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Examining non-participation through people's functional perspectives: a Q methodology study of non-participating Uruguayan dairy farmers

Brett Andrew Kramer

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Examining non-participation through people’s functional perspectives:
A Q methodology study of non-participating Uruguayan dairy farmers

by

Brett Andrew Kramer

A dissertation submitted to the graduate faculty
in partial fulfillment of the requirements for the degree of

DOCTOR OF PHILOSOPHY

Major: Agricultural Education

Program of Study Committee:
Nancy Grudens-Schuck, Major Professor
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Greg Miller
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Iowa State University
Ames, Iowa
2004
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Major Professor

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For the Major Program
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<td>GDP</td>
<td>Gross Domestic Product</td>
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| INML         | Instituto Nacional para Mejoramiento Lechero  
(translated from Spanish to mean "Dairy Herd Improvement Association") |
| FAO          | Food and Agriculture Organization of the United Nations |
| EPDs         | Expected Progeny Differences |
ACKNOWLEDGEMENTS

I have always wondered at the voluminous lists of people other writers have acknowledged in their dissertation. Upon completing this one, I now know why those lists are rarely short. Here is my chance to extend a very personal "thank you" to those human beings who have enriched my life by adding in substantive ways to the process of my PhD education and this dissertation.

Although I acknowledged the support and contributions of my project partners throughout the manuscript, I would like to do so here again by thanking Pedro de Hegedus and Virginia Gravina (and Juan, Lucia, and Maria) for your wisdom, kindness, love, and support. Additionally, Gabriel Rovere and Gabriel Oleginni from Mejoramiento Lechero deserve much of the credit for the work herein for they were crucial to its completion. The Facultad de Agronomía in Uruguay as well as Iowa State University College of Agriculture, Global Agriculture Programs deserve recognition for they were significant financial contributors to the work.

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ABSTRACT

This dissertation illustrates how Q methodology was used to solve a problem of low enrollment in a dairy herd genetic registry project in Uruguay to better understand the reasons why many farmer producers declined to participate. The results of Q methodology led to a more satisfying understanding of the needs, interests, and values of non-participants in this agricultural extension project. The dissertation argues for expanded use of Q as a tool for educational program planning and evaluation in addition to its better known use as a research instrument.

Q statements were developed from in-depth interviews with non-participating producers and project staff, and project documents. Data collection and analysis of q-sorts (44 total) occurred in February and September of 2003. Centroid factor analysis with theoretical rotation was used to arrive at a four-factor solution to the combined data matrix of 44 q-sorts. Three of the four factors were stable across both analyses. The first factor, the "Technicians", cited lack of technical assistance as the reason for non-participation and sought a solution that focused on delivering the project through better trained technical advisors. The "Efficiency Activists" cited structural issues as the barrier to participation with improved industry-wide efficiency as the solution. The "Traditionalists" offered personal and political reasons
for their lack of participation. Finally, the "Economists" reflected the poor economic conditions facing many producers in Uruguay, namely depressed milk prices.

The study attended to consensus items as an entry point for program improvement. A primary strategic solution for increasing participation by working with other farmer organizations was shared by three factors. The four factors also provided insight into how program planners might garner farmers' participation by better training the technicians who deliver the service.
CHAPTER 1. GENERAL INTRODUCTION

Introduction

Our personal mental frames are made up from our past learning and experience, and our constructs, beliefs, values and preferences. ... From their nature, then, personal realities all differ. We all 'see things differently'. (Chambers, 1997, p. 57).

This excerpt from Whose Reality Counts (1997) touches upon the key issue addressed in this dissertation: tapping peoples' perspectives in such a way that those perspectives reflect an individual's needs, interests, and values to define how that individual "sees" things. The dissertation is defined further by its focus on non-participants. The agricultural extension education study upon which this dissertation is based explains the non-participant perspectives present and operating in a dairy genetic improvement project in Uruguay.

Problem Statement

The benefits of citizen participation in programs and processes are well-founded. This excerpt from Participation: People behind the projects (International Fund for Agricultural Development, 1999) states:
The ultimate goal of participation is to raise people's awareness of their social and economic rights and duties, as a way of moving them from a state of dependence towards greater self-reliance and to enable them to assume an independent role in decision-making (p. 5).

Finding agreement on the value of having people involved in the planning, implementation, and evaluation of programs as well as in partaking of program services, is relatively easy. This agreement is due in large part to the realization that the problem with non-participation is the loss of human investment (Arnstein, 1969; Brown, 2003). When people decline to participate in programs by becoming involved in decisions about programs, their perspectives are lost and cannot inform or benefit the program (Cohen & Uphoff, 1977; Fetterman, 1997). Therefore, non-participation becomes a downward spiral; people lose the opportunity to benefit from programs at even a minimum level (Lutrell, 1989; Lyons, Smuts, & Stephens, 2001; The World Bank Group, 2003).

What is not so easy is coming to terms with "why" participation does not occur. Participation has been "talked about" in various ways by various theorists from various disciplines (Boone, 1985; Brisolara, 1998; Cross, 1981; Deshler, 1995; Miller, 1967). This variability is partly responsible for the philosophical and
methodological differences and challenges in the social sciences as they relate to studying non-participation. To begin with, arriving at a universal definition for participation – or non-participation - has not been achieved (Cohen & Uphoff, 1977). What constitutes participation for critical theorists differs from what constitutes participation for motivational theorists. Consequently, no comprehensive theory exists for explaining participation, let alone the lack thereof (Deshler, 1995). Adult education researcher Deshler (1995) points to the need for more intensive study of non-participants and a greater focus on the complex reasons behind their motivations to resist participation (p. 4238).

**Conceptual Framework**

This dissertation answers the call for more intense study of non-participants. Figure 1.1 is the framework that serves to map out conceptually: (1) the research problem this dissertation addresses, (2) an array of explanations, assumptions, and theories that explain the problem from different vantage points, (3) solutions offered to remedy the problem, and (4) results that might be expected from these remedies. The framework structures the dissertation. The reader is encouraged to refer to Figure 1.1 as the argument progresses through the manuscript.
FROM NON-PARTICIPATION TO ENGAGEMENT

When people do not participate in programs, their perspectives are lost and do not inform programs, nor do they benefit from them.

People do not participate because...

<table>
<thead>
<tr>
<th>Explanation</th>
<th>Based on...</th>
<th>Argued by...</th>
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<tbody>
<tr>
<td>The program does not meet their needs</td>
<td>Congruent values lead to participation</td>
<td>Resistance Theory</td>
</tr>
<tr>
<td>They are not included in the planning</td>
<td>Personal and social forces exist and exert influence</td>
<td>*Quigley</td>
</tr>
<tr>
<td>Their values clash with that of program planners</td>
<td>People possess a level of adoptive readiness</td>
<td>*Boehm</td>
</tr>
<tr>
<td>They respond to internal or external forces</td>
<td></td>
<td>Congruent values lead to participation</td>
</tr>
<tr>
<td>Their level of innovativeness is low</td>
<td></td>
<td>Personal and social forces exist and exert influence</td>
</tr>
</tbody>
</table>

Assumptions:

- Needs are identifiable and if met, people show up
- "Participation" means authentic inclusion in all planning levels

Theories & Theorists:

- Needs Assessment
- Functionalists
- Empowerment
- "Efforts"
- "Scissors"
- "Freire"
- Resistance Theory
- *Quigley
- *Boehm
- Adoption and Diffusion Theory
- *Rogers

Remedied through...

<table>
<thead>
<tr>
<th>Solutions</th>
<th>Resulting in...</th>
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<tr>
<td>&quot;Needs&quot; contextualized to include values and interests</td>
<td>Points of divergence and convergence in people's functional perspectives are identified, resulting in the identification of:</td>
</tr>
<tr>
<td>Values and interests made explicit</td>
<td>Points of leverage to increase people's engagement in programs</td>
</tr>
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</table>

Figure 1.1 Conceptual Framework
Educational Importance

The benefit from people's participation in programs and projects is widely acknowledged (The World Bank Group, 1996). In the realm of extension education, this is no less true. According to Röling (1990), agricultural extension is an intervention designed to produce changes in behavior for some common good, often also for an individual's good. However, Röling clarifies the participation necessary to such changes as "voluntary"; therefore change is predicated upon some level of participation in the intervention. Without participation in the intervention, changes may be less likely to occur. Consequently, the individual and society are less likely to prosper from the intervention. When participation is genuine, the participant is not coerced into participating. For example, when an extension educator is informed that their lack of attendance at an in-service training would not be viewed positively, and the extension educator decides to participate, there is evidence that some level of coercion (i.e. obligation/influence) is at work. A more extreme example might be the required participation of farmers in government mandated programs. Neither of these examples are what is meant by participation in this dissertation. Rather, for the purposes of this dissertation, participation is meant to be voluntary without threat of coercion, either indirectly or directly. Such a definition of participation largely describes many of the projects and programs undertaken by
agricultural extension. When people are not threatened, coerced, or otherwise made to feel that their involvement in a program is mandatory, they can opt out of participating in programs. The potential (and reality) of people choosing to avoid participating in programs lies at the heart of why the topic of this dissertation is important to agricultural education.

According to the Food and Agriculture Organization of the United Nations and The World Bank (2000), education and training interventions should not be considered as mere knowledge transfer processes. Instead, FAO and The World Bank argue that education and training interventions – such as those commonly undertaken in agricultural extension systems – can engage people in critical thinking and problem solving as both a means to an end and the end itself. This view of extension could be considered somewhere between traditional extension and “emancipatory extension” (Freire, 1970; Röhling, 1990).

Central to emancipatory participation is the idea that programs and projects function better for the individual and for society when greater levels and degrees of participation occur. Emancipatory participation is founded upon concepts of democracy and natural rights. Heron (1999) claims that “One basic right is the right of people to participate in decisions being made about them.” (p. 22). This is no small matter and speaks to what is at stake for extension education: the risk of
disrespecting potential participants' rights by refusing to include them or incorporate their perspectives in the planning, implementation, and evaluation processes. Heron (1999) says that refusals result in alienation.

As well as being autonomous, learning is also necessarily holistic, that is, it involves the whole person, a being that is physical, perceptual, affective, cognitive (intellectual, imaginative, intuitive), conative (exercising the will), social and political, psychic and spiritual. It may involve the whole person negatively by the denial of some of these aspects and their exclusion from learning. In this case we get alienation, such as intellectual learning alienated from affective and imaginal learning, with the result that the repression of what is excluded distorts the learning of what is included.” (p. 23)

However, gaining participation from prospective participants in non-formal educational programs or projects is sometimes difficult (Caffarella, 2002; Cross, 1981; Knox, 1986; Rubenson, 1977). Moreover, extension has been unsuccessful in garnering the participation of those audiences that may have the greatest need for the educational or technological intervention (G. Stephenson, 2003). But “need” and the extension education concept have different meanings and implications, depending upon the culture in which it is applied (Röhling, 1990). For the
Uruguayan case this is also true; the genetic improvement project (as an extension-like intervention) is situated in its own social, agricultural, and research contexts.

Background and Contexts

The social context

Uruguay is located on the southern part of the South American continent between two large countries: Brazil and Argentina. This location has largely dictated some of Uruguay's history as it often served as the battleground between rival forces entrenched in either country (Weil et al., 1971). This was generally the case until 1828, the year Uruguay won her independence from Brazil. Since that time, Uruguay has enjoyed a relatively peaceful democratic existence – with the notable exception of military rule between 1973 and 1985. Uruguayans are largely European in ancestry (88% White) as most natives were either forced to relocate or killed (Davis, 1995). As a result, Uruguay is infused with Italian and Hungarian twists in cuisine, architecture, and culture. The official language is Spanish; however, the Uruguayan version of Spanish is a distinctive dialect, a fact not uncommon in the Spanish-speaking world.

Prior to military rule, Uruguay was considered by many as the democratic model for South America. Its political institutions were stable and had managed to
produce stable economic conditions. Government was generally modeled after European systems and had adopted many of the practices of a socialist welfare state including state-sponsored education, retirement, and health care. These services were not without economic cost and the world recession of the late 1960s and early 1970s took its toll in Uruguay as it did elsewhere. Consequently, Uruguay succumbed to a military plebiscite in 1973 and came under military rule. During the military dictatorship, more people in Uruguay were imprisoned than in any other South American country on a per capita basis. Evidence of the regime's brutality and use of torture are well-documented (Davis, 1995). In 1985, the military agreed to a referendum on its authority and peacefully relinquished power to a democratically elected government after losing the referendum. Uruguay remains politically stable but has enjoyed limited economic growth.

Uruguay's growth is limited by several factors, not the least of which is scarce natural resources and restricted land mass. The country has an area of just over 72,000 square miles, roughly the size of the state of Washington, and is divided into 19 departments (i.e., "states"). With a population of approximately three million four hundred thousand, it is a small country in terms of number of people and is not growing rapidly (.79% per annum). Montevideo, the capital, is a moderately sized city of just over one million people. Life expectancy is relatively high with an
average of 76 years; the bulk of the population (63%) is between the ages of 15 and 64. Uruguayans are highly literate (the literacy rate is an enviable 97.3%) and are predominantly Roman Catholic in their religious faith (66%), although a large portion of the population do not profess a religion (31%) (The Central Intelligence Agency, 2002).

Uruguay's economy is dominated by the service sector (mostly tourism), but the agricultural sector makes up the bulk of its exported goods. Between 1996 and 1998, Uruguay averaged a 5% annual growth rate but then fell victim to the worldwide depression of 1999-2001. Also to blame for the economic suffering was the dismal banking situation in Argentina and Brazil's sputtering economies – together these two countries purchase more than 50% of Uruguay's exports. Despite the deep recession, Uruguay fared better than most of its neighbors, largely due to its solid reputation of stability among investors and its investment-grade sovereign bond rating - one of only two in South America. However, Uruguay still faces tremendous economic adversity brought about partly by the banking fall-out in Argentina as well as by its deficit and falling GDP (-1.3% in 2000 and -1.5% in 2001). This is particularly troublesome for Uruguay because the service sector accounts for the largest share of GDP (65%) followed by industry (29%) and agriculture (6%). With the service-focused economy, it is no surprise that unemployment rates are
high (15% in 2001) which are off-set to a certain degree by the relatively low rate of inflation (3.6% in 2001) (The Central Intelligence Agency, 2002).

The agricultural production context

Despite accounting for only 6% of GDP, agriculture production in Uruguay is an important sector in the economy. For many years, particularly in the first half of the 20th century, Uruguay was a world-renowned exporter of quality beef (Davis, 1995). The beef industry continues to prove a major source of Uruguay's total exports: in 1991, meat and leather were the second and fifth largest commodity groups exported and combined to account for 18% of the country's total exports (The World Bank, 1994). However, wool and animal hair have traditionally been Uruguay's number one export, although their share of the export market has certainly fallen over the past 30 years, due in large part to the advent of synthetic fibers. Nevertheless, wool and animal hair remained a major export commodity in 1991, representing 16% of total exports. More broadly, however, it may prove useful to point out that in 1965, agricultural products accounted for 86% of Uruguay's total exports while in 1991, agricultural commodities represented a rather healthy 64% of Uruguay's total exports (The World Bank, 1994). Although agriculture production accounts for only about 6% of Uruguay's GDP, due to its external demand, it
remains a cornerstone of Uruguay's economy, particularly with respect to those commodities and sectors experiencing growth.

The dairy industry

The Uruguayan dairy industry has experienced substantial progress in the past 30 years (Jarvis & Sere, 1993). From 1971 to 1991, Uruguayan milk production was estimated to have grown at an annual rate of 2.5% with rates of growth improving over time (Jarvis & Sere, 1993). Much of the growth during this time is attributable to improved pasture technology; Uruguayan dairy farmers exhibited a propensity to adopt new forms of pasture improvement to increase productive efficiency. However, the "ceiling" of benefits from this technology has probably been reached, indicating that if the dairy sector is to experience sustained growth and improved efficiency, then such growth or efficiency must come from other advancements (Jarvis & Sere, 1993).

It was just such an advancement that the Instituto Nacional para el Mejoramiento Lechero (hereafter referred to as "INML" and translated from Spanish to mean "National Institute for Milk Improvement") sought to develop and promote when it established the genetic registry project. The INML was established in 1991 through the concerted efforts of seven agencies in Uruguay. Its primary objective was to establish and promote a computerized record system of expected progeny
differences (EPDs) for the evaluation and selection of dairy cattle. The purpose of EPDs in selecting sires is to match the bull’s characteristics with the heifer’s characteristics so that the offspring will be more productive (in terms of milk production, higher butterfat percentage, etc...) than the previous generation of heifers. For example, if a farmer has a cow that has a low volume of milk production but that has calved at regular intervals, a bull with above average milk and average calving interval EPDs would be selected. The genetic registry project expects farmers to use the data to make better decisions, specifically those related to sire selection and culling (i.e., removing) less productive cows. Culling decisions can be based on a number of factors, such as the percent buttermilk and/or protein in fluid milk, volume of milk (liters of milk produced per day), or post-partum intervals (the number of days it takes a cow to cycle into estrus and then become pregnant with a calf).

The genetic registry project can be characterized as a technology transfer project. Dairy farmers are invited to enroll in the project through the INML. Farmers are provided with software for computer data entry of production data, such as the amount of milk produced per day, post-partum interval, and offspring data. The farmer sends these data to INML on a regular basis (some weekly, others monthly), most often electronically via an internet connection. Program personnel at INML
receive the data, file it electronically, and aggregate it. At the end of the calendar year, INML program personnel compile and analyze the data in the aggregate. Each farmer’s cow in the registry is then compared to the aggregate-level data, for which a profile is generated for the farmer. Farmers are then sent a printed report for each of their cows detailing this comparison. Additionally, an aggregate-level report is generated and disseminated by INML to all farmers and other interest groups.

However, from the outset, INML recognized that the mere collection and dissemination of information was not sufficient; one of its five primary objectives was to lend technical support to dairy farmers to improve information quality and, most importantly, its use in decision-making. INML program personnel believe that it is through training farmers on how to interpret and use the information that gains in the productive efficiency of the dairy industry will occur. This is testament to the organization’s commitment to being farmer-focused.

As of August, 2003, the genetic registry project included over 250 dairy farmers, situated in 13 of the 19 departments, with over 50,000 head of dairy cattle producing 600,000 liters of milk per day. Of those producers registered with the project, only 19% have fewer than 100 head while 71% have between 100 and 500 head of producing cows (Instituto Nacional para Mejoramiento Lechero, 2003). In 2001, Uruguay produced 1.2 million tons of fresh milk with approximately 350,000
cows; approximately one-quarter of one percent of the world's total milk production (International Dairy Federation, 2002). In fact in 1991, milk and cream exports accounted for 2% of Uruguay's total product exports (The World Bank, 1994).

Although INML had managed to attract the involvement of many large farmers and a scattering of medium to small-sized dairy farmers, more widespread participation, particularly from operations with less than 100 head, had eluded them. This situation seemed understandable when viewed in light of two factors: cost and the price of milk. The user fees that partly support the registry are computed on the number of production units a farmer has in the registry, thus making it more cost effective for larger farmers to participate than it is for smaller farmers to participate. Moreover, the price of milk in Uruguay at the time of the study (2002 and 2003) was at its lowest point in years – approximately seven cents per liter (compared to roughly 32 cents per liter in the United States). However, despite these two barriers, INML program planners believed that the genetic registry project could be beneficial to farmers with any number of dairy cows.

The research context

In October of 2002, INML program planners consulted with the author and other partners to request assistance in evaluating the genetic registry project. A specific programmatic issue that the evaluation was expected to shed light on was
the issue of non-participation. The author, in collaboration with partners and program planners, designed an evaluation to focus on the genetic registry project. However, in addition to providing evaluative information about the genetic registry project, the author also wished to test a novel approach to evaluation, termed Q methodology. The evaluation question served as a way to learn about Q methodology in the context of evaluating an important agricultural improvement project.

The author and collaborators met to discuss possible evaluation questions, the answers to which would prove useful and meaningful to both the program planners and the researcher/author. The first “round” of talks identified two populations about whom program planners were interested: current participants and non-participants. With respect to each population, program planners had different questions. For example, with respect to participants, program planners wanted to know how well the genetic registry project was working and possible areas that might be improved. However, program planners’ interest in participants was less acute than their interest in those farmers who were not currently participating in the genetic registry project. The evaluation therefore focused on farmers who were not involved in the genetic registry project. Discussion with program planners developed the following evaluation question: Why had some
Farmers in Uruguay decided to forego participation in the genetic registry project? At issue was determining what economic and social forces existed to influence this decision. Due to the complexity of economic and social forces – and how farmers perceive and respond to them – the author viewed Q methodology as an appropriate alternative to conventional research and evaluation methodologies (Brown, 1980). The author believed that Q methodology would function well under these conditions because the methodology uncovers diverse, expected, and unexpected orientations toward the program (in this case, the genetic registry project). The author also hoped that the methodology could identify points of consensus and disagreement in non-participating producers' perspectives that program planners could leverage to increase participation in the registry.

Research Questions

The context for the study was an evaluation of a Uruguayan genetic registry project. Within that context, however, the research question this dissertation addressed is "what theories serve to explain non-participation in the genetic registry project?" More specifically, the research is driven by the following:

1. How well does Q methodology function in framing farmers' needs, interests, and values as "functional perspectives"?
2. How well does Rogers' (1962) model on the diffusion of innovations explain non participation in the genetic registry project?

