FACTORS AFFECTING OKLAHOMA CHEROKEE FARMERS' USE OF TRADITIONAL AGRICULTURAL PRACTICES: SOCIOECONOMICS, THEORY OF PLANNED BEHAVIOR AND RESOURCE ACCESS

By

MITAL SHARAD SHAH

A THESIS PRESENTED TO THE GRADUATE SCHOOL
OF THE UNIVERSITY OF FLORIDA IN PARTIAL FULFILLMENT
OF THE REQUIREMENTS FOR THE DEGREE OF
MASTER OF SCIENCE

UNIVERSITY OF FLORIDA

2006

This document is dedicated to seekers of knowledge and Cherokee farmers.

ACKNOWLEDGMENTS

I would like to thank my partner, Jacob, and my family for being supportive of my endeavors as a graduate student. I will always be thankful for the patience and participation of the Cherokee farmers in this study and the individuals who helped me develop the instruments for this research – they made this study possible. I would like to also thank Cherokee Nation's Natural Resources Department for all the help in the field and the new found friendships. I would like to thank my thesis chair, Dr. M.E. Swisher, for her hard work, availability, discipline and guidance as an academic mentor. I would like to thank my committee members, Dr. Hugh Popenoe and Dr. Richard Allen, for their patience, wisdom and insight. Lastly, I would like to thank Meisha Wade and Cathy Ritchie from the School of Natural Resources and Environment.

TABLE OF CONTENTS

APPENDIX

LIST OF TABLES

LIST OF FIGURES

Abstract of Thesis Presented to the Graduate School
of the University of Florida in Partial Fulfillment of the
Requirements for the Degree of Master of Science

FACTORS AFFECTING OKLAHOMA CHEROKEE FARMERS' USE OF TRADITIONAL AGRICULTURAL PRACTICES: SOCIOECONOMICS, THEORY OF PLANNED BEHAVIOR AND RESOURCE ACCESS
By

Mital Sharad Shah

December 2006

Chair: Marilyn E. Swisher
Major Department: Interdisciplinary Ecology

Many individuals discuss the importance of maintaining traditional agricultural practices. Some argue that they may contribute cultural and biodiversity. It is important to understand the factors that can influence farmers to consciously maintain these behaviors when perceived direct benefits may not accrue from using them. The case study took place in Cherokee Nation's fourteen county jurisdictions in northeast Oklahoma. The purpose of the study was to investigate how socioeconomic characteristics, the theory of planned behavior and access to resources influence the degree to which Cherokee farmers use traditional agricultural practices (TAP). Thirty-four Cherokee farmers participated in the study. Instruments were administered through self-completion questionnaires and interviews.

Farmers were placed into two user groups based on their use of TAP. Groups were compared to each other based on the measured predictor variables. Results show that high TAP users tend to be small scale farmers or home gardeners. They sometimes identify

themselves as traditional farmers and have a positive attitude towards using traditional farming. Social pressure urges them to use TAP. Their confidence, perceived barriers and access to resources do not influence their decision-making to use TAP. The research indicates that these farmers' motivations to use TAP are associated with indirect benefits such as preservation of cultural heritage and environmental conservation. Low TAP users tend to be large scale commercial farmers. They have a less positive or negative view towards traditional farming and identify themselves as modern farmers or as both traditional and modern farmers. The research indicates that these farmers' motivation to use TAP less than the high TAP user group is associated with the desire to maximize efficiency and direct economic benefits. Based on the logistic regression, socioeconomic characteristics were the best predictors of farmers' use of TAP over theory of planned behavior and resource access. Future research should explore additional factors such as connection to land, biophysical environment and degree of isolation to better understand Cherokee farmer behavior. Researchers still need to develop a more comprehensive and predictive behavior model.

CHAPTER 1
INTRODUCTION

Maintenance of Traditional Agricultural Practices

Many individuals discuss the importance of maintaining traditional agricultural practices. Some argue that using these practices promote biodiversity and cultural diversity. Berkes (1999) defines traditional agricultural practices (TAP) as locally adapted agroecological management behaviors. Farmers transmit them from one generation to another. He believes that these practices encourage biodiversity and offer insight into biological species, systems analysis and resource management (Berkes, 1999). Alteri (2001) and Food and Agriculture Organization of the United Nations (2004) depict the maintenance of TAP as encouraging stability of production, diversity in the diet and reduced insect and disease incidence by increasing on-farm biodiversity . Some researchers encourage examining and researching indigenous farmers' use of TAP because they may offer solutions previously overlooked to problems related to ecological degradation and food security.

Gliessman describes these practices as contributing to the conservation of indigenous knowledge and culture (2003). Further, anthropological research demonstrates a relationship between loss of biodiversity and cultural diversity or linguistic diversity (Harmon, 1996) and suggests that maintaining biocultural diversity is important. Maffi (2005) says "It was increasingly apparent that the variety of cultural knowledges, beliefs, and practices developed by human societies…are being placed at risk by the socioeconomic and political processes threatening the integrity and the very

survival of indigenous and local cultures and of the environments in which they live—and that this massive and rapid change has profound implications for the maintenance of life on earth" (p.604). Further, Maffi (2005) highlights the importance of examining the relation between these components to better understand "the pressures it is undergoing, and the possible actions to ensure its perpetuation" (p. 604).

However, the use of some traditional agricultural practices (TAP), such as swidden agriculture, are controversial in relation to their effects of on-farm and off-farm environments and their potential benefits over other agricultural systems. Fujisaka, Hurtado and Uribe (1996) note that "slash-and-burn agricultural systems have received a great deal of attention given their observed or hypothesized role in tropical deforestation, biodiversity loss, and contribution to global warming" (151). Other practices, such as ancient agricultural activities in Lebanon, are associated with contributing to deforestation of cedar trees (Talhouk, Zurayk & Khuri, 2001).

Interestingly, most of the benefits associated with using TAP are indirect and future-oriented. Maintaining traditional agricultural practices may not provide direct benefits to the individual, compared to other types of agricultural systems, such as conventional farming. What then influences farmers to maintain or reject traditional beliefs and values exhibited by using traditional agricultural practices? It is important to understand the factors that can influence farmers to consciously maintain these behaviors when perceived direct benefits may not accrue from using them.

Theoretical Foundation

Many theories examine decision-making and its influence on the adoption or persistence of behaviors with proven direct benefits, such as exercising, breastfeeding or increasing food yields. The rational actor model within economic theory suggests that

farmers engage in particular behaviors by rationally determining the costs and benefits associated with using those behaviors. Sociologists examine how access to different mass media and interpersonal resources can influence the adoption or rejection of new farming technologies. Psychology's theory of planned behavior examines how self-efficacy, or confidence, and perceived facilitator and inhibitors, attitudes, and social influences predict the adoption or persistence of certain behavior.

Although these theories have predicted behavior with direct benefits, no research examines how or if these theories can explain rational decisions to adopt or maintain behaviors that do not exhibit observable direct benefits. While these theories may also explain the latter type of decisions, it is also possible they will not do so. Understanding the factors that influence farmers' decisions to use traditional practices may provide a deeper understanding of why people elect to maintain many kinds of behaviors that do not seem to provide direct benefits to them.

Cherokee and American Indian Farmers

Some American Indians engage in individual and community level action to preserve and revitalize the use of traditional agricultural practices. This is evident by the presence of organizations such as Traditional American Indian Farmers Association, Native Seed/Search, and Tohono O'Odham Community Action. Some researchers are assessing the relationship between farming and culture, the types of traditional agricultural practices being used by American Indian farmers and the sustainability of these practices.

The number of principal farm operators is declining among most ethnic groups in the U.S.A. However, American Indians are among the few ethnic groups that show an increase in the number of principal operators. In 1997, there was approximately 13,000

American Indian Principal Operators, while in 2002 this number increased by 15% to 15,000 (United States Department of Agriculture, 2002, p. 1). It is important to understand this growing farming population's decision-making process and the factors that motivate them to use specific types of farming practices.

I examine theories that try to understand adoption behavior and decision-making with Cherokee farmers in northeastern Oklahoma. Historically the Cherokee were farmers and used definable and specific TAP. Today, the Cherokees use a wide variety of agricultural practices. I will examine how well the theories described above explain farmers' persistent use of TAP within the context of Cherokee farming.

Purpose and Objectives of Study

This research explores theories that may explain why Cherokee farmers choose to use certain agricultural technologies. I draw upon four theoretical models from the disciplines of sociology, psychology, and economics. This research explores psychosocial variables drawn from the theory of planned behavior and self-identity theory. I use the theory of planned behavior (Ajzen, 1991) to determine how perceived behavior controls, subjective norms and attitudes towards traditional farming effect Cherokee farmers' decisions to use TAP. I use self-identity theory to determine how farmers orient themselves as farmers. I use the diffusion of innovation model (Rogers, 1995) to determine how traditional and non-traditional communication networks affect Indian farmers' decisions to use traditional agricultural practices. Lastly, I test the classical economic model by measuring socioeconomic characteristics to determine if this model, compared to the other theories just discussed, is the strongest predictor of American Indian farmers' use of TAP.

Research Questions

The broader research questions of this study include:

1. What motivates indigenous people to use traditional agricultural practices (TAP)?

2. What factors influence American Indian farmers' decision-making to use or not use traditional agricultural practices (TAP)?

Definitions

- Attitude: a person's judgment that performing the behavior is good or bad

- Control Beliefs: beliefs about the presence of factors that may facilitate or impede performance of a behavior

- Diffusion of Innovation: process by which new ideas are communicated through certain channels over time among the members of a social system

- Farmer: An individual who actively cultivates land for food production. This definition is not based on farm/garden size, amount of time spent cultivating, or amount of sales related to production. This definition is inclusive of cash crop farmers and subsistence farmers or gardeners

- Perceived Behavioral Control: an individual's perceived ease or difficulty in performing a specific behavior

- Self-efficacy: an individual's confidence about their capabilities to produce effects

- Subjective Norms: perceived social pressures that the individual believes are exerted on him/her to perform a specific behavior.

- Traditional Agricultural Practices (TAP) : agroecological management behaviors that a farmer performs which are transmitted from one generation to another; agricultural innovations which were not developed during and after the Green Revolution

CHAPTER 2
LITERATURE REVIEW

Traditional and Conventional Agricultural Practices

Alteri (2001) defines traditional agriculture as "an indigenous form of farming, result of the co-evolution of local social and environmental systems and that exhibit a high level of ecological rationale expressed through the intensive use of local knowledge and natural resources, including the management of agrobiodiversity in the form of diversified agricultural systems" (para. 1). However, traditional agricultural practices are not definable as a specific set of practices common to all indigenous or local communities.

The question "what is traditional" has been a topic of debate among American Indians, anthropologists, and national and international governments and agencies for decades. According to Mauze, some people argue that traditional is based on beliefs, values and practices that have been used since pre-contact. Others consider that "traditional encompasses both continuity and change" (Mauze, 1997, p.7). This "invention of tradition" recognizes cultures as dynamic, adaptive and changing as opposed to static (Mauze, 1997, p.7). There is no consensus about the definition of traditional within and among American Indian cultures and sensitivities exist between different cultures toward the use of this term (Nagel, 1996).

The Cherokee historically were a farming people. Various secondary sources document pre-contact agricultural activities. The Cherokee used a definable set of agricultural practices called three sisters farming. Three sisters farming is a form of

companion planting where different varieties of corn, bean and squash are planted closely together. This often entails building a mound with the soil and planting the three types of plants together as a cluster on the mound (or on several different mounds). This type of agriculture was and is used by many agriculture-oriented Indian communities throughout the U.S. in various ecosystems (arid to deciduous forest). Some communities make modifications with irrigation methods to adapt to different climate regions. The use of these three food crops has historically carried cultural and religious significance for many Indian agricultural communities. This is especially true for those who have relied upon these crops as their major source of food resources.

