participate in a given program. Survey respondents were presented with eight choice sets in which to select their preferred program offering. If a subject did not prefer a program or was unsure about their intentions regarding a program offering, they could select neither.

Participants were also asked a brief series of demographic questions to obtain baseline information about respondents and their relative locations in the state. For our purposes, ranchers of all experience levels and operational classifications were of interest. However, one screening question was included to allow those not involved in grassland ranching to self-select out of the survey.

Table 2. Demographic Questions Posed to Survey Respondents

Which best describes your grazing operation?	Which zip code(s) are most of these lands located?	How many years have you raised and managed grazing animals?	How would you describe the acres your animals graze on?	How many acres are involved in your grazing activities?

Statistical Analysis

The analysis that was employed in this study was based on a utility model of consumer choice. This was modified to include the random block effects where each respondent is randomly assigned to one and only one block. Since the choices are multinomial (choice 1 or 2 or neither), a multinomial logit link function with the base as the "neither" category (C) was used as the response of which the predictor was a mixed linear model with the factors as the fixed effects and the blocks as the random effects.

The logit model is a generalized linear mixed model and was fit with SAS Proc Glimmix to test for main effects and first-order interactions of the attributes. See Kanmogne and Eskridge (2013) for more details on the statistical analyses of confounded factorial conjoint choice experiments.

Results

Using NAICS (North American Industry Classification System) estimates referenced in the USDA's (2019) Census of Agriculture, our sample population constituted 63% of the 11,551 ranches engaged in cattle production on grasslands in Nebraska. Over the 8-week survey period, we registered 251 completed surveys from producers—a 3.5% response rate of our study's sample population.

Our geographic assessment (Figure 3) shows respondents were primarily operating in north-central Nebraska (Sandhills region), one of the largest contiguous grasslands in the world. In comparison to NAICS data about Nebraska's ranchers, we found our sample population to be reflective of many of the core demographic characteristics outlined.