**Dissertation Organization**

This dissertation is divided into six chapters:

Chapter one includes a statement of the problem, the conceptual framework for the study, an introduction to contexts in which the dissertation is situated, the research questions, and the form these take in this dissertation. Chapter two reviews the literature relevant to the problem this dissertation addressed. Chapter three is a methodological article with an advanced treatment of Q methodology submitted to *Operant Subjectivity*. Chapter four is an article published in the *Journal of International Agricultural Education and Extension* in the summer of 2003 presenting results of the first phase of research, completed in February, 2003. Chapter five is a theoretical article applying diffusion of innovations theory to non-participation in the genetic registry project. Chapter six presents general conclusions which include a discussion and recommendations for the field of agricultural education.
CHAPTER 2. REVIEW OF LITERATURE

The following chapter describes the literary and theoretical landscape that surrounds this dissertation about improvement of agricultural extension education programs. The genetic registry project was partly a technological innovation, partly an educational endeavor, and wholly a social intervention. All of these dimensions constitute a reason to discuss aspects of the literature at differing levels of detail. The chapter begins with a discussion of five distinct explanations of the non-participation problem, the assumptions those explanations are predicated upon, and the theories and theorists arguing for each explanation. Literature that supports (my) proposed "solutions" to the problem is then addressed. Finally, the chapter wraps up with an introduction to Q methodology and some of its basic tenets. The final section in this chapter acquaints the reader with Q methodology so that the author's methodological solutions, featuring theoretical rotation, may be better understood.

Explanations, Assumptions, Theories, and Theorists

Needs assessment literature

The literature on needs assessment is vast. For the purpose of this dissertation, the literature is broken into two manageable "camps" — the Functionalist
and the *Empowerment* perspectives. Although this dichotomy is overly simplistic, it
is nevertheless useful for tracing the logic of each position through the literature.

Sandra Pearce (1998) uses this same dichotomy to sketch the terrain of needs
assessment. Because of the abundance of the functionalist position in the agricultural
education literature, more discussion is devoted to it than is devoted to the
empowerment position.

Before delving into each position, it may be useful to discuss briefly the
foundational theorist for the needs assessment literature: Abraham Maslow (1943).
Maslow introduced a "hierarchy of needs" to the psychology field in the 1940's. One
of his seminal works in this area was published in 1962, *Toward a Psychology of Being*
(1962). In it, Maslow offered a pyramid structure of needs that has become ingrained
in most discussions of need by educators. Basic needs (for physiological functions
and/or survival) formed the base and self-actualization formed the apex of the
pyramid. Maslow claimed that to reach self-actualization, humans first must satisfy
all, or at least most, of their other needs, beginning with survival needs (e.g., food
and shelter), continuing to safety needs (e.g., the relative degree of lack of harm),
moving to emotional needs (e.g., love, affection, and belongingness), and finally
meeting esteem needs (e.g., self-worth). Only after the bulk of these "lower-level"
needs are met is self-actualization then possible. Maslow's hierarchy of needs is
grounded in the individual and does not necessarily apply to organizations or systems. Nevertheless, it has formed the basis of much of the needs assessment literature and philosophy, and many theorists continue to cite Maslow's theory as foundational to their own.

**Functionalist position**

The functionalist position posits that people do not participate in programs because the program does not meet their need(s). The functionalist position is based on the assumption that needs are identifiable. If the program is structured and targeted to meet those needs, people will participate in programs. According to Pearce (1998), this approach "underlies most program planning models in adult education and training" (p. 252) and is directly attributable to scientific empiricism. Pearce traces the functionalist perspective to the foundational work of John Dewey because, according to Pearce, it was largely Dewey who applied the logic of science and the scientific method to the field of education. Two approaches that illustrate this approach are that offered by Borich (1980a; 1980b) and that offered by Scissons (1982).

*Borich model.* An example or approach to needs assessment often cited in agricultural education literature is provided by Borich (1980a). Borich claims that "...training need can be defined as a discrepancy between an educational goal and
trainee performance in relation to this goal” (p. 39). Borich provides a model to arrive at an index that can either be interpreted as an assessment of participant and program needs or of program effectiveness, depending upon one’s position in relation to the program and its participants. The discrepancy model, as it is often called, includes five steps, beginning with listing the competencies required of, or necessary to, successful teaching. Second, trainees are surveyed about the relevance of, and their level of attainment of, each of these competencies. Alternately, trainees may also indicate levels or dimensions of these competencies, such as their knowledge of the competency’s mechanics or their ability to perform the competency. The researcher next ranks the competencies according to a discrepancy index. The discrepancy index is calculated from “the difference between perceived importance and perceived level of attainment across the three dimensions: knowledge, performance, and consequence.” (Borich, 1980a, p. 40). For each dimension, these discrepancy scores are multiplied by the average perceived importance score determined over all respondents. These “weighted” discrepancy scores are then ranked from highest to lowest with higher scores indicative of higher priority for program revision. The fourth step in the Borich model is to compare these higher priority competencies with training program content to determine the
emphasis for the training program. Finally, the program or the competency is created or revised to emphasize the highest-priority competency items.

Perhaps the first journal article in the agricultural education field to appear based on the Borich model was Barrick, Ladewig, and Hedges (1983). The authors used the model to identify in-service topics (i.e., professional development) for agriscience teachers in Ohio. The authors asked 307 teachers to indicate their level of interest, level of knowledge, and level of application on a five-point, Likert-type set of choices for each of 12 topic areas. The authors concluded that program “Priorities can be based on more than a survey of desires or felt needs” (Barrick et al., 1983, p. 19). What is noteworthy about the article is that although the authors conclude that interest does not always equate with technical need, the method of determining when and where they are incompatible is essentially left up to the researcher through the process of computing mean weighted discrepancy scores.

Waters and Haskell (1988) argued for the use of the Borich model in quantifying training needs of extension staff in Nevada because it had advantages over other methods, among them, the Q-sort. The authors claimed that surveys and Q-sorts did not sufficiently address the likelihood that people had knowledge of a topic or that they could apply that knowledge. Waters and Haskell would have the reader believe that the process of computing a discrepancy score between a person’s
reported interest in a topic and their reported level of knowledge and application of that topic is somehow more indicative of a person's "real" needs. The authors used the Borich model in an attempt to illuminate "real" places of cognitive need and therefore, "real" areas of need. Most important is that Waters and Haskell cast extension staff's motivation and interests as less important than the organization's interest (extension). "Needs" are defined more in terms of what the organization needs than by what the employees value and areas about which they are motivated. I contend that at best, this leads to lackluster participation and, at worst, a lack of participation.

There are no less than 10 articles from The Journal of Agricultural Education from 1988 to 2002 that employ the Borich model or some form of it (e.g., mean weighted discrepancy scores). Without exception, these articles argue that measuring the disparity between a person's interest in a topic or area and their knowledge and ability in that area somehow leads to a suitable identification of need. What is disconcerting is that not one of these articles addressed the underlying issue of program participation. The concern is that the current mode of thinking (as evidenced by the agricultural education literature) about need in a programmatic sense is hyper-focused on gaps in knowledge and insufficiently addresses the issue that knowledge (or lack thereof) may be less of a driving force behind a person's
participation in programs than are other factors such as interests, values, and structural concerns. Other literature bases have, to some extent, addressed this issue.

Scissons model. Scissons (1982), on the other hand, argues that with respect to assessing needs, the issue is not so much methodology or approach as it is the definition of educational need. In his typology of educational needs, Scissons offers a framework for distinguishing between the various definitions of need (Figure 2.1). At the core of the typology rests three need components – competence, motivation, and relevance. What Scissons refers to as “complex needs” are those combinations to the left of “need components”; to the right of the need components lay the combinations that define wants.

Scissons (1982) defines the basic need components in a fairly straightforward fashion: competence refers to one’s ability to perform a range of skills, relevance refers to applicability of those skills in one’s situation, and motivation refers to the propensity for one to remediate the supposed lack of competence. As the reader can ascertain from Figure 2.1, a derived need is one that is comprised of all three need components – competence, motivation, and relevance; therefore, by Scissons own definition, of the highest order in the typology, despite his assertion that “no one definition of need is superior to all others in all contexts” (1982, p. 27).
The value of Scissons' (1982) work as it relates to agricultural and extension education is the recognition that “need” is a complex construct. Attempts to reduce the construct to one of deficiencies or discrepancies are inadequate because they fail to embrace other dimensions, such as motivation, relevance, value, or interests. Nonetheless, the Scissons model shares basic assumptions and explanations of
people's lack of participation in programs with Borich and others (see Caffarella, 2002; Clark, 1990; Knowles, 1980).

**Empowerment position**

Contrasted with the functionalist position is the empowerment position (Pearce, 1998) which draws on the work of Paulo Freire (1974) and Ivan Illich (1971). The empowerment position explains peoples' lack of participation in programs in a much more challenging way: people do not participate in programs because they are not included in the planning, implementation, or evaluation of the program. This explanation of non-participation largely rests on the definition of participation. For those in the empowerment camp, participation means authentic inclusion in all levels of the process. Both Freire (1970) and Chambers (Chambers, 1997) discuss extension's traditional reliance on experts to address challenges (technical and otherwise) in developing countries at the expense of the inclusion of the indigenous population and their local knowledge.

Authentic inclusion is quite different from the functionalist position that suggests all a planner must do is identify knowledge gaps (in other words, identify discrepancy needs) and plan the program to address those gaps (or needs). Pearce (1998) claims that viewing needs assessment through the empowerment lens suggests that needs are socially constructed and, as such, are much more a product
of the process than they are of the person. This would preclude the program planner from conducting needs assessment outside the realm of the socially constructed program. Further, this would suggest that participants' needs are not knowable a priori (as the functionalist position might support), but are defined and determined by, and in the context of, a group of participants coming together to determine what it is they desire to change.

For example, Bawden (1992) describes an experience in combining participatory planning from the empowerment position in re-designing an agricultural education curriculum at a college in Australia. In the late 1970s, faculty at Hawkesbury Agricultural College in Australia decided to revamp their curricula via a multidisciplinary approach to education. Faculty believed that their graduates were not being sufficiently prepared to deal with an increasingly complex and uncertain agriculture. The Hawkesbury Experience (per Bawden), as an exercise in participatory planning, was intended to fully immerse the faculty in all aspects of the program as a way to achieve greater synthesis of systems concepts in achieving wholeness in the program. The intent was to avoid the academic education versus technical training dichotomy with which the institution had struggled previously. It was hoped that by approaching curriculum development from an empowerment position, faculty would become more engaged in all aspects of the program,
including in decisions related to their own learning. This inclusion thus would transform the learning system from one based upon knowing (propositional knowledge) and doing (practical knowledge) to one based upon being (experiential knowledge). A crucial aspect to re-designing the curricula at Hawkesbury Agricultural College was the process by which participants shaped their perceptions such that they developed a holistic perspective on agriculture (Bawden, Ison, Macadam, Packham, & Valentine, 1985).

**Resistance theory**

Resistance theory is rooted in the adult basic (i.e., literacy) education literature. It attempts to explain why people do not participate in adult basic education as a clash of values between participants and the people who plan programs (Sparks, 1998). The assumption is that to the extent participants and planners share the same value-set, participation will occur. To the extent that participants and planners do not share the same value-set, participants will resist participating in adult basic education programs (Boshier, 1973).

Wendy Luttrell (1997) argues that schools play a crucial role early in life in defining who someone is – and what they can become. This “identity control” has a profound impact on adults as they return to the educational process later in life. Not only do these learners struggle to redefine their selves; they also struggle against a
class structure that fails to re-affirm their value as learners. This social inequality creates an educational atmosphere in which life skills are not valued to the same degree as school skills, thus causing the individual adult learner to reject the values present in the schooling structure. This rejection of values leads to a resistance to education, particularly when the program planner epitomizes the very values against which the learner is struggling.

Allan Quigley (1990) suggests that resistance to education is actually a political boycott of the educational provider’s vision of the future; a vision most adult basic education participants do not share (see also Deshler, 1995). Quigley (1987) describes his experience in rural Canada with Native Canadians as an experience in resistance to values he was seen to embody. Despite what he thought of as a well-planned and culturally-sensitive approach to adult basic education, Native Canadians nevertheless chose to discontinue their participation in the learning activity. Quigley surmised (eventually) that this decision was based as much upon the learners’ rejection of “mainstream” values as it was upon the fact that he and they did not share the same socioeconomic class or values (Quigley, 1998).

This congruency of values, or lack thereof, is also described in Boshier’s congruence model (1973), albeit somewhat differently. Boshier suggests that
participation in formal education can be best understood as the degree to which a person's self-concept is internally congruent, as well as the degree to which it is congruent with the educational environment. The larger is the gap or discrepancy between a person's self-concept and important characteristics of the learning environment (mostly social), the greater is the propensity that the individual will either drop out or refuse to participate. Boshier's research focused on measuring students' congruence with various aspects in the educational environment - their ideal self, their fellow students, their instructors. The more incongruent a person saw themselves with respect to their ideal self, their fellow students, or their instructors, the greater was the probability that they would discontinue the educational activity voluntarily. Moreover, according to Cross (1981), "Boshier's theory suggests...that certain people, especially those who show high degrees of dissatisfaction with themselves, are likely to project their own dissatisfaction onto the environment and to drop out of almost any environment...." (p. 120).

Luttrell (1997), Quigley (1987; 1990; 1998), and Boshier (1973) all address the central issue in resistance theory: people resist participating in programs (either initially or subsequently) because of lack of congruency in values. While Boshier focuses more on interpersonal aspects of congruency, Luttrell and Quigley focus
more heavily on socially and culturally incongruent values. All, however, explain people’s lack of participation in educational programs as a clash of values.

**Chain-of-response theory**

Chain-of-response theory can be viewed as the assembly of several theories that have attempted to explain people’s participation in programs. Across all of these theories, however, is a common explanation of people’s willingness (or not) to participate in programs: people’s participation is a response to internal and external influences. This is based on the assumption that both personal and social forces exist and that these forces exert influence on a person’s decision on whether or not to participate in programs. This explanation of participation has a substantial history in the literature, and so it is necessary to give it a more thorough discussion.

It was virtually impossible to read any of the later theorists on participation and escape reference to perhaps the first theory of participation in adult education: that of Harry Miller (1967). Miller combined the psychological aspects of Maslow’s needs hierarchy (Maslow, 1962) with Kurt Lewin’s (1947) sociological aspects of force field analysis into a model that explains participation (or lack thereof) by way of competing positive and negative forces. Miller’s model or theory is generally referred to as “Force Field Analysis”, primarily because it looks and reads much like Lewin’s. However, Miller drew quite heavily from Maslow in explaining the
relationship between educational interests, age, and position in the life cycle. Miller argues that individuals in the early stages of adulthood are concerned primarily with satisfying the lower-level needs on Maslow's hierarchy, namely those related to economics. However, as the individual matures and presumably satisfies these needs with enhanced earning capacity, the individual becomes free to pursue those needs at the apex of the Maslow hierarchy, namely self-actualization.

From Lewin, Miller drew on the idea that there exist in society (i.e., the environment) various forces that act upon the individual that explain a person's motivation to act and the character of the actions themselves. The strength of these forces dictates whether a person is propelled forward by the positive forces or succumbs to the negative forces, as evidenced by non-participation. Miller provides an example: education for vocational competence for the lower-lower class. Miller argues that social forces, such as the action-excitement orientation of the (U.S.) male culture combined with hostility to education and to a middle class object orientation provide very strong negative social forces discouraging participation in educational activities despite the psychological needs of survival and safety that the education may provide.

Cross (1981, p. 115) writes admiringly of Miller's theory (1967) and recognizes its usefulness in explaining much of the participation terrain of adult basic
education. However, Cross points out that she could find no recent theoretical work or research building upon the model – and that was as early as 1981. Although I can offer no explanation for the lack of buttressing research that Cross observes, there is an observation worth noting: Miller’s model characterizes participation as dichotomous. That is, one either participates or one does not. But participation, it can be argued, is more of a continuum along which people choose to engage.

Kjell Rubenson (1977) offers another model for explaining one’s propensity to participate in adult education programs. Commonly known as the expectancy-valence model, it draws from both Miller and Lewin in explaining participation as a factor of one’s perceived expected successful completion of the educational endeavor and the likely benefit it will offer. The expectancy piece of the model is actually composed of two factors: a person’s expectation 1) that he or she will be successful in the educational endeavor and 2) that success in the educational endeavor actually will lead to positive or beneficial consequences. Both of these factors incorporate a force-field approach to the educational situation, for they reflect the interaction between an individual’s psychological being and the environment in which he or she exists.

The strength of the positive and negative internal and external forces will dictate whether an individual opts out of an educational endeavor – or moves on to
the second aspect of Rubenson's model, the valence aspect. If a person anticipates being successful in the educational endeavor and the consequences from participation will be beneficial, then, according to Rubenson, the person will participate in the endeavor. If the value of participating outweighs the costs associated with that participation, then the person opts for participation. From an agricultural extension education perspective, the expectancy aspect of the model may not be quite as pertinent as the valence aspect largely because the non-formal nature of most extension education presupposes a least a certain degree of "successful" completion. This was confirmed by Van Tilberg (1989), who surveyed 276 Ohio extension clients using the expectancy-valence model. Van Tilberg reported (1989) three factors that explained participation: negative experiences, self-improvement, and social involvement (p. 44). The lack of negative experiences coupled with the positive value from self-improvement proved to be the motivational drivers for those clients that participated and persisted in extension programs. Van Tilberg (1989) concluded that "Individuals are most satisfied when they experience self-improvement, do not have negative learning experiences, have the initial worry of arranging participation solved and like the teacher" (p. 45).

It must be pointed out, however, that the expectancy-valence model is not necessarily balanced; that is, if the valence portion outweighs the expectancy
portion, one can expect participation. According to Cross (1981), the opposite is true. The model is more multiplicative than balanced for, if a person decides that the negative forces outweigh the positive ones with respect to the expected success and/or benefit, then the valence aspect is never considered. To be more specific, take the example used above. Persons who would have decided that the likelihood of completing the course was low would not have given further consideration to participating. Likewise, had they decided that success was likely but that the salary increase was not, they would not have given further consideration to time away from family. The model, then, is more cumulative or successive than it at first appears, and it is in this sense that it bears a resemblance to Cross's chain-of-response model (Cross, 1981).

Cross's (1981) chain-of-response model is a compilation of the models previously discussed into one that attempts to illustrate the hierarchical nature of factors affecting participation (Merriam & Caffarella, 1999, p. 67). First in the chain (or series) of responses to participation in an educational activity are a person's self-evaluation and their attitudes about education. Attitudes about education, for Cross, arise out of a learner's past education experiences as well as from other peoples' attitudes toward education, particularly those closest to the person. Again, these two factors should sound familiar to the reader by now, for they are what other authors
have viewed in one way or another as the psychological factors and the sociological/environmental factors impacting individual participation in adult education. However, Cross suggests that in most people, there is a relatively stable and balanced nature to this psychological/social balance to learning, such that it predisposes some people either to seek out or to avoid new learning experiences (Cross, 1981, p. 126).

The next point in the chain or series of responses deals with the importance of goals and the individual's expectation that participation will meet these goals. This point in the model incorporates Rubenson's expectancy-valence model which Cross (1981) readily admits to the borrowing (p. 126). Cross moves quickly to the next stage or influencing factor in the chain-of-response, which she calls "life transitions". It is here, Cross argues, that events occur in peoples' lives that can either strengthen their participation in educational activities (such as becoming unemployed and needing additional job training) or weaken it (such as needing to care for an elderly parent). It is noteworthy that Cross does not appear to consider life transitions as having a negative force on people's participation in education. Rather, most of the examples provided and discussed are done so in an attempt to illustrate how such transitions affect the participation phenomenon positively. The reader is left
uncertain whether or not Cross views this stage as having negative consequences, but it is assumed that she does, regardless of the lack of examples or discussion.

It is at this stage of the model, stage “E”, where individuals assess opportunities and barriers to their education. Cross (1981) claims that in all probability, those who have reached this stage with a strong desire to participate will seek opportunities to do so (p. 127). Conversely, Cross also points out that for those who are only marginally motivated to participate, it is here that even small barriers may prove too formidable, resulting in non-participation. Closely related to this stage is Cross’s next stage, information. It is in this stage that the accuracy of information plays a crucial role in serving either as the final encouragement or the final discouragement to potential participants. Provided accurate and timely information is accessible, participation reasonably can be expected.

However, the genetic registry project was not a straight-forward educational program or concerned with adult basic education, around which much of the aforementioned participation models have been built. Yet the genetic registry project had educational components inherent to it; for example, training the farmers to enter data, submit the data, and interpret the data. The project is a social and technical intervention in the animal science field suffused with educational tones. Some would argue that it is more appropriately conceived as a program of technology
transfer, a point that will be addressed shortly. The concept of a continuum of participation will prove useful in explaining why some farmers decided to forego participation in the genetic registry. It is the first stage in Cross's model that the dissertation ties to; that of one's attitudes toward the innovation (the genetic registry project) – and the attitudes of those closest to the individual contemplating participation in the innovation. Moreover and perhaps more importantly, Cross's first stage in the model roughly corresponds to an author who is familiar to most readers in agricultural education: Everett Rogers.

**Diffusion and adoption theory**

It was mentioned earlier that the genetic registry project could be described as technology transfer. The technology transfer approach is one that could also be called a hard systems approach (Bawden, Macadam, Packham, & Valentine, 1984). According to Bawden et al. (1984), there are four models of problem solving in the agricultural sciences: the reductionist scientific approach (RS), the reductionist technological approach (RT), the hard systems approach (HS), and the soft systems approach (SS). All four approaches are legitimate ways to approach and solve agricultural problems; however, the hard systems approach also can be viewed as the prototypical technology transfer model (Bawden, 1991). The approach is markedly different from the aforementioned reductionist approaches because it will
"include a recognizable boundary, inputs, outputs, essential transformation and some parameters of performance" (Bawden et al., 1984, p. 213). Steps in the process whereby scientific explanations and technological solutions are sought distinguish the hard systems approach as that most closely fitting the technology transfer model.

The model is useful, for it accurately depicts, to a large degree, the way the technology transfer function works. For example, the technology transfer model was built on the idea that technical experts possess knowledge and generate technological innovation to solve farmers' problems. The model is characterized by technological solutions with scientific explanations that optimize specific sub-systems (e.g., milk production). It is this sub-system optimization that characterizes our most widely recognized model of technology transfer today: the United States Cooperative Extension Service (Rogers, 1988).

