

Understanding Landowner Decision Drivers Regarding Conservation through Research

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High commodity prices and other factors have led to a reduction in land devoted to conservation (Stubbs, 2012; Rashford, Walker and Bastian, 2010). The loss of associated environmental benefits as landowners and operators forgo conservation practices and opt-out of conservation program participation can be especially long-felt due to the cost of land conversion.

Motivated by a desire to understand the decision-making process of landowners and operators regarding these conservation practices and programs, Lesch and Wachenheim (2014) and Wachenheim, Lesch and Dhingra (2014) conducted extensive literature reviews of related literature. They considered research investigating (intended or actual) adoption of conservation practices on working lands and in land retirement programs. Wachenheim, Lesch and Dhingra put special emphasis on identifying factors influencing participation in the Conservation Reserve Program (CRP) and also covered literature related to program effectiveness.

A majority of literature reviewed reported on primary research using producer and landowner input elicited through surveys, interviews, and instruments obtaining their reactions to hypothetical choice sets including conservation practices. Literature using secondary data was also considered. Lesch and Wachenheim considered three meta-analyses. Knowler and Bradshaw (2007) reviewed 31 separate analyses covering 23 published studies from a variety of developed and developing countries. They considered the impact of variables in four categories on adoption of conservation practices: farmer and farm household characteristics; farm biophysical characteristics; farm financial/management characteristics; and exogenous factors. Few variables were identified that generally, across studies, explained adoption of conservation practices. A similar review of factors contributing to the adoption of Best Management Practices was advanced by Prokopy et al. (2008). The primary differences from the meta-analysis by Knowler and Bradshaw were that Prokopy et al. limited their meta-analysis to literature originating from the United States and considered only those conservation practices that affected water quality. Referencing some 25 years and 55 studies, they focused on the influence of variables in the categories of capacity, awareness, attitudes, and farm characteristics on adoption rates. A follow-on meta-analysis by Baumgart-Getz, Prokopy and Floress (2012) considered many of the same studies and added unpublished work to overcome bias associated with its exclusion. They used more sophisticated analysis techniques and broke down previously combined variables into separate factors. They also worked to overcome the limitation that data type can influence the predictive effect of variables on adoption. Results of this later work were more conclusive.

Studies by Lambert et al. (2006a, 2006b, and 2007), Lambert, Sullivan, and Claassen (2007), and Lambert and Sullivan (2006), who used secondary data to investigate use of working land structures among family farms, were considered. Also reviewed were studies related to adoption of tillage practices; riparian buffers and forests, conservation technology and enrollment in the

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Conservation Reserve Enhancement Program and the Environmental Quality Incentives Program. Lesch and Wachenheim also looked at barriers to adoption.

Literature specifically related to CRP was reviewed by Wachenheim, Lesch and Dhingra (2014). Considered were studies that examined the impact of commodity prices on CRP enrollment and modeled CRP extensions under varying levels of rental payments and with and without grazing allowed. Studies which estimated the role of CRP on the disposition of other fallow acres (slippage) and on land values; examined landowner contract bidding; and investigated CRP contract holders' views on the use of CRP parcels for recreation were also included. In contrast to Lesch and Wachenheim (2014), most of the work reviewed did not attempt to estimate or predict participation in conservation programs or adoption of conservation practices.

The goal of the literature reviews was to identify and better understand the role of factors influencing the decision-making process and decisions of landowners and farm and ranch operators regarding conservation practices and enrollment in conservation programs. The purpose of the current article is to share recommendations regarding research efforts resulting from the extensive consideration of related literature.

Recommendations

Research recommendations are offered to help guide efforts to elicit, analyze and draw conclusions from producer and land-owner attitudes, perceptions and actual or intended behavior regarding conservation. Readers will find some recommendations to be new and others to be useful reminders. The relevance and order of importance of each is left to the investigator, policy maker, or others putting them into practice.

1. *Recognize and incorporate the reality that few decisions are made in isolation by paying attention to the influence of others on and role of others in the decision-making process.* Most reviewed literature was focused around information as reported by the landowner or producer without explicit input by or consideration of those involved in or influencing their decision. A notable exception was Habron (2004) who found spousal influence significant in explaining use of riparian fencing within the Umpqua River Basin of Southwest Oregon. When the focal point of a study is estimating the likelihood of actual (versus intended) behavior, this dependent variable (participated or did not participate) implicitly includes the influence of others. If this is absent from the associated predicting independent variables, important information may be lost.