Three-sisters farming was historically traditional agricultural practices (TAP) used by the Cherokee. However, as discussed above, it is difficult to define traditional agriculture today within the context of specific practices due to adaptations over time. For the purpose of the study, traditional agricultural practices are measured by what I perceive them to not be, in contrast to practices that have developed in the post WWII period. These conventional agricultural practices are clearly identifiable. I therefore defined conventional agricultural practices and allowed study participants to reply to all questions based on the individual's definition of TAP.

Conventional agriculture grew out of the "Green Revolution." The Green Revolution started in 1960's. The technological products and advancements that arose from this revolution are used today by many farmers. They changed how most agricultural production systems function. An agricultural production system that primarily uses some or all components of the Green Revolution's technological introductions is now considered a conventional agricultural production system. Innovations associated with conventional agriculture include the mechanization or the

development of new agricultural machines, such as combines, tractors, thresher, and the development of high yielding seed and plant varieties. Other innovations include synthetic fertilizers, pesticides, herbicides and insecticides (DeWalt & Barkin, 1987; Freed & Freed, 2002, p.20).

The aim of the Green Revolution was to reduce food shortages by increasing agricultural productivity through the introduction of new technologies (Freed & Freed, 2002). Many policy makers and economists supported the revolution on the basis of the high-payoff input model. It surmises that " the key to transforming a traditional agricultural sector into a productive source of economic growth was the investment designed to make modern, high-payoff inputs available to farmers….[farmers] were viewed as rational, efficient resource allocators" (Ruttan, 1998, p.159). The high-input model stresses the need for agricultural research and human capital formation. The Green Revolution between the 1960s and 1980s increased grain production and commercialization of agriculture. Food production output per acre and farmer income increased (Mellor, 1998; Staaz & Eicher, 1998; Freed & Freed, 2002). Conventional agriculture helped people become less reliant on food imports in many countries, such as India and China (Mellor, 1998).

Today, we are in the post-green revolution era. Some farmer and researchers are seeking alternative ways to manage agricultural systems that reduce environmental degradation. Some of these alternative innovations and management techniques include the use of biotechnology to develop new plant varieties, increasing farmer knowledge about current technologies and the use of them, integrated pest management, conservation tillage and reducing external chemical inputs (Morris & Byerlee, 1998; Rasul & Thapa, 2004; Jordan, 2004). This is evident in some parts of Asia where some

farmers are cultivating new, high yield, modern varieties with the help of improved germplasms and using new resources and conservation management techniques, such as conservation tillage (Gollin, Morris & Byerlee, 2005).

Historical Context of Cherokee Agriculture

This context section provides a historical background about Cherokee farmers. Overall, the history shows that the Cherokee use a variety of agricultural practices. Various secondary data sources associate different levels of acculturation and socioeconomic indicators with the types of agriculture practices they use. This makes the Cherokee Nation an appropriate site selection for the research.

I have separated the context section into five subsections, based on major voluntary and involuntary relocation and resettlements of the now Western Band of Cherokees. Political ecologists such as Cernea and Scudder argue that changes in agricultural practices of a community may result from relocation and associated physiological, sociocultural and psychological stresses (Scudder, 1982). I draw upon the political ecology perspective primarily to help frame the historical context of modern Cherokee agriculture.

Pre-contact Conditions: Prior to 1690

Cherokee settlements were in the mountainous southern Appalachian highland region of what is now the U.S.A. prior to contact with the Europeans in 1690. This area includes parts of the states of Georgia, Alabama, South Carolina, North Carolina, Tennessee, Kentucky and Virginia. It covered an estimated 40,000 square miles (James Mooney's History, 1891-1900, p.14). This area contained approximately 50 to 60 towns of 250 to 300 people each and a total population of approximately 22,000 (Goodwin, 1977, p. 46- 47). Towns or villages were located near rivers for defense and to

accommodate religious and subsistence activities. The villages migrated periodically due to flooding, drought, disease and food shortage.

Land-tenure and utilization was a village concern, not an individual matter based on private ownership. The Cherokees were horticulturalists. They supplemented cultivation with hunting and gathering. Women were the primary farmers and gathered wild resources, while men helped prepare fields and hunted (Gearing, 1958).

Each Cherokee family cultivated two to three plots. These consisted of individual gardens near the home, a communal garden in the village and a communal garden outside the village. The individual garden plots next to the homes contained medicinal plants so that the families did not always have to gather medicine and herbs. Each family had to work in communal gardens to receive part of the harvest. Villages cultivated outside of the walled villages when settlements were large and gardens in the village did not supply enough food for village members (Employee of Cherokee Heritage Center, personal communications, September, 2005).

Food plants included cultivated plants and gathered wild vegetables, fruits, nuts, seeds and herbs. The Cherokee supplemented their diet with meat acquired by hunting and fishing. Agriculture accounted for 40-60% of food resources, while hunting and gathering accounted for the rest (Goodwin, 1977, p.55). Corn or maize served as the Cherokee's primary food crop, as it did for many southeastern Indian tribes. The planting, harvesting and consumption of corn had ceremonial and religious significance. Other commonly cultivated crops included varieties of beans, squash and sunflowers (Goodwin, 1977).

Interplanting corn, bean and squash (three sisters farming) was common. They mounded soil and planted crops in the mound. Corn was planted in the middle of the

mound. Beans were planted at the base of the corn and wound around the corn stalk. Squash was also planted at the base of the corn plant and covered the ground around the plants. This allowed the Cherokee to plant crops in the same spot for a long period of time without depleting the soil of nutrients (Gina, personal communications, September, 2005). Irrigation methods included hand watering and ditch irrigation. The type of irrigation method used depended on proximity to the water source. Yields were high and labor requirements low. Farm implements included: wooden digging sticks, scapulas, blade and hoes (Goodwin, 1977).

Gathering occurred when resources were available. Gathered resources included wild vegetables, such as amaranth, fruits, such as blueberries and strawberries, and nuts and seeds, such as hickory, chestnut and walnuts. Hunting took place year round. White tailed deer and elk were caught by traps, snags, drives, and stalking. Cherokees also hunted birds and other small game, such as rabbits and squirrels, with bow and arrows, cane blowguns and traps. Fish were caught with dipping nets and grapevine drags (Goodwin, 1977).

Contact to American Revolution: 1690-1775

Changes in land use and agricultural practices occurred soon after initial contact with European explorers and frontiersmen, beginning sometime between 1590 -1690. The dominant forces affecting changes in agricultural practices were associated with the introduction of new technologies and the gradual acceptance of the European socioeconomic system and values. The land controlled by the Cherokees decreased due to claims made by European settlers (Goodwin, 1977).

Europeans and Indians established trade routes in the early 1700s, which greatly altered Cherokee life. The Europeans introduced the Cherokees to innovations such as

the plow, domesticated livestock, metal tools and guns through trade. They commonly traded guns, cloth and rum with Cherokees for agricultural products, minerals and deerskin. Cherokees adopted new crops, such as peaches, apples, onions, watermelons, rice, okra, cabbage, and potatoes. Cotton was also introduced during this period, but was not widely cultivated. Tools such as the plow and iron hoe and axe were also introduced, but they were rejected by village chiefs and their use was limited during this period. Goodwin (1977) states that the use of these tools was rejected because chiefs thought that they would affect the balance of nature and reduce the number of people needed for cultivation and gathering.

Starting in the 1690s, missionaries encouraged Cherokees to hunt less game and cultivate more land. This was a mechanism used by missionaries to reduce the amount of land needed to hunt, which would reduce the amount of total land needed by Cherokees for food resources. They urged the "Cherokees to abandon their ancient ways, including hunting, and instead, 'to employ themselves in tilling the ground'" (Knepler, 1942, p.60). "Apparently, the colonial and federal governments had adopted a policy designed to change Indian values concerning land tenure, so that they might be satisfied with less" (Goodwin, 1977, p.141). The missionaries focused on teaching Cherokees to become more reliant on European agricultural techniques. Further, many European farmers believed that Indians were not adequately using their land because they under cultivated it or did not cultivate it at all. This was considered a waste. This encouraged farmers and missionaries to teach Cherokees to farm the European way, which they believed made the land more productive (Hurt, 1987).

As a result, more pronounced changes occurred in hunting patterns. The introduction of guns and horses greatly contributed to this change. Horses became the

primary mode of transportation for hunting. Men hunted in groups by foot before contact. Now hunting became an individual activity. Many hunted not only for subsistence but also to make a profit through trade. Animals were over-hunted and game populations decreased drastically. By 1720 many Cherokees raised European domesticated animals, such as hogs, chickens and cattle, to offset the deficit in game. Overgrazing by livestock was common and resulted in soil deterioration (Hurt, 1987).

Warfare broke out soon after trading began between the Europeans and Cherokees. This was primarily due to maltreatment of Cherokee people and land disputes. Some Cherokee settlements were destroyed and the population declined. European diseases were prevalent and a small-pox epidemic in the late 1730's further contributed to a decline in the Cherokee population. The estimated Cherokee population by 1735 was 17,000, but by 1758 the population was reduced to approximately 7,500 (Goodwin, 1977, p.107). The population recovered by the time of the American Revolution to approximately 16,000 (Goodwin, 1977, p.117).

Conversion of forest areas into large tracts of open land used for cultivation accompanied the expansion of European settlements. A decrease in territorial lands made it necessary for Cherokees to use techniques that maximized development of agricultural resources. Cherokees abandoned or relinquished large tracts of land and moved into marginal areas less desired by Europeans as encroachment continued. There was a reduction in the food supply and agricultural techniques previously used were not as effective in fulfilling the village needs in these marginal areas.

Villages were autonomously governed during pre-contact period. After contact, many villages combined as allies for protection and a state-like system of government developed among these towns. Eventually, Cherokee settlements started to resemble

colonial settlements. Wide-spaced homes replaced clustered homes. Homesteads with log cabins became common. Introduction of commercial trade, slaves and fur led to the further dispersion of pre-contact town clusters. The Cherokees began to look to European agricultural practices to maintain economic viability when the fur trade declined in the 1750s. This meant that larger amounts of arable land were sought after and more intensive agricultural practices were used. Families more commonly cultivated individual and private plots and the communal form of farming and ownership diminished. Some families had plantations by the end of this period. Woodlands adjacent to the settlements continued to be an important source of fuel and game. This area served as forage area for newly introduced domesticated livestock. They fenced gardens and farms near the home to keep livestock out of them (Goodwin, 1977).

Overall, a sedentary, intensive form of land-use and private ownership began to replace the pre-contact communal ownership and cultivation of land, hunting and gathering activities. Innovations introduced by the Europeans included metal tools and equipment, new domesticated plant varieties, animal husbandry, guns for hunting and warfare, private land ownership and sedentary agriculture. When the American Revolution began Cherokee's used a variety of agricultural practices ranging from small-scale communal farming to large-scale individually based intensive farming.

American Revolution to Removal: 1775- 1838

The new American government forced Cherokees to cede their lands after the American Revolution. Indians continued to lose lands to American farmers. After the Constitutions creation in 1789, the Indian Intercourse Act in 1790 was passed to help regulate and protect the purchase of Indian lands by treaties. However, the federal

government did not have the resources to enforce the law and keep American farmers from taking Indian land illegally (Hurt, 1987).

The Cherokee's signed the *Treaty of Peace and Friendship* with the United States of America in 1791. One of the aims of the treaty was to lead the Cherokees "to greater deal of civilization, and to become herdsmen and cultivators, instead of remaining in a state of hunters" (Kappler, 1904, Article 14). The U.S. also promised to assist the Cherokee Nation with implements to advance animal husbandry and agriculture. Cherokees began using the plow and associated tools to increase crop yields (Perdue, 1996).