**Rogers' model**

It may prove beneficial to turn to Rogers' (Rogers, 1962) general theory of adoption and diffusion to help understand from where the "optimizing" concept derives and its centrality to the technology transfer model. The process of adoption and the five stages he identifies (Rogers, 1962, 1995; Rogers & Burdge, 1972) is essential to Rogers' theory of adoption and diffusion. Those stages are:
interest-evaluation-trial-adoption. These categories have not changed substantively, although the terminology did change from Rogers' first work (1962) to his most recent edition (1995). In his most recent work (1995), Rogers uses the terminology of knowledge-persuasion-decision-implementation-confirmation. There is a sixth stage, however, that Rogers addresses - that of discontinuance. When an adopter discontinues use of an innovation or fails to adopt it in the first place, Rogers claims these reasons can be either rational or irrational discontinuances. Rationality, however, is defined as "the use of the most effective means to reach a given end" (Rogers, 1962, p. 91). "The most effective means" however, has been predetermined to mean the innovation itself such that those who do not adopt the innovation are considered "laggards" (Rogers, 1962, p. 91). The sense that "experts" define what is considered rational is evident in Rogers' later work as well.

Whether an individual should or should not adopt an innovation is often difficult to determine. Rationality, defined as the use of the most effective means to reach a given goal (Merton, 1949/1968), is not easily measured in many cases. The classification as to whether or not an adoption is rational or not can sometimes be made by an expert on the innovation under study. Through lack of knowledge or through inaccurate perceptions, the individual's evaluation of an innovation
may not agree with an expert’s. ... Our main concern in the present case is with objective rationality rather than with subjective rationality as perceived by the individual. (Rogers, 1995, p. 215).

With respect to the hard systems approach and Rogers’ diffusion of innovations theory, technical solutions and scientific explanations carry more weight in the problem solving process. The technology transfer model has been, and continues to be, organized around these models and theories (see Framst, 1995; Rogers, 1988; G. Stephenson, 2003; Vanclay, 1992). This reliance on the expert position is prevalent not only in the hard systems approach and extension models (Rogers, 1988) but is also prevalent in the functionalist approach to needs assessment covered in a previous section of this chapter. But the “objective reality” to which Rogers, and to some extent Borich (1980a, ; 1980b) refer, largely denies the existence of subjectivity with respect to how potential program participants orient themselves to interventions, be they of a technological or educational nature.

Moreover, in Rogers’ (1962) earlier work the socio-psychological dimension as it relates to a farmer’s innovativeness was central to the rate at which he or she adopted a new technological innovation. This same dimension is prevalent in most of the participation literature as well. Although much of the diffusion research has moved away from the socio-psychological personal dimension to one focused on the
structural macro level dimension (Fliegel, 1993), examining the subjectivity of non-participants is focused necessarily on the former. In particular, with respect to studying non-participating Uruguayan dairy farmers, Rogers' adopter categorization on the basis of innovativeness would seem a useful model. Rogers' innovativeness dimension is based upon the time at which an individual adopts an innovation and is continuous across the five adopter categories into which "innovativeness" is carved. For Rogers, the innovativeness dimension largely explains why people do not participate in programs, because in the case of non-participants, their level of innovativeness is low. This explanation is based on an assumption that people can be characterized along a continuum of adoptive readiness, containing the five adopter categories. The five adopter categories are called innovators, early adopters, early majority, late majority, and laggards (Rogers, 1962, 1995).

_Innovators_ are the first to adopt and represent approximately 2.5% of the total adopters. Rogers' (1995) latter characterization of this group as venturesome with extensive communication networks, substantial financial resources, risk-taking, and with an ability to understand technical information is somewhat different from his earlier characterization of the same. In his earlier work, Rogers (1962) described this group as more cosmopolite, better educated, the youngest in age, the highest in
terms of social status, the largest and most specialized operators, wealthy, and with
greater mental capacity (p. 185). One characterization that has not changed was
Rogers’ characterization of this group as daring, rash, and risky.

*Early adopters* are the next group to adopt, and represent about 13.5% of the
population in question. They are more integrated in the larger social system and are
therefore viewed with a good deal of respect by their peers. They have high social
status, large and specialized operations, and the greatest degree of contact with local
change agents. The *early majority*, on the other hand, are more deliberate and
represent a substantial 34% of the population. They are the embodiment of
“average” in terms of education, operation-size, and opinion-leadership; however,
they adopt just before the “average” member of the social system (Rogers, 1995, p.
264). Contrasting the early majority with the *late majority* reveals the latter 34% to be
skeptical with overwhelming pressure from social peers needed before adoption.
This group is on the other side of average in that these adopters are just below
average in most everything from intellect to size of operation to wealth (Rogers,
1962, 1995).

Finally, Rogers’ (1962) last category of adopters is referred to as *laggards*.
Laggards are the most traditional members of a social system oriented to the past as
opposed to the future. They represent the lowest tier of every indicator: social status,
degree of specialization, size of operation, intellect, and leadership (Rogers, 1962, 1995). In general laggards make up the final 16% of adopters in a social system. Such a continuum of “participation” as Rogers (1995) offers is useful in examining the lack of participation of Uruguayan dairy farmers in the genetic registry project. It is important to remember that to date, between 3% and 5% of dairy producers in Uruguay have registered with the project. According to Rogers' theory, the lion's share of those who have adopted would be classified as innovators; the rest would fall into the early adopter category. The remaining producers who have not (yet) registered with the project would by necessity fall somewhere along the continuum of innovativeness from early adopters to laggards. Among non-participants, one would therefore expect to find four (more or less distinct) groups or perspectives with respect to the innovation (the genetic registry project). Furthermore, to revisit the larger research question that drives this dissertation study, one might expect to find Rogers' theory useful in explaining the (relative) lack of participation in the project. However, it must be noted that the nature of agricultural innovations are such that they require a long-term perspective; that is, some innovations take a generation or more for full adoption (Fliegel, 1993). The genetic registry project could therefore be considered very "young" with respect to agricultural innovations.
“Solution” Supporting Literature

Referring to the conceptual framework (Figure 1.1), two specific epistemological "solutions" are offered in order to bridge some of the gaps in the aforementioned theories to more adequately address the problem of people's lack of participation in agricultural extension programs. The first proposes to situate the concept of "needs" within a contextual framework that includes values and interests, specifically those of the program planner(s). The argument is that why people do not participate in programs cannot be understood or remedied outside understanding the needs, values, interests of prospective participants as well as program planners. To do so, however, does require an adjustment to the typical conception of needs.

Monette (1977), in a review of the literature on adult educational needs, claimed that "need" could be defined by four categories: basic human needs, felt (and expressed) needs, normative needs, and comparative needs. More germane to the current argument, however, is Monette's assertion that no discussion of needs can be undertaken without a consideration of values.

The importance of value considerations is most obvious when the educator is faced with the question of choosing among conflicting or contradictory needs which are to be met or the question of which
needs should be dealt with among the nearly infinite number or the question of which course of action for meeting needs is to be selected. It becomes apparent that the concept of need has no meaning without a set of norms and that it is therefore impossible even to identify needs without them (Monette, 1977, p. 123).

Monette (1977) was objecting to the lack of a consideration of values in most of the educational needs assessment literature. In a later article, Monette asserted that the process of needs assessment, as based upon the Tyler (1950) model, is insufficient in guiding practitioners and learners alike (Monette, 1979). The model that Tyler proposed was, and arguably still is, pre-dominate in much of adult education today, including agricultural education (for example, see McNeil, 1996). The Tyler model of curriculum organization is one that is based upon four basic questions: 1) what is the educational purpose of the school (curriculum)?, 2) what are the learning experiences to be provided?, 3) how can these experiences be organized?, and 4) how can we evaluate them? In the Tyler model, needs assessment is crucial to defining the educational objectives of the learning activity. However, what tends to happen is that the educational objectives become defined in terms of observable behavior of a technical nature. As a result, needs assessments are only useful in so far as they are able to elucidate the needed technical information. What
this approach lacks, however, is the very consideration of values supported by Monette; hence Monette's criticism of it. Needs, it can be argued, cannot be so narrowly defined; such a definition fails to account for the socio-cultural context in which that definition occurs (Monette, 1979).

A mere consideration of values, though, is not sufficient. This is the second "solution" offered: values must be made explicit such that planners' and participants' values are allowed to interact. This interaction of values becomes a social process whereby value positions are expressed, clarified, and discussed. According to Cervero and Wilson (1994), program planning is a social process, as opposed to a scientific one. More specifically, there are three guidelines for responsibly planning adult education programs: 1) to plan responsibly, planners must be political; 2) planners must represent program interests democratically and ethically; and 3) planners must work to develop the negotiating skills necessary to plan effective programs in a world that is inherently political.

Cervero and Wilson (1994) recognize that on any given day, a program planner is faced with many decisions of what to do, what to do next, and why. Such a deluge calls for decision making that is based upon ethical thinking, which Cervero and Wilson (1994) define as "the capacity to think about questions of value, significance, and responsibility when deciding what action to take" (p. 137).
Furthermore, Cervero and Wilson argue that ethical decision making is necessary so that planners have a sense of both "what for" and "how to". However, in the context of representing program interests in a democratic sense, there is also the "for whom" consideration. That is, whose interests are represented, are they represented validly, and how is it known if this is an accurate picture of those interests? Cervero and Wilson, based on Freire (1970), challenge the idea that needs identification is politically neutral. Freire contends that education is political in the sense that it is used either for individual adjustment to a system or the transformation of that system according to the ends of the individuals involved in its transformation (see also Monette, 1977).

Interests, though, are not the same as educational needs, although the former may subsume the latter. It is common to consider as needs those things about which the learner articulates that they desire to learn or to know. Additionally, in many program planning models of a more technical nature (e.g., Tyler), needs are also defined as the more mundane items relating to programming: time, place, duration, etcetera. Clearly, that to which Cervero and Wilson (1994) refer (interests) is not of the same character as the prototypical definition of needs. Cervero and Wilson offer an expanded view of needs by placing needs within the context of a politicized program planning framework. Their central thesis – that programming occurs
within a politicized environment – urges the planner to be cognizant of the power issues in existence in a programmatic context.

The "power" dimension is ignored too often in much of the agricultural education literature, with the exception of the empowerment perspective on needs assessment. Much of the agricultural education literature places the recognition and analysis of participants' educational needs outside of the context of the planner. Put more simply, needs analysis (or assessment) does not occur within the same framework as that of the planner. Rarely are participants asked to interact with planners' perspectives with regard to programming needs. Rather, the planner analyzes participants' needs (if they are gathered in the first place) in relation to what has been decided (a priori) can be delivered. This a priori decision is rife with unexpressed values, mainly the planners'. To get past this, values must be made explicit. Monette (1977) argues that identified values "...are not intended as definitions of outcome, but rather as heuristic devices..." (p. 91). In his earlier article, Monette writes with a condemning tone of those educators/planners who neglect exposing their own values, "Manipulation by the educator may be determined by...the extent to which the educator exposes his own assumptions and world-view, hence engaging himself in dialogue with the world-view of the students" (p. 124). Further on the same page, Monette explains:
Needs do not exist “out there”, well-defined and obvious to any observer. The experience of need proper to individuals is mediated by the qualitatively and quantitatively limited perspective (emphasis added) of the observer, including his goals, his philosophy, and his language. That explains the critical role of the dialogical relationship between educators and their constituency and the resultant bankruptcy of a supposedly value-free concept of need. (p. 124).

Monette (1977; 1979) does not stand alone with Cervero and Wilson (1994) with respect to acknowledging that program planners’ values impact their work (see also Apps, 1985; Boone, 1985; Knox, 1986), but he does address it more directly. Unfortunately, none of the authors previously cited provide a methodological approach to capture their theoretical one sufficiently.

**Q Methodology**

The previous section discussed some of the buttressing literature for the epistemic solutions offered in this dissertation. This section will address the other vacuum in the current understanding of people’s lack of participation in programs: the methodological one. In the case of a Q methodological approach to tapping needs, interests, and values, all of these are infused in an array of statements
participants and planners are asked to rank. The value-laden q-statements allow program planners to identify where their values and interests intersect with and diverge from the population they intend to serve. The following section discusses the history, literature, and processes that have formed the methodological basis through which this has occurred.

Q Methodology has a rich, if little-known, history. In 1934, British psychologist and physicist William Stephenson (a student of Charles Spearman) penned a letter to the editor of Nature magazine (see W. Stephenson, 1935a). In it, he wrote that he had undertaken work on re-conceptualizing correlation analysis such that in place of correlating tests vis-à-vis random variables believed to be expressions of traits, he had developed, instead, a method to correlate whole persons. Specifically, that to which Stephenson referred would later grow into a scientific method of its own right – what is currently known as Q Methodology.

Q Methodology involves the study of human subjectivity: the self-referential frame through which human beings define and express their world. Q is more than a technical data analysis tool. It is a way of approaching the study of human behavior with its own epistemology and ontology. Q has been used to explore phenomena in a litany of fields and disciplines, including agricultural extension. For example, Pelletier, Kraak, McCullum, Uusitalo, and Rich (1999) used Q in a study of
food policy formation in upstate New York. Pelletier and his colleagues were primarily interested in how the deliberative democratic process affects issue definition, formation, and implementation schedules. The issue in their case dealt with agricultural extension programming in the areas of food production and environmental sustainability, with additional tones of community development and social justice. The authors utilized Q to measure how the search conference process changed participants' individual and functional perspectives with respect to shared and individual values. Q proved useful in tracking the way in which people's patterns of values regarding food policy changed as a result of their participation in the search conference. Pelletier and his colleagues produced an informative article on how Q could be used to track these shifting values across experiences. It differs from the current study in that the current study does not use Q as a method to track changes in people's perspectives; rather it uses Q to better capture significant pieces of non-participants' perspectives as they relate to an extension education program.

In the discipline of political science, one of the most famous Q studies was undertaken by Lipset (1963). Brown (1980) uses Lipset's study extensively in his book *Political Subjectivity* to highlight methodological and technical aspects of Q methodology. Lipset's study investigated people's perspectives on the democratic process as it pertained to their respective country's government (the United States,
Great Britain, Canada, and France were represented). The Lipset study differentiated how citizens of various countries described their respective views on the balance between personal freedoms and government responsibility.

Steelman and Maguire (1999) used Q to look at the various ways in which people framed issues related to national forest management practices in the Chattooga River watershed in North Carolina, South Carolina, and Georgia and on the Monongahela National Forest. The Monongahela study was different in that the authors had participants sort the q-set multiple times in response to various questions (known as conditions of instruction) in a group setting. The authors demonstrated an innovative and promising use of Q in regard to group settings, particularly as the methodology relates to public policy definition and formation.

In the area of communication sciences, Q studies abound (see Brenner, 1996; Kinsey, 1994; W. Stephenson, 1980). A seminal work is Stephenson’s (1967) *The Play Theory of Mass Communication*. Although Stephenson lays out examples of Q’s suitability in communication inquiry, the book is also methodological. However, sufficient literature exists within the communication sciences to make a listing here seem overly dutiful.

A field that has seen an increase in the exercise of Q methodology in the past 10 years is that of public health. The eminent scholar in this arena, Karen Dennis
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(2001), published a wonderful piece on the uses and misuses of Q methodology within the field. Perhaps the public health study that is most illustrative and informative with respect to Q methodology is by Rubenstein and Lasswell (1966). Brown (1980) used the study in *Political Subjectivity* to illustrate the power of theoretical factor solution criteria in a methodological sense. Moreover, Rubenstein and Lasswell’s study of hospital ward team decision making exemplified how Q could be used in an evaluative sense. The study sought to specifically contrast the ward team physician’s perspective with that of others, because ultimate decision making power with respect to patient care rested with the ward physician. The q-analysis revealed that the single ward physician was the only significant loading on one of the factors – and his loading was pure on this factor. During the rotation phase, the authors sought to retain this characteristic as they rotated to a theoretically satisfying solution that maximized the clarity between this factor and all others, thereby revealing specific differences in the way each factor group approached decision making with respective to patient care. This study, as much as any others I have read, has practical application to the field of agricultural and extension education and the current study, for it exemplified how Q unearths very real differences in perspectives where they matter: in the context of power. The theoretical rotation scheme enabled the researchers to pinpoint how the physician
approached decision making and why this was important in terms of policy.

Extending this to agricultural education, theoretical rotation can be used to pinpoint areas of difference between how the various planners and participants approach the program.

Finally, Q appears in the psychology literature as well. With respect to psychology, it seems appropriate to sketch the most marked debate within the Q community of scholars. One of the most widely published Q scholars is Jack Block from Berkeley, California. Block, a psychiatrist, is well-known throughout the Q community as well as the psychology field for developing an instrument called the California Q-set (see Block, 1961). Block's use of Q methodology is fundamentally different from that of others and largely defines one of the two main branches of Q. The primary difference between the two branches is how Q is used: Block uses Q as a psychoanalytic diagnostic instrument from the observer's perspective whereas Brown (1980) uses Q in an interpretive approach from the subject's perspective. One of the tensions between the two is with respect to the composition of the q-set. Block maintains that the q-set should be tested to operationally define constructs; Brown disagrees. Brown argues that the q-set is a collection of ambiguous statements that do not necessarily mean anything in and of themselves; meaning is infused into the statements by the individual doing the q-sorting. Brown would argue that the
nature of language mitigates against subscribing specific, researcher-defined meaning to a particular statement. Block disagrees and argues that the methodology can be a powerful tool to reveal a person's psychological condition based upon the patterning of statements. The patterning of statements, however, is defined *a priori* and used to interpret and diagnose psychological well being. The research in this dissertation is aligned with the Brown camp primarily due to issues related to epistemology.

**Q and evaluation**

*Q* shows up only sparingly in the evaluation literature. In fact, only one such article was unearthed (Garrard & Hausman, 1986), and its use of *Q* was suspect, so it bears a brief discussion here. The authors attempted to determine consensus among a group of program planners with respect to a social intervention, using a hybrid between a Delphi approach (see Dalkey, 1969; Helmer, 1966) and *Q* methodology. Thinking they had something new and innovative, the authors coined the term "priority sort" to attach to their method. Unfortunately, the study does not do justice to *Q* methodology, although its use of a modified Delphi technique is worthy of mention. In the end, the authors arrive at a rank-ordered set of program priorities more or less consensually agreed upon that could have been garnered in many different ways. They do not undertake a *Q* analysis, and their product is barren of
the rich data characteristic of Q. According to personal communication with Steven Brown (2002c), other Q researchers have used the methodology to various degrees in evaluative undertakings with modest success. The lack of substantive work in evaluation using Q speaks to its potential as one of many forms of inquiry in a field characterized by practical, context-specific inquiry.

**Concourse theory**

Central to Q is concourse theory (W. Stephenson, 1978). A Q-concourse can be thought of as a population of statements, thoughts, visual depictions, or many other such human expressions. For example, in any given program, there are different opinions, perceptions, feelings, thoughts, and/or ideas about what it is like to be part of the program—or even outside of it. These can be captured and recorded using either qualitative data gathering techniques (i.e., interviews) or other techniques such as document review (e.g., reviewing the program's stated goals and objectives) or survey techniques. Particular to evaluation practice is that these “statements”, so gathered and recorded, are kept close to the language in which they are originally expressed. The importance of this will become apparent later.

Q-concourses may be expansive (such as people’s views on capitalism) or relatively discrete (such as Scriven’s theory of program evaluation). However, the concourse itself (meaning the entire population of statements) does not provide an
efficient or structured way through which program participants, planners, and administrators can "interact" with it. For this reason, a sample of statements is drawn from the Q-concourse, called a Q-sample. The structuring of the sample is driven by theoretical concerns to provide a subset of the concourse in relation to the particular issue at hand. In evaluation terms, it makes for good practice to structure the sample according to the evaluation questions or theory deemed suitable in the context.

Once the structure is set, it becomes a matter of course to divide the coded data (i.e., statements) according to their relative "fit" within one of the cells. It is worth noting that although the Q researcher may place a particular statement within a specific cell or category, this a priori "labeling" makes little difference to the subsequent analysis or interpretation of the data. No assumption is made that the statements themselves "measure" the identified categories (Brown, 1993) or the theory or structure that undergirds the sample. In other words, what Q concerns itself with more directly is the use of theory, not an attempt to confirm or disconfirm it; what is searched for is a manifestation of the theory used to build the Q-sample. "Meaning" in a Q inquiry context does not reside in individual statements; rather, meaning is constructed by the study participants as they place statements into patterns in their Q-sort. This is what Brown (1980) alluded to when he wrote,
"Meaning is not in the statements themselves, but in terms of what people do with them" (p. 55).

By holding too strongly to a belief that any one particular statement "means" something definitive (usually to the researcher), the researcher risks losing valuable insight into a person's subjectivity via the pattern of statements. And this is not merely a risk to those who are adept at and familiar with survey research and modern questionnaire design. Interpretive researchers may also fall prey to such a trap by placing too much importance on a priori interpretation of the rich qualitative data obtained through interviews (Brown, 1993). What distinguishes Q from either of these two approaches is that it privileges the respondent's inference as to what the statements "mean" via the patterning of those statements in the Q-sort. In this way, Q is more informed than either of the two previously mentioned approaches to inquiry because analysis and interpretation of the phenomena is directly aided by the subjects themselves: subjects speak for themselves via the Q-sorting task.

Q-samples

While sampling theory oftentimes uses random sampling, Q harnesses the flexibility of purposive sampling (W. Stephenson, 1953). However, as is the case in survey research, the goal is to provide a miniature of the population which mirrors the larger one in terms of its comprehensiveness, without sacrificing representation.
That is, statements are homogeneous with respect to their kind (meaning relating to the same thing) but heterogeneous in regard to variance inherent in difference (W. Stephenson, 1953, p. 65). To achieve a representative Q-sample, Q borrows from the work of R. A. Fisher (1960). One of Fisher's contributions was a variance design for experiments involving small samples. The "balanced block" design made famous by Fisher allows the researcher to specify the effects, levels, and interactions in a sample and thereby incorporate them into the experimental design. In Q, the Fisherian design is useful in that it enables the researcher to "carve up" his/her theory into applicable dimensions (effects and levels) that provide for a representative Q-sample from the larger concourse. Many times, more than one dimension is at issue and so the Q-sample design takes the form of a matrix or table. The Fisherian theoretical structure for the current study is more completely described in chapter three.

