Attitudinal Variability Among Southern High Plains Cotton Producers Toward Integrated Crop/Livestock Systems

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Abstract

Sustainable agriculture is important for farmers nationwide, and especially farmers in the Texas Southern High Plains. Studies conducted in the Sustainable Agriculture Research and Education Program stress the need for sustainable agriculture; however, if agriculture is to move towards sustainability, sustainable practices must be adopted. Integrated crop/livestock systems were used as an indicator of sustainable behavior. Q methodology was utilized to discover the expected, unexpected, and diverse orientations towards sustainable agriculture systems. Fourteen cotton producers were interviewed to gain Q concourse statements. These statements were then put on Q cards and given to 23 cotton producers who were considered to be non-adopters of integrated systems. Varimax rotation yielded three factors. The first group, Forward Thinking Pragmatists, realized the need for sustainable agriculture systems, yet are hesitant to adopt due to skepticism of the economic implications. The second group, Optimistic Integrators, realized the need for sustainable agriculture systems, yet had not adopted because of a lack of education. The third group, Traditionalists, saw no future for sustainable agriculture. They are already sustainable in the fact they have switched from growing corn to growing cotton. Overall, research revealed optimism for future sustainable agriculture systems.
Introduction

Farmers around the United States as well as around the globe are becoming more and more interested in the concept of sustainable agriculture and are beginning to realize that agriculture’s future is at doubt as resources are diminishing. The Southern High Plains region with its immense agriculture is definitely a region where adoption of sustainable practices could produce solutions to diminishing resources. In 2002, the National Agricultural Statistics Service indicated that the Texas Southern High Plains produced approximately 3,253,000 bales of Upland cotton (USDA, 2002). Gross receipts for this cotton production totaled approximately $974,367,000, which is 7.7% of the total agricultural gross receipts for the state of Texas. With the Southern High Plains producing “over 20% of the U.S. cotton,” and with these figures, it is easily seen how important agriculture is to the Southern High Plain’s economy (Allen, 2002, p. 4).

Sustainable agriculture is a very popular topic; however, sustainability is not an easily definable term. “We are really just beginning to identify what might make a sustainable agriculture” (Horne & McDermott, 2001, p. 55). Since agriculture encompasses such a broad area, thousands of different definitions can be applied to sustainability in agriculture. Röling and Wagemakers (1998) contends that “precise and absolute definitions of sustainability, and therefore of sustainable agriculture are impossible” (p. 25). However elusive it’s definition, sustainable agriculture could quite possibly be the leading concept in the future of agriculture as “a cadre of agricultural researchers, educators, and farmers believe that the agricultural systems advocated by sustainable agriculture have great potential for addressing…negative impacts of conventional agriculture” (Agbaje, Martin, & Williams, 2001, p. 38). With sustainable agriculture’s growing popularity and necessity, several researchers have answered the call and have begun the development of sustainable technologies. Among these endeavors is a multi-disciplinary, multi-institutional sustainable agriculture integrated crop/livestock system lead by a team of researchers at Texas Tech University.

The integrated crop/livestock system was developed to offer an alternative to farmers from their cotton monoculture systems. The system utilizes a paddock system. One paddock consists of a perennial grass, W.W. B. Dahl Old World Bluestem, while the other paddock contains a rotation of rye/wheat/cotton on one year; and on alternating years, a rotation of wheat/cotton/fallow. Steers graze the bluestem grass as a primary source of forage, but are allowed to graze the small grain crops when available. The alternative system is compared to a monoculture cotton system. The alternative system was established in 1997 and uses 21% less water, 41% less nitrogen fertilizer, and is more profitable than the monoculture cotton comparison. An added advantage of the alternative system is it allows for multiple income streams (beef cattle, bluestem seed, and cotton).

Purpose and Objectives

The primary purpose of this research was to describe diverse, expected, and unexpected orientations of cotton producers in the Texas Southern High Plains toward the integrated crop/livestock system. As a means of accomplishing the purpose of the study,
an answer to the following question was sought: What are the points of consensus and differences of non-adopting cotton producer’s perspectives?

**Theoretical Base**

Although the university system is providing new and innovative research discoveries, with an awesome potential for application in current production settings, commonly there is a breakdown in the transfer of this knowledge from the researcher to the producer. Even with a plethora of knowledge with potential to benefit agriculture, research personnel have not had the focus of making this new knowledge practical to farmers’ current problems. Without adoption of sustainable practices supported or verified by research, in essence the research has little value and the producer, as well as the region, may miss out on an opportunity for possible sustainable alternatives. Gamon et al. (1994) summarized this concern very succinctly by stating that “the link between research and reality is still a tenuous one” (p. 38).

In understanding the current status of the integrated crop/livestock system, the Targeting Outcomes of Programs (TOP) model is used. The TOP model “focuses on outcomes in planning, implementing, and evaluating programs [and] is based on a hierarchy that integrates program evaluation within the program development process” (Rockwell & Bennett, n.d., p. 1). Concentrating on the program development side of the model, this research sought to understand the reactions of Texas Southern High Plains farmers toward these integrated systems. It was anticipated that attitudes of producers towards the integrated crop/livestock system would be revealed so that reactions might be known and program development could proceed along the TOP hierarchy.

