

An Abstract of the Thesis of

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As the climate conditions in regions shift, research seeks to gain more understanding of agricultural producers' behavioral choices specifically in relation to climate change and alternative practices. This research aims to compare elicitation tools to find the most appropriate method to elicit agricultural producers' choices and attitudes toward changing production practices in response to climate change. Economic theory shows that rational choice can be displayed in production decisions, including incentives other than cost and profit. Tools examined in this research, that elicit information about these incentives and decisions, are surveys, interviews, games, and focus groups. Studies using these tools in agricultural research have shown targeted approaches to be more effective in eliciting information. These tools were first compared generally, then within the context of the Regional Approaches to Climate Change (REACCH) Pacific Northwest research region. This research finds a mixed-mode of survey and game implementation to be the most effective method for eliciting long-term and short-term agricultural production decisions for this contextual case study.

Keywords: behavioral economics, agriculture, production, rational choice, elicitation

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Methods for Eliciting Adoption of Alternative Agricultural Practices:

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Chapter 1: Introduction

Policy makers and researchers are developing ways to promote climate change adaptation and mitigation in the field of agriculture. In order to do this effectively knowledge about climate, ecology, as well as agricultural producers' perceptions and behaviors must be gathered to inform the decision-making process. Programs such as Regional Approaches to Climate Change (REACCH) seek to improve sustainability through interdisciplinary approaches with an emphasis on scientific research and understanding. Agricultural land use, and producers' choices of practices are highly related to agricultural sustainability and effects of climate change (Laursen and Eigenbrode 2014). This research focuses specifically on farmers' choices to adopt alternative practices.

Eliciting agricultural producers' attitudes and practice-adoption decisions allows policy makers to create more targeted approaches, and some elicitation tools may be more effective than others. Also, when discussing an individual's attitudes or choices in response to climate change and other related environmental issues, including motives such as altruism that could rival self-interest is important, and tools must be able to capture this. This research aims to compare elicitation tools to find the most appropriate method to elicit agricultural producers' choices and attitudes toward changing production practices in response to climate change. This paper outlines the progression of rational choice through classical and neo-classical economic theory, then discusses the development of elicitation tools and outlines some common methods. The fourth chapter

describes applications of these methods in behavioral economic studies in the field of agriculture, focusing on farmers' attitudes and adoption behavior. Moving beyond previous research and theory, the paper narrows application to the REACCH Pacific North West agroecological cereal production region, comparing methods to find the most appropriate tool for scenarios within the regional parameters. Suggestions will then be made for implementation of the appropriate method within the context of the case study.

Chapter 2: Development of Choice and Adoption Theory

There has been continuing work in the field of economics to develop theories that help explain patterns in the real world or guide economic behavior. Understanding the roots of economic theory may create stronger foundations of our empirical understanding of behavior (Beed and Beed 1999). This chapter will first outline the progression of economic paradigms and theory. Secondly it will focus on rational choice and adoption in production.

Economic Paradigms

The classical economic paradigm, which dominated the 1700's and early 1800's, based many theoretical assumptions on the idea that individual actors were self-interested and rational (Pearce and Turner 1990). When looking at the context of competitive free markets, classical theorist Adam Smith believed that this individual behavior could lead to benefiting society as well as the individual. Smith saw individual choices to be self-serving, and these selfish choices would work to further civil society (Smith 1904).

Under rational choice theory, individuals weigh benefits and costs and take action based on a choice to gain the most personal value or benefit. Influencing incentives include monetary factors, social pressures, preferences, and personal goals. In the classical paradigm, value was defined in monetary forms. Classical theorists discussed definitions and calculations for value. David Ricardo writes, "the value of a commodity... depends on the relative quantity of labor which is necessary for its

production” (Ricardo 1821, 3). Like many theorists of the time, Ricardo focused on values of goods or commodities that could be traded within a market, with little talk of placing value on goods such as ecosystem services. Ricardo speaks of the indispensable usefulness of water and air, but argues that “nothing can be obtained in exchange for them”, so they have no value in use (Ricardo 1821, 3).

While Smith, Ricardo and other classical theorists examined the nature of an individual’s self-interested choice, they did so within the parameters of society or the larger scale economy. Growth and development were large concerns of the time; therefore social theories reflected a forward-looking time frame.