It is important that the Q-sample be manageable in terms of size for two important reasons: 1) it is very difficult and time consuming for respondents to distinguish between upwards of 100 items in a sample, and 2) it is unnecessary because Q-samples with smaller numbers of statements will yield the same factors (see Brown, 1980; Daily, 1973; Hilden, 1958). Therefore, Q-samples generally tend to number roughly between 30 and 60, with the exact number being decided by the number of replicates in a given Fisherian cell design.
Within a given cell of the Fisherian design, "balance" is required. Balance refers to the respondent having an equal opportunity to react to positively and negatively worded statements within each of the Fisherian cells (created from all of the combinations of all levels in a Fisherian design). Therefore, within each cell an equal number of statements are chosen that generally reflect both a positive assertion and disagreement with it (W. Stephenson, 1953, p. 79). However, caution must be employed when seeking balance to avoid selecting statements that are antonyms (e.g. "high" and "low") for they serve little purpose in illuminating the more fine grained linguistics that most concourses reflect. Additionally, it is fruitful to select statements within each cell that exhibit heterogeneity; that is, statements that are most different from one another (Brown, 1980, p. 189). This kind of selection (or sampling) scheme is more likely to produce a sample that mirrors the concourse and approximates its complexity (Brown, 1980, p. 189). Furthermore, this also allows the respondent to respond to, interact with, and construct his or her own interpretation of the subtle shades of meaning between statements. To write here that the task of selecting "positive" and "negative" statements is an easy one would be misleading; it is anything but easy and requires a great deal of effort, analysis, and careful editing of statements to arrive at a high-quality Q-sample.
P-samples

Once a Q-sample is drawn, the statements are numbered randomly, printed on separate cards, and submitted to respondents for the Q-sorting task (Brown, 1993). Selecting individuals to sort the cards is the process of constructing a “p-set”, meaning “person-set”. This process advances similarly to Q-sample selection in that persons are selected purposefully, because the perspective they might offer is linked to the research question. That is, they are selected because they are thought to have something to say in relation to the research question. As is the case with a Q-sample, a Fisherian design is oftentimes helpful in structuring this process. Constructing the Fisherian design for the p-set is virtually identical to that of the Q-sample: main effects with their attendant levels are placed in a table-like structure.

The number of persons selected to perform the q-sort is guided by recent research on factor stability. Fairweather (2001) indicates that approximately 70% of study respondents typically load on a single factor, meaning their Q-sort has a statistically significant correlation with one factor and one factor only. Additionally, Fairweather suggests that when moderate Q-factor stability is desired, a minimum of six to eight significantly loaded Q-sorts per factor is required. Moderate factor stability is defined as a situation in which no more than three distinguishing statements per factor “move” in and out of the distinguishing statement category.
Put more simply, moderate factor stability is when the researchers are willing to tolerate the possibility that up to four distinguishing statements within the composite factor array may "switch places" if more q-sorts correlate with the factor. However, when high factor stability is required (meaning no more than one distinguishing item switches place), a minimum of 12 significantly loaded Q-sorts per factor is required (Fairweather, 2001). Given:

1) a 70% ratio of respondents to significant loadings
2) a study that expects three or four factors to emerge
3) high factor stability is desired
4) then between 50 and 70 respondents are necessary.

If moderate factor stability is desired, between 35 and 45 respondents are necessary.

**Q-sort array and the condition of instruction**

Once the Q-sample and P-sample are determined, respondents are asked to place the q-statements in an array that resembles a quasi-normal distribution. The distribution, called a Q-sort array, is more platykurtic (i.e. "flatter") than a normal distribution but nevertheless retains the shape and properties of symmetry (see Figure 2.2).
Before actual sorting begins, respondents may be asked to read through all of the cards one time. In the case of this study, Uruguayan respondents were first asked to read through all of the statements and reflect upon each statement according to how they might react to the statement with respect to the identified condition of instruction. The condition of instruction for the Uruguayan study was:

**Spanish version:**
Por favor, clasifique las siguientes tarjetas de acuerdo con porque usted no ha participado en el proyecto de registro genético.

**English version:**
Please sort the following 32 cards according to why you have not participated in the genetic registry project.

For program planners for whom the condition of instruction was not exactly appropriate, it was altered to read “...according to why you believe producers have not participated.” The condition of instruction is important in many ways for it not only serves to orient the respondent to the specific context under study, but it also sets the experimental bounds to the study. Stephenson (1953) envisioned the
condition of instruction as one of the most powerful tools in Q-methodology because he saw it as the way to bring the study of human subjectivity into the laboratory, thereby making its study much more experimentally based. The condition of instruction can be altered from one study to the next, or within a given study.

Stephenson (1953) cited several studies he personally conducted where the condition of instruction was altered in subsequent administrations of the same Q-sample in order to measure the degree of agreement between various "selves"; for example, between a perceived self and an idealized one. For the Uruguayan study, however, the condition of instruction was held constant across all administrations.

Respondents are directed to begin sorting the Q-sample into three piles (either after reading through all of the statements or on the initial sort): statements on the left reflective of those most unlike the respondent; statements in the middle having no relevance for the respondent; and finally, statements on the right reflecting those most like the respondent. Once all statements have been placed into their respective pile, respondents are instructed to select the appropriate number of statements (in the Uruguayan case, two) they feel are most uncharacteristic of their position and place these statements on the far left of the sorting surface. Once complete, respondents are then instructed to select the appropriate like number of statements that are most characteristic of their perspective and place these on the far
right of the sorting surface. Respondents then work to place the appropriate number of cards in the respective place-holders, from opposite ends of the distribution, finally arriving in the middle – the location of least relevance. After the sorting is complete, the respondents are asked to record the array on a grid on a sheet of paper. This is done by writing the number of the card (statement) in the cell that corresponds to where it was placed in the distribution.

It is sometimes worthwhile, but not necessary, to collect demographic information from respondents (Brown, 1980). One might collect sex, programmatic role (e.g., participant, administrator, and planner), age, educational level, or other information deemed important for the analysis. Finally, the sheet of paper on which the Q-sort and demographic information are recorded is coded by placing the respondent number in the upper right-hand corner of the paper.

Q factor analysis

After all of the Q-sorts were obtained and entered into the software package PCQ® for Windows, Academic version 1.4 (Stricklin & Almeida, 2000), they were analyzed. The sorts were first correlated, and then factor analyzed. In general, centroid and principal components are the two methods of factor analysis most widely marshaled for this task. Factor analysis on its own, however, is of limited use without rotation. Two rotation techniques, varimax and theoretical, are commonly
used. The centroid method is most often used in conjunction with judgmental rotation and principal components analysis is augmented most often by varimax rotation.

The result of the statistical manipulation (regardless of the method used) is a set of factors that reduce the data into a few perspectives held in common, typically between two and four. The outcome of the data analysis is by no means prescribed; regardless of the number of perspectives the researcher anticipates, there is no set number of factors (i.e., perspectives) that result from any one particular analysis. Indeed, with judgmental rotation, the researcher is free to pursue several different factor analytic solutions that carve the data in different ways to illuminate where perspectives merge – and where they diverge. Factor analysis and rotation are discussed in depth in Chapter Three.

Summary

The preceding sections have attempted to lay the groundwork for the chapters to follow, which address methodology, substantive results of the study, and theory. However, the larger argument of the dissertation also pertains to a methodological innovation with respect to program planning and evaluation for agricultural and extension education. My argument is that agricultural and
extension program planners' perspectives on needs and deliverables should be included alongside participants' appraisal of their own needs in order to make values explicit. By doing so, needs are contextualized to include values and interests (in the form of functional perspectives) within the same programmatic framework. Because of their programmatic grounding, these functional perspectives better define people's orientation to the program. Finally, if agricultural and extension program planners can better understand the holistic way people (including themselves) orient themselves to programs, it may be possible to leverage people's increased engagement in programs in order to improve the human condition.
CHAPTER 3. WHEN THE P-SET MATTERS: THEORETICAL ROTATION AS A TOOL FOR IDENTIFYING POINTS OF LEVERAGE IN PEOPLE’S PERSPECTIVES FOR PROGRAM IMPROVEMENT

A paper in review in *Operant Subjectivity*; submitted October, 2003

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Abstract

This paper's main objective is to provide a specific example of a research context using Q methodology in which theoretical rotation (also referred to as judgmental, geometric, or hand rotation) was justified and pursued. The paper specifically illustrates 1) how the authors determined theoretical rotation criteria; 2) the process by which these criteria guided the rotation; and 3) why this was more statistically, theoretically, and pragmatically satisfying than using varimax rotation. The case focused on the social, economic, and contextual reasons why some farmers in Uruguay declined to participate in a dairy herd improvement project, called the genetic registry. Q methodology was used to cast non-participating farmers' perspectives in relation to those of program planners. Because the unrotated factor

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matrix supported program planners loading on the same factor, theoretical rotation was used to retain as many program planners as possible on the same factor. By following this rotational scheme, one functional perspective was most heavily populated with program planners: the result was a data solution that contrasted the program personnel's perspective with that of the other three perspectives which emerged in the rotation, all of which were populated entirely by farmers. Practical implications point to the suitability and power of theoretical rotation versus varimax rotation in Q methodology when the p-set "matters". That is, it matters when Q methodology is used to intentionally keep one set of respondents on the same factor in order to contrast their shared perspective intentionally with other perspectives which emerge in the study. The result is contrasting functional perspectives and the identification of leverage points between the perspectives that represent points of convergence and divergence.

Introduction

According to the International Dairy Federation, world milk production was forecasted to exceed 501 million tons in the year 2002 (International Dairy Federation, 2002). In 2001, Uruguay produced 1.2 million tons of fresh milk with approximately 350,000 cows. In 1993, the Instituto Nacional para Mejoramiento
Lechero (INML) was formed in Uruguay to help improve the dairy industry through a genetic registry. The genetic registry entails recording individual-level production data from farmers' herds with the expectation that farmers will use the data to make better production decisions, specifically those related to culling (removing) less productive cows. This paper describes an evaluation of the genetic registry project.

The evaluation was expected to shed light on non-participation. In 2002, INML had approximately 200 dairy herds registered out of the roughly 6,000 dairy herds in Uruguay. Although INML had managed to attract the involvement of many large farmers and a scattering of medium to small-sized dairy farmers, more widespread participation, particularly from operations with fewer than 100 head, had eluded them. The evaluation focused on persons about whom program planners had questions: those farmers who had never enrolled in the genetic registry project. The evaluation question became: *Why had dairy farmers in Uruguay decided to forego participation in the genetic registry project?*

The authors chose Q methodology to answer the evaluation question. The main reason for choosing Q Methodology was to purposely contrast program planners' perspective(s) with that of potential participants. This decision gained the attention of planners with regard to issues about which they disagreed with non-participants. It was hoped that theoretical rotation could identify a factor populated
largely by program planners and other factor(s) populated largely by non-
participants. This rotation criterion was anticipated to draw attention to perspectives
that might otherwise be ignored by program planners. Privileging perspectives by
role (farmer versus planner) could also serve a more practical purpose: identifying
ideas for improving the program based on consensus items shared among the
factors.

The purpose of this paper is to illustrate the suitability and power of
theoretical rotation versus its varimax counterpart under specific conditions of use. It
is not the intent, direct or otherwise, to argue for the use of theoretical rotation in
every research context or to denounce varimax rotation. The authors hope to clarify
regarding where and when the rotation may prove useful in answering research
questions posed by a study. The discussion provides a concrete example of when,
why, and how theoretical rotation was used in the Uruguayan evaluation.

Methods

The authors and INML program planners identified both program
participants and non-participants to interview. The concourse was developed from
interviews with one dairy cooperative administrator, three technicians (defined as
professionals employed to counsel farmers on management decisions), and four
dairy farmers (none had participated in the genetic registry project). All interviews were transcribed in the speakers' native language (Spanish) and coded according to emergent and theoretical themes.

The theoretical Fisherian structure developed for use in this study consisted of two main effects, each with two levels, thereby resulting in the 2x2 matrix displayed in Table 3.1. The two main effects deal with pressure (economic pressure and social pressure) and perspective (that of the farmer and that of planner), resulting in four cells that structured and organized the Q sample. Eight statements from each of the four cells in Table 3.1 were selected, resulting in a Q sample of 32 statements.

Table 3.1: Theoretical Fisherian Structure of the Uruguayan Q Sample

<table>
<thead>
<tr>
<th>Main Effects</th>
<th>Levels</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pressures</td>
<td>Economic (a)</td>
</tr>
<tr>
<td>Perspectives</td>
<td>Social (b)</td>
</tr>
<tr>
<td></td>
<td>Farmer (c)</td>
</tr>
<tr>
<td></td>
<td>Planner (d)</td>
</tr>
</tbody>
</table>

Total cells: \[ac + ad + bc + bd = 4 \text{ cells}\]

The 32 statement Q-sample was submitted to 27 individuals for sorting. Farmers were asked to sort the 32 statements according to the following condition of instruction: "Please sort the following 32 statements according to why you have not participated in the genetic registry project with INML". In the case of program planners, the condition of instruction was: "Please sort the following 32 statements according to why you believe farmers have not participated in the genetic registry
project with INML." All respondents were asked to arrange the 32 cards in the quasi-normal distribution represented in Table 3.2.

Table 3.2: Q-set Sorting Distribution

<table>
<thead>
<tr>
<th></th>
<th>-4</th>
<th>-3</th>
<th>-2</th>
<th>-1</th>
<th>0</th>
<th>+1</th>
<th>+2</th>
<th>+3</th>
<th>+4</th>
</tr>
</thead>
<tbody>
<tr>
<td>Data</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>4</td>
<td>6</td>
<td>4</td>
<td>4</td>
<td>3</td>
<td>2</td>
</tr>
</tbody>
</table>

Of the 27 people who sorted the Q-set, 20 were farmers who were not enrolled with the INML project or any other similar project; the other 7 respondents were program personnel (planners, technicians). It is important to reiterate that the reason for choosing such a p-set was to situate non-participants' perspectives in relation to those of program personnel. The qualitative data gathering phase had led the researchers to believe that program personnel and non-participants would hold different perspectives on non-participation. Moreover, because evaluation practice is intended to improve programs, analyzing the data to make them clearer and more understandable for those responsible for the intervention (i.e. program personnel) was deemed essential. This point cannot be overemphasized, because it formed the foundation for the theoretical rotation in the analysis. Leonard Barchak (2003) notes, "If you merely want to establish the existence of factors, any person or persons will do. ... But if you have practical problems to solve, you may want to try to acquire the viewpoint of quay [key] individuals...." (p. 72).
After the data were gathered, the Q sorts were analyzed with the assistance of the software package PCQ® for Windows, Academic Version 1.4 (Stricklin & Almeida, 2000). The sorts were first correlated, and then submitted for factor analysis. Two methods of factor analysis are most widely marshaled for this task: centroid and principal components. Of the two, principal components is the most recognized and frequently employed method of factor extraction. However, as Stephenson (1953) and Brown (1980) have noted, the power of the centroid method is its flexibility. There exists debate within the Q community over this issue, despite Stephenson’s strong theoretical arguments in support of the centroid method.

The debate over the different methods of factor extraction may have as much to do with a person’s statistical training as anything else (although the authors know of no empirical evidence to support this tentative explanation). Centroid factor extraction uses an average correlation estimate (on average, the correlation between the sort under scrutiny and all others) to place on the diagonal of the inputted correlation matrix. This allows the researcher to pursue theoretical hunches for it does not require a determinant solution. Principal components analysis (PCA), on the other hand, uses a perfect inter-sort correlation estimate (1.0) to place on the diagonal of the inputted correlation matrix. This is very clean from a statistical perspective but it places a restriction on the data because of the assumption.
Furthermore, it is hypothesized here, based in no small part on the authors' statistical training, that this assumption may very well be the source of the often-cited eigen value criteria for factor retention. That is, one reads in the literature (see Everitt & Dunn, 2001; Gable & Keilty, 1993; Kim & Mueller, 1978) that the number of factors to retain can be based on those factors with eigen values greater than 1.0. When one considers that in PCA, 1.0 is placed on the diagonals, it is discernible (and justifiable) where this criterion comes from: no factor should be retained that cannot serve to “explain” at least one variable.

In R-methodological studies, it is variables (representing tests or characteristics) that are reduced. If a factor - which is supposed to function “better” than a single variable by explaining a linear combination of several variables - does not have an eigen value greater than 1.0, the factor is essentially “explaining” less than one variable itself. In this case, the researcher would be better served to use the variable in place of the factor, for the factor has done little to reduce the data and thereby accomplish the expected task. Centroid extraction places no such restriction on the data. The number that is placed on the diagonal varies within and across each study according to the number of Q-sorts. That is, if one additional Q-sort is added, all of the numbers on the diagonals potentially would change; whereas with PCA,
1.0 is placed on the diagonal in every single instance, regardless of the number of Q-sorts added or deleted.

In Q methodology, factor analysis is followed by factor rotation. Rotation consists of changing the reference points of the geometric coordinate system to more closely fit the data. The criteria for fit vary, however. Many rotation techniques, with their attendant criteria, are addressed in the literature. Two sets of criteria of which the readers might be aware are "simple structure" and "theoretical structure". These are guidelines to rotation that are distinct in what they privilege in the rotation process. Simple structure refers to a situation in which all individuals’ Q sorts are maximized on one factor with near-zero loadings on all others, thus enhancing clarity of the results (McKeown & Thomas, 1988). Simple structure can also be thought of as a clean structure, for its criteria give priority to removing confounding sorts while simultaneously accounting for the greatest number of sorts in as few factors as possible. In other words, the rotational scheme should “tidy things up” so that sorts are in their proper place. Those that do not easily fit into the solution are minimized.

Another set of criteria that serves to focus the researcher in factor rotation is known as theoretical structure. Theoretical structure employs the researcher’s ideas about what is important in the rotation task. That is, theoretical structure is pursued
because the researcher has specific theoretical hunches and hypotheses to test (Brown, 1980). More important than “cleaning up the data” is the testing and probing of the data for possible explanations to propositions formulated with respect to specific theory. In the current example of dairy farmers and the program planners, the theoretical structure directed researchers to keep program planners on the same factor.

Simple structure and theoretical structure are guidelines for rotation – they are not the rotation techniques themselves. In Q, there are two main rotation techniques: varimax rotation and theoretical rotation, also referred to as judgmental, geometric, or hand rotation. It is worth noting that varimax rotation, at least in the journal Operant Subjectivity, appears to be the method of choice: in perusing volumes 24 and 25 of the journal, varimax rotation was chosen five to one over theoretical rotation. The purpose of this paper is to illustrate the way in which a less common approach to rotation (theoretical rotation) yields better results.

However, a brief aside about the two methods is in order before continuing with the illustration. Varimax rotation dictates that one “best” solution exists to the rotation of factors. This solution is based upon a well known statistical principle called ordinary least squares. Varimax rotation proceeds by searching for, and finding, the solution that minimizes the sum of the squared differences between the
data and the vector represented by the factor. While this carries with it wonderful statistical properties, it doesn't necessarily carry with it wonderful practical or interpretive properties. With Varimax, the researcher is left with a single set of results, regardless if those results enlighten the phenomenon or answer the research question in a meaningful way. Furthermore, because varimax rotation is determined by a mathematical property, theoretical properties are left unaddressed. Theoretical rotation, on the other hand, does not have the convenient statistical properties of varimax. What it lacks in this arena, however, it more than makes up for through its flexibility. The flexibility of theoretical rotation permits the researcher to find the best explanation to the data, not necessarily the most statistically satisfying one.

**Results**

As part of a theoretical rotation scheme, researchers determined the extent to which program planners (Q-sort numbers 21 through 27 in all subsequent tables) loaded on a common factor in the unrotated factor matrix. Researchers used a guiding rule: *If they (program planners) did so (loaded on a common factor), it could be reasoned that their individual perspectives had common functional roots, different from others in the study.* Provided program planners perspectives had common functional roots, it was the researchers' intention to rotate the matrix in such a way as to keep
the program planners together on the same factor during the rotation. The other factors which emerged in the study could then be more easily contrasted with that of the program planners, resulting in a solution which answered the evaluation question.

The unrotated factor matrix (see Table 3.3) was examined to determine if the seven program personnel loaded on a common factor. Five of the seven had loadings that were highly correlated with the same factor (factor A). Although not all of these were considered statistically significant ($r > .46$, $p = .01$), they were meaningful enough to warrant keeping them on the same factor during rotation.

As one can determine from examining Table 3.3, the unrotated factor matrix appeared to support three or four factors reasonably well while three other factors had only one loading each. The remaining two factors (not shown) had no meaningful or statistically significant sorts correlated with them. In fact, the two loadings on factors D and E did not reach the threshold for statistical significance, hence it might be argued that the unrotated matrix supported the existence of a maximum of five factors.