Iron tools such as hoes, axes, scythes and plows were too costly to use before this period. Now Cherokees used these tools more commonly (James Mooney, 1900). Many Cherokees learned how to use introduced farm implements and relied upon them for agriculture with the help of the U.S.. Draft animals allowed them to use large, heavy tools to clear difficult terrain, such as mountainous and heavy vegetation. The Cherokees began using the plow and could now cultivate introduced grain crops such as wheat, barley and rye.

Beginning in this period a distinction was made between different Cherokees and their agricultural activities. One group became more acculturated into American society. These Cherokees were sometimes characterized as mix-bloods, wealthier Cherokees or assimilated Cherokees. They were characterized as having plantations and engaging in large-scale commercial production. The other group was sometimes characterized as poorer, full-bloods or less assimilated. Their agriculture was often described as small scale and subsistence based. In later periods it is difficult to determine if there is an overlap between these two distinctive groups and how mutually exclusive they are.

However, the terminology is used throughout other periods to characterize the two groups and is used in various texts. With that said, those who developed commercial operations soon became intensive agriculturalists, cultivated large tracts of land and became wealthy plantation holders. They cultivated cotton, wheat and barley and adopted the culture of the southern aristocracy, which included slave ownership (Graebner, 1945). Some Cherokees who engaged in subsistence activities farmed communally, but it was becoming less common.

From 1800 to 1820 the Cherokees adopted many additional innovations such as the Euro-American education system, literacy and Christianity. U.S.'s republican form of government was also adopted as the political structure of Cherokee Nation (Wahrhaftig, 1978). Further, Malone cited by Goodwin (1977) states "by the 1830's, the Cherokees had become a nation of farmers, with 2,700 families, or 93% of the population, managing their own farms and tending to thousands of cattle, swine, horses" (p. 140).

In 1819, Congress created the Civilization Fund which aimed to civilize Indians through farming. Numerous schools run by Christian churches began to offer education to Indian males and females to help them learn tasks to integrate them into society. Males were taught to farm and maintain livestock while women were taught to weave, spin and cook (Hurt, 1987).

Tensions over land increased between American settlers and Cherokees. Thomas Jefferson aimed to create Indian policies to assimilate Indians into American culture through farming during his presidency, beginning in 1801 (Perdue, 1996). Jefferson hoped to reduce Indian land holdings, which would allow more land to become available for white settlers. He also hoped that eventually the Indians would move west. Hurt cites Esarey "To promote this disposition to exchange lands which they have to spare and we

want for necessaries…we shall push our trading houses, and be glad to see then good and influential individuals among them run in debts…they will become willing to lop [debt] them off by a cession of lands….they will in time either incorporate with us as citizens of the United States or remove beyond the Mississippi" (Hurt, 1987, p. 86).

The U.S. government encouraged land allotment through treaties with Cherokee in 1817 and 1819. The allotments granted the heads of the household 640 acres if he/she lived on the land and cultivated it. This allowed the American government to determine which and how much land a household could receive. Further, it encouraged assimilation through farming and private ownership, as opposed to communal land ownership and farming. The allotment reduced Indian land holdings because not all land was under cultivation. In total, Indians of the southeast lost 80 to 90% of their total land holdings (Hurt, 1987, p.93-94).

Americans encouraged Indians to emigrate to lands west of the Mississippi during the 1820s. Numerous Supreme Court cases, such as Cherokee Nation vs. Georgia in 1830 and Worchester vs. Georgia in 1831, dealt with issues related to land ownership by Indians and state governments (Hurt, 1987, p.91). Some Cherokees voluntarily moved in the 1820s and 1830s to Indian Territory in what are now parts of the states of Oklahoma, Arkansas and Kansas to avoid additional conflict with Americans. Many of them faced economic hardship initially, but were able to reestablish farm operations. Many of these Cherokees were the wealthier, more acculturated farmers. By 1837, these Cherokees were considered the most advanced Indian farmers in the west and had between 1,000-1,100 farms (Graebner, 1945, p.234). Many other Cherokees moved farther south into Georgia. Some were rich plantation holders with slaves, while others remained subsistence farmers. The subsistence farmers were sometimes called

traditionalist because they refused to adopt all the new introduced innovations (Perdue, 1991).

Heated conflict ensued between the American and Indian cultures in the east. Settlers forcefully and "lawfully" took lands owned by Cherokees. Americans destroyed Cherokee agricultural lands to motivate them to move west. Eventually those who did not voluntarily move to Indian Territory were forced to move there in 1838 as a result of the signing of the Treaty of New Echota in 1835 (Hurt, 1987). The treaty stated that the United States would purchase all land owned by the Cherokee Nation east of the Mississippi for five million dollars. The signing of the treaty was highly contentious and not all Cherokee leaders were present during the signing or willing to move. Thus, many Cherokees were forced to move in large groups during the winter of 1838 in dispatchments of 1,000 people each after being held in prisoner camps. The path they traveled is known as the "Trail of Tears" (Wahrhaftig, 1966).

Overall, tensions increased between Cherokees and white settlers over land holdings. This conflict eventually led to the emigration of many Cherokee to Indian Territory. Numerous policies were passed to encourage assimilation through farming. A distinction became evident between the lifestyle and agricultural activities of the subsistence and commercial farmers. Communal land ownership and farming were being replaced by private land ownership and family run farms. The division of labor changed from farming as being a female oriented activity to that of a male activity. Farming became less of a subsistence activity and more cash and commercial oriented. This was due to the introduction of numerous farm implements, the wide use of metal tools, cultivation of introduced plant varieties, such as cotton, and education programs.

Removal to Statehood: 1838 – 1907

The effects of the removal were devastating. Approximately ¼ of the Cherokees that emigrated west in 1838 died due to starvation, disease, and cold weather during the approximately 1,000 mile journey. Those who moved west to Indian Territory are now identified as the Western Band of Cherokee Nation. Those Cherokees who remained east during the removal consisted of a small group of armed individuals who resisted removal and hid in the mountains of North Carolina. They were eventually recognized as the Eastern Band of Cherokee Nation.

The western Cherokees began to rebuild their life within a foreign temperate terrain of the Ozark Mountains in what are now parts of Oklahoma, Arkansas and Kansas. Agriculture was still very much a part of Cherokee life during this time. Some families relied on subsistence communal farming. Others cultivated large tracts of land with cash crops such as cotton. The first wave of resettlement took place before the signing of the *Treaty of New Echota*. These resettlers consisted primarily of mixed bloods that had strong European values and plantations in the eastern U.S. They colonized the best agricultural lands in Indian Territory and cultivated cash crops.

The Cherokee that emigrated in 1838 cultivated more marginal lands, because the best lands were already claimed. However, compared to many of the other eastern tribes that moved to Indian Territory, such as the Seminoles and Choctaw, they had more fertile land to cultivate and were more successful at rebuilding a life with farming. Land ownership consisted of private and communal ownership. As in the previous period, two types of agricultural systems developed in Oklahoma among the Cherokee. They consisted of subsistence farming and plantation-style, specialized commercial production

operations (Employee of Cherokee Nation's Facility Management, personal communications, August, 2005; Nall, 1977).

By the 1840s the Cherokees were making progress in intensive agriculture in eastern Oklahoma. Cherokee farmers grew potatoes, beans and peas and raised livestock, such as cattle and hogs. Missionaries and federal farm agents provided agricultural education and farm implements to only male farmers (Nall, 1977). For large scale, wealthier farmers, implements used included mowers, reapers and threshers. The wealthier had slaves, who cultivated the fields. They also had large plantations, gardens and fruit orchards, which allowed them to be self-sufficient (Graebner, 1945). Cotton gins and grist mills were also present. Previous to the 1840's many of the Cherokee farms in the west, large or small scale, used implements such as iron plows, axes, hoes, chisels and wedges (Graebner, 1945). Those Cherokees who were poorer and did not have slaves were described as having small garden plots (three to ten acres) and cultivated purely for subsistence. Corn was the primary cultivated crop. Other crops commonly cultivated included beans, melons and sweet potatoes. Men planted, cultivated and harvested the fields while the women wove, spun, cooked and sometimes maintained small home gardens (Thoburn & Wright, 1929, p.243). In 1854, a major drought caused damage to Cherokee crops. Yet, many farm operations rebounded by 1860 and the Cherokees were considered one of the most successful Indian farmers. Some of the wealthier Cherokee developed profitable operations without the aid of the government, which often provided poor quality implements and seeds too late. Many sold grain and livestock to nearby military posts. Crops included wheat, oats, rye, cotton, peas, potatoes, turnips, squash and corn. Fruit orchards where also maintained and included apple,

peaches, pears and plums. Livestock included horse, cattle, oxen and sheep. Other Cherokees still practiced subsistence agriculture (Hurt, 1987; Graebner, 1942).

By 1862, during the Civil War, Cherokees split into two factions and fought for both the Union and Confederacy. Many Cherokees fled to Kansas during the war. Union and Confederate troops traveled though Cherokee land within Oklahoma. Many destroyed crops, farm implements and livestock. The Civil War severlly hindered agricultural activities.

When the Civil War ended, Cherokees returned to their farms. However, many stopped farming and relied on government aid due to constant theft and requisition by military troops of crops and livestock (Hurt, 1987). Many of the Cherokees still had gardens and cultivated corn, potatoes, squash and beans. Some who relied on subsistence agriculture sometimes did not have enough food for winter (Gaebner, 1945, p. 323). Many had some livestock for meat and still hunted and fished to supplement their diet. Some of the Cherokee continued to farm commercially, such as those in the Piney Community in Delaware County. According to the 1880 census they maintained fruit trees, cultivated corn, wheat, potatoes and cotton and raised hogs, horses and sheep (O'Brien, 2001). Most of these Cherokees, over 3,500, were farmers by profession (Graebner, 1942, p.333).

The American westward expansion eventually led settlers to Indian Territory after the Civil War ended. Many settlers squatted on Cherokee land and stole and sold cattle for profit in Kansas. A new federal government philosophy was developed and implemented by the Bureau of Indian Affairs after the Civil War. This consisted of reducing Indian Territory and breaking up communally owned land into individual allotments. Between 1880 and 1890 American commerce in the west was built on

speculative value of Indian lands. Land hawks and Indian agents leased large tracts of Indian land to incoming American settlers. The Dawes Commission tried to get Cherokees to agree to the allotment of tribal lands and dissolve the Cherokee government. Cherokee leaders refused, but the Dawes Commission, through the Dawes General Allotment Act of 1887, authorized a census of all Cherokee in the west and a survey of their land (Lewis, 1995). White squatters began to move onto Cherokee lands. They illegally cultivated crops and allowed their cattle to graze on Cherokee land. The squatters favored the dissolution of the Cherokee Nation and the creation of a new America state. A resistance organization among the full-blooded Cherokee, called the Ketoowa Society, revitalized elements of the old culture. This included ceremonies, creation of villages in cluster and some communal planting (Thomas, 1961).

The Curtis Act was passed by Congress in 1898. It called for the dissolution of the Cherokee tribal government and forcible allotment of lands. The government allotted the head of any household with 160 acres, each single individual above the age of eighteen 80 acre and each minor 40 acres. Like the allotments in the east, this reduced the amount of land Cherokee owned and required that property ownership become private or held in trust by the federal government as opposed to tribally owned. Full bloods resisted enrolling for land allotments, but after the imprisonment of the leaders of the Ketoowa Society, such as Redbird Smith, many full bloods enrolled. In 1907 most of Cherokee land became part of the 46th State of the United States -- Oklahoma (Thomas, 1961).

Overall, during this period Cherokees began to adjust to Indian Territory and continued farming. Some Cherokees farmed commercially while others farmed for subsistence. Cotton became a major cash crop for commercial farmers. Ranching became a more prevalent activity during this period. Yet, the Cherokee continuously

encountered setbacks due to theft, drought, destruction of land during the Civil War and relocation due to allotment. This reduced the number of Cherokees that farmed and the amount of land owned.