Recognition of this limitation associated with using surveys was one driver in the growth in popularity of using experimental auctions to evaluate market potential for products. Incorporating the possibility the participant may be required to purchase the product adds consideration of the influence of others (e.g., family members) into the bid selection. Because experimental auctions with the possibility of a bid being accepted would generally not be appropriate to predict enrollment in conservation programs or adoption of conservation practices, including consideration of familial or other personnel influences otherwise needs to be made more explicit. In one notable exception, Chakrabarti, Swallow and Anderson (2014) used a Lindahl auction framework to elicit financial contributions for payment to farmers in two Vermont counties who agreed to protect the nesting habitat of the Bobolink.

2. *Consider that what respondents report may not be what they do, believe or experience, or the specific farm structure and practices they have in place.* The internal and/or predictive validity, as well as reliability of extant findings is usually not investigated. There is some evidence from the conservation literature that survey responses may produce data at odds with observed practices (e.g., see Carr and Tait, 1991). Research which examines behavior (what did or did not occur), especially when it is evidenced by supporting secondary data (e.g., USDA program

enrollment data), may therefore be more predictive of future behavior than respondent-reported intentions. The tradeoff is that secondary data generally does not allow for the same detailed understanding of why.

3. *Consider variables carefully for inclusion in data collection and analysis.* Variables historically shown to be important to explain conservation behavior but which are sometimes absent include some related to farm structure such as land location², farm type, and the type of conservation practice considered (Vitale et al., 2011; Camboni and Napier, 1993). Landowner variables sometimes not considered include those related to the planning horizon as it relates to farm transition (e.g., heir transfer, retirement); occupation including farm and non-farm; land ownership; level of interest in what others are doing and thinking; motivations; thoughts on external stakeholders; traditionalism; and attitudes about property rights and the role of the government. Focusing on literature reviewing decision-making by landowners and operators with like circumstances to the target population and conducting in-person surveys or focus groups among the population of current interest as part of instrument development can be useful to identify important variables for inclusion.

Likewise, inclusion of variables that the literature or in-person interviews or focus groups show to be unimportant or, even if important in explaining behavior, managerially insignificant, should be reconsidered to limit instrument length. For example, Baumgart-Getz, Prokopy, and Floress (2012) and Prokopy et al. (2008), contrasting with Gedikoglu and McCann (2012), did not find risk aversion to be significant in explaining conservation behavior and suggested researchers consider carefully whether it is necessary to include. It may be that risk aversion is not important to the decision, but it may also be that the proxy used to represent risk aversion does not adequately do so.

This proxy and that representing any host of other variables the theoretical model supports as potential contributors to specific decisions is worth careful investigation prior to conducting a study. For example, Baumgart-Getz, Prokopy, and Floress (2012) improved on an earlier meta-analysis by breaking the factor education into formal and extension; investigating ordinal versus continuous representation of data; and delineating social networks into four types. The distinctions for education and information venues are likely to become increasingly important as social networks and other learning and sharing venues evolve at an ever-increasing pace.

Other methods of eliciting landowner perceptions should be considered to further refine variables considered. Research reviewed, particularly that related to CRP adoption, concluded that a host of factors are self-reported to be important to most decision-makers; so many that it is difficult to distinguish between those factors more and less important. In this case, the literature likely over-represents the number of influencing factors as well as their importance. Rather than asking landowners to eliminate factors that they do not consider or minimally consider in the decision (few are actually eliminated), it may be valuable to (first) ask them to identify those that are important and to rank or otherwise prioritize them.

Finally, data collected and variables considered must provide the information required to answer the specific research questions posed. A study designed to predict enrollment in a land

² A reviewer made an interesting point regarding the choice of variable designed to represent land location. As the reviewer notes, land location can be measured in any number of ways; for example, distance from a place of importance such as the nearest town or elevator or as being within a specific county. Further complicating representation of location is the reality of fragmented farms. It may be prudent to query operators about the location of the parcel(s) in question to the home farm or other specified location or land feature.

retirement program will differ from one investigating the effect of characteristics of that land retirement program on overall conservation acres; the latter would need to explicitly include intent that may influence slippage.