Prior to theoretical rotation, a varimax solution was estimated to compare it to the theoretical rotation that would be pursued. Many times, a theoretical solution is similar to a varimax solution (Brown, 1993). In this instance, however, the varimax
Table 3.3: Unrotated Seven-Factor Matrix

<table>
<thead>
<tr>
<th>Q-Sorts</th>
<th>FACTORS</th>
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<tbody>
<tr>
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(only loadings greater than .40 are shown; decimals have been omitted)

* signifies “did not load”)

solution produced disappointing results. Although the solution accounted for 26 of the 27 sorts in the preliminary analysis, it did so via nine factors (see Table 3.4), with program personnel loading on four different ones. While the varimax solution accounted for a good deal of the variance and all but one person’s Q-sort, it did so
Table 3.4: Varimax Nine-Factor Matrix

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<th>B</th>
<th>C</th>
<th>D</th>
<th>E</th>
<th>F</th>
<th>G</th>
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<td>-49</td>
</tr>
</tbody>
</table>

# sig. loadings | 3 | 4 | 3 | 3 | 1 | 3 | 3 | 1 | 5 | 26 |
Eigen values    | 1.61 | 2.63 | 1.64 | 2.14 | 1.31 | 1.45 | 1.42 | 1.15 | 2.89 | 16.22 |
% variance      | 6 | 10 | 6 | 8 | 5 | 5 | 5 | 4 | 11 | 60 |

(only statistically significant loadings >.46 are shown; decimals have been omitted);

* signifies "did not load"
without any degree of parsimony. Additionally, two of the factors evidenced bi-
polarity, which can defy factor interpretation and explanation.

Moreover, as can be expected from a nine-factor solution, there were no
accompanying consensus or differentiating items. It was hoped that consensus and
differentiating items would illuminate ways in which program planners could learn
how “their perspective” compared with non-participants’ perspectives. The
similarities and differences would be places from which to start to increase
enrollment in the project.

However, in all fairness, the parameters of a varimax rotation are established
by the researcher such that the number of factors rotated is typically a deliberate
decision. Therefore, more realistic varimax solutions were sought. The researchers
chose to compare three-, four-, and five-factor varimax solutions, the summary of
which is included in Table 3.5. Table 3.5 lists which factor each sort loaded on in the
three different solution schemes (i.e., three, four, and five factors).

From careful inspection of Table 3.5, Factor A appears to be quite stable with
respect to “who” loads on it, across all three factor solutions, as does Factor C.
Factors B and D (when applicable), however display less stability with respect to the
individuals loading on these factors across the three, four, and five factor varimax
solutions. Of particular concern is the location of the program planners (sort
Table 3.5: Varimax Factor Solutions Comparison

<table>
<thead>
<tr>
<th>Q-Sorts</th>
<th>3-factor</th>
<th>4-factor</th>
<th>5-factor</th>
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</tbody>
</table>

* signifies “did not load”

numbers 21 through 27). Because the varimax solutions proceed according to mathematical criteria, they do not have the flexibility to keep as many of these sorts as possible on the same factor, which would otherwise preserve some of the natural phenomena found to be present in the unrotated factor matrix.
Theoretical rotation

It is for situations like this where varimax rotation does lead to satisfying results that theoretical rotation is compelling. Table 3.6 lists the results from the theoretical rotation. The rotation was undertaken according to the following principles, listed in order of importance:

1. Maintain as many of the seven program personnel as possible on the same factor.
2. Account for the greatest number of sorts in the fewest number of factors.
3. Eliminate confounded (dual-loading) sorts.

From Table 3.6, the result from the theoretical rotation was a four-factor solution, accounting for 17 of the original 27 sorts and 39% of the variability in the original 27x27 correlation matrix. Factor A contained nine significant sorts and explained 16% of the variability; Factor B held three sorts and 10% of the variability; Factor C had three sorts and 8% of the variability; and finally, Factor D consisted of two sorts and explained 5% of the variability. None of the 27 sorts were confounded after theoretical rotation, although several had high loadings (but not statistically significant) on more than one factor. More importantly, five of the seven program personnel were retained on Factor A, thus preserving both the "naturalness" found in the unrotated factor matrix, as well as supporting the reason for undertaking the study at the outset. That is, the researchers now had obtained a composite factor
Table 3.6: Theoretical Factor Matrix

<table>
<thead>
<tr>
<th>Q-Sorts</th>
<th>FACTORS</th>
<th>A</th>
<th>B</th>
<th>C</th>
<th>D</th>
</tr>
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<tbody>
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<td></td>
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<td>*</td>
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<td>2</td>
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<td>7</td>
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<td>27</td>
<td></td>
<td></td>
<td>47</td>
<td></td>
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</tr>
</tbody>
</table>

# sig loadings | 9  | 3  | 3  | 2  | 17  
Eigen values   | 4.36| 2.68| 2.05| 1.39| 15.62 |
% variance      | 16  | 10 | 8  | 5  | 39  |

(as before, only statistically significant loadings >.46 are shown; decimals have been omitted)

* signifies "did not load"
largely populated by program planners that could be used to contrast their perspective with the farmers.

Figure 3.1 depicts Factors A and B before theoretical rotation was pursued. Of particular note, q sorts 21, 23, 24, and 27 do not reach the level of statistical significance (.46, p > .01), indicated by their location below the upper dotted line. Factors A and B were rotated approximately 28 degrees in three rotations to arrive at the final factor solution illustrated in Figure 3.2. In Figure 3.2, q sorts 23 and 24 are now correlated with Factor A above the level deemed statistically significant, while the other program planners originally loading on Factor A are retained. Figure 3.2 corresponds to the final theoretical solution matrix detailed in Table 3.6 and is useful for “seeing” the program personnel factor in factor space.

Before going further, it is useful to compare the varimax four-factor solution to the one derived from theoretical rotation (see Table 3.7). In many ways, the solutions are similar. Both solutions resulted in 17 of the 27 persons loading on one of the four factors and factor C is reasonably similar across both solutions. However, beyond that, there are striking differences. It is particularly important to attend to the loadings of sort numbers 21 through 27: in the varimax solution, four of the seven sorts loaded across two factors, A and D. Additionally, factors A and D in the varimax solution were correlated in the amount of .35, while factors B and D shared
Figure 3.1: Unrotated Factors A and B in Factor Space
Figure 3.2: Rotated Factors A and B in Factor Space
Table 3.7: Varimax and Theoretical Factor Solution Comparison

<table>
<thead>
<tr>
<th>Q-Sorts</th>
<th>Varimax</th>
<th>Theoretical</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>D</td>
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<td>27</td>
<td>D</td>
<td>A</td>
</tr>
</tbody>
</table>

* signifies “did not load”

A substantial degree of correlation in the amount of -.45. Under the theoretical rotation solution, however, factor A held five program planners, factor D was populated by only one program planner, and the degree of correlation between the two factors was reduced to -.28 (the highest correlation between factors in the theoretical rotation scheme).
Factor Interpretation

After rotation, a Q-analysis generally proceeds by way of factor interpretation. Factors with significant Q-sorts are analyzed in terms of their item scores. Not only are the individual factors' item scores analyzed, but the relative placement of items with respect to other factors is also analyzed. Because the main purpose of this paper is methodological and not necessarily phenomenological, little space will be spent on factor interpretation. However, knowing that readers of *Operant Subjectivity* consistently enjoy learning of the results of Q studies, brief factor interpretations will be presented. Moreover, some summary explanation of factors will add to the discussion section concerning the practicality of theoretical rotation.

**Factor A: The Technicians**

Factor A is characterized by a focus on the technical approach to programming with a rejection of low milk prices or international policy as explanatory reasons for the lack of farmer participation. As stated previously, five of the seven program personnel loaded on this factor; however, these five were joined by four farmers to further define the factor. Furthermore, the sort most highly correlated with the factor is that of a farmer. The Technicians view technology as a way out of economic depression and with the assistance of experts, a way to increase enrollment and use of dairy genetic registry procedures. Practical implications suggest that more
farmers would participate if the program worked through technicians and that farmers would be more likely to participate if it was clear that experts would assist and train them.

Factor B: The Efficiency Activists

Factor B endorses efficiency in the industry. This perspective rejects social forces (such as competing organizations) as an explanation for farmers’ lack of participation. Rather, the way to recruit more farmers in the project is to make the entire system more efficient – from the program to the entire supply chain. Although the Efficiency Activists do not reject technology, it just isn’t their focus.

Factor C: The Traditionalists

Factor C, the Traditionalists, is a bi-polar factor with two sorts on the positive pole and one sort on the negative pole. The positive pole was much more strongly defined: the two sorts were correlated with the factor at .66 and .75 respectively, while the sort negatively correlated with the factor was -.54. The Traditionalists is a perspective that resoundingly rejects technical assistance and training. The perspective emphasizes both independence and cynicism. The cynicism is identified, in part, by a solution endorsed at the positive end of the continuum; mostly, however, solutions are rejected. Traditionalists reject both structural and political remedies to increasing enrollment.
Factor D: The Economists

Factor D was difficult to interpret. The Economists are somewhat focused on dairy/milk prices as the motivating force behind their personal lack of involvement. However, despite the fact that price appears to dampen their enrollment in the project, the solution has more to do with social forces, such as working with other organizations and training farmers.

Discussion

The evaluation question dealt with understanding why dairy farmers in Uruguay had not participated in a project. Program planners wanted to understand the perspectives of non-participants in order to increase enrollment. The rotation criteria cast the two groups on separate factors. Table 3.8 summarizes the key criteria with respect to the evaluation question and the various rotation schemes’ performance with respect to these criteria.

Table 3.8: Rotation Techniques Compared on Key Criteria

<table>
<thead>
<tr>
<th>Key Criteria</th>
<th>4-factor varimax</th>
<th>4-factor theoretical</th>
</tr>
</thead>
<tbody>
<tr>
<td>Number of program planners on a shared factor</td>
<td>2 on A</td>
<td>5 on A</td>
</tr>
<tr>
<td>Number of consensus items</td>
<td>2 on D</td>
<td>1 on D</td>
</tr>
<tr>
<td>Total number of differentiating items</td>
<td>7</td>
<td>10</td>
</tr>
<tr>
<td>Number of significant sorts</td>
<td>17</td>
<td>17</td>
</tr>
<tr>
<td>Number of factors correlated above .3</td>
<td>2</td>
<td>0</td>
</tr>
</tbody>
</table>
The number of consensus items identified via theoretical rotation was much
greater than any of the varimax solutions and proved very beneficial despite several
of them having values which placed them close to each factor’s center; indicating
they do not carry much salience for any factor. The fact that they did not have a
great deal of salience for each factor was useful in that it indicated where each factor
was less contentious. Two such statements are as follows:

(+1 +2 +1 +2)  *If we want producers to value the use of production, reproduction, and
genetic records, it is necessary to improve their income so they can pay for the technical assistance.*

(0 0 -1 -1)  *What is the point of improving a cow’s genetic potential if there are other problems later, such as nutrition, that really limit the impact of the improvement?*

But because the condition of instruction was such that it asked for placement
of statements according to reasons for non-participation, disputes are not over the
program’s goals or value. One of the most encouraging items discovered by way of
theoretical rotation (that varimax did not identify) was the consensus regarding a
possible way to increase enrollment: via the local existing organizations, as seen in
the following statement:

(+4 +2 +2 +3)  *If we want farmers to participate, the project must work with other organizations that are actually currently providing services to the farmers.*
This was interesting for two reasons. First of all, program planners at INML had already begun this process as of the 2002 calendar year. They had switched tactics in 2002 and began presenting program information through small, local organizations of about 10 farmers. Experience, as well as the data, confirmed that this was a wise programming or marketing decision - and should continue. From a program improvement and evaluation perspective, this discovery was affirming.

One program planner commented in the post-study follow-up interview:

Researcher:
Did any factors surprise you in this study, and, if so, which ones?

Program Planner:
Yes, one thing. Your summary said farmers think that INML needs to improve total efficiency and one part of that efficiency is the relation between institutions. I thought that as well – but I didn’t expect this study to reveal that. I didn’t expect it, but I believed it.

In Uruguay several organizations operate on the local level, charge a fee, and are active in policy discussions. This situation makes these organizations political in nature and therefore suspect of other organizations that might attempt to attract members, particularly at the expense of local membership. The challenge for INML becomes how to work with local organizations to raise enrollment. Confirming this shared perspective – and its strength – was of particular value to program planners:
Program Planner:
This reality showed itself again, which is good. Sometimes it is not necessary to discover anything but it is necessary to confirm whether or not you are thinking correctly. I can now confirm that farmers think it is good for INML to be more efficient in their relationship with other institutions. Because I could sense this and it was revealed in the concourse, this implies this is a strong feeling among farmers.

The local organizations, then, become strategic leverage points for program intervention. Although there is no way for the current study to infer what percentage of non-participants are associated with each perspective, what is critical is that all of the perspectives are in agreement that working with the local organizations is a desirable way in which to increase participation in the genetic registry project.

Implications

It is the strategic leverage points for the project that hold substantial implications with respect to Q methodology. Among the community of Q scholars, there is no lack of fervor for the methodology itself. However, if the results of Q methodology research are to have practical value, research questions must be approached with an eye on intended use of the research outcomes. Intended outcomes from research must be kept on the research "radar screen". As researchers embark upon analysis, specifically the rotation phase, the quality and applicability of outcomes need to take priority.
This is not a denunciation of varimax rotation. It is, however, an argument for Q researchers to be more attentive to the theoretical and practical strategies pursued during the rotation stage such that rotation proceeds for a specified purpose. Another way of stating this is to say that instead of “plugging and chugging”, taking for granted the statistical gratification from varimax rotation, the researcher employing Q instead might decide a priori why answers are sought and what it might mean to get certain kinds of answers. Any rotation technique will produce answers, and, oftentimes, the answers are quite similar. But “the devil is in the details,” and although answers may appear similar at first glance, what can be done with the answers may prove quite dissimilar.

The Uruguayan example illustrated that the quality of the meaning derived from Q factors can be contingent upon the type of rotation scheme employed. This rotation decision may be particularly crucial to the improvement of social or educational interventions.

**Acknowledgements**

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College of Uruguay; Department of Agricultural Education and Studies, Iowa State University; Global Agriculture Programs, Iowa State University; Graduate Student Senate, Iowa State University.
CHAPTER 4. EVALUATING A DAIRY HERD IMPROVEMENT PROJECT IN URUGUAY: TESTING AND EXPLAINING Q METHODOLOGY

A paper published in The Journal of International Agricultural and Extension Education

Brett Kramer**, Virginia Gravina**, and Dr. Pedro de Hegedus***

Abstract

This paper has two purposes: 1) to describe and explain Q methodology and 2) to describe the evaluation of a dairy herd genetic registry project in Uruguay. The evaluation used Q methodology to focus on the social, economic, and contextual reasons why some producers in Uruguay had not participated in the registry. Centroid factor analysis with theoretical rotation reduced the 27 Q sorts into the following four distinct perspectives as explanations for lack of participation in the project: "Technicians" (cited lack of technical assistance available to some producers and sought a solution that focused on delivering the project through better trained

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***** Professor of Extension, University of Uruguay College of Agriculture and Visiting Professor, Federal University of Santa Maria (Rio Grande del Sul); research study collaborator.
technical advisors); "Activists" (cited structural issues as the barrier to participation with improved industry-wide efficiency as the solution); "Independents" (resonated with strong tones of personal and political reasons for the lack of participation); and "Economists" (reflective of the poor economic conditions facing many producers in Uruguay, namely depressed milk prices. However, despite the stark differences, the four perspectives also converged on a possible solution that recommended delivering the project through small, local, established organizations. Practical implications were 1) identifying and understanding why dairy producers abstained from participating was more complex than a simple explanation of a gap in knowledge about the program and 2) Q methodology functioned well in an agriculturally related evaluation context where tapping diverse and sometimes ignored perspectives is critical for program improvement.

**Introduction and Setting**

According to the International Dairy Federation, world milk production was forecasted to exceed 501 million tons in the year 2002 (2002). In 2001, Uruguay produced 1.2 million tons of fresh milk with approximately 350,000 cows. Its northern neighbor, Brazil, was responsible for over 22 million tons of fresh milk from over 16 million head of cows in 2001. In light of this level of milk production,
Uruguayan levels pale in comparison. The following paper describes an evaluation of a project designed to assist Uruguayan dairy producers in their efforts to remain competitive regionally and provide domestic foodstuffs.

In 1997, the Instituto Nacional Mejoramiento Lechero (INML) was formed in Uruguay to help improve the dairy industry. The INML fairly closely resembles the Dairy Herd Improvement program (DHI) in the United States and translates from Spanish to "The National Dairy Herd Improvement Institute". The INML is financed through user fees and the monetary contributions from seven agricultural agencies. This broad support suggests its importance and indicates the many sources of funding necessary to implement agricultural development projects in Uruguay.

Central to its mission is the goal of assisting producers to produce more milk through better informed production decisions, especially those based on data about expected progeny differences (EPDs). In 1998, INML program planners began a project to improve the genetic base of the dairy industry in Uruguay through a genetic registry. The genetic registry entails recording individual-level production data from producers' herds with the expectation that producers will use the data to make better decisions, specifically those related to culling unproductive cows.
Purpose, Objectives, and Evaluation Questions

In October of 2002, INML program planners consulted with the authors to request assistance in evaluating the genetic registry project. There was one specific programmatic issue that the evaluation was expected to shed light on and that was the issue of non-participation. In 2002, INML had approximately 200 dairy herds registered out of the roughly 6,000 dairy herds in Uruguay. Although INML had managed to attract the involvement of many large producers and a scattering of medium to small-sized dairy producers, more widespread participation, particularly from operations with less than 100 head, had eluded them. This situation made logical sense when viewed in light of two factors: cost and the price of milk. The user fees that partly support the registry are computed on the number of production units in the registry, thus making it more cost effective for larger producers than for smaller ones. Moreover, the price of milk in Uruguay was at its lowest point in years—approximately seven cents per liter (compared to roughly 32 cents per liter in the United States). However, despite these two barriers, INML program planners believed that the program could be beneficial to producers both large and small.

The authors, in collaboration with program planners, began a focused evaluation of the genetic registry project. However, in addition to providing evaluative information about the project, the authors also wished to test a novel
approach to evaluation, termed Q methodology. The evaluation question therefore served as a way to learn about Q methodology in the context of evaluating an important agricultural project.

The evaluation focused on producers who had no knowledge of, or association with, the genetic registry project. Discussion with program planners developed the following evaluation question: Why had some producers in Uruguay decided to forego participation in the genetic registry project? More specifically, what economic and social forces existed to influence this decision?

Due to the complexity of economic and social forces – and how producers perceive and respond to them – the authors viewed Q methodology as an appropriate alternative to conventional research and evaluation methodologies because Q methodology functions well under these conditions. The authors hoped that the methodology would perform well in uncovering diverse, expected, and unexpected orientations toward the program. Moreover, the authors also hoped that the methodology could identify points of consensus and difference in non-participating producers' perspectives that program planners could leverage to increase participation in the registry.
Methodology

Q Methodology has a rich, if little-known, history. In 1934, British psychologist and physicist William Stephenson (a student of Charles Spearman) penned a letter to the editor of Nature magazine (See W. Stephenson, 1935a). In it, he wrote that he had re-conceptualized correlation analysis such that in place of correlating tests vis-à-vis random variables believed to be expressions of traits, he had developed, a method to correlate whole persons. What Stephenson described would grow into the scientific method Q Methodology.

Q Methodology (hereafter simply referred to as Q) involves the study of human subjectivity: the self-referential frame through which human beings define and express their world. Q is more than a technical data analysis tool. It is a way of approaching the study of human behavior with its own epistemology and ontology. Q has been used to explore phenomena in fields such as food and agricultural policy (Pelletier et al., 1999), political science (Lipset, 1963), public policy (Focht, 2002) communication (W. Stephenson, 1967), public health (Dennis, 2001), psychology (Block, 1961), and evaluation (Garrard & Hausman, 1986).

Central to Q is concourse theory (W. Stephenson, 1978). A Q concourse can be thought of as a population of statements, thoughts, visual depictions, or many other such human expressions. For example, in any given program, there are different
opinions, perceptions, feelings, thoughts, and/or ideas about what it is like to be part of the program – or outside of it. These can be captured and recorded using either qualitative data gathering techniques (i.e. interviews), document review, or survey techniques. Once the Q concourse is captured and recorded, a Q sample is taken from it. The Q sample, like many samples, is not undertaken haphazardly. The structure of the sample is best driven by theoretical concerns in order to provide a subset of the concourse in relation to the issue at hand. In evaluation terms, it makes for good practice to structure the sample according to the evaluation questions or program theory.

The authors and INML program planners identified both program personnel and non-participants to interview as a main technique for establishing the concourse. It was our sense that the two groups would have different stories to tell about the genetic registry project. We wanted to understand why dairy producers were not participating in the project from the producer’s point of view. In the evaluation literature in general, non-participants are generally neglected as a source of data; something we wanted to remedy in this project. We interviewed one dairy cooperative administrator, three technicians (two of whom were not connected to the project), and four dairy producers (all of whom who had not participated in the
project). All interviews were transcribed in the speakers’ native language (Spanish) and coded according to emergent and theoretical themes.

The theoretical structure developed for use in this study consisted of two main dimensions (also referred to as “main effects”) with two “levels” within each of these, thereby resulting in the 2x2 matrix displayed in Table 1. The two main dimensions dealt with perspective (that of the farmer and that of the larger context) and pressures (economic pressures and social pressures). The cross-multiplying resulted in four cells that structured the Q sample.

Table 4.1. Theoretical structure of the Q sample pertaining to dairy herd improvement in Uruguay, 2002

<table>
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<th>Main Effects</th>
<th>Pressures</th>
<th>Perspectives</th>
<th>Levels</th>
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<td>Economic (a)</td>
<td>Farmers</td>
<td>Social (b)</td>
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<tr>
<td>Social (b)</td>
<td>Context (d)</td>
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<tr>
<td>Farmer (c)</td>
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<td>Context (d)</td>
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</tr>
<tr>
<td>Total cells:</td>
<td>ac+ad+bc+bd = 4 cells</td>
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</tbody>
</table>

The coded data (i.e. statements) from the interviews were then divided according to the relative “fit” of each within one of the four cells. Although the Q researcher may choose to identify a particular statement with a specific cell or category, this a priori “labeling” makes little difference to the subsequent interpretation of the data. No assumption is made that the statements themselves “measure” the identified categories or the theory or structure that undergirds the sample. What Q concerns itself with more directly is the use of theory, and not an
attempt to prove it directly (Brown, 1993). The meaning we strive to find via Q does not reside in the statements; rather meaning is in the pattern of their Q sort. Stephenson was interested less in the statements themselves than in what people did with them (W. Stephenson, 1963).