In terms of program development, participation is one of the steps in the TOP model. Through the gathering of qualitative interview data and quantitative Q data, the researchers sought to have a deeper understanding of the diversity of attitudes of farmers in the region that would affect program participation. It was anticipated that this knowledge would allow the researchers to target specific client groups and better understand their reactions toward the alternative system.

With the transference of the integrated crop/livestock system still in the early adoption stages, it is important that researchers know how producers perceive the integrated crop/livestock system. With the attitudes and perceptions of producers known, program planners can more efficiently diffuse information in the future by targeting producer groups who may be more open to the adoption of sustainable practices.

**Methods/Procedures**

The design of this study involved the use of Q Methodology. Q Methodology (hereafter simply referred to as Q) involves the study of human subjectivity. “From the standpoint of Q, subjectivity is regarded simply as a person’s point of view on any matter of personal and/or social importance” (McKeown & Thomas, 1988, p. 7). Kramer, Hegedus, and Gravina (2003) add to the definition of subjectivity as “the self-referential
frame through which human beings define and express their world” (p. 42). In a way, Q serves as a measure of how a person sees their personal world.

Central to Q is concourse theory (Stephenson, 1978). “In Q, the flow of a communicability surrounding any topic is referred to as a concourse” (Brown, 1993, p. 94). Thus a concourse is drawn from any relevant discussion surrounding a certain issue or phenomenon. These thoughts surrounding an issue “...can be captured and recorded using either qualitative data gathering techniques (i.e., interviews), document review, or survey techniques” (Kramer et al., 2003, p. 42).

After a Q sample is drawn, a person is asked to rank them in an order of most like them or least like them (Q sorting), and it is from this sorting of statements that a number of perceptions occurring in reality appear (Brown, 1993). With the fact that the Q sorter is ranking the statements in terms of their point of view, subjectivity is being brought into the picture (Brown, 1993). Since there is “…no right or wrong way to provide my point of view about anything” subjectivity is present and can be measured to some extent (Brown, 1993, p. 94). “When people say I think that, or in my opinion, they are relaying something meaningful about personal experiences” (McKeown & Thomas, 1988, p. 12). The Q sample statements may be of opinion, but that opinion in the context of reality is what is seeking to be captured by the investigator.

“The major concern of Q Methodology is not with how many people believe such and such, but with why and how they believe what they do” (McKeown & Thomas, 1988, p. 45). Q may not give an accurate representation of the population, but it does provide an explanation for phenomenon that are currently occurring in reality.

In deriving a Q sample from the concourse, procedures implemented by Kramer et al. (2003) were followed. 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…” (p. 43). The two main effects deal with the pressures of adopting sustainable systems (that of economic and bio-physical/social) and philosophical orientation of the person (that of sustainable or individualistic). Through cross-multiplying, four cells determined which statements were pulled from the concourse to be used in the Q sample, and structure the Q sample. No assumption is made that the statements placed within respective cells measure or define, by any means, that cell. The development of the 2x2 matrix and placement of statements into those cells only served as a structure for developing the Q sample. The meaning that the researchers were seeking to find does not reside in the statements themselves, but rather in how the statements were patterned in the Q sort.

The Q sample was balanced in terms of each Q sorter having the equal opportunity to respond either positively or negatively to statements contained in each cell (Kramer et al., 2003). For example, within one cell, four statements were chosen that reflected a positive assertion while four statements were chosen that reflected disagreement with the positive assertion (Stephenson, 1975). The 32 Q sample statements were printed on laminated cards (with respective numbering on the back). Respondents were asked to
place the statements in an array that resembles a quasi-normal distribution. The array, seen in Figure 1 is often flatter than a normal distribution, but maintains properties of symmetry (Kramer et al., 2003). After the Q cards were sorted, the placement of the cards was recorded.

Most unlike me ←------------------------------------------Not-relevant------------------------------------------Most like me

Figure 1. Q Sort Array for the 32 Statement Sustainable Agriculture Sample.

Population and Sample

Q is not concerned with a large sample and is often utilized in single-case studies (McKeown & Thomas, 1988). This current study was a part of a larger study that included both producers and key program planners. It was not the attempt of Q to create a sample that was statistically representative of the greater population, therefore, random selection of producers that performed the Q sort was not a high priority. However, some structure was used in selecting participants for the Q sort. Attempts were made to perform sorts in varying geographical regions of the Southern High Plains. Attempts were also made to perform sorts with a varying age group of producers, and attempts were made to perform sorts with both medium-scale and large-scale farmers.

Ten producers who were considered adopters of integrated crop/livestock systems were interviewed to gain Q sample statements as well as four producers who were considered non-adopters of integrated systems. Twenty-three producers who were considered to be non-adopters of integrated crop/livestock systems were chosen as a sample for the Q card sorting.