Statehood to present: 1907-2005

After statehood many Americans moved west. Many forests were logged and bottomlands planted with cotton. Cherokees leased their hillside properties to cattlemen or to subsistence farmers in tiny tracts to tenants. Further, game was hunted nearly out of existence (Wahrhaftig, 1978).

Many Cherokees withdrew from politics in response to the lack of recognition by the federal government of Cherokee Nation as a governing body. As a result the Cherokees had no control over their land rights and mineral products. The Bureau of Indian Affairs held Cherokees' allotted titles to land as trust land. The government allowed incoming frontiersmen to use resources on land they did not own until the 1970s. Allotted land holdings were not contiguous or always accessible. Many Cherokees had to sell portions of their allotments or separate extended family units to dwell on the different land allotments. An influx of Americans came to Oklahoma and purchased large amounts of land.

During the 1920s, many Cherokees did not have money to buy cattle or grow cash crops. No loans were available to Cherokee farmers to purchase implements. Many leased their lands to incoming settlers. Many in the acculturated group continued to farm commercially, grow cash crops, such as cotton and wheat, feed crops and harvested lumber. They were able to keep larger amounts of land and remained wealthy. The other group farmed for subsistence and grew watermelon and cantaloupe for additional cash.

They were predominately poor (Employee of Cherokee Nation's Facility Management, personal communication, August, 2005).

The drought during the Great Depression in the 1930s put many farmers near starvation and they were unable to remain economically self-insufficient. Many Cherokees abandoned farming as a commercial activity. However, many still maintained gardens and canned their food. In Delaware County, "Cherokees continued to live off the land. Everyone had a garden and supplemented their diet with fish, crawdads, squirrels, mushrooms, berries, and nuts…. Awards were given [by the Indian Farm Agent] to the Cherokee who canned, cured, or dried the most for 'winter use' and who saved the 'most seed for his or her garden'" (O'Brien, 2001, p.15). According to the U.S. Census of 1930, "Indians [Cherokee] are more commonly owners of the farms they operate than both whites and Negroes" (Hewes, 1942, p.403) within four counties in northeastern Oklahoma. The average acreage cultivated was likely ten and many Cherokees had home garden plots rather than commercial farms (Hewes, 1942, p. 408).

Within Adair County near Stillwell, with the help of school teachers and Extension Agents, Cherokees developed a prosperous strawberry cooperative and received loans for farm implements under the Indian Welfare Act. Eventually, in 1946 the cooperative dissolved and many growers started their own private strawberry operations (Debo, 1951). Although few Cherokees grow strawberries commercially in Stillwell, the town still holds an annual strawberry festival in remembrance of the strawberry industry.

In 1928 the Merriam Report depicted the overall state of Indians in America. The report highlighted issues about Indian policy related to agriculture and assimilation. This included recognizing that there was a lack of experienced educators, farm implements and loans available to Indian farmers. Further, leasing of lands and allotment were

problematic. After the report, reform policies in the 1930s, such as the Indian Reorganization Act of 1934, encouraged Cherokees to retain land base, end allotment and funded programs with an economic base. These policies promoted agricultural education of women and communal farming (Duffy & Stubbins, 1998; Hurt, 1987). The Civilian Conservation Corps, established in 1933, helped and taught the Cherokees to restore overgrazed and farmed lands to a level where the land could be cultivated again (Hurt, 1987).

The BIA attempted to teach the poorer Cherokee to use the latest agricultural techniques by holding demonstration projects. It tried to teach Cherokees to raise their own food on their allotments, but many projects were not successful. Many were dependent on the government for help and community cooperation became less important for raising food (Fogelson & Kutshe, 1961). Poorer Cherokees had few draft animals or farm implements. "The restricted Indians as a class do less farming than before the allotment of land. The practice of renting land, including crop land, to white farmers is now more common among restricted Indians than formerly….self-support by subsistence agriculture is the modest goal held for restricted Indians" (Hewes, 1942, p. 409-410). Although capital became available to fund farm projects, it was still considered a basic obstacle to farming (Hewes, 1942).

During the 1940s, the wealthier Cherokees raised big gardens at home using plows. They had high crop yields, canned fruits and vegetables, smoked and salted pork, sold cream and milk and churned butter. It was important to preserve food for the family during the winter. Many of these Cherokees became cattle ranchers. They used half their land for cattle grazing and the other half to grow corn and hay. They invested and worked on their own property. Men cultivated fields, while women raised home gardens. The

poorer Cherokees also had cattle and goats, but they did not keep the animals in fenced pastures. They had smaller tracts of land and raised gardens which had corn, squash, cucumbers, okra and potatoes. They were primarily subsistence farmers on their privately owned lands. Children were sent to work off the property to produce additional income (Employee of Cherokee Nation's Facility Management, personal communications, August, 2005).

During WWII, the federal government terminated the previous Indian policy. New federal policy encouraged leasing Indian lands and assimilation (Hurt, 1987). During the 1960s, agricultural farm agents introduced conventional agricultural techniques and innovations. Cherokees who were still farming commercially were able to benefit from these innovations, but many lacked capital and credit to purchase large farm implements.

Through the1950s to 1970s the Army Corp of Engineers built dams where Cherokee settlements were. Many families were again displaced. Many received social services and others moved to California (Wahrhaftig, 1978). In the 1960s the Cherokee reunified to become a Nation and gained control over Cherokee affairs. The Cherokee Nation was designated land within a 14 county jurisdiction in northeastern Oklahoma. There was a decrease in small farm land holdings and an increase large land holding of 220 acres or more for farming and ranching. A decline in commercial farming was evident, but many still raised home gardens. There were inadequate resources for profitable large farms to develop. There was also a shift of political power from country to town. The acculturated Cherokees entered more fully into the cash economy and prospered. There was a further breakup of family unit (Wahrhaftig, 1966). The number of wage laborers increased and some Cherokees worked on others' farms to harvest beans, peas, strawberries and huckleberries. The need and desire to possess gardens and

farms fell. Most food was and is obtained from grocery stores. The construction of dams for river flood control and recreation areas increased. New restrictions on land are enforced because of this, such as hunting and fishing regulations, hog-fence laws and restricted stream and forest use (Wahrhaftig, 1966).

Many Cherokees in eastern Oklahoma live in what are now growing towns. Yet, there are still others who live in rural, isolated and fairly inaccessible areas. They tend to be relatively poor. In 1966 there were 50 Cherokee communities that have between 30 to 60 households organized around churches and stomp grounds, a location of traditional religious gatherings and ceremonies, with a total population of 9,500 in Oklahoma (Wahrhaftig, 1966). In the 1970s economic based reports in eastern Oklahoma show that supporting agricultural development would not be profitable. Under the Indian Financing Act , established in 1974, grants and credit became available to finance Indian enterprises (Duffy & Stubben, 1998). In the1970s and 1980s the Cherokee Gardens in Tahlequah provided employment to members of the Nation. However, the economy has shifted to draw tourists to Cherokee Nation as an attraction. The Cherokee Heritage Center and National Museum and Drama in Tahlequah draw many tourists today. The Cherokee National Museum has replicated two Cherokee settlements from the pre-contact and colonial period where gardens and farms are recreated and tours available of the villages.

Some Cherokees own large-scale farms today. Home gardens are more prevalent then large farms, but maintaining a garden is also becoming less common (Employee of Cherokee Nation's Natural Resources Department, personal communications, August, 2005). In 2002 the Five County Agriculture Project proposal was submitted to the Nation's government to start teaching youth in rural Cherokee communities how to maintain and harvest fruit trees. The Nation denied the proposal (Employee of Cherokee

Nation's Natural Resources Department, personal communication, August, 2005). Today a few Cherokee communities participate in religious activities which honor agricultural activities through ceremonies such the as the Green Corn Ceremony. Some of these Cherokees garden communally more for symbolic reasons rather than for subsistence within various stomp ground in the 14 counties. Further, Cherokee commercial farmers have access to loans, farm implements, incentive programs and agricultural education programs. These are available through various USDA programs, such as Farm Service Agency, Cooperative State Research Extension and Education Services and Natural Resources Conservation Services. The Cherokee Nation's Natural Resource Department employs an agricultural liaison. This individual informs Cherokee farmers about USDA programs and other marketing resources through newsletters, field days, workshops and fairs.

Today there is no census available about the number of Cherokees farming. According to the USDA's 2002 Agriculture Census the number of American Indian farmers as principal operators in Oklahoma is 7,470 and has increased since 1997 (USDA, 2005, p.10). American Indians in Oklahoma cultivate 1.5 million acres of land on 6,392 farms (USDA, 2002, p.502). According to the census Oklahoma also has the highest number of American Indian principal operators. Within Cherokee Nation's 14 county jurisdiction there are 2797 farms, which is 44% of all Indian farms in Oklahoma. There are 3228 principal farm operators, 43% of all Oklahoma American Indian principal farm operators, and approximately 537,00 acres of land under cultivation or 36% of all Oklahoma land cultivated by Indians (USDA, 2002, p.502) (Appendix A). Prior to allotment in the late 1890s before Oklahoma statehood, the Nation owned approximately 1.7 million acres of land. Today the Cherokee Nation owns approximately 100,000 acres

with another 100,000 acres of individual allotted land held in trust by the federal government (Employee of Cherokee Nation's Strategy Team, personal communications, June, 2006).

Overall, during this extensive time period the Cherokees of Oklahoma practice farming at several scales, ranging from home gardening to commercial, large scale farming. Cherokee farmers have been introduced to numerous innovations such as tractors, hybrid seeds and new irrigation methods. However, for a large part of this period some Cherokees were unable to use and incorporate these new innovations into their agricultural operations because they lacked access to capital. Similar to previous periods they have experienced numerous changes resulting from Indian agricultural policy and relocation. Today, farming is a less important component of most Cherokees' lifestyle compared to previous periods. However, access to resources, such as those provided by the USDA is evident.

Conclusion

Overall, major agricultural changes have taken place from pre-contact to the present. Men, instead of women became the primary cultivators of agricultural lands. Less land became available to Cherokees to supplement cultivation with hunted and gathered resources. Communal property ownership and farming has changed to private property ownership and private or single family farms. Numerous farm implements and domesticated plant and animal species have been introduced into the agriculture system. Large scale, intensive, sedentary farming techniques, such as monoculture, replaced mound planting and subsistence farming. Lastly, farming and gardening are no longer a primary occupation or activity for many Cherokee families.

Theoretical Framework

Classical Economics

Classical economic theory states that farmers' decisions to use certain agricultural technologies are determined by rationally weighing the costs and benefits associated with using those technologies (Staaz & Eicher, 1998). The rational actor model of human decision-making posits that individuals will behave in consistent, well-ordered ways to maximize personal gains. Preferences are considered exogenous, meaning other people or institutions do not influence their decision-making (Gowdy, 2004, p. 246). For example, a farmer may decide to grow a specific crop because it is subsidized by the government and the economic incentives from the subsidies provide the greatest return.

However, some economists argue that, "individual actors do not act as cost-benefit calculators who continuously adapt their behavior to changing environmental conditions. They may or may not respond 'rationally' to incentives" (Gowdy, 2004, p. 249). They argue that the classical economic model alone does not take into account individuals' endogenous preferences. Endogenous preferences can include intrinsic values, future values, personal history, social influences and context (Gowdy, 2004; Osiniski, Kantelhardt, & Heissenhuber, 2003). According to Osiniski, Kantelhardt, and Heissenhuber, (2003), the economic model can incorporate endogenous components, such as assessing the intrinsic values of landscapes by determining how much people are willing to pay for environmental service. However, transferring the valuation placed on landscapes is not transferable between regions.