The purpose of placing statements within a cell of the Fisherian structure is to provide a miniature of the population that mirrors the larger one in terms of its comprehensiveness, without sacrificing representation. In Q, statements are homogeneous with respect to their kind (they are related to the same thing) but heterogeneous in regard to variance inherent in difference. In the Uruguayan Q sample, statements were alike with respect to the topic of non-participation yet diverse with respect to the specific mechanisms underlying the non-participation. Furthermore, the Fisherian design in Table 4.1 ensured representativeness.

It is also important that the Q sample was manageable in terms of size: it is difficult and time consuming for respondents to distinguish among more than 100 items (Brown, 1980). Q samples generally tend to number between 30 and 60, with the exact number being decided by the number of replicates in a given Fisherian theoretical structure. In the Uruguayan design, the authors sampled 8 statements from each of the four cells in Table 1 (i.e. ac, ad, bc, bd), resulting in a Q sample of 32 statements.
The Q sample also needs to be balanced. Balance refers to the respondent having an equal opportunity to react positively and negatively to items in at least one of the main dimensions (such as perspective or pressure). Therefore, within one cell (such as that would be created from combining farmer and economic), four statements were chosen that reflected a positive assertion while four statements were chosen that reflected disagreement with the positive assertion (W. Stephenson, 1953, p. 79). Caution must be employed to avoid selecting statements that are antonyms (e.g. "high" and "low") for they serve little purpose in illuminating the more fine grained discrimination reflective in most concourses.

Once the Q sample was drawn and statements numbered randomly, they were submitted to respondents for the Q sorting task. Respondents (called a p-set or person-set) were selected because they might have something to say in relation to the topic. Therefore, the p-set was purposeful. The producers were selected based on a 2x2 matrix with herd size (less than 100 head; more than 100 head) and participation (non-participants in any project; participants in other organizations/projects) serving as the main effects for structuring the sample.

Respondents were asked to place the statements, (written on individual cards), in an array that resembled a quasi-normal distribution. The distribution is
oftentimes more platykurtic (i.e. "flatter") than a normal distribution but nevertheless retains the shape and properties of symmetry (see Figure 1).

![Figure 4.1: O sort array for the 32-statement Uruguayan O sample](image)

Respondents were directed to begin sorting the 32 statements into three piles: statements on the left reflective of those most unlike respondents; statements in the middle having no relevance for respondents; and finally, statements on the right reflecting those most like respondents. Once all of the statements were placed into their respective pile, respondents were instructed to select the two statements most uncharacteristic of their position and place them on the far left of the sorting surface. Once complete, respondents were then instructed to select the same number of statements that were most reflective of them and place them on the far right of the sorting surface. Respondents then proceeded to work alternately from opposite ends of the distribution, finally arriving in the middle – the location of least relevance. They were then asked to record the array on a sheet of paper. This was done by
writing the number of the statement in the cell that corresponds to where it was placed in the distribution.

It is at this stage that the evaluator analyzes the Q sorts, generally with the assistance of modern computing technology. The sorts are first correlated, and then submitted for factor analysis. Two methods of factor analysis are most widely marshaled for this task: centroid and principal components. Of the two, principal component analysis is the favored method of factor extraction. However, it has its limitations in Q methodology. There exists debate within the Q community over this issue despite Stephenson’s strong theoretical arguments in support of the centroid method (1953).

To summarize briefly, the debate over the different methods of factor extraction have to do with their statistical properties. Centroid factor extraction uses an average correlation estimate (on average, the correlation between the sort under scrutiny and all others) to place on the diagonal of the inputted correlation matrix. This allows the researcher to pursue theoretical hunches for it does not require a determinant solution. Principal components analysis, on the other hand, uses a perfect inter-sort correlation estimate (1.0) to place on the diagonal of the inputted correlation matrix. This results in a clean factor analytic structure whereby factors are extracted in descending order according to the amount of variability that each
explains. However, this ordering suggests that the factors so arranged is a somehow more "correct" solution to the data, thus discouraging any theoretical pursuits deemed interesting (Brown, 1980). The authors, informed by Stephenson, used the centroid method of factor extraction.

Factor analysis is of limited use without rotation. Rotation consists of changing the reference points of the geometric coordinate system to fit more closely the data and obtain "simple structure." Simple structure refers to a situation in which individuals’ Q sorts are maximized on one factor with near-zero loadings on all others, thus enhancing interpretability of the results (McKeown & Thomas, 1988, p. 52). There are two methods most widely practiced by modern Q researchers: theoretical rotation and varimax rotation. Varimax rotation proceeds according to the mathematical criteria of minimizing the sum of the squared differences between the individual data points and the factor vectors. Theoretical rotation proceeds according to principles based upon expected phenomenological events and while it does not have the convenient statistical properties of varimax, what it lacks in this arena it more than makes up for through its flexibility. This flexibility is made possible through centroid factor extraction. In summary, the centroid method is most often used in conjunction with theoretical rotation and principle components analysis is most often augmented by varimax rotation.
Moreover, rotation in Q is undertaken in order to arrive at one factor solution at a time, such that sorts are purely loaded on one factor and near zero on others, thus focusing the lens through which we can view the factors and their relation to one another. This focusing, via rotation, does nothing to disturb the fundamental nature of the data; nor does it change the coordinates of any data point (i.e. Q-sort) in geometric space. What it does do, however, is to aid in the interpretation of factors at the other end. The authors used theoretical rotation in this study.

Findings

The 32 statement Q-sample was submitted to 27 individuals for sorting. Of these, 20 were producers who were not enrolled with the INML project or any other similar project; the other 7 respondents were program personnel (e.g., planners, technicians). Of the 20 producers, nine had herds numbering over 100 head and 11 had herds numbering less than 100 head. The reason for choosing such a p-set was to compare non-participants' perspectives in relation to those of program personnel.

First it was necessary to “test” whether or not the data supported an inference that the two groups would differ in their Q sorts. This was done via factor analysis: if the program planners generally loaded on the same factor, we could then reason that their individual perspectives had common functional roots, different from other
perspectives discovered in the study. Such a condition would allow us to pursue a rotational scheme that sought to maximize their sorts' variability on the same factor and explore the ways in which this perspective converged and diverged from other perspectives in order to address non-participation.

In the analysis, it was determined that the inferred structure did indeed hold true for the p-set: the unrotated factor loadings indicated that five of the seven program personnel loaded on the same factor (called Factor A). A varimax solution was first sought for the data matrix. This is not unusual and oftentimes helps to lend insight into possible rotation solutions before any theoretical rotation begins. However, in this particular case, varimax rotation led to a decidedly unsatisfactory solution: although it accounted for 26 of the 27 sorts, it did so in nine different factors with no accompanying consensus or differentiating items. Theoretical rotation then proceeded according to the following principles, listed in order of importance:

1. Maintain as many of the seven program personnel as possible on the same factor.
2. Account for the greatest number of sorts in the fewest number of factors.
3. Eliminate any confounded (dual-loading) sorts.

The result was a four-factor solution, accounting for 17 of the original 27 sorts and 39% of the variability in the original 27x27 correlation matrix. Factor A contained nine significant sorts and explained 16% of the variability; Factor B held
three sorts and 10% of the variability; Factor C had three sorts and eight percent of the variability; and finally, Factor D consisted of two sorts and explained five percent of the variability. None of the 27 sorts were confounded after rotation, although several had high loadings (but not statistically significant) on more than one factor.

A Q-analysis generally proceeds by way of factor interpretation; that is, those factors with significant Q-sorts associated with them are analyzed in terms of their item scores. Not only are the individual factors' item scores analyzed, but the relative placement of items with respect to other factors is also analyzed. This method of data presentation will become readily apparent in the following section. There are two driving principles in data presentation: 1) presentation and explanation of the factor item scores for each factor and 2) presentation of factor items scores that differentiate the particular factor from other factors.

Factor A: The Technicians

Factor A is characterized by a focus on the technical approach to programming. The factor rejects low milk prices or international policy as explanations for the lack of producer participation. Five of the seven program personnel loaded on this factor and were joined by four producers. Furthermore, it is a producer whose sort is most highly correlated with the factor. The Technicians
view technology (and its attendant experts) as the answer to participation woes, as well as to depressed economic conditions. Factor A is defined by the following two ideas: 1) program participation can be enhanced if the program would focus on working through technicians and 2) producers would be more likely to participate if they were provided the technical training and assistance. The technical focus is illustrated by the following items (with item scores in parentheses for Factors A through D respectively; Factor A’s scores are in italics):

\[ (+4 \ 0 \ -4 \ -4) \text{ The way to get more producers to participate in the project is through the technicians that provide assistance.} \]

\[ (+3 \ 0 \ +1 \ 0) \text{ In order for producers to utilize the system, the project needs to provide them with technical assistance.} \]

\[ (+3 \ -2 \ -4 \ -3) \text{ I want to use the system of the Milk Improvement Project, but I need help to keep data and enter it in the computer.} \]

With the exception of Factor C in the second item, there is little agreement with Factor A’s perspective among the other three. Indeed, with respect to the first item, both Factors C and D reject the item as strongly as the Technicians embrace it – they are polar opposites with respect to increasing participation in the project by way of the technician as a medium to do so. Additionally, the third item highlights Factor A’s fixation on the assistance part to the equation; Technicians believe that producers need physical help to deal with the technology.
The following pricing and policy items deepen the Technicians perspective (item scores arranged as before). Note that the Technicians reject rather than affirm these statements:

(-4 +2 +3 0) Milk prices are low because the international markets and the policies of the bigger countries keep them low.

(-4 +4 +2 +4) If we could modify the international markets, milk prices would be more favorable to us.

Factor A factor not only endorses technology as a solution to participation and economic woes, but it couples this endorsement with a rejection of price as a barrier to economic prosperity. Factor A is in agreement with prototypical diffusion-adoption model of technology transfer (Rogers & Burdge, 1972). In other words, in order to solve real-world problems, agencies are thought to need to implement technical solutions via experts, preferably via one-on-one contact with producers.

Factor B: The Activists

Factor B is demarcated by its endorsement of activism towards the international markets and the industry as a whole. According to the Activists, the way to increase participation is to make the system more efficient from markets to the entire supply chain. Although the Activists do not reject technology, it is not foremost on their radar screen. Items that clarify the Activists' perspective are:

(+1 +4 -1 -1) If we want the producers to participate we have to help them to become more efficient as in other parts of the world.
If we could modify the international markets, milk prices would be more favorable to us.

The only way for producers to participate more in the project is through the improvement of the entire technological process of the industry chain, so that the producers can become more competitive.

Although there is some agreement between the Activists and Factor D with respect to international markets, it is in what the Activists reject that further illuminates their perspective:

If I had more time I would participate in the project, but the problem is that it takes time to sit down and enter data in the computer.

Producers simply do not want to use the record system - that's why they don't participate.

I already belong to a dairy organization and it is difficult for me to be part of several different ones.

The Activists strongly reject the idea that lack of participation (or its appropriate solution) has anything to do with time, motivation, or competing organizational interests. This also squares with the tone of the items scored +4: both extremes resonate with a sense of resolve, action, and motivation to address structural issues impacting the individual dairy producer.
Factor C: The Independents

Factor C, the Independents, is a bi-polar factor with two sorts on the positive pole and one sort on the negative pole and is populated by producers who had more than 100 head of cows. The positive pole was more strongly defined. The two sorts were correlated with the factor at .66 and .75 respectively, while the sort negatively correlated with the factor was -.54. The authors therefore offer a tentative explanation of the factor, although one that is supported by the differentiating items.

The Independents is a perspective characterized by items that carry tones of independence while rejecting technical solutions to non-participation. However, interwoven through the factor is a cynicism that the project is not particularly equipped to address the overwhelming issue of price. This cynicism is buttressed by the notable absence of "solution" items at the positive end of the continuum and a rejection of other "solution" items at the other end of the continuum. Items that characterize Factor C are:

(+1 +1 +4 -4) The milk prices are too low, but we can't turn that around - we have to accept the current situation and see what we can do. It is not because of low milk prices that I have not participated.

(-1 +1 +4 +2) I don't like to be pressured to participate. It is my decision and no one else's.

(-3 -1 +3 -3) I don't see what the project can do to help increase low milk prices.
And at the other end of the continuum, notice the rejection of solution items:

(+4 0 -4 -4) The way to get more producers to participate in the project is through the technicians that provide assistance.

(+2 +3 -3 +2) Producers would get to participate in the project if it showed that by using the record and management system, they would improve their efficiency.

(+2 0 -3 +3) More producers would be using the record system if they were trained to collect and enter data in the computer.

Unlike the Technicians or the Activists, the Independents reject structural or political remedies to non-participation. One is left wondering what would be required to increase the participation from this group. There is some evidence that participation from this group will not occur partly because economic pressures are not a driving consideration for participation thus:

(-2 +1 -3 +1) If the price of milk were higher, I would participate in the milk improvement project.

Some explanation of what is motivating the Independents to forego participation can be garnered from statements that speak to other organizations' efforts in the same general arena, particularly when viewed in context with the statement above on being pressured to participate. It is true that statements of this kind are not the most salient to Independents; but the statements nevertheless provide a tentative explanation for the complexity of a perspective that is strongly autonomous and unconcerned with price as a mechanism prohibiting their
participation. Independents offer some degree of solution to non-participation by means of working with other local organizations; however, there is no accusatory tone as in Factor B. Instead, here is evidence they wish to continue working with their local organization, regardless of the tack the project employs to increase participation:

(+4 +2 +2 +3) If we want producers to participate, the project must work with other organizations that are actually currently providing services to the producers.

(-1 -2 +2 0) I am loyal to my organization that I work with; it provides all of the services I need.

Factor D: The Economists

Factor D was the most difficult factor to interpret. There are paradoxes within the factor array: at one end, price seems to be the reason for non-participation while at the other end of the array, price as an explanation for lack of involvement seems to be rejected. It appears from the factor array that the Economists have a fixation on price as the motivating force behind their personal lack of involvement. However, despite the fact that price appears to be a force prohibiting broader involvement, the solution offered to increase participation has more to do with social forces, such as working with other organizations and training producers.

(-1 0 +3 +4) I don’t see what the project can do to change the policies that determine the low prices of milk.
If we could modify the international markets, milk prices would be more favorable to us.

I don’t believe milk prices are likely to increase, so I don’t think I will participate to keep records.

Unlike the Technicians, Activists, or Independents, the Economists reject the following item because it is low prices that have barred their greater involvement with the project:

The milk prices are too low, but we can’t turn that around - we have to accept the current situation and see what we can do. It is not because of low milk prices that I have not participated.

There is nonetheless a sense of harmony within the perspective and it is about price. Price is a formidable barrier to Economists' participation; one has only to view the item scored +3 above to get a sense that this group will not participate because prices are not likely to increase. Moreover, the item is unambiguous in its explication of a cause-and-effect relationship: low prices (the cause) drive non-participation (the effect). A summary of the four perspectives is presented in Table 4.2.

Discussion and Implications

One strength with respect to Q is that, oftentimes, consensus items emerge from a study. One of the most striking discoveries was a possible way in which to
Table 4.2: Factor Description Summary

<table>
<thead>
<tr>
<th>Factor</th>
<th>Reason for non-participation</th>
<th>Possible solution</th>
<th>Leverage points</th>
</tr>
</thead>
<tbody>
<tr>
<td>Technicians</td>
<td>Lack of technical assistance</td>
<td>Train technicians – deliver program through them</td>
<td>Focus on a service mentality</td>
</tr>
<tr>
<td>Activists</td>
<td>Nothing to do with lack of time or motivation; it is structural</td>
<td>Improve efficiency of the entire industry/supply chain</td>
<td>Focus on making the argument that the project is aimed at increased efficiency</td>
</tr>
<tr>
<td>Independents</td>
<td>Personal and to some extent, political/social</td>
<td>Focus on working with local organizations</td>
<td>Give them space to disagree – but look for ties to local organizations</td>
</tr>
<tr>
<td>Economists</td>
<td>Low price of milk</td>
<td>To a degree, deal with prices but also technology</td>
<td>Unclear at this point</td>
</tr>
</tbody>
</table>

increase participation: via the local existing organizations, as seen in the following statement:

(+4 +2 +2 +3) If we want producers to participate, the project must work with other organizations that are actually currently providing services to the producers.

This finding was affirming: program planners at INML had already begun this process as of the 2002 calendar year. They had switched tactics in 2002 and began presenting program information through small, local organizations of roughly 10 or so producers. Program planners' experience, as well as the data,
confirm that this was a wise programming decision and should continue. The second reason concerns policy. In Uruguay, as in more developed countries, there are several organizations which operate on the local level, charge a fee, and are active in policy discussion. This makes these organizations political in nature and also competitive with respect to membership. Many of these local organizations perform technical service similar to that of INML - but none so broadly or with so many registrants. INML is therefore challenged to work with oftentimes-politicized local organizations to attract members into a strictly technical venture. Each of the four perspectives, however, sees the potential benefit from working with these organizations, despite current challenges.

The local organizations, then, become strategic leverage points for program intervention. Although there is no way for the current study to infer what percentage of non-participants are associated with each perspective, what is critical is that all of the perspectives agree that working with the local organizations is a desirable way in which to increase participation in the genetic registry project.

The current study also holds numerous implications for extension education. One theoretical implication has to do with a conception of needs. What is oftentimes perceived to be a straightforward process of needs identification is more complex than a simple knowledge gap. People have educational needs, but these do not
always motivate people to participate in meaningful and worthwhile educational interventions. People's needs are situated within a human value system that enforces such concepts as need, interests, and motivation; concepts not readily amenable to contemporary forms of needs identification and assessment, which brings us to the methodological implication.

Because the concept of educational need is one that is situated within a larger system of human values and interest (what the article refers to as "perspective"), our methodological choice in tapping these perspectives must be adept at rising to the challenge. Forms of inquiry must take into account not our definition of terms and things, but must allow participants to saturate these very terms and things with their individual, very human, meaning. Such an approach calls for privileging participants' voices over our own and must work from a frame grounded in the program to be sure that the inquiry is grounded in the language of the program itself. All of these characteristics so describe Q. The authors hope that the reader is left at this point intrigued that the methodology holds merit for investigations into human subjectivity within the field of agricultural extension and education.

There are also implications of the research with respect to Q methodology. Three main points come to mind. The authors were pleased at how receptive program personnel were to Q methodology. Although they had not heard of Q, they
were open to its potential to highlight the complexities of the issues. This was unexpected not because the program planners in this study appeared rigid but because it is not uncommon for Q researchers to meet methodological inflexibility on the part of those first introduced to Q. Secondly, a hands-on training using Q at the beginning of the research endeavor proved useful in introducing program personnel to the intricacies of the methodology. It is our suspicion that this training reaped dividends, because program personnel became excited about the prospect of trying something new. Finally, it is important for researchers and practitioners interested in using Q to realize that there is a learning curve in undertaking such an endeavor. Because Q borrows from two distinct traditions, forging these into a distinct approach to inquiry is at times daunting.

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CHAPTER 5. NEW PERSPECTIVES ON TECHNOLOGY TRANSFER USING Q METHODOLOGY: A COMPARATIVE STUDY OF FARMERS AND TECHNICIANS IN URUGUAY

A paper to be submitted to the *Journal of Agricultural Education*

Brett Kramer* and Nancy Grudens-Schuck*

Abstract

Technology transfer projects in the developing countries have experienced varying degrees of success. The dominant model of technology transfer was developed by Everett Rogers (1962), commonly termed “adoption-diffusion”. Prior research has affirmed the power of the model to describe the transfer of technology across a broad range of contexts; however, the limitations of the model for agricultural and extension and education in developing countries are generally neglected, warranting closer inspection. This paper describes a research project in Uruguay that focused on adoption of an agricultural technology, dairy herd genetic improvement. The authors sought to understand the perspectives of farmers who had declined to adopt the technology. The authors used Q methodology to contrast the nonparticipating farmers’ perspectives on non adoption with the perspectives of

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program staff on the same issue. Thirty-five farmers and nine program staff completed a 32-statement Q survey in 2002 to 2003. Q factor analysis distinguished four aggregate factors. Although one factor strongly resembled Rogers' laggard category, the other three factors challenged tidy placement in the adoption-diffusion framework. Farmers' willingness to adopt a technology may be a complex array of values and interests and not solely due to socioeconomic characteristics as implied in Rogers' framework.

**Introduction**

Rogers' (1988) model for adoption of technology is ubiquitous in agricultural and extension education, but there is evidence that Rogers' theory, frequently termed the "adoption-diffusion model", fails to explain adequately the advance of technology in developing countries (Friere, 1998; Röhling & Wagemakers, 1988). Critics of the model focus on researchers' lack of understanding of farmers who reject the adoption of new agricultural technologies (Röling & Wagemakers, 1988) and on negative effects of rapid adoption that put a majority of farmers at an economic disadvantage over time (G. Stephenson, 2003). Broad scale reluctance to adopt technology designed to improve production, however, slows the pace of sustainable development and compounds the severity of poverty among rural
people, including poor farmers, women farmers, and landless agricultural workers. Adjustments to the adoption-diffusion model include acknowledging structural elements (see Fliegel, 1993), yet these provide a partial and unsatisfactory answer to the charge of failing to explain non adoption.

The pervasiveness of the model itself may contribute to the lack of progress in understanding why farmers reject new technologies. New methodologies may be needed to produce fresh perspectives on non adopters. Researchers may have difficulty asking new questions about farmers when their lens is heavily colored by Rogers' (1988) categories and implemented via methodologies particular to Rogers' original field of study, sociology. This study utilized Q methodology (hereafter, Q) to shed light on why farmers declined to participate in a dairy herd improvement project in Uruguay. The use of Q in both sociology and agricultural education research is sparse. Q has been used selectively to study rural development and food systems (Pelletier et al., 1999) but mainly is used in the fields of political science and communications (Brown, 1980). Few articles employing Q have appeared in the agricultural education literature, with the exception of work by Delnero and Montgomery (2001), which documented the perceptions of California agriculture teachers toward their work. Q emphasizes personal demographic information (such as educational level or size of operation) much less than sociological studies,
including Rogers’ (1988) framework. In contrast, Q uses factor analysis to determine “functional perspectives” (Brown, 2002a, p. 125), a term akin to “worldviews,” an appellation used by interpretive (qualitative) researchers (Creswell, 1997).