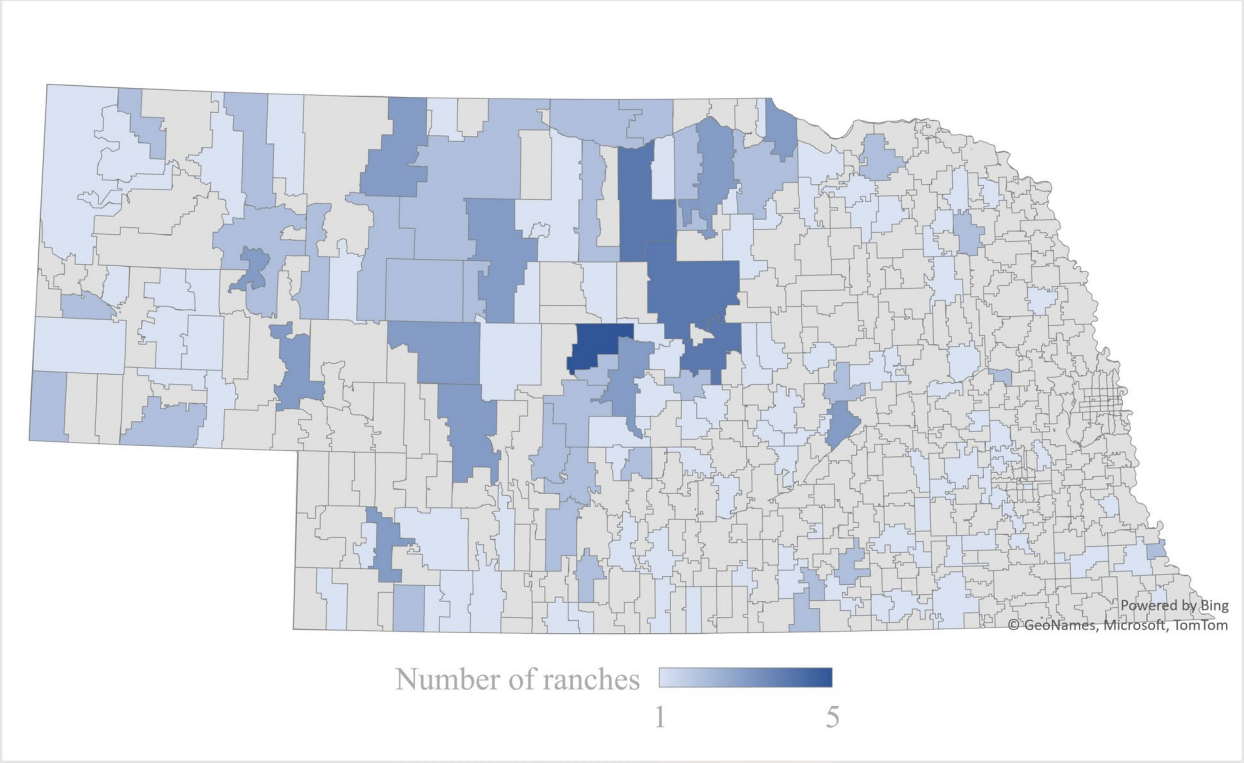

Figure 3. Locations where ranchers had grazing animals, reported by zip code. Up to five zip codes per rancher were allowed.

For example, across categories such as ownership, total acres grazed, type of grazing, and average experience, we find the responses in our sample to mirror statewide trends. For example, 52% of participants reported owning grazing lands utilized in their operation with 77% having more than 20 years of experience. NAICS survey data indicates that 54% of ranchers

reported owning the lands they grazed and 74% had 11+ years of experience. In comparing the type of lands grazed, we find similar trends with survey 78% of respondents reporting they grazed rangeland compared to 84% of those in the NAICS survey.

Ranchers' Participation in PES Programs

Our experimental model found ranchers were largely indifferent toward many of the contract features that were tested (payment amount and contract length). The management actions, however, were found to play a significant role ($p<0.0001$) in respondents' willingness to participate in a given program. In a closer examination of the relationship between payment levels and contract lengths, neither was found to play a significant role in whether a rancher would participate in a PES program.

In the broader context of the 16 management activities tested, 61% of ranchers were willing to participate when programs were tied to practices known to improve biological diversity such as reduced stocking rate, rotational grazing, or stockpiling (Table 3). Conversely, the least preferred practices were related to the management of water resources on the ranch. Approximately 8% of respondents suggested they were willing to remove structures that restricted water movement or remove species or vegetation that had been introduced. Further, participants did not appear to have strong interests in reducing nutrient or insecticide applications to improve water quality (21.97%).

Table 3. Ranchers Participation Rate in PES Programs

Management Program	Participation Rate
Using grazing practices to improve biodiversity	62%
Using grazing/haying systems with built-in drought management	42%
Utilizing native, locally adapted species in restoration/management projects	41%
Using a combination of grazing and prescribed fire to benefit wildlife or habitat	41%
Removing or discontinuing woody plantings within grasslands or improved pasture	40%
Using adapted native seed sources for pasture and grassland seeding	35%
Incorporating wildlife-friendly fencing in grasslands and riparian areas	29%
Managing in cooperation with other large blocks of habitat to conserve wildlife	29%
Staggering timing or height of haying to increase plant and animal diversity	24%
Practicing integrated pest management to enhance biodiversity	23%
Upgrading or installing water conservation measures	22%
Reducing nutrient and insecticide applications to protect water quality	22%
Implementing filter strips, grassed waterways, etc. to minimize the effects of fertilizers and pesticides on wetlands and waterways	18%
Using wildlife-friendly conservation buffers for waterways to prevent siltation	17%
Removing structures that restrict the natural movement of aquatic species	8%
Removing introduced "rough fish" or aquatic vegetation to improve water quality	8%

Note. Nebraska ranchers who operated cow/calf herds on native grasslands or improved pasture larger than 50 acres were asked to participate in this study. Of the nearly 7,300 ranchers we contacted, 251 chose to participate in this study.