There is evidence that people do act in ways to affect other's wellbeing and are influenced by other people's preferences. People do make choices based on fairness, which could keep an individual from maximizing personal benefit (Johnson, Rutstrom &

George, 2006). Fischer, Irlenbusch and Sadrieh's (2004) research show that resource extraction and exploitation of common pool resources can increase when considering intergenerational links. However, financial incentives are a stronger motivator of continuing exploitation.

In Indian society, historically, economic growth and increased income for material goods were not the primary purpose of exchange between parties. Exchanges did have economic incentives, but they also served as social and spiritual interchanges. This may not be the case today, but it is important to consider some of these historical factors when examining modern Indian decision-making (Duffy & Stubben, 1998).

The classical economic model may offer an incomplete explanation of farmers' decisions to use particular farming practices (Henrich et al., 2001). Alternative explanations that include endogenous preferences may provide more robust explanations of why farmers' engage in particular behaviors. Economic sociologists, beginning with Weber, do examine some endogenous social factors, such as the effects of others' behaviors on an individual's decisions. These components are often socioeconomic factors, such as gender, age, income, participation in farm organizations. Ultimately, economists embed social factors within the economic model to better understand decision-making (Swedberg, 1998) and many economic sociologists have highlighted the importance of adding endogenous factors to the economic model (Zafirovski, & Levine, 1999, Luzar, & Diagne, 1999).

A great deal of research explores the correlation between socioeconomic characteristics and adoption behavior. Results show varying associations between agricultural behaviors and socioeconomic characteristics. Knowler and Benshaw (2006)

said that a "more detailed synthesis of these adoption studies indicated that there are few if any influences on adoption that apply universally" (p.20).

Pattnayak, Mercer, Sills and Yang (2003) found that farmers' age positively correlates with adoption of agrofoeresty. On the other hand, Mathijis (2003) and Gockowski and Ndoumbe's (2004) research show that there is a negative correlation between age and adoption behavior. The adoption of new technologies positively correlates with land size based on Adesina and Chianu's (2002) research. However, Gockowski and Ndoumbe's (2004) results show that there is negative correlation between monocrop adoption and land size of Cameroon horticulturalists. Gockowski and Ndoumbe's (2004) suggest that the negative correlation may exist due to population pressure for farmers with smaller land holdings.

Pattnayak, Mercer, Sills and Yang (2003) and McNamara and Wetzstein's (1991) research show that there is a positive correlation between farm income and adoption behavior. Gockowski and Ndoumbe's (2004) analysis of others' research show that there are significant positive relationship and insignificant relationships between these two variables. Thangata and Alavalapati (2003) show that there is little difference between income and agroforestry adopters and non-adopters. Lastly and more consistently, previous findings show that the number of laborers on farms positively correlates with use of new agricultural technologies or conservation practices (Thangata & Alavalapati, 2003; Gockowski & Ndoumbe, 2004; Wubeneh & Sanders, 2006).

Overall, many socioeconomic characteristics correlate with farmer adoption behavior. The direction and significance of these correlations are inconsistent for the most part and can be location specific.

Social Psychology Theories

Social psychology focuses on the endogenous components that influence people's behaviors. This research examines endogenous components in the theory of planned behavior (TPB). TPB builds upon and is a combination of two social psychology theories, the theory of reasoned action (TRA) and self-efficacy, which I describe below.

The Theory of Reasoned Action

Ajzen and Fishbein's (1980) theory of reasoned action (TRA) proposes that individuals, as rational agents, use information at any given time available to them to make decisions about intentions to perform behaviors. A behavior is the observable response in a given situation with respect to a given target (Ajzen, N.D.). Examples of behaviors include women breastfeeding their newborn babies, voters choosing candidates in an election and college students attending classes. Intentions are the motivating factors that affect and influence a behavior. They are the conscious decision-making process used by individuals to determine if he/she will engage in the behavior. Intentions are indicative of how much effort people are willing to invest in order to perform a behavior (Ajzen, 1988). An individual's intention is the primary determinant of his/her behavior. The stronger an individual's intentions to commit a specific behavior, the more likely he/she will do so. Intentions are determined based on two factors, an individual's attitude towards a behavior (a personal factor) and subjective norms (a social factor).

Attitudes are a person's judgment about whether a specific behavior is positive or desirable, or negatively or undesirable (Ajzen & Fishbein, 1980). Two components influence attitudes towards a behavior, behavioral beliefs (b) and the evaluation of the behavior (e). Behavioral beliefs (b) are an individual's most prominent beliefs about the outcome that a specific behavior will produce (Robinson & Doverspike, 2006). For

example, an individual might believe that walking on a treadmill for 30 minutes daily will reduce his/ her blood pressure (b) and believe that lowering his/her blood pressure is good (e).

Ultimately, the individual's attitude toward the behavior reflects his/her assessment of the outcome associated with the behavior and whether the outcome is perceived as positive or negative. For example, a person may believe that farming traditionally preserves his/her cultural roots (b), and that preserving his/her culture is good (e). The individual then may have a positive attitude toward farming traditionally. Figure 2-1 depicts this relationship.

$$A = \Sigma (b) (e)$$

Figure 2-1: The relationship between attitudes (A), behavioral beliefs (b) and the evaluation of the outcome (e) (Ajzen, I. (nd). *The Theory of Planned Behavior*. Retrieved March 15, 2005, from http://www.people.umass.edu/aizen/index.html)

The other factor that influences an individual's intention to perform a behavior is subjective norms. Subjective norms are the perceived social pressure to engage in a behavior. This consists of two components, normative beliefs (n) and motivation to comply with influential others (m). Normative beliefs are an individual's beliefs about what important individuals or groups, known as referents, consider to be desirable or undesirable behavior. An example of a normative belief is when a farmer's grandfather, whose opinion he/she considers important, does not approve of traditional farming. Notice the normative belief consist of a referent's (grandfather) belief and also the importance of the referent to the individual. For example, the referent may have a positive view of traditional farming. However, if the referent's opinion is not important

to the individual then this normative belief will not be influential in determining an individual's subjective norm.

A subjective norm is the social pressure to engage in a behavior (SN). This occurs when an individual believes that an important referent (n) supports a specific behavior and the individual wants to comply (m) with the referent's beliefs. See Figure 2-2 for the relationship between these variables.

$$SN = \Sigma (n) (m)$$

Figure 2-2: Relationship between subjective norms (SN), normative beliefs (n) and motivation to comply (m) (Ajzen, I. (nd). *The Theory of Planned Behavior*. Retrieved March 15, 2005, from http://www.people.umass.edu/aizen/index.html)

The TRA tries to explain how personal and social factors can influence and determine the behavior of an individual. People will engage in or perform a behavior if they evaluate the behavior positively (attitudes) and they feel social pressure to perform the behavior (subjective norms). Behavioral beliefs influence an individual's attitude towards performing a behavior. Likewise, normative beliefs influence an individual's subjective norm. The intention to adopt a behavior is based on the combination of individual's attitude toward the behavior and subjective norms. The strength of the individual's intention to perform a behavior determines the actual performance of the behavior. The stronger the intention to engage in a behavior, the more likely an individual will perform a behavior. Figure 2-3 depicts the TRA's causal linkages between factors.

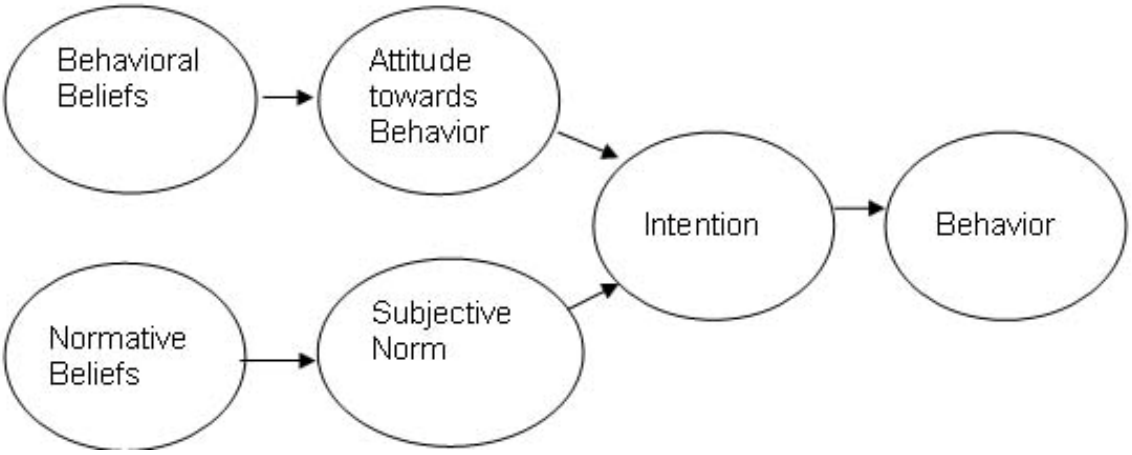

Figure 2-3. The causal linkages between variables associated with theory of reasoned action (Ajzen, I., and Fishbein, M. (1980). Understanding attitudes and predicting social behavior. Englewood Cliffs, NJ: Prentice-Hall.)

Researchers test TRA among a variety of behaviors and intentions, such as participation in environmental programs (Luzar & Diagne, 1999), use of educational curriculums (Codd & Cohen, 2003; Meyer, Roberto, Boster & Roberto, 2004), and health related behaviors (Dodge, Ford & Perko, 2003).

Sapp (2002) discusses the importance of the hierarchy of effects principal developed by Ajzen and Fishbein in influencing behavior. The hierarchy of effects principal surmises that cause and effect are rational in that knowledge, attitude and intentions can predict and determine behavior. Individuals can make rational decisions to engage in a behavior based on these factors. However, inconsistencies between attitudes and behaviors are observed in past research. "Conditions such as contrary beliefs…countervailing values, addictions motivated by both physical and social conditions … and abnormal psychology can create nonrational behavior" (Sapp, 2002, p.38). Sapp discusses how the lack or limitations of knowledge can lead to these attitude-behavior inconsistencies or nonrational behavior instead of the above conditions. The inconsistencies may actually be related to "an inability to engage in behavior that

accurately reflects attitudes and intentions" (Sapp, 2002, p.38). According to Sapp (2002) and Sanderson's (2004) research results, a lack of knowledge about adoption behavior can impede an individual's ability to adopt a behavior or intention to adopt a behavior. Therefore a certain amount of knowledge is needed to be able to successfully perform a behavior.

The TRA rests on the idea that intention can be expressed as a behavior when the behavior is under an individual's volitional control (Ajzen, 1991). Yet, what happens if an individual perceives that there are barriers keeping him/her from performing a behavior? What if he/she believes that performing a behavior is not in his/her control?

Theory of Self-efficacy

In the mid-1990s Bandura (1995) developed the social cognitive theory ofself-efficacy. The theory focuses how perceived behavioral controls (PBC) influence an individual's decision-making process. The theory accounts for situations when an individual believes he/she does not have full control (volition) over his/her decisions to perform a behavior. This theory is used among disciplines such as education, marketing, health sciences and engineering.

Perceived behavior controls (PBC) refer to an individual's perceived ease or difficulty in performing a specific behavior. PBC include barriers or facilitators that influence an individual's ability to engage in a behavior. It consists of two components. They are confidence and control beliefs. Confidence refers to an individual's belief in his/her capabilities to organize and complete a course of action. An example of confidence includes a mother's belief that she can successfully breastfeed her child for six months. Control beliefs are an individual's perception of the presence of factors that may facilitate or impede performing the behavior (Ajzen, I., ND). For example, an

individual may not believe that he/she can build a ten story building if he/she does not have the adequate skills and training in engineering. A farmer may believe that the/she cannot farm traditionally if there is a drought.