4. *Consider barriers to adoption.* Knowing what would prevent / is preventing participation may require that question be explicitly asked. In a conceptual paper, Nowak (1992) argues that the key to increasing adoption of conservation practices is to overcome barriers preventing such. He notes reasons farmers may be unable to adopt including lack of information or that needed information is too expensive to obtain, that the change may be too expensive or the labor requirements too great, that the planning horizon for the decision-maker may be too short to recoup the investment, or that there is a lack of support, managerial skill, or the authority to make the decision. Nowak notes that unwillingness to adopt may stem from conflicting, inadequate, or non-case-specific information, that the structure or practice may not fit with the current production system in place or otherwise is not appropriate for the farm, or increased risk. The importance of barriers to adoption of conservation practices has been confirmed by work by Ervin and Ervin (1982), Brant (2002), Lemke et al. (2010), and McCann and Claassen (2014), among others, but has not received due attention in the literature designed to estimate or predict conservation inclinations.

5. *Consider modeling the decision-making process.* The literature includes detailed reviews of the challenges associated with different models. Early attempts to predict conservation behavior such as Rahm and Huffman (1984) and Besley and Case (1993) noted problems associated with use of aggregate data such as considerable variability in within-area soil type and weather patterns. Also noted in the literature are problems associated with the use of time series, cross sectional and panel data to predict conservation practice or program adoption. Besley and Case (1993) proposed use of dynamic choice modeling, arguing that focus should be placed on modeling the decision-making process itself as opposed to the resulting static choice. For example, research concluding that landowners refine their bids for enrollment in the CRP in response to results of earlier enrollment periods (i.e., that they learn) supports investigation of the bid determination process used by producers, work notably absent from the literature.

6. *Investigate whether differences in landowner or farm structure characteristics call for estimation of separate equations.* Multiple authors have concluded that, because of differences in effect of influencing factors, a research question should identify the specific conservation practice under consideration (e.g., Knowler and Bradshaw, 2007; Habron, 2004). Other factors that might justify separate equations include: benefactor of practice (e.g., landowner, downstream resident); farm locale; farm type; irrigation use; and full versus part-time farmer. For example, Ervin and Ervin (1982) modeled only those owning and operating farmland in recognition that the tenant / operator relationship would change the nature of the decision-making process.

Adopting segmentation techniques will also improve the fit of programs and associated education efforts about the same. For example, understanding decision-making regarding use of buffer strips among livestock producers in the Prairie Pothole Region and designing appropriate educational efforts will likely be more fruitful than for general conservation programs among farmers throughout the Midwest.

7. *However, recognize that a focus on a particular conservation practice and / or program may be limiting if considered in isolation if choices regarding conservation practices are not independent.* Separate estimations or those not inclusive of all conservation options may not then accurately predict conservation behavior, underscoring the importance of understanding the whole of the decision-making process a priori to the use of quantitative survey efforts.

8. *Be cognizant of the overarching importance of economic factors over the length of the planning horizon.* Understanding and predicting landowner choices can be improved by explicitly including their expectations about future market conditions, but this is sometimes overlooked or underemphasized in the literature. This factor poses measurement challenges conceptual as well as operational but is worthy of investigation when the contract horizon is long. Costs included in adoption of conservation practices or returning land from a conservation-oriented use back into production can be high.

Economic conditions considered should also be relatively wide in range. Results from the literature covering periods with different market conditions cannot be confidently extrapolated to current and future conditions. More complete study of this area may require longitudinal considerations or somewhat extensive use of sensitivity analysis. There does exist literature reporting on the effect of changes in commodity prices without an increase in land-rental payment rates for land retirement programs such as CRP. This work concludes, not surprisingly, that increased commodity prices would result in acres pulled or not re-enrolled. In practice, maximum rental rates are calculated based on soil productivity and existing local cash rents. That is, increases in opportunity cost associated with program enrollment are designed to be reflected in higher rental rates. Changes in the maximum bid rate are an endogenous response to changes in economic conditions rather than the exogenous assumption depicted throughout much the existing literature used to investigate sensitivity of the solution.