The neoclassical paradigm of the late 1800’s introduced a narrowing of the focus of theory to examine marginal or incremental changes, trending away from the classical concern of economic growth over time (Pearce and Turner 1990). Theorists such as William Stanley Jevons and Thorstein Veblen rejected previous theories from the classical paradigm claiming them unable to accurately represent aspects of a free market (Jevons 1888). Veblen held that both paradigms were founded on the traditional psychological understanding that human conduct is a rational response to surrounding conditions, but argued that marginal-utility economics of the neo-classical paradigm are “more neatly defined and their limitations are more adequately realized” (Veblen 1909, 622). What has been referred to as the *marginal revolution* allowed for greater focus on individuals and choices affecting small changes such as production decisions and costs associated with these decisions. In this paradigm individuals are viewed as self-interested actors who make choices in response to surroundings and situations, guided almost entirely by rational thought (Veblen 1909). Veblen acknowledges that there may be slight

variations in individuals that are not due to rationality, but he argues that these variations are slight and unable to be explained by neoclassical theory (Veblen 1909).

One component within the internal calculation of individual choice is utility. The term utility, where in the classical theories had been mentioned, became the primary tool used to examine value. Jevons describes utility as an object ranking as commodity through serving a purpose, even an abstract one (Jevons 1888). In classical theory, the definition of value relied on concrete monetary quantities associated with labor, while in neoclassical theory, there is a shift towards allowing for more abstract concepts that make it more difficult to attach calculated monetary value.

A paradigm that embraces abstract concepts, going beyond monetary value, is the humanistic paradigm. In response to the neoclassical economic basis of choice that relied on substitutable wants or needs, humanistic theorists created a hierarchy of needs leading to individuals' choices (Pearce and Turner 1990). Environmentalists could argue that within this hierarchy environmental quality is a human need, expanding the inputs of choice beyond the confines of monetary or market value. Supporters of this more behavioral approach also believed that, unlike the static preferences of neoclassical theory, preferences could shift due to individuals learning or adjusting to culture. Humanist theorists also developed the idea of extended rationality based on the concept that humans are community oriented, allowing for an individual to be seen with multiple sets of preferences: self interest and altruism (Pearce and Turner 1990). Depending on the scenario, each set of preferences may have priority above the other. Economic models that consider non-use values are in essence assuming that individuals are not making

exclusively self-interested choices, as existence or bequest values are altruistic in nature. Environmental or ecosystem services and goods can often have non-use value.

Within the humanist paradigm, a framework coined *metaeconomics* formed around the mid-1930's to capture previously ignore values and behaviors in economic modeling and calculations. Metaeconomics uses a combination of theory from the fields of economics, sociology and psychology in order to address the varied facets of behavioral choices by combining “egoistic/hedonistic self-interest motivations with empathetic/sympathetic other-interest motivations into one coherent theory of human behavior” (Sheeder and Lynne 2009, 4). This framework is founded in scientific studies of the human brain showing that “humans have evolved with egoistic and empathetic ranges” that are in tension with one another (Lynne 2002, 411). The competition between self-interest and public interest demonstrates this internal tension, and within the metaeconomic framework, can be displayed through sets of two overlapping indifference curves. An individual will resolve their tension by choosing the point where the two curves overlap, and while this neither maximizes egoistic nor empathetic utility, it balances the competing interests (Lynne 2002).

Rational Choice and Adoption in Production

Rational choice can also be applied to the choice of adopting practices or innovation. An individual makes a choice by maximizing benefit or utility. In the case of producers, choices involve production practices, and an informed rational decision must take external as well as internal forces into consideration. Benefit and cost are influenced

by input and output factors, not all of which are under a producer's control. As external factors shift, a producer must use strategy to keep a competitive advantage, and this often comes in the form of innovation or adopting new practices (Shanahan, Hooker, and Sporleder 2008). Internal capabilities and risk factors may also influence a producer's decision. Specifically in the discussion of agricultural producers adopting innovative practices important elements are: a process of learning by landholders, trialability of the innovation, the relative advantage the innovative practice has over existing practices (Pannell et al. 2006). If the producer sees adopting a new practice as enhancing personal goals or creating benefit, then the rational choice is to adopt the practice.

Producers must also take time horizons into consideration when making choices. Their goals may be long-term or they may be short-term. Short-term goals often revolve around profit maximization. On the other hand long-term goals do not, because in the long-term, "the only reasonable long-run level of profits for a competitive firm that has constant returns to scale at all levels of output is zero" (Varian 2010, 355). Long-term goals must therefore be for sustaining production, which may be at odds with maximizing profits.

Chapter 3: Development of Elicitation Methods

Understanding individuals' behavior and choices requires more than observation. As the trend in theory shows, calculated rational choice might not be the only factor associated with an individual decision. Choosing to adopt a behavior has abstract qualities, similar to non-use values, such as morals, culture, or attitudes. Methods that seek to elicit information about non-use values may also be applicable in eliciting information about behavior because of this similarity. For these types of information, methods with direct approaches, such as seeking information from respondents, are more feasible due to the lack of market data from which to indirectly measure preferences (Freeman III 1993).