**Background**

The importance of increasing milk production to a small country like Uruguay (South America) cannot be overemphasized. World milk production was forecasted to exceed 501 million tons in the year 2002 (International Dairy Federation, 2002). In 2001, Uruguay produced 1.2 million tons of fresh milk from approximately 350,000 cows.

In 1993, the Institute Nacional para el Mejoramiento Lechero (INML) was formed in Uruguay to improve the dairy industry’s ability to compete with its neighbors. Central to its mission was the goal of assisting farmers to make better-informed production decisions as a means to produce more milk. The INML focused on improving the genetic base of the dairy industry through a genetic registry, which registry operates much like its North American counterpart, the Dairy Herd Improvement Program. Such programs require farmers to record production data from individual cows regularly. Farmers analyze the data and make decisions in light of that information, especially information important to the selection of sires (bulls) and culling (i.e., removing) cows that perform below standard. Over time,
improved genetics (of both dams and sires) leads to increased more efficient production of the herd as a whole through improvements in, for example, pregnancy rates, udder health, high peak volume of milk, or increase in the number of days of high volume milk production.

In 2003, the INML had registered 240 dairy herds of approximately 6,000 herds in Uruguay, but it desired greater participation. From October of 2002 through August of 2003, co-author Kramer and INML program planners agreed to study the phenomenon of low participation in the genetic registry project in Uruguay (see also Kramer, Gravina, & de Hegedus, 2003). The study focused on farmers who had no association with the genetic registry project. The study team developed the following question: Why had some farmers in Uruguay decided to forego participation in the genetic registry project?

**Theoretical Framework**

Central to Rogers' (2003) adoption-diffusion theory are five stages experienced by the adopter of a successful technology: (1) awareness, (2) interest, (3) evaluation, (4) trial, and (5) adoption. There also is a sixth stage comprised of discontinuance and non adoption. Rogers' early work focused on the rate at which a community adopted a technological innovation, and the continuum he developed
was collapsed into five categories that describe traits of prospective adopters. The categories are (1) innovator, (2) early adopter, (3) early majority, (4) late majority, and (5) laggard. There also is a sixth category: non adopter.

When an individual discontinues use of an innovation (or fails to adopt it in the first place) the reasons can either be rational or irrational (Rogers, 2003). Rationality is defined as "the use of the most effective means to reach a given end" (Rogers, 1962, p. 91). "The most effective means," however, is defined largely by agricultural experts (Röhling & Wagemakers, 1988). Consequently, non adoption and discontinuance are equated with failure or deficit as defined by external (i.e., etic) standards rather than standards internal (i.e., emic) to the individual or community (Creswell, 1998). It is the reliance on a framework honed in North America, under conditions of relative prosperity and stability, that undermines many of Rogers’ assumptions (Röhling & Wagemakers, 1988).

Innovators are the first to adopt. They represent approximately 2.5% of the total adopters. Rogers (2003) characterizes members of this group as venturesome. They possess extensive communication networks and substantial financial resources, are willing to take risks, and understand technical information. In his earlier work, Rogers (1962) described innovators as cosmopolite, better educated, youngest in age, highest in terms of social status, largest and most specialized in
terms of operation, possessing great wealth and mental capacity (1962, p. 185). A characterization that has not changed over time is Rogers' portrayal of members of the group as daring, rash, and risk taking.

*Early adopters* represent about 13.5% of the population. They are described as fully integrated in the social system rather than on the fringe like innovators. Early adopters typically are viewed with respect by their peers. They tend to have high social status; large, specialized operations; and a high degree of contact with local change agents (such as extension educators or industry technicians). The *early majority*, on the other hand, is composed of individuals who are more deliberate. They represent a substantial portion (34%) of the population. They are the embodiment of “average” in terms of education, operation size, and opinion-leadership; however, they adopt just before the typical member of the social system (Rogers, 1995, p. 264). The *late majority* (34%) is composed of skeptical individuals. They require pressure from peers to adopt technology. This group is composed of individuals who are below average in almost everything, especially intellect, operation, size and wealth (Rogers, 1962, 1995, 2003). Rogers’ last category of adopters is referred to as non adopters or *laggards*. Laggards are the most traditional members of a social system; they are oriented toward the past as opposed to toward the future. They represent the lowest tier of every indicator: social status, degree of
specialization, operation size, intellect, and leadership (Rogers, 1962, 1995, 2003). Laggards make up the final 16% of adopters.

**Purpose and Objectives**

This paper describes the extent to which Rogers' (1962) theory on the diffusion of innovations explains the lack of participation in the genetic registry project by dairy farmers in Uruguay. The paper 1) reports the number of aggregate functional perspectives of dairy farmers and program staff on an expanded data set from a preliminary study, published in full previously (Kramer, Gravina, & de Hegedus, 2003), and 2) examines the extent to which Rogers' adopter categories (as measured by the degree of innovativeness dimension) correspond to the aggregate functional perspectives.

**Methods**

Q identifies emic (i.e., insider) perspectives that operate in a local context by submitting a collection of locally derived statements to factor analyze to increase validity (Brown, 2002b) Q was developed to study human subjectivity, the emic perspective, defined as the self-referential frame through which human beings define and express their world. Q has been used to explore areas such as public
policy (see Brown & Coke, 1977; Focht & Lawler, 2004), psychological types (see Block, 1961), and agricultural extension (Pelletier et al., 1999). Q is a method of studying human behavior that is both similar to, and yet distinct from more commonly employed qualitative and quantitative approaches to agricultural education research. Q shares an assumption with qualitative interpretive research that knowledge is socially constructed (Creswell, 1997). Q differs from interpretive inquiry in its reliance on a statistical phase. What Q shares with quantitative research is the reliance on multivariate techniques (i.e., factor analysis), but Q is distinct from commonly used forms of multivariate analysis because persons (i.e., subjects), not traits or characteristics, become variables and are factor analyzed. Consequently, Q's procedures may be unfamiliar. Therefore, this paper provides extended explanations of key procedures.

Procedures

Most Q studies proceed in four steps: (1) development of statements, termed a q-set; (2) selection of individuals who complete the survey termed p-set; (3) factor analysis of data; and (4) interpretation of results (Brown, 1993). The statements are based on a Q concourse, the collection of statements, ideas, thoughts, values, or opinions important to an issue (W. Stephenson, 1978). The concourse can be captured using interviews, document or literature reviews, or survey techniques. To
generate the concourse for the current study, the study team focused on the experience of nonparticipation and non adoption. Ideas from non participants contributed strongly to the concourse. In many contexts, including program evaluation and agricultural education research, non participants are neglected as a source of data about programs (Deshler, 1995). Non participants are neglected, in part, because they are challenging to locate. Moreover, most forms of survey research presume respondents' knowledge about programs, decreasing the likelihood that individuals who possess incomplete knowledge of programs will complete the survey in a way that provides high-quality data.

Q methodology works best when it compares and contrasts the perspectives of influential actors in the setting (Brown, 1980). The study team predicted that the ideas of program staff would contrast sharply with those of non participants; therefore, the study is about the ideas of farmers in relation to those of program staff. Moreover, INML program planners (administrators as well as technicians) were in the process of changing the program on the basis of unsubstantiated assumptions about the motivations of non participants. The comparison of each group's ideas through Q was anticipated to increase the quality of decisions made by program planners with regard to non adopters.
(a) q-set selection and development

Individuals from both groups were interviewed, including a dairy cooperative administrator, three technicians (two unconnected to the project), and four dairy farmers (none had participated in the project). Interviews were transcribed verbatim in the speakers' native language (Spanish) and coded by themes. A sample of statements (q-set) was then chosen from the concourse for use in the Q survey in a way that mirrored the themes. The Q sample was structured according to two theoretical dimensions (called "main effects"), each with two levels, resulting in a 2x2 matrix. The dimensions addressed perspective (role) (i.e., farmer or technician) and pressure (e.g., economic pressure or social pressure). This structure, modeled after Fisher, provided a miniature of the population in terms of comprehensiveness while enhancing representativeness (Brown, 1980). All statements focused on nonparticipation with respect to "perspective" or "pressure". The Q sample ultimately was composed of 32 statements for use in the survey.

(b) p-set selection and survey administration

The Q statements were numbered randomly and placed on cards. Respondents were provided 32 cards and a grid printed on paper. They sorted the cards into cells on the grid. The grid was, typical for Q, more platykurtic (i.e. "flatter") than a normal distribution but nevertheless retained the shape and
properties of symmetry (see Figure 5.1). Forty-four respondents sorted the statements.

Respondents were chosen because they might have something to say about the topic (e.g., individuals were chosen purposively), which is a preferred strategy for selecting respondents in Q (Brown, 1980). Thirty-five farmers were selected by herd size and geographic location. INML program planners identified nine program staff to complete the Q-sort and tapped a diverse set of program staff, including some who were more familiar with the project and some who were less familiar. The data were collected in two waves: 27 sorts were collected in February 2003, and an additional 17 sorts were collected in August 2003.

**Figure 5.1: Q sort array for the 32-statement Uruguay Q sample**

Respondents were instructed to sort the 32 cards according to the following question, called the “condition of instruction” (albeit in Spanish): Please sort the following 32 statements according to why you have not participated in the genetic registry
Respondents were directed to sort first into three piles: (1) those most unlike respondents' ideas, (b) statements having no relevance for respondents, and (3) statements reflecting those most like respondents' ideas. Once all of the statements were placed into their respective piles, respondents were instructed to continue sorting, working from the extremes of +4 to -4 (places of greater salience) to the middle (neutral or indifferent). Respondents recorded their array on a sheet of paper.

**(c) factor analysis of data**

Q sorts were analyzed with the assistance of the software package PCQ® for Windows, Academic Edition 1.4 (Stricklin & Almeida, 2000). The 44 sorts were correlated, then factor analyzed. Two methods of factor analysis are used most widely for this task: centroid and principal components. Of the two, principal components is the most frequently employed method, but, as Stephenson (1953) and Brown (1980) have noted, the centroid method is more flexible and preferred by the more experienced Q methodologists; centroid was employed in this study. Factor analysis in Q is of limited use without rotation. Rotation changes the reference points of the geometric coordinate system to fit the data more closely. Many rotation techniques, with their attendant criteria, are addressed in the Q methodology literature, including varimax rotation and theoretical rotation (McKeown & Thomas,
1988). Varimax rotation finds a single “best” solution based on an ordinary least squares equation. Theoretical rotation consists of the researcher judgmentally rotating the coordinate system to find the best theoretical solution to the data. The authors used theoretical rotation in this study.

**Findings**

**Objective 1: Determine the number of aggregate “functional perspectives” among dairy farmers and program staff.**

The result from factor extraction and rotation was a four-factor solution, accounting for 23 of the 44 sorts and 34% of the variability in the original 44 x 44 correlation matrix. Factor A contained 8 significant sorts and explained 11% of the variability Factor B contained 10 sorts and explained 12% of the variability Factor C contained 2 sorts and explained 6% of the variability and Factor D contained 3 sorts and explained 7% of the variability.

The four factors represent aggregate functional perspectives, comprised of the ideas of both farmers and program staff. The factors are explanations of why dairy farmers had not participated in the genetic registry project. Although different, the four perspectives also shared varying degrees of correlation. Table 5.1 summarizes the correlation as well as the reliabilities and standard errors for each factor. For a Q factor analysis (as for most other analyses) the lower the degree of correlation
between factors, the better. Among the six pair-wise correlations, only one was
above .3 (factors B and D), indicating that the four aggregate perspectives operating
in the context were distinct.

Table 5.1  Factor correlations, reliabilities, and standard errors for the four retained factors

<table>
<thead>
<tr>
<th>Factor Correlations</th>
<th>A</th>
<th>B</th>
<th>C</th>
<th>D</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>0</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>B</td>
<td>-.29</td>
<td>0</td>
<td></td>
<td></td>
</tr>
<tr>
<td>C</td>
<td>.13</td>
<td>.05</td>
<td>0</td>
<td></td>
</tr>
<tr>
<td>D</td>
<td>-.28</td>
<td>-.34</td>
<td>-.08</td>
<td>0</td>
</tr>
<tr>
<td>Reliabilities</td>
<td>.96</td>
<td>.97</td>
<td>.88</td>
<td>.92</td>
</tr>
<tr>
<td>Standard Errors</td>
<td>.38</td>
<td>.34</td>
<td>.74</td>
<td>.61</td>
</tr>
</tbody>
</table>

Objective #2: Examines the extent to which Rogers' adopter categories (as
measured by the degree of innovativeness dimension) correspond to the aggregate
functional perspectives.

Rogers (2003) claimed that certain characteristics are associated with people
at the time they adopt an innovation. These specific claims have been tested in
diffusion research over the past 30 years and found to hold up in many
cases (Fliegel, 1993). For the purposes of this paper, the degree of innovativeness
interpreted through analysis of the placement of selected statements in the factor
arrays is addressed. Rogers claimed that the adopter categories were partially a
function of the degree of innovativeness of particular farmers: earlier adopters have
a greater degree of innovativeness.
Degree of innovativeness was defined in the study by statements in the Q set that possessed tones of fatalism, dogmatism, extent to which there was willingness to change, and attitude toward risk. Rogers' theory (1995) should predict that the aggregate functional perspectives resonating with greater degrees of innovativeness would be earlier in the adoption stage. Conversely, those functional perspectives exhibiting less innovativeness would be later in the adoption process. The extent to which innovativeness was integral to factors was determined through analysis of the placement of statements within the respective factor arrays (Table 5.2). The factor scores in Table 5.2 for each item indicate where the functional perspective placed that item in Figure 5.1. For example, in the first item under "fatalism", in all but one of the aggregate perspectives the item was scored (or placed) to the left of zero; in other words, the item was found to be unlike three of the four perspectives. Items with a positive factor score (e.g., +4) indicate items with which persons associated with a factor would agree strongly.

Discussion

According to the theory of adoption-diffusion, the majority of those who have adopted the technology in a program, characterized as "low uptake", would be classified as innovators. Among non-participants, one would expect to find four or
Table 5.2 *Summary of factor scores for items reflective of Rogers' innovativeness dimension*

<table>
<thead>
<tr>
<th>Items</th>
<th>Factor Scores</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>A</td>
</tr>
<tr>
<td><strong>Fatalism</strong></td>
<td></td>
</tr>
<tr>
<td>I don’t see what the project can do to help increase low milk prices.</td>
<td>-2</td>
</tr>
<tr>
<td>I don’t see what the project can do to change policies that determine the low prices of milk.</td>
<td>-1</td>
</tr>
<tr>
<td><strong>Dogmatism</strong></td>
<td></td>
</tr>
<tr>
<td>I don’t like to be pressured to participate. It is my decision and no one else’s.</td>
<td>-1</td>
</tr>
<tr>
<td>All of my needs are covered so I don’t see why I need to participate in the project.</td>
<td>-2</td>
</tr>
<tr>
<td><strong>Willingness to change</strong></td>
<td></td>
</tr>
<tr>
<td>I want to use the system of the Milk Improvement Project, but I need help to keep data and enter it in the computer.</td>
<td>0</td>
</tr>
<tr>
<td>More farmers would be using the record system if they were trained to collect and enter data in the computer.</td>
<td>+2</td>
</tr>
<tr>
<td><strong>Attitude toward risk</strong></td>
<td></td>
</tr>
<tr>
<td>Farmers would participate in the project if it showed that by using the record and management system, they would improve their efficiency.</td>
<td>+2</td>
</tr>
</tbody>
</table>
more distinct perspectives (with respect to the genetic registry project) that align with Rogers' (2003) remaining categories. The farmers who have not (yet) registered with the project would be expected to fall along the continuum from early adopter to laggard. Furthermore, one might expect to find Rogers' theory useful in explaining the relative lack of participation in the project. What follows is a discussion of each of the four aggregate functional perspectives, interpreted via Rogers' degree of innovativeness dimension. Factor A (the "Technicians") was characterized by a moderate rejection of the fatalistic and dogmatic items while simultaneously displaying a moderately positive approach to risk. The Technicians viewed technology (and its associated experts) as the solution to participation woes as well as to depressed economic conditions. Factor A was in agreement with prototypical adoption-diffusion models of technology transfer (Rogers & Burdge, 1972). In other words, in order to solve real-world problems, it is considered good practice for agencies to implement technical solutions via experts, preferably through personal contact with farmers. Factor A portrays individuals as ready and willing to adopt technology.

Factor B (the "Efficiency Activists") exhibits a strong rejection of the fatalistic and dogmatic items in Table 5.2, coupled with a moderate willingness to change and a strongly positive attitude toward risk. The Efficiency Activists also strongly
rejected the idea that lack of participation had anything to do with a lack of motivation or lack of time. Both the positive and negative extremes resonated with a sense of resolve, action, and motivation (hence, "activism") to address structural issues impacting the individual dairy farmer. Note the strong rejection of the dogmatic item as well as the rejection of an item associated with resistance to risk.

(0 -4 0 -1) Farmers simply do not want to use the record system that's why they don't participate.

(0 -2 0 +3) If I had more time I would participate in the project, but the problem is that it takes time to sit and enter the data in the computer.

Factor C (the "Traditionalists") was quite opposite from Factors A and B in terms of where they might be placed on a degree of innovativeness dimension. The Traditionalist perspective was characterized by extreme independence (functioning as isolationism) and rejected technical solutions to nonparticipation. These characteristics are present in the seven items in Table 2. Notably, interwoven through the factor was cynicism and suggestions that the project was not equipped to address the issue of price—or much of anything else. Surprisingly, however, was the fact that the Traditionalists were both farmers who had more than 150 head of cows.

The fourth factor (the "Economists") was imbued with moderate tones of fatalism and dogmatism yet appeared very willing to change and moderately
positive attitudes towards change. The factor presents an array of disparate ideas associated with nonparticipation, ranging from low prices to lack of technical support, while at the same time explaining nonparticipation via lack of farmer motivation. Most of these ideas also are present in the other three factors. The potpourri character of the factor undermines its explanatory power.

Conclusions and Recommendations

One of the most enduring elements of Rogers' (2003) theory is the prediction that farmers with larger-sized operations will adopt new technologies at a faster rate, and in higher numbers. Yet, the herd sizes of more innovative farmers (the Technicians) ranged from 10 to 131 head, while the herd sizes for the less innovative farmers (the Traditionalists) were above 150 head.

The Efficiency Activists, on the other hand, might be the next group of individuals willing to adopt the new technology. They are Rogers' (2003) global thinkers and have slightly larger herd sizes. Moreover, they state that they do not require assistance with the technology and agree that the ability to adopt lies within the farmer's control. It would seem that Rogers' generalization about production unit size holds true for the Efficiency Activists.
The Traditionalists offer the most striking similarity to Rogers' (2003) categories, specifically, the laggards. Rogers claims that laggards are the last to adopt, and he has noted this trend throughout his career, including a higher degree of dogmatism and fatalism in this group. The dogmatic tone of the Traditionalists can be heard in the statement regarding being pressured to participate. Traditionalists view their decision to do so as belonging to them and to no one else, a distinctly asocial view. Moreover, the fatalistic tone can be heard in the statements with which the Traditionalists agree most strongly, namely that the current situation of the international markets cannot be turned around, and that the project is ill-equipped to address it. Surprisingly, the Traditionalists also offer the most striking affront to Rogers' framework because they are farmers with relatively large farms of more than 150 head of cows.

Conclusions

It is also worth noting that with respect to Q, consensus items (among the factors) emerge frequently from a study and can be put into service to improve programs. One of the striking discoveries was that for all of the factors, lack of resources was not a limiting factor to their participation, as Rogers has claimed (1995). This is evident in the following items:

(-3 -2 -3 -4) I don't have the resources to participate in the project.
The reason I have not participated in the project is because the price of milk is very low; I don’t have the money to pay for the cost of the service.

These items would seem to refute Rogers’ claim that socioeconomic status is related to the time of adoption. It also could be argued that the above items measure socioeconomic status inadequately; but coupled with the surprising data on herd size, the researchers were suspect that in the case of the Uruguay genetic registry project, Rogers’ generalizations on socioeconomic status and farm size were not well supported.

Although the data on farm size were unexpected and of interest, the Q study does not disconfirm the farm size element of Rogers’ (2003) theory conclusively. The data are bounded in at least two respects. First, the study focused on non adopters, not innovators or early adopters. At this early point in the process of introduction of dairy registry procedures in Uruguay (i.e., 10 years), the non adopter category would be larger than those having adopted, suggesting that a wide range of types of farmers would be expected among non adopters. Second, the purpose of Q methodology is to produce distinct perspectives; aligning demographics is a secondary procedure. To make strong claims about the correlation of size of operation and rate of adoption would require a different study employing different methods and certainly larger sample size.
The current study also challenges how needs are conceptualized and treated within adult and extension education. What is often perceived to be a straightforward process of needs identification is more complex than a simple knowledge gap. People have educational needs but these do not always motivate people to participate in meaningful and worthwhile educational or technological interventions. People's needs are situated within a human value system that envelops such concepts as need, interests, and motivation. Moreover, demographic characteristics, such as age and farm size, may not carry much weight with respect to farmers' willingness to participate in programs (see G. Stephenson, 2003). What the Q factors point to is a decision matrix that may be influenced more by values and interests, and how these connect to, and structure, on individual's holistic perspective.

Finally, these holistic perspectives were suitable in examining a farmer's degree of innovativeness via the patterning of statements carrying tones reflective of one's degree of innovativeness. It is in this sense that Q functioned well, helping the researchers to understand better the phenomenon under study, that is, nonparticipating farmers' orientation to the technology transfer project. This is a major strength of Q: it permits the researcher to examine phenomena from a
naturalistic perspective, which forces the researcher to hold back *a priori* notions of "how things should be."