In an examination of lower-order interactions among contract length and payment level, we did not detect significance among these attribute classes or the variables that were tested. In short, this finding suggested there was no specific thematic relationship between program configurations (i.e., high payment + short contract length = more participation).

Implications of the Project

A widely held belief in voluntary conservation programs is that if a program doesn't pay, then a rancher will not want to play. On the surface, this may be partially true, but the reality is far more nuanced. Because grassland ranching involves managing for a certain level of unpredictability, giving up operational control of something as important as water just isn't worth the risk—regardless of the incentive being offered.

Few in the livestock or natural resources sectors would argue that compensatory payments are not enticing features to offer ranchers engaged in conservation. However, what we found in the literature and confirmed in our study was its importance may be overstated.

In the attributes we tested–management action, contract length, and payment level–only management variables were found to have significant effects on a rancher's preference for a given PES program. This finding was similarly evidenced in the model study by Hansen et al. (2018), where ranchers self-reported that the nature of the management action and its intended outcomes were of higher importance than the payment level.

What this means for voluntary conservation programs is that if a given initiative—like those in the Farm Bill—is legislated without direct involvement or feedback from ranchers, money alone won't be able to generate long-term conservation outcomes. New program offerings may find more success with terms and conditions that acknowledge the uncertainties in ranching (periods of increased flexibility, open access to learning networks, and direct involvement in program administration through stakeholder cooperatives).

This research also provided insight into education and outreach efforts by natural resource professionals. The leading program choice for enrollment by ranchers— managing herds to increase biodiversity—implies that ranchers understand the importance of biodiversity in grasslands and believe they can directly contribute to its supply. Policymakers and researchers may find increased returns on investment in working lands conservation by making biodiversity a focal point of management rather than an isolated deliverable.

Our review of the literature also sheds light on the need for PES and other conservation programs to create more intentional feedback loops with ranchers. Local participation and decision-making ability are particularly attractive to ranchers, but notably absent in many of today's conservation offerings (Donlan, 2015). A robust PES program would incorporate stakeholder involvement at several levels (i.e., program design, price negotiations, satisfaction surveys, etc.).

This approach mirrors principles laid out in human-centered design and persistence frameworks, ensuring those charged with stewarding natural resources are also protected with technology transfer, financial investment, and localized decision-making ability. With these elements present in the correct proportion, programmatic satisfaction will remain high and bring about the best possibility of behavioral persistence if the option to participate in PES markets remains constant.

In the face of declining funding for conservation, there is an obvious need to better understand how to engineer programs that produce positive financial outcomes at the ranch level while enhancing the ability of grassland managers to supply ecosystem services at a landscape level.

Future Opportunities

We believe there are an array of contributions that others can make to further the research of PES programs in Nebraska. First, we find it logical to continue research in this field with agricultural practitioners who are engaged in conservation stewardship. Building on studies surrounding ranchers' perceptions of biodiversity and innovation, an effort to create a framework that moves a PES concept to a fully functioning PES marketplace is a critical need.

Another area of need surrounds the creation of the collaborative trust networks that are inherent to successful conservation programs. We believe this can be accomplished through securing research funding, which is part of a leveraged approach to assist ranchers with developing pilot locations statewide. These sites, like other sites used for technology transfer, should be equipped to serve as the first information exchange among potential program participants. These sites need to be accessible, replicable and bring together the cadre of entities that will be needed to make PES successful.

The third and largest need will come from the understanding of how to establish the market-based instruments that will lead to PES adoption. This research will need to cover areas of ecosystem service delivery, monitoring, and compliance, as well as how to market these services in a manner that resembles a commodities market exchange. Furthermore, because healthy grasslands exemplify diversity and complexity, it would only make sense for future research to embody an interdisciplinary approach that bridges natural-world capital with land manager motivations.

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Further Reading

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