Research indicates that self-efficacy can influence an individual's decision-making process and ability to perform a behavior. For example, studies show that students with high self-efficacy have higher grades in school than those with lower self-efficacy (Schunk, 1991). In addition to academic performance, self-efficacy is also a predictor of adoption and maintenance of breast self-examinations (Luszczynska, & Schwarzer, 2003). Some studies show that self-efficacy is the primary, but not the sole, determinant of an individual's intentions and behaviors (Sanderson, 2004; McGinty, 2006). Self-efficacy may also predict the persistence of a behavior in the future (Luszczynska, & Schwarzer, 2003; Schaefers, Epperson & Nauta, 1997). Schaefers, Epperson and Nauta's (1997) research shows that self-efficacy is one of the determinants, but not the prime determinant, of women's persistence in engineering as an academic major. Other factors that influenced persistence behavior include academic ability, supports and barriers and interest congruency, or the degree of fit between women's personality and demands of an occupation.

Various research show that self-efficacy can be influential of adoption and persistence behavior with direct benefits. However, results show that self-efficacy is only sometimes a prime determinant of adoption and persistence behavior.

Theory of Planned Behavior

In 1998, Ajzen incorporated Bandura's theory of self-efficacy into the TRA to better understand the effects of decision-making on human behavior when individuals do not have full voluntary control over their decision making process (Sapp, 2002). The

theory of planned behavior (TPB) is the result of this combination (Figure 2-4). Within the TPB perceived behavioral controls can influence intentions and behavior directly.

The TPB has been applied to educational development, commerce, career choice and development and adoption of non-risk health behaviors (Pavlou & Fygenson, 2006; Brickell, Chatzisarantis, & Pretty, 2006; Ahuja & Thatcher, 2005; Robinson & Doverspike, 2006). The TPB often accurately predicts behavior based on attitude, intention, PCB, and subject norms. The TPB's predictive power increases especially when an individual perceives that he/she does not have control over his/her decisions to perform a behavior. This theory has been tested once among farming populations with regard to farmers' adoption of agricultural practice (McGinty, 2006). McGinty's results show that self-efficacy and attitudes do positively influence Bahian farmer's adoption of agroforesty. Self-efficacy was the primary determinate of farmer's intentions to adopt agroforestry. Farmers' persistence or adoption of agricultural behaviors can be influenced by their perceived behavioral barriers.

Researchers have not tested this theory with American Indian farming populations to determine its predictive power in adoption and maintenance of traditional and conventional practices. I think the TPB is more applicable to exploring American Indian farmer behavior than the TRA due to their past historical experiences with agricultural policy and their minority status. There may be barriers or facilitators that American Indian farmers perceive as influencing their use certain agricultural technologies.

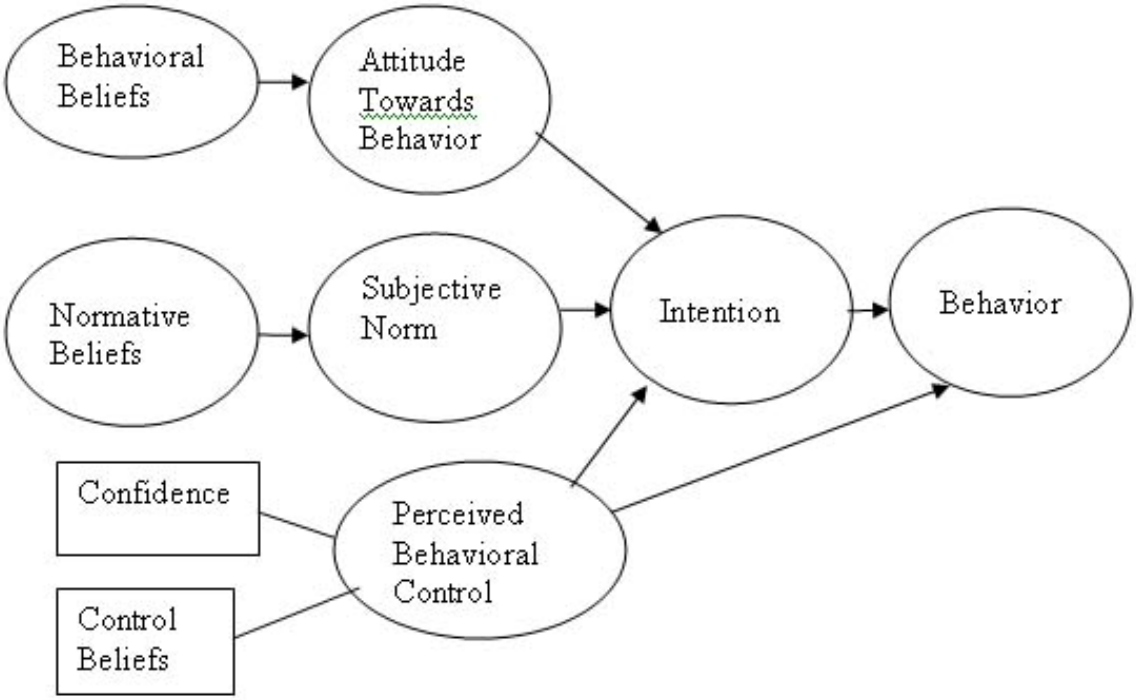

Figure 2-4. The causal linkages between variables associated with theory of reasoned action (Ajzen, I., and Fishbein, M. (1980). *Understanding attitudes and predicting social behavior*. Englewood Cliffs, NJ: Prentice-Hall; Ajzen, I. (nd). *The Theory of Planned Behavior*. Retrieved March 15, 2005, from http://www.people.umass.edu/aizen/index.html)

Ajzen (1991) suggests that the TPB can incorporate additional predictor variables as part of the model if they can account for significant variance over and above the TPB variables. Conner and Armitage (1998) review the possibility of extending the TPB with additional variables derived from other theoretical frameworks and research evidence. A few variables are recognized as increasing TPB predictive power. Some include past behavior and habit, moral norms and self-identity. There is growing evidence to support the addition of variables to the TPB to increase the understanding of how they relate to the other predicator variables associated with the TPB and behavior. This study also explores the role of an additional variable, self-identity, added to the TPB in predicting Cherokee farmers' use of TAP.

Self-identity

Within social science disciplines the definition of identity has been explored since the 1950's when E.H. Erickson first published his work about identity. Erikson's definition of identity includes internal or psychological and external or sociological dimensions. He defines identity as "an individual's awareness of the sameness and continuity of his/her individuality as it relates to the sameness and continuity of one's meaning for others" (Schwartz, 2001, p.8). This multidimensional definition of identity includes three forms of identity that can co-exist and vary in significance over different situations and points in time in an individual's life. Ego identity is "a person's consciousness of individual identity and unconscious striving for continuity in character". Personal identity consists of "goals values and beliefs that one shows the world". Social identity is "sense of inner solidarity with a groups ideals" (Schwartz, 2001, p.10).

With these broad and inclusive definitions of identity, Erikson sets the stage for research addressing theory and methodology related to identity among social scientists. Numerous definitions and theoretical models try understanding and determining the meaning of identity within different contexts. Research related to physical activity, voting behavior and use of physician use of telemedicine or information technologies examine the influence of identity on behavior (Jackson, Smith Conner, 2003; Gramberg & Holmberg, 1990; Ellis, Robb, Burke, 2005; Gagnon, et al, 2003).

Psychologists have diverged into two different groups when discussing and researching identity. The first group focuses on the social components that influence self-identity. Styker defines identity as a part of social orientation and influences or "the linkages of social structures with identities" (Styker & Burke, 2002, p. 287). Burke focuses on the "internal process of self-verification" (Styker & Burke, 2002, p.288).

Combining Styker and Burkes' definitions, self-identity includes factors that influence a person's perception of him/herself based on an internal understanding or external influences (Styker & Burke, 2002). Conner and Armitage (1998) define self-identity as "the salient part of an actor's self which relates to a particular behavior. It reflects the extent to which an actor sees him- or herself fulfilling the criteria for any role" as affected by internal or self and external or social influences (Conner & Armitage, 1998, p.1444).

Identity theory implies that people will behave in ways that conform to their self-image. The stronger a person's self identity, the more likely the individual will behave consistently with that identity. Wilson, Urban, Graves and Morrison's research (2003) with mid-western farmers illustrate this relationship. One component of the research examines the degree to which Central Illinois farmers' identities are related to their daily agricultural practices. Sixty percent of the farmers in the study use plow till farming. Many of these farmers "spurn or nominally adopt no-till farming" (Wilson, Urban, Graves & Morrison, 2003, p.28). The rejection of no-till farming is associated with their beliefs that plow tillage is efficient and effective. No or minimum tillage is also associated with government intervention or outside control. Many of these farmers distrust the government and external authorities for various reasons and try to reject their programs when they can. No-till is also rejected because it is seen "to dirty the rural landscape" (p.28). Seventy percent of these farmers associated no-till farming as countering farm aesthetics. This research implies that these farmers' self-identity is related to rejecting external and government intervention and preserving farm aesthetics. Their rejection of no or minimum tillage practices reinforces this identity. On the other end, the adoption of no or minimum tillage by other farmers also reinforced their identity as promoters of environmental conservation. I build upon Wilson's research to consider

the influence of self-identity on the types of agricultural practices used by farmers. In my study if a farmer identifies him/herself as a traditional farmer, then he/she may use farming practices that reinforce this identity as a traditional farmer.

I explore American Indian farmers' self-identity as it relates to being a traditional farmer. I encourage farmers to provide a definition of what constitutes being a traditional farmer. It is not my aim to determine what the agreed upon view of traditional is. My aim is to understand how farmers identity themselves in relation to being a traditional farmer. It will be challenging to measure farmer's self identity as being a traditional farmer because what is viewed as traditional differs among farmers. The manner in which I measure it may not truly capture what each farmer means by traditional.

Numerous studies incorporate self-identity into the TPB (Jackson, Smith, & Conner, 2003; Fekadu, & Kraft, 2001; Pierro, Mannetti, & Livi, 2003). When self-identity is incorporated into the model, significant relationships exist between an individual's self-identity, the intention to use a behavior. Pierro, Mannetti and Livi's (2003) research shows this relationship. They conducted two independent studies to see the effects that identity can have upon people's intentions to attend Latin American dance classes and purchase low-fat food. The results from both studies show that the identity variables are significant and independent predictors of intentions to perform the behavior. They increased the explanatory power of the TPB. However, the variables associated with the TPB overall explained more of the variance in intentions then the identity variable. I incorporate self-identity as an extension to the theory of planned behavior to determine how it may influence American Indian farmers' use of TAP.

Diffusion of Innovation

Rogers' (1995) diffusion of innovation theory, published in 1962, describes the factors that may motivate people to adopt new technologies over time. The theory is used to explain the adopter's of new technology behavior in the form of ideal types. For example, those individuals who are most likely to adopt a new technology first are called early adopters. Early adopters consist of opinion leaders, who are respected by their peers in a local setting. They are the first individuals within a local setting to adopt a new innovation and then provide an evaluation of the innovation to peers. On the other hand, "laggards are the last in a social system to adopt an innovation…. The point of reference for the laggard is the past…Decisions are often made in terms of what has been done previously… [they] tend to be suspicious of innovations and change agents" (Rogers, 1995, p. 265).

Various disciplines and subject matters use this theory to examine adoption behavior. This includes rural sociologist's study of farmers' adoption of new agricultural innovations (Jacobson, Sieving, Jones, & Van Doorn, 2003). Research in education examines the spread of new teaching ideas (Wilson, & Stacey, 2003). Business marketing analysts assess consumer and organizational adoption of new products such as computers, pharmaceuticals and phones (Attewell, 1992; Berndt, Pindyck, & Azoulay, 2003).

Rogers defines diffusion as "the process by which an innovation is communicated through certain channels over time among members of a social system" (Rogers, 1995, p. 5). An innovation is an idea or practice that is perceived as new by an individual. It is not so important that the idea is new in terms of the amount of time that has passed since its

discovery. Rather, the information or idea should be new to the individual and/or social system that encounters it.