Data Collection and Analysis

Data collection occurred in two parts: 1. collection of qualitative interview data, 2. collection of Q sort data. Producer interviews were conducted in the spring and summer of 2003. A process of snowballing was used to obtain names for those interviewed, whereby each interview participant was asked for names of producers that they knew were either adopters or non-adopters of the system. Interviews were not rigorously structured by the interview schedule. Rather, the schedule served as a guide for interviews. Interview data were recorded in the form of field notes then transcribed to a word processing program.
After a concourse was developed and Q sample statements were placed on cards, Q sort data were gathered beginning in July 2003. Sorting data were collected from 23 producers considered to be non-adopters of the integrated crop/livestock system. In Q Methodology, persons, not traits are correlated.

Primary data analysis was performed with the assistance of PCQ Analysis Software for Q- Technique for Windows (Academic Edition, version 1.4). Centroids were extracted based on the number of factors designated by the researcher. PCQ allowed the extraction of factors from one factor to nine factors.

Following factor extraction, a rotation of those factors was performed through PCQ. Several rotational schemes were attempted. Each rotational scheme was undertaken with the number of iterations set at 200, and the significant level set at .46 (as set by the standard error times 2.5, with n=the number of statements). This scheme was undertaken with several different factor extraction values (Brown, 1993). It was determined that a three factor Varimax rotation provided for the best statistical analysis of the data.

A correlation matrix for the 34 different sorts was generated with associated factor loadings based on the three factor extraction scheme. Following Varimax rotation, factor loadings for each of the 34 individuals was reported. Eigenvalues for each of the three factors were reported along with the percent variance accounted for by each factor. Totals for eigenvalues and percent variance were also reported.

Results/Findings

Following the Varimax rotation, 28 of the 34 sorts (both producers and program planners) were accounted for in one of the three factors that were extracted. This loading of 28 of 34 total sorts gave a loading percentage of 82. Reliabilities for Factors A, B, and C were .98, .97, and .94, respectively. One sort was confounded in that it loaded in more than one factor and five sorts were not significant in that they did not load in any of the three factors.

Factor A and Factor B had a correlation of -.28, Factor A and Factor C had a correlation of -.46, and Factor B and Factor C had a correlation of -.11. Factors A and C had a significant correlation between each other, thus meaning there was some overlap in the mind-sets and thinking of those loading on Factor A and those loading on Factor C. Other correlations between factors were deemed insignificant.

The Forward Thinking Pragmatists (Factor A) were characteristic of producers with a strong desire for alternatives that are economically and environmentally sustainable. Farmers in this group did not place statements containing concepts of the sustainable crop/livestock system very high in the sort array. Although these producers were concerned about conservation and sustainability issues, they did not perceive that the sustainable crop/livestock system was economically viable. They also felt somewhat trapped by current farm policies. As a group, they were discouraged that governmental programs and not strong commodity markets had to be factored into their management
decisions.

The Optimistic Integrators (Factor B) were interested in integration and were very concerned with water and conservation issues. They were very open to diversification as they valued the multiple income streams that would come with diversification. These producers had a very open mind towards the sustainable integrated crop/livestock system as an alternative to their current system. These producers desired to cultivate less and place more emphasis on soil health, rather than mass production.

The Traditionalists (Factor C) clearly identified themselves as cotton farmers. They valued technology that has allowed them to continue growing cotton on a larger scale. They saw no need for alternatives; consequently, they were not as concerned with water and environmental issues as were farmers in the other two groups. They did not feel restricted by diminishing water resources and were optimistic that they would be able to pass their operations on to future generations.

**Educational Importance, Implications, and Application**

In terms of consensus, both the Forward-Thinking Pragmatists and the Traditionalists seemed to receive their identify and self-worth from being cotton farmers. This phenomenon is deeply rooted in their culture. Both the Forward-Thinking Pragmatists and Optimistic Integrators were open to including livestock production into their farming systems. A final point of consensus was that all groups could envision the future of the region with the continuing and increased constraints on natural resources. In terms of points of difference, each group had a different attitude toward integrated systems. The Forward Thinking Pragmatists exhibited a healthy skepticism towards the economic viability of integrated systems. The Optimistic Integrators, valued the added diversity of the system and were ready to adopt. The Traditionalists, did not want to change and do not see the integrated crop/livestock system as something that they would like to incorporate into their farming systems.

In terms of educational importance, a deeper understanding and appreciation for the diversity of livelihood systems and differing typologies of farmers in the region is the first step in planning for the diffusion of the system. A proposed strategy is to use the systems of early adopting Optimistic Integrators as on-farm demonstrations for non-adopters to observe (i.e., Traditionalists and Forward-Thinking Pragmatists), with economics and water use closely monitored and reported. Additionally, outreach efforts should include education on cattle management and the infrastructure components needed in adopting an integrated crop/livestock system.

**References**