A final economic consideration often overlooked in the literature is the effect of changes in practices or program enrollment on farmland prices for the involved and nearby acres, which can be especially important if the landowner also owns adjacent or nearby land. For example, the literature shows that CRP has a positive impact on economic returns to land ownership and that this impact varies by region and by source (e.g., farmland prices, agricultural returns, growth premium, option value) (e.g., see Chamblee et al., 2011; Lin and Wu, 2005; and Wu and Lin, 2010). However, it should be noted that farmers may not be aware of these benefits and therefore they may not be influencing their decisions; the literature reviewed in Wachenheim, Lesch and Dhingra (2014) presents conflicting information about this.

9. Carefully define the model to include the reality from the literature that landowners may not simply maximize net present value. For example, results from Suter, Poe and Bills (2008), Lynch and Brown (2000), and Kingsbury and Boggess (1999), among others, suggest that up-front payments (e.g., establishment payments) are more important than the annual payment for CRP by more than would be explained by economics alone. This may be true even when cash flow is not limiting, perhaps because these payments represent to the landowner the government's investment (share) in establishing required infrastructure to implement the conservation practice. Further, the literature shows that producers do not always make economic choices that appear to be most economically-efficient, or, maximize economic return; certainly we have more to learn about landowner decision-making.

10. *Consider continued, not just initial, adoption.* What may motivate participation or conversion initially may differ from what would motivate continued participation or conversion. This is likely particularly true when substantial or costly changes are involved in conversion to or from land-use involving conservation practices and / or enrollment in conservation programs. This distinction has received little attention in the literature.

Even given the steep penalty, early withdrawal from a conservation contract is also an option. It should be considered, particularly under conditions when the opportunity cost of continuing to honor the contract is high. Most literature is based on the implicit assumption that, once enrolled, landowners will complete the contractual period. Our investigation uncovered no

studies of producers who had exercised an early-opt out under penalty. Studies drivers in this group may reveal insights useful to policy intending to maintain target-levels of conservation-land or important to specific landscape types or specific producer groups.

11. *Explicitly address non-response bias and response distribution which does not reflect the at-large population under consideration; even for initial or very detailed reporting*³. Adjusting for bias before reporting is particularly important when results that do not include the appropriate adjustment are likely to be externally interpreted without full consideration of this bias. As response rates to traditional mail and/or telephone surveys wane, this rises in importance.

Conclusions

Some common themes emerged from the literature reviews. First, the value of well-defined study objectives and associated testable hypotheses cannot be overstated; nor can understanding the theoretical underpinnings defining the model within which to test these hypotheses. Spending the time understanding the question and the context within which to answer it is fundamental to meaningful research about decision-making regarding conservation. One best begins by gaining a thorough understanding of what we already know. Review the most current literature relevant to your specific research objectives.

Other recommendations are useful reminders and will be helpful for research teams to address prior to study implementation. One is the importance of recognizing and mitigating self-reporting bias. What people report to be or about what they did or would do does not always accurately reflect reality. The familiar lessons of asking the right questions and creating some redundancy when collecting information may help mitigate the impacts of inaccuracies in self-reported data. Non-reporting bias also warrants explicit consideration, particularly given the potential for misuse of reported results. Second, take into account that landowners may not be aware of some of the financial implications of their decision. Third, use available resources to well-define variables used to explain perceptions, attitudes, or choices. Carefully consider the literature and conduct focus groups, face-to-face interviews, or other means of qualitative research prior to undertaking a more extensive study. Do not overlook barriers to adoption. Fourth, in model development and analysis keep in mind there may be a lag between factors influencing the decision and the decision and its implementation. Fifth, carefully consider the trade-off between adopting a narrow focus on a particular conservation practice and a more general look at the many conservation options available to landowners; sometimes a trade-off between a good fit to the model and a relevant fit. Sixth, consider not only the adoption decision, but the decision to continue an existing conservation practice or program, as well as any decision to opt-out. Measure twice, cut once.

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³ A reviewer noted that this is common sense. As fewer responses speak for the agricultural sector and response rates are low and continue to decline, adjusting for non-response bias grows in importance. Organizations are sophisticated and can mine data for an answer that, once the data is corrected for bias, is not in evidence. The recommendation is that scientists must more carefully than ever consider how data can be used to tell a different story than that resulting when data is adjusted for non-response and other bias that make it unrepresentative of the population to which it is attributed.

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