Researchers have used a variety of methodological approaches and tools to elicit information about non-use values or behavior. One of the most commonly used methods is surveying because it is one of the least expensive approaches and can be distributed to large numbers of people. There are also other methods such as interviews, games, and focus groups that all have different strengths. Specific scenarios or informational goals may dictate the methodological approach used.

Surveys

Surveys include a questionnaire with research-relevant questions that respondents fill out and then return. Implementation methods have shifted over time in order to gain better response rates. Mail surveys have long been used as a method for obtaining

information from individuals, but response rates for basic mail surveys are low. In 1978, Don Dillman introduced the Total Design Method (TDM), which included personalized letters and repeated mailings of surveys, to garner much higher response rates of around 70% (Dillman 2007). TDM took advantage of social exchange principles to gain higher response rates, but as technology and knowledge advanced, Dillman found that the emphasis on the same protocol for all research scenarios could be improved upon by using Tailored Design (Dillman 2007). This new method sought to adapt the original approach to the specific need of research scenarios by adjusting layout and design. Also, mixed-mode surveys, using both questionnaires and interviews, were found helpful in circumventing low response rates from using a single method (Dillman 2007).

Interviews

Interviews allow researchers to ask more in depth questions of respondents, but they take more time and funding than surveys. Many interviews follow a questionnaire format with a set of questions and follow up questions that allow respondents to expand upon ideas or answers (Brennan and Christley 2013). There are also interviews that seek to gain deeper qualitative data and are more personal sessions with very open ended questions (Tiwari et al. 2008; Enyong, Bationo, and Debrah 1999). The type of interview used depends on the depth of qualitative data that the research hopes to elicit. An interview questionnaire can be used with many respondents to try and determine similarities, trends, or behavior. In depth personal interviews are much more likely to

give a lot of insight about one particular person or set of individuals, but the information is difficult to extrapolate.

Games

Games allow researchers to observe how individuals make choices within a structured system. Studies often use lottery systems to elicit choice or decision behavior (Grether and Plott 1979; Bougherara, Gassmann, and Piet 2011). Participants are given a choice of lotteries, and there are different probabilities and outcomes from each choice. This allows for clear decisions to be made between the two lottery choices. Games can have varying contextual scenarios such as a simple win or lose scenario, or participants can be placed in a hypothetical market with differing returns based on choices. Real payouts can be given as winnings to try and obtain accurate behavior and decision-making data that represents reality (Bougherara, Gassmann, and Piet 2011).

Focus Groups

Focus groups are sometimes used if researchers want to understand attitudes behind actions or the source of these attitudes or values. These are often done with small groups that represent a population researchers are trying to address or understand (Enyong, Bationo, and Debrah 1999; Tiwari et al. 2008; Graham 2009). These more intimate groups allow for discussion and problem solving, collecting mainly qualitative data. Researchers guide discussion, but focus groups also allow for participants to have

influence over the course of discussion. If there is an important topic that researchers did not foresee, the group can bring that topic to attention and researchers are able to learn from this.

Overall Application

For these methods, one potential way for eliciting information about a research question is to create a hypothetical question or scenario to perform Hypothetical Direct Valuation (Freeman III 1993). This allows for all individuals to respond to the same contextual information that researchers can tailor to answer different questions about behavior or values.

Practical applications of these methods in research studies often implement mixed-mode approaches that can include any or all of the previously mentioned tools. As mentioned before, this increases response rate, but it also allows researchers to address different components of a research question that may not be answerable with just one tool. For example, when researching choices and attitudes behind these choices, it may be beneficial to elicit information from a large number of individuals through a survey method as well as gaining more in depth knowledge through a focus group or set of interviews.

Also, the use of technology in implementation has shifted over time to reflect technology use in society. With the growing use of computers, many of these methods can be conducted via the Internet or other technological portals. For surveys, similar format of question asking can be implemented, without the process of mailing surveys

back and forth. Interviews may choose to use a technological component while still relying on face-to-face interaction for most of the information. Games, which before may have required a proctor to facilitate, can use software that is designed to allow game play to occur and participants to record choices. Focus groups are harder to conduct via technology, but internet forum set ups or a traditional set up aided by a technological aspect such as an interactive scenario component could be used.

Evaluating Methods of Elicitation: General Use

This research implements the use of a rubric (Fig. 1) to compare the four elicitation methods mentioned previously: surveys, interviews, games, and focus groups. Categories for comparison were based on what qualities may lead to effective and accurate elicitation of information.