The primary factor influencing an individual's decision to adopt or reject an innovation is his/her access to information (Hooks, Napier, & Carter, 1983). Information and resources include education and contact with knowledgeable sources of innovation, such as county extension agents or other farmers. The information transfers to individuals through communication channels. The relationship between the source of the innovation and receiver of the innovation determines the effectiveness of this transfer of information. This thesis explores two channels of communication from this theory. The first is mass media channels. They are a means of transmitting messages through mass media such as radios, televisions, newspapers and magazines. The other source is the interpersonal channel, which involves face-to-face interactions and exchanges between individuals. Examples of interpersonal communication include farmer-to-farmer, or extension agent -to-farmer, community elders-to- farmers (Rogers, 1995, p. 18).

Many researchers use this theory to examine factors that influence farmers to adopt new farm technologies. Some include conservation practices, precision technologies and conventional agricultural practices (Floyd, et al., 2003; Hooks, Napier, Carter, 1983; Sevier & Lee, 2005; Carletto, de Janvry, & Sadoulet, 1999; Weir, & Knight, 2004). The results are inconclusive in either fully supporting or rejecting the theory's effectiveness in explaining adoption behavior. However, what does appear to be consistent is that that there are associations between this theory and economic and social psychology theories. The innovation diffusion theory is more effective in explaining farmer behavior when used in combination with the economic and social psychology theories (Lynne, Shonkwiler, & Rola, 1988; Nowak, 1987; Floyd, et al., 2003). Rogers (1995) also

indicates that this theory can complement other theories to better understand adoption behavior.

My research explores the channels of communication farmers rely upon as sources of information about traditional and conventional farming practices. I also explore how these resources influence farmers' adoption or maintenance of traditional and conventional agricultural practices.

Research Questions and Hypotheses

This literature review explores various theoretical frameworks that explain why certain factors may impact individuals' decision-making to engage in specific behaviors. I developed research questions and associated hypotheses to determine how the various theory-based variables influence American Indian farmers' decision-making to use (TAP). Figure 2-5 shows this relationship.

Research Questions

To what degree do socioeconomic characteristics explains farmers' use of TAP?

3. To what degree do attitudes, subjective norms, perceived behavioral controls and self-identity explain farmers' use of TAP?

4. To what degree does access to different types of resources explain farmers' use of TAP?

5. Which theoretical model best explains farmers' use of TAP?

Hypotheses

1. A relationship will exist between farmers' socio-economic characteristics and their use of TAP.

6. A strong positive relationship will exist between farmers' attitudes towards the use of TAP, subjective norms, self-efficacy, control beliefs, self-identity and their use of TAP.

7. A positive relationship will exist between farmers' access to resources and their use of TAP.

8. The theory of planned behavior will better explain why farmers' use TAP than any of the other theoretical models.

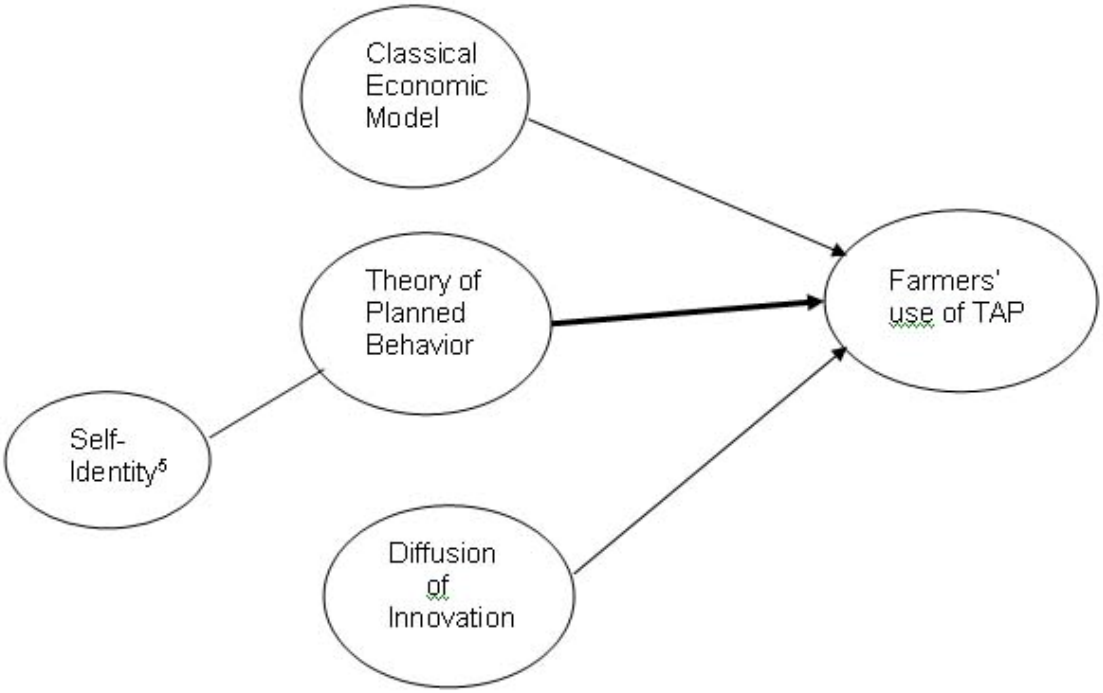

Figure 2-5. Association between theoretical models and farmer behavior. Note: Self-identity is used within this research as an extension of the theory of planned behavior.

Definitions

- Attitude: a person's judgment that performing the behavior is good or bad
- Control beliefs: beliefs about the presence of factors that may facilitate or impede performance of a behavior.
- Diffusion of innovation: process by which new ideas are communicated through certain channels over time among the members of a social system
- Farmer: An individual who actively cultivates land for food production. This definition is not based on farm/garden size, amount of time spent cultivating or amount of sales related to production. This definition is inclusive of cash crop farmers and subsidence farmers or gardeners.
- Perceived behavioral control: an individual's perceived ease or difficulty in performing a specific behavior and their confidence in their ability to perform the behavior
- Self-efficacy: Individual's confidence about their capabilities to produce effects

- Self- identity: the extent to which an actor sees him- or herself fulfilling the criteria for any role" as affected by internal (self) and external (social) influences (Conner and Armitage, 1998, p. 1444)

- Subjective norms: perceived social pressures that the individual believes are exerted on him/her to perform a specific behavior.

- Traditional agricultural practices (TAP): agroecological management behaviors that a farmer performs which are transmitted from one generation to another; agricultural innovations used before 1960

CHAPTER 3
METHODS

Research Design

I used an explanatory case study design because I wanted to examine the complex interactions between numerous variables. This design allowed me to achieve a better understanding of how numerous theory-based variables can influence farmer behavior. I also used this design because I tested three theories under conditions that differ from those of previous studies (de Vaus, 2001; M.E. Swisher, personal communications, November, 2004). I selected the cases and allocated them to comparison groups based on the outcome variable. The outcome variable I placed the cases into a high TAP, medium TAP or low TAP group *posteriori.* The groups depict maximum variability.

This research examines multiple cases. This provides a more rigorous test of the theories than a single case design. I used a sequential and retrospective design, where each case involves collecting information related to an extended period of time (de Vaus, 2001, p.229). The study examined cases as holistic units of analysis. I assessed characteristics of individuals as a whole as opposed to exploring embedded or sublevel characteristics of the individual in detail. Each case consists of one Cherokee farmer or gardener who currently cultivates crops (fruit, vegetable and grain) primarily for human consumption.

According to Swisher (personal communications, November, 2004) internal validity in research is "the degree to which the research design eliminates other explanations than the ones proposed in the hypothesis or proposition." Internal validity

assesses the degree to which the design illustrates casual direction between the predictor and outcome variables. Case studies sometime have low internal validity because they, unlike experimental designs, do not create interventions to create control and treatment groups. The retrospective nature of the case selection threatens the internal validity. However, I took certain measures to increase internal validity.

I address this concern by evaluating multiple cases, creating comparison groups, assessing linkages through several instruments and data sources and using an idiographic approach to examine cases. I reduced the number of possible alternative causal explanations by comparing multiple cases. I created comparison groups based on the outcome variable and compared them to each other, based on the predictor variables. The use of comparison groups and their contribution to internal validity is comparable to experimental designs, except in case study designs the groups are created *posteriori*. I examined how different predictor variables affect multiple cases within each comparison group. This inferred causality.

"Idiographic explanation focuses on particular events, or cases, and seeks to develop a complete explanation of each case. By developing a full, well-rounded causal account, case studies can achieve high internal validity" (de Vaus, 2001, p. 233-234). Unlike nomothetic explanations, which focus on a restricted range of variables, the idiographic approach decreases the possibility of alternative explanations and offers a fuller explanation of each case. I assessed the interrelation between the variables by measuring numerous predictor variables in combination with each other (de Vaus, 2001).

Further, I include a historical context of Indian agricultural policy and Cherokee agriculture to decrease the effects of history and examine how history may influence behavior. I reduce the effects of maturation by including questions within the instrument

packet that examine the potential effects that history can have on participants responses. Questions related to age and numbers of years farming examine maturation.

"External validity is the extent to which results of the study can be generalized beyond the study" (de Vaus, 2001, p.28). It is important to differentiate between two types of generalizability in case studies. Some researchers refer to statistical generalizability when discussing external validity. Statistical generalizability is the ability to generalize the findings of the research to a broader population than the sample. Statistical generalizability can increase by using probability and random sampling. Case studies sometimes do not aim to achieve statically generalizability. The findings from a case study do not always offer explanations of phenomena to a population outside of those who are studied. Rather, case studies focus on achieving theoretical generalizability. Theoretical generalizability refers to the ability to generalize findings from a study to a theory. The cases tell us about the effectiveness of the theory as an explanation of the phenomena under study.

Replication enhances the external validity of case studies (Yin, 2003). I used multiple cases in this research both to achieve theoretical replication, by assigning groups on maximum variability, and literal replication, by comparing cases within each group. A major strength of the study is that it incorporated explanatory breadth by examining the complex interactions between numerous variables. "Our ability to incorporate complexity is a direct reflection of how well we understand and can explain the phenomena we want to study" (M.E. Swisher, personal communications, November, 2005).

Artificiality and sensitization are threats in this study. Some associate artificiality with experimental designs. This can also be an issue with case studies and can affect

responses and behaviors within case studies. For example, people may respond differently to questions in an interview or questionnaire because they may try to give the researcher a response he/she wants to hear. I tried to reduce artificiality by encouraging that participants interact in a setting comfortable to the participant— non experimental conditions. Sensitization is an uncontrollable threat. Inclusion in the study may alter responses.

Sample Framework and Sample Selection

The theoretical population of this study is American Indian farmers in the United States. Farmers are individuals who actively cultivate land for food production. This definition does not consider farm size, amount of time spent farming or value of sales. I used this definition in order to include individuals in this study who are either cash crop producers or home gardeners. All cases include American Indian farmers or home gardeners who cultivated land within the study site and had the same tribal affiliation. Many American Indian Nations/Tribes in the U.S. are from distinct traditions, languages, and historical backgrounds. American Indian Nations are not really a single ethnic group, but rather a collection of many ethnic groups (Champagnes, 1999). I restrict my study to a single federally recognized tribe within the United States that has tribal members who currently farm or garden since the phenomena under study has a strong cultural component.

I contacted 23 federally recognized tribes recommended by a key informant working with Native Women in Agriculture to select a tribe within the USA. Ten tribes of the 23 possessed cases which fit the parameters of the sample selection. Many of the other tribes did not have many or any farmers but instead had ranchers. Two of the ten tribes officially rejected the proposal to conduct research with tribal members. Seven

tribal governments either were non-responsive or said that the tribe would claim ownership and publication rights over any material written about the tribe. One tribe, the Cherokee Nation, did fit the parameters for case selection and was willing to work with me. We agreed that the Cherokee Nation would review the thesis and determine whether it would be officially endorsed by the Nation upon completion of the research.