**Recommendations**

It would seem that the more innovative farmers, the Technicians, were willing to adopt the new technology, but had not done so. Perhaps their smaller herd size did not justify the investment. An extension program (as many programs do) that focuses its efforts on larger farmers however can, and does, miss the farmer with fewer resources. This has been one of the criticisms of diffusion theory (G. Stephenson, 2003) and one which Rogers readily acknowledges (Rogers, 1988). The study lends credence to extension programs that focus *earlier in the adoption* process on limited-resource farmers, small-scale farmers, and others who typically are viewed as outside the innovator-early adopter categories. Presently, such efforts to support small-scale farmers come at the end of educational programs that support technology transfer. Taking these data seriously has implications for agricultural extension programs.

The authors also recommend applying survey methodologies that extend the current study to make generalizations as to demographics via more typical survey methodology. In fact, the authors already had begun work on this aspect and had identified nine items from the Q study that distinguished the four factors quite well.
The nine items, in addition to demographics, were to be administered via a telephone survey to a stratified sample of dairy farmers in January and February of 2004. It is hoped that the authors correlate the Q factors to some of Rogers' demographic generalizations more successfully.
CHAPTER 6. GENERAL CONCLUSIONS

Discussion

Based upon the research, three conclusions merit extended discussion. First, bundling needs, interests, and values into the construct of functional perspectives holds promise for both needs assessment and evaluation in agricultural and extension education. Second, Q appeared to function well in the context of evaluating an agricultural project in Uruguay. Third, aspects of Rogers' (1962) theory on the diffusion and adoption process deserve closer inspection.

This study established that despite marked differences in orientations to the innovation (the genetic registry project) areas of consensus existed for farmers and program staff. It is the ability of Q to specify consensus areas that holds promise for agricultural education and extension. Although differences may appear to overshadow those ideas or concerns held in common, they are not necessarily insurmountable. One strategy made possible by this application of Q is that Q shows us that planners can start from a place where agreement exists and work toward resolving or addressing differences upon which resistance to adoption (or participation) is more heavily cemented. As G. L. Stephenson (2003) argued, extension educators have traditionally spent little time in trying to convince farmers, whose views may conflict with their own, about the value of adopting an
innovation. What the current study demonstrated is that despite pronounced differences in perspectives, farmers and program staff agreed about an appropriate strategy for project delivery, namely, to work through local organizations. With respect to differences in perspectives between program staff and the farmer non-participants, the data revealed that some of these differences were anticipated by staff. However, other differences were a surprise to program staff. This served as an educational mechanism for program staff to be better informed about what non-participants believed to be relevant with respect to their lack of participation in the project.

Secondly, Q seemed to function well in an extension-related agricultural project. Program staff, such as technicians, were pleased with the results from the study and they saw promise in the identified strategies for increasing participation in the project, (most notably, working through existing farmer organizations to market and implement the project). As discussed, the factors revealed through the study proved to be a mix of the expected and unexpected for program staff. Those factors program staff expected to emerge in the study did, in fact, emerge. By meeting this expectation, the study enhanced program staff confidence in the results and, by association, lent credibility to Q. By enhancing program staff confidence in the results and in Q, those factors which unexpectedly emerged in the study were
lent a higher degree of validity. That is, the factor that was most difficult for program staff to face (the Traditionalists) was nevertheless made more believable and legitimate to program staff by the perceived legitimacy of the other factors (see also Chapter Three).

It was this perceived legitimacy of the unexpected factors revealed by Q that may have implications for agricultural and extension education. It is possible that Q methodology could serve a facilitative role in bringing to light those areas upon which extension educators and their clients agree and disagree as they pertain to such things as curriculum design, method of delivery, and evaluation methods. In place of speculating or conjecturing about areas of disagreement and agreement in isolation, extension program planners and their clients may choose instead to use Q methodology as a way to bring them to light. As a result of the process, both extension educators and their clients may be better equipped to situate their perspective in relation to the other and thereby arm themselves with practical strategies to go forward with the planning, implementation, or evaluation task in a more consensual manner. Provided this can occur, there is hope that participation in extension related activities and programs can be enhanced.

To enhance participation, however, extension educators need to embrace prospective participants as having needs, interests, and values that influence their
decision to participate in combination with demographics. Additionally, extension educators should recognize that their individual and institutional interests and values impact their approach to extension programming (see, for example, Cervero & Wilson, 1994; Monette, 1979). Coming to terms with the way in which program planners’ and participants’ needs, interests, and values interact, however, is challenging. Trying to understand and capture this complexity in an effort to make it interpretable, therefore of practical programming value, is partially what this dissertation addressed through the introduction of “functional perspectives.

In concrete terms, the factor arrays that represent the Technicians, Efficiency Activists, Traditionalists, and Economists points of view are these functional perspectives. They are functional because they represent actual segments in the disparate orientations to the program. It is argued here that they are also functional because they contain multifaceted, yet holistic, representations of the way people have combined their needs, interests, and values into an interpretable perspective. For example, the Technicians factor needed assistance with the technological aspects of the project but was interested in obtaining this assistance through their local technicians - indicating that they valued the way in which INML could work more efficiently with other organizations. At the same time, the factor further defined “needs” by rejecting any financial need, an interest in modifying international
markets, or placing value upon a need to make the entire industry more efficient. Evidenced by these (and other) examples, functional perspectives appear adept at bundling needs, interests, and values into a single measure without meaningful loss of information or detail.

For extension education, the use of functional perspectives in place of more traditional needs assessment approaches (e.g., the Borich model) may prove useful in two ways. First, functional perspectives may enable extension educators to capture the needs, interests, and values of prospective participants by embracing the way in which these are intertwined. Provided these perspectives can be captured, extension educators may be better able to market extension programs to prospective participants (examples from the field of marketing using Q Methodology include (Adams, 1983; L.J. Barchak & Arnold, 1991; Mauldin, Sutherland, & Hofmeister, 1978)). Second, these functional perspectives can then be mined in such a way to inform program planners what interests, values, or needs are most salient to prospective participants - and how these relate to the extension educator’s most salient interests and values. By making public these different components of participants’ and program planners’ perspectives, it is possible that barriers to participation such as incongruent values, asymmetrical power relationships, or social forces can be addressed and with any hope, overcome.
With respect to Rogers' (1962) theory on the processes through which technological innovations become diffused and adopted, demographic correlates were found to be suspect. Recall that the group most resembling Rogers' laggard category, the Traditionalists, was composed of larger producers. Rogers has claimed that laggards are generally the smaller producers with lower socio-economic status who do not always have the financial capacity to take advantage of agricultural innovations. Moreover, the traditional technology transfer model is not particularly adept at addressing the concerns and needs of these producers (G. Stephenson, 2003). The nature of these concerns and needs were shown to encompass factors other than economic ones and is supported by other literature (see Thompson & Scoones, 1994; Vanclay, 1992). The implications from this finding to extension echoes an argument put forth by Gary Stephenson (2003): extension has to work harder to reach those clients who may appear stubborn in their resistance to adoption. Stephenson argues that historically, extension agents have wasted little time with these "non-believers" and have instead, focused their efforts on those clients exhibiting a greater willingness to try new things. While this strategy is convenient, it does not necessarily embody the mission Cooperative Extension is intended to serve (G. Stephenson, 2003).
Recommendations for Agricultural and Extension Education

There are three recommendations for the field of agricultural extension education. The first is a recommendation for the agricultural education community to embark upon more studies employing Q methodology. The second recommendation proposes to test more participation models using Q methodology. Finally, the section wraps up with recommendations on how to do things differently for those who might endeavor to replicate this study.

In a search of the agricultural education literature, very few studies using Q methodology were found. It appeared that some authors found the methodology to their liking in the 1970s but little has appeared since. However, other disciplines appear to be experiencing a growth of studies in which Q methodology has been employed. Increased use of Q in agricultural education would not be overly difficult because agricultural education is not the province of any one particular approach to inquiry. Qualitative and quantitative studies have appeared in the discipline's premier journal (Journal of Agricultural Education) for a decade. There is evidence Q has potential to join these two approaches to inquiry within the field of agricultural education. In summer and fall of 2003, the author worked with researchers Matt Baker and Kelly Jones at Texas Tech University, Lubbock, Texas to use Q methodology in a study about sustainability issues in the Lubbock, Texas area.
(Jones, 2003). The author’s connection to researchers at Texas Tech University was made at an agricultural extension education conference (Kramer et al., 2003). Researchers at Texas Tech University were excited about the way in which the methodology explored contentious issues in agricultural education (M. Baker, personal communication, June 2, 2003).

In October of 2003, the author submitted a research proposal to the National Science Foundation to conduct research with and about Q methodology in South America (entitled “Who’s Missing? Why Some People Do Not Participate in Uruguay’s Capacity-Building Projects”). Although the context of the research is rural development, the focus was on better understanding why some people opt out of participating in capacity building projects. In the proposal, the author proposed using Cohen and Uphoff’s (1977) measures of participation as a lens through which to view “opting-out” of capacity building projects. The proposal is evidence of the way agricultural educators working in different contexts can draw from Q methodology to explore phenomena.

Future research might include investigating additional participation models with Q methodology. For example, applications of Cross’s (1981) chain-of-response model or Boshier’s (1973) congruency model could be explored in a Q methodological approach. Beyond participation models, a researcher may focus on
other theories or models via a Q methodological study. The Fisherian structure in a
Q methodological approach allows the researcher to make explicit the theory about
which the singular proposition (the research question) informs.

Finally, the author would be remiss if he did not offer some suggestions for
those wishing to employ Q methodology in a study and so avoid pitfalls the author
experienced. First, the author recommends that great care be taken in fleshing out
the condition of instruction. The condition of instruction bounds a study and is of
great importance. The author is unclear if changes would have produced
distinguishable differences in the current study’s condition of instruction; it is fair to
say, however, that the condition of instruction for this study was simplistic and
perhaps echoed the evaluation question a little too directly. Second, the author
strongly encourages any future researcher to be attentive to the Fisherian structure
of the q-set and the manner in which it is constructed from theory. In the current
case, the researcher(s) kind of “backed their way into” the structure. Had more
attention been given to the structure, perhaps the study would have rendered firmer
results with respect to the fit (or lack thereof) between Rogers’ adopter categories
and the functional perspectives. The third suggestion stems from not only this study
but also from a current study undertaken by the author. The author has found that
selectively transcribing in-depth interviews with a specific goal of producing Q-
statements was more efficient than complete transcription in generating high-quality
data suitable for Q. The time necessary for transcription was cut by 50%, thereby
making it quicker to produce the Q concourse and the subsequent q-sample, without
apparent loss of quality.
APPENDIX. Q SAMPLE STATEMENTS AND THEIR FACTOR SCORES
<table>
<thead>
<tr>
<th>Number</th>
<th>Statement</th>
<th>Factor Scores</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>If the price of milk were higher, I would like to participate in the genetic registration project.</td>
<td>-2 +1 -2 -1</td>
</tr>
<tr>
<td></td>
<td><em>(Si el precio de la leche fuera mayor, yo me asociaría a Mejoramiento Lechero.)</em></td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>The milk prices are too low, but we can't turn that around - we have to accept the current situation and see what we can do. It is not because of low milk prices that I have not participated.</td>
<td>+1 0 +3 +1</td>
</tr>
<tr>
<td></td>
<td><em>(Los precios de la leche son muy bajos, pero no hay vuelta, tenemos que aceptar el marco actual y ver que se puede hacer. No es por el precio de la leche que no me he asociado a Mejoramiento Lechero.)</em></td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>If I had more time, I would like to participate in the project but the problem is that it takes time to sit at the computer and enter data in the computer.</td>
<td>0 -2 0 +3</td>
</tr>
<tr>
<td></td>
<td><em>(Si tuviera más tiempo yo participaría en el Proyecto pero el problema es que sentarse y poner los datos en la computadora lleva su tiempo.)</em></td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>All of my needs are covered so I don't see why I need to participate in the project.</td>
<td>0 -3 +2 -1</td>
</tr>
<tr>
<td></td>
<td><em>(Tengo cubiertas mis necesidades y no veo que necesite asociarme a Mejoramiento Lechero.)</em></td>
<td></td>
</tr>
<tr>
<td>Number</td>
<td>Statement</td>
<td>Factor Scores</td>
</tr>
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</tr>
<tr>
<td>5</td>
<td>Farmers would participate in the project if it showed that by using the record and management system, they would improve their efficiency.</td>
<td>+2 +4 -2 +2</td>
</tr>
<tr>
<td></td>
<td><em>(Los productores se asociarían a la Institución si se demuestra que por utilizar el sistema de registración y manejo que promueve M. Lechero sus tambos son más eficientes.)</em></td>
<td></td>
</tr>
<tr>
<td>6</td>
<td>The project cannot solve the technical changes required to increase producer participation in the genetic record system.</td>
<td>+1 0 0 +1</td>
</tr>
<tr>
<td></td>
<td><em>(Mejoramiento Lechero no puede solucionar los cambios técnicos que se requieren para aumentar la participación de los productores en estos sistemas de registración.)</em></td>
<td></td>
</tr>
<tr>
<td>7</td>
<td>The way to get more producers to participate in the project is through the technicians that provide assistance.</td>
<td>+4 +1 -3 -2</td>
</tr>
<tr>
<td></td>
<td><em>(La manera de que los productores participen en el sistema de M. Lechero es a través de los técnicos que los asesoran.)</em></td>
<td></td>
</tr>
<tr>
<td>8</td>
<td>Producers simply do not want to use the record system - that’s why they don’t participate.</td>
<td>0 -3 0 +2</td>
</tr>
<tr>
<td></td>
<td><em>(Los productores simplemente no quieren utilizar el sistema de registros de M. Lechero. Por eso no participan.)</em></td>
<td></td>
</tr>
<tr>
<td>Number</td>
<td>Statement</td>
<td>Factor Scores</td>
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<td>--------</td>
<td>----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------</td>
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</tr>
<tr>
<td>9</td>
<td>The Diary Improvement project has not worked enough with the technicians to train them in this technology so they can motivate the producers to use this tool.</td>
<td>+3 +3 +1 +3</td>
</tr>
<tr>
<td>10</td>
<td>If we want producers to participate, the project must work with other organizations that are actually currently providing services to the producers.</td>
<td>+4 +3 +4 0</td>
</tr>
<tr>
<td>11</td>
<td>If we want the producers to participate we have to help them to become more efficient as in other parts of the world.</td>
<td>+1 +4 0 +2</td>
</tr>
</tbody>
</table>

(Mejoramiento Lechero no ha trabajado lo suficiente con los técnicos asesores para capacitarios en esta tecnología a los efectos que puedan motivar luego a los productores a utilizar esta herramienta.)

(Mejoramiento Lechero debe trabajar con otras organizaciones que proveen actualmente de servicios a los productores si queremos que estos participen.)

(Si queremos que los productores participen entonces debemos ayudarlos a que puedan ser tan eficientes como en otras partes del mundo.)
<table>
<thead>
<tr>
<th>Number</th>
<th>Statement</th>
<th>Factor Scores</th>
</tr>
</thead>
<tbody>
<tr>
<td>12</td>
<td>In order for producers to utilize the system, the project needs to provide them with technical assistance.</td>
<td>+3 +2 +1 +1</td>
</tr>
<tr>
<td>13</td>
<td>I don’t have the resources to participate in the project.</td>
<td>-3 -2 -3 -4</td>
</tr>
<tr>
<td>14</td>
<td>I want to use the system of the Milk Improvement Project, but I need help to keep data and enter it in the computer.</td>
<td>+3 0 -4 +4</td>
</tr>
<tr>
<td>15</td>
<td>I wish we could raise milk prices, but even if they were - I’m not sure that keeping records is worth it.</td>
<td>0 -2 -3 -2</td>
</tr>
</tbody>
</table>

*(Para que los productores utilicen el sistema de M. Lecherro se les debe proveer de asesoramiento técnico.)*

*(No me da para asociarme a Mejoramiento Lechero.)*

*(Yo quiero usar el sistema de Mejoramiento Lecherro pero necesito ayuda para llevar los datos y entrarlos en la computadora.)*

*(Ojalá se pudieran aumentar los precios de la leche, pero aún así no estoy seguro que llevar registros valga la pena o reñite económica su costo.)*
<table>
<thead>
<tr>
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</thead>
<tbody>
<tr>
<td>16</td>
<td>The reason I have not participated in the project is because the price of milk is very low - I don’t have money to pay for the cost of the service.</td>
<td>-2 0 -2 -3</td>
</tr>
<tr>
<td></td>
<td><em>(La razón por la cual no me he asociado a Mejoramiento Lechero es porque los precios de la leche son muy bajos. No tengo plata para pagar el costo del servicio.)</em></td>
<td></td>
</tr>
<tr>
<td>17</td>
<td>I don’t like to be pressured to participate. It is my decision and no one else’s.</td>
<td>-1 -2 +4 -4</td>
</tr>
<tr>
<td></td>
<td><em>(No me gusta que me presionen para participar, es mi decisión y de nadie mas.)</em></td>
<td></td>
</tr>
<tr>
<td>18</td>
<td>If we want producers to value the use of production, reproduction, and genetic records, it is necessary to improve their income so they can pay for the technical assistance.</td>
<td>+1 +2 +1 -3</td>
</tr>
<tr>
<td></td>
<td><em>(Si se quiere que los productores valoricen el uso de registros productivos, reproductivos y genéticos, es necesario que se mejoren sus ingresos para que puedan pagar por el asesoramiento técnico.)</em></td>
<td></td>
</tr>
<tr>
<td>19</td>
<td>Milk prices are low because the international markets and the policies of the bigger countries keep them low.</td>
<td>-4 +1 +2 0</td>
</tr>
<tr>
<td></td>
<td><em>(Los precios de la leche son bajos, porque los mercados internacionales y las políticas de los grandes países los mantienen bajos.)</em></td>
<td></td>
</tr>
<tr>
<td>Number</td>
<td>Statement</td>
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</tr>
<tr>
<td>20</td>
<td>What is the point of improving a cow's genetic potential if there are other problems later, such as nutrition, that really limit the impact of the improvement?</td>
<td>0, +1, -1, -3</td>
</tr>
<tr>
<td>21</td>
<td>I don't see what the project can do to change the policies that determine the low prices of milk.</td>
<td>-1, 0, +3, 0</td>
</tr>
<tr>
<td>22</td>
<td>The function of the project is important, but it should also focus on other, more relevant problems, such as nutrition.</td>
<td>0, +2, -1, +2</td>
</tr>
<tr>
<td>23</td>
<td>I already belong to an dairy organization and it is difficult for me to be part of several different ones.</td>
<td>-2, -4, 0, -2</td>
</tr>
</tbody>
</table>
24 The genetic registry project has a very specific task; it cannot be dedicated to solve all the producer's problems so that they will participate.

(Mejoramiento Lechero tiene una tarea muy específica; no puede dedicarse a solucionar todos los problemas para que el productor pueda asociarse al sistema de registro.)

25 The only way for producers to participate more in the project is through the improvement of the entire technological process of the industry chain, so that the producers can become more competitive.

(La única forma para que los productores participen más en el sistema de registro de M. Lechero es mejorar todo el proceso tecnológico de la cadena agroindustrial, para que los productores sean más competitivos.)

26 If we could modify the international markets, milk prices would be more favorable to us.

(Si pudiéramos modificar los mercados internacionales, los precios de la leche serían más favorables para nosotros.)
<table>
<thead>
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</thead>
<tbody>
<tr>
<td>27</td>
<td>The project has not had many members because it has worked in an isolated way, separate from other local organizations.</td>
<td>+2 -1 0 -1</td>
</tr>
<tr>
<td></td>
<td><em>(Mejoramiento Lechero no ha tenido muchos socios porque ha trabajado aisladamente de otras organizaciones.)</em></td>
<td></td>
</tr>
<tr>
<td>28</td>
<td>I don’t know about the services that the dairy improvement project can provide me.</td>
<td>+2 -1 -1 0</td>
</tr>
<tr>
<td></td>
<td><em>(No estoy enterado de los servicios que me brindan en Mejoramiento Lechero.)</em></td>
<td></td>
</tr>
<tr>
<td>29</td>
<td>More producers would be using the record system if they were trained to collect and enter data in the computer.</td>
<td>+2 0 -4 +4</td>
</tr>
<tr>
<td></td>
<td><em>(Más productores utilizarían el sistema de registros de M. Lechero si estuvieran entrenados para recoger e ingresar los datos en la computadora.)</em></td>
<td></td>
</tr>
<tr>
<td>30</td>
<td>I am loyal to my organization that I work with; it provides all of the services I need.</td>
<td>-1 -1 +1 0</td>
</tr>
<tr>
<td></td>
<td><em>(Yo soy leal a la organización con la cual ya trabajo y me da todos los servicios que necesito.)</em></td>
<td></td>
</tr>
<tr>
<td>Number</td>
<td>Statement</td>
<td>Factor Scores</td>
</tr>
<tr>
<td>--------</td>
<td>---------------------------------------------------------------------------</td>
<td>---------------</td>
</tr>
<tr>
<td>31</td>
<td>I don’t see what the project can do to help increase low milk prices.</td>
<td>-2  -3  +2  -2</td>
</tr>
<tr>
<td></td>
<td>(No veo que el sistema de Mejoramiento Lechero pueda aportar para ayudar a mejorar el precio de la leche.)</td>
<td></td>
</tr>
<tr>
<td>32</td>
<td>I don’t believe milk prices are likely to increase, so I don’t think I will participate to keep records.</td>
<td>-3  -4  -2  0</td>
</tr>
<tr>
<td></td>
<td>(No creo que existan posibilidades de que los precios de la leche vayan a subir, así que no pienso asociarme a Mejoramiento Lechero para llevar registros.)</td>
<td></td>
</tr>
</tbody>
</table>
REFERENCES