The accessible population is Cherokee farmers of Oklahoma within the Cherokee Nation's 14 county jurisdiction in northeastern Oklahoma. These farmers were also my sampling frame. Cherokee is self-defined. The farmer/home gardener claimed to be member of Cherokee Nation. I did not ask them if they held tribal membership cards due to sensitivities associated with this issue.

Cherokee farmers of Oklahoma are of the same sociolinguistic background and descendents of Cherokees who emigrated west during the 1820's and 1830's. There is currently no census information available that is specific to the Cherokee Nation farmers. According to the USDA Agriculture Census of 2002, there are currently 2797 farms, 3228 principal farm operators and approximately 537,00 acres of land under cultivation by American Indian operators in the 14-county jurisdiction. This is likely an incorrect estimation of Cherokee farmers because numerous American Indian tribal members who are not Cherokee also live within this region. The USDA does not census home gardener populations because they are not considered farmers. The unit of analysis is the individual farmer who is the primary decision-maker of the agriculture system. I chose this unit of analysis so that I could measure the variables associated with the theories under study.

Cherokee farmers are an excellent population to explore the theories under examination. The effects of the variables associated with these theories are not well

understood in the context of this population. Cherokee farmers use a variety of agricultural practices. I test the effects of the independent variables across a wide range of behaviors.

I used a non-probability snowball sampling technique to identify cases. "Snowball refers to the process of accumulation as each located subject provides other subjects" (M. Brennan, personal communication, March 2005). The exact number of Cherokee farmers within Oklahoma is unknown as is specific location of all Cherokee farms or home gardens. The population can be difficult to access, especially within rural areas. The Cherokee Nation's Department of Natural Resources provided contacts of potential participants. The snowball technique continued by asking research participants for recommendations and contact information of additional individuals who fit the parameters of the preliminary case selection. These include being a member of Cherokee Nation and currently farming or home gardening within 14-county jurisdiction. The use of non-probability sampling can affect the external validity of the research (Sullivan, 2001). However, since this case study design relies on theoretical generalizability, using this sampling technique does not affect external validity.

The initial goal was to select 90 cases total. Each of the three groups, high TAP users, medium TAP users and low TAP users, should posses 30 cases. I could not reach this goal due to time and resource constraints. Overall, I examined 34 cases. I collected information from 42 cases but missing data and inability to fulfill sample selection parameters led me to discard eight cases.

Data Collection

I assessed secondary data sources such as USDA Agriculture Census and reviewed research projects and historical resources provided by members of the Cherokee Nation

before I entered the field to gain a better understanding of the population and region of study (Babbie, 1998; Sullivan, 2001). The Cherokee Nation's Natural Resources Department and the Tahlequah Chamber of Commerce provided maps of the 14 county jurisdiction, historical information, demographic information, library references and local festival and events important to members of the Cherokee Nation.

I entered the field for a period of one month in August 2005 where I administered the research instruments. Four employees of the Cherokee Nation's Natural Resources Department and an employee of the Strategy Department were key informants who were familiar with the population of study. They helped me access initial cases and offered insight into local etiquette and the historical context of Cherokee farming (Krannich, & Humphrey, 1986).

Many individuals were recruited over the phone, at the Bell community Pow Wow, by other participants and at stomp dances. I asked participants if they were interested in participating in the research. I contacted approximately 55 individuals, of which 42 agreed to participate in the study. I contacted consenting participants to schedule an interview and complete a self-completion questionnaire at a place and time of convenience to the participant. Upon meeting with participants, I gave them a letter of informed consent. They were given an introduction to the purpose of the research, the consent process and instructions about how the meeting would progress, with a general reference to the length of the process.

I gave participants the self-completion questionnaire which consisted of scales, indices and one or multiple check-box response format questions. I offered to administer this portion of the packet verbally if it made the participant more comfortable. One participant chose that the questionnaire be administered verbally. I reviewed the index

that measured the outcome variable when the participants finished the self-completion questionnaire, which took most participants approximately 15-30 minutes. I assigned participants to groups based on the outcome variable. If any one group had over 30 participants, then the meeting would have ended and I would not have administered the interview portion. This never happened because no one group reached the maximum limit of 30. I then administered a structured interview, which lasted approximately 45 minutes. The interview consisted of open-ended responses, scalar-like questions, and one-check response question. I asked participants if they had any questions at the end of the interview and if they had any contacts who might be interested in participating in the research. I also mentioned that the results of the study would be sent to them in a manner which they preferred. If the meeting took place at the location of the farm or garden, I asked participants if they were willing to show me their garden/farm. Nine of the participants showed me their cultivated land. I did not ask the other participants to show me their garden/farm because we either did not meet in a location where the land was cultivated or because of time restraints.

Methods

Instrument Development

I developed instruments to measure the independent (attitudes, normative beliefs, self-efficacy, control beliefs, subjective norms, self-identity, access to resources and socioeconomic characteristics) and dependent variable (behavior or use of TAP) for this research. Instruments did not exist to measure the specific phenomena under study nor were adapted to study participants. I developed a Likert scale to measure attitude, indices to measure self-efficacy, control beliefs, subjective norms, normative beliefs, self-identity, access to resources and behavior which were included in a self-completion

questionnaire. The self-completion questionnaire also contained check box response questions to measure socioeconomic characteristics. I developed a structured interview to additionally measure behavior, control beliefs, self-efficacy, attitudes, subjective norms, access to resources, self-identity and socioeconomic characteristics They were displayed in an open response format questions and scalar response question format (Appendix B).

Scales and Indices

Scales and indices are often used to measure multi-dimensional variables like those in this research. They are composite measures that generate responses to a set of related items to create a single data point. Overall, "A scale or index assigns a numerical value to a concept, attitude, perception, opinion or some other complex attribute of a person" (M.E. Swisher, personal communications, March, 2006). I developed one Likert scale to measure farmers' attitudes towards traditional farming. Ajzen defines "attitudes towards a behavior" as "the degree to which performance of the behavior is positively or negatively valued" (Ajzen, ND). Other definitions of attitude exist which are multidimensional, but these definitions are difficult to operationalize and the relationship between the multidimensional components are not fully understand (Tesser and Shaffer, 1990).

"A scale is a multiple-item measuring device in which there is a built-in intensity structure, potency, or natural levels of feeling to the items that make up the scale" (Sullivan, 2001, p.160). The Likert scale measured the intensity and range in value of farmers' attitudes towards traditional farming by posing multiple statements. The scale consisted of a range of scalar responses to a particular statement. I used a five-point scale with response options including strongly agree, agree, neutral, disagree and strongly disagree. I gave each response item for each question a point value. I gave high point

values to positive attitudes towards traditional farming, while less positive and negative views were assigned lower point values. I added the point values together to give each participant a summative attitude score (Sullivan, 2001). The scale measured the degree to which participant attitude is positive or negative toward traditional farming.

I did the following to standardize the scale. I developed a range of 153 statements with two faculty members from the University of Florida. I placed these statements in five categories: very positive, positive, neutral, negative and very negative. A panel of 15 colleagues scored the 153 items in a scalar response format with choices ranging from very weak to very strong to determine how favorable or unfavorable each statement was.

I then selected statements with the highest item-total correlation using Cronbach's alpha. I asked a panel of 12 experts from the southeastern United States to respond to the remaining 40 items. I chose respondents based on their familiarity with agriculture and also on their explicitly stated view about traditional farming. Four respondents stated that they had a positive view of traditional farming, four stated that they had neutral views and four stated that they had negative views. I ran two t-tests for each item to determine which of the statements best differentiated between positive and negative attitudes to increase the discriminatory power of the scale. I eliminated statements based on neutral responses and inconsistency between the general opinion and the marked responses.

I used p-values to determine the items for each scale that significantly differentiated between attitudes. Sixteen items remained and maintained fairly equal positive and negative responses. I calculated Cronbach's alpha for the scale after data collection. I did not delete any to increase the Cronbach's alpha and item-total correlations. The final Cronbach's alpha was 0.91 and the average item-total correlation was 0.42 (Appendix C, Table 1).

"An index is a composite measure in which separate indicators of the phenomenon are combined to create a single measure…scores on each individual indicator are summed to give an overall score on the composite phenomenon" (Sullivan, 2001, p.159-160). I developed an unweighted unidimensional index to measure the behavior. Behavior is the manifest, observable response in a given situation (Ajzen, ND). The index consisted of multiple behaviors identified by an expert panel familiar with various agricultural practices. The term traditional is not clearly defined among different American Indian cultures. I operationalized the behavior, TAP, with the help of an expert panel, as those practices that are not conventional agricultural practices developed post WWII. These post WWII practices are well defined. Members of the expert panel listed conventional agricultural practices that could be used in both home gardens and farms in order not to exclude cases based on size of land holdings. For example, I did not measure behaviors such as tractor use or combine use because home gardeners with small acreage of cultivated land would likely not engage in these behaviors.

I measured multiple behaviors to operationalize TAP in order to increase the reliability and consistency of my results. This reduced the weakness associated with the use of a single measure of a general behavior, which often results in inconsistent and unreliable results (Ajzen, 1988, p 54). I included thirteen items in the behavior index. The index used a scalar response format with five categories, almost never, rarely, sometimes, often and almost always. I calculated the summative scores for each participant. Low scores indicated high use of TAP while high scores indicated low use of traditional practices. The index originally had 13 items, but while collecting data it became evident that two items were not inclusive of small plot cultivators, crop insurance and pest scouting. They were deleted from the index. I deleted additional items, seeds or

cultivators that are readily available commercially and mechanical land preparation, after data collection in order to further increase the reliability of the instrument. Nine items remained in the index for analysis (Appendix C, Table 2).

I created one and two dimensional indices to measure subjective norms, normative beliefs, self-identity, self-efficacy, control beliefs and resource access. I used an expert panel to create these indices. The Delphi method is a technique used to identify items about which there is consensus among a group of experts (Adler & Ziglio, 1996). This approach aims to get experts' opinions about a subject by using a series of questions with controlled opinion feedback (Adler & Ziglio, 1996). I first compiled a list of nine experts in agriculture. These experts included farmers, agricultural extension agents and agricultural service providers. I created a list of topics and questions that related to each variable measured. I then asked the expert panel to list 7-10 items that would answer the questions for each variable. Next, I created a rule to determine which items to keep on the list. I kept the items that 40% of respondents said were important. I then created a list which included these top responses and sent them back to the panel and had each person rank the items for importance on a 1-5 scale. I then took the mode for each item and kept the most consistent four to six answers. These items were included in the final indices that measured the variables (Appendix C, Tables 3 through 12).

I developed two indices to measure self-identity, control beliefs and access to resources. I created a modern identity index and traditional identity index to measure self-identity. I created a modern control belief index and traditional control belief index to measure control beliefs. Lastly, I created a modern resource access index and traditional resource access index to measure access to resources. I developed two indices for each of these variables to determine if the modern and traditional indices are

diametrically opposite to each other. For example, if an individual scores high on the traditional self-identity index, can he/she also score high on the modern self-identity index? Can farmers have both positive scores on both traditional and modern self-identity? Are these categories mutually exclusive?

Reliability accesses how consistently the instrument will produce the same results (Carmines & Zeller, 1979). I am confident of the reliability of my scales and indices because of the process I used to develop them. These instruments have high internal consistency and are replicable. Internal consistency is the degree to which items in a scale or index actually measures the same construct as intended to measure. Cronbach's alpha (Sullivan, 2001) is a measure of internal consistency based on the correlation between all possible split-halves of the items. It also provides the correlation between each item and the total score of the scale or index and provides an overall coefficient of scale reliability. I deleted items from the scale and indices that did not correlate well with the other items, thus improving the reliability and raising the Cronbach's alpha value.

Unlike scales, index inter-item reliability is not determined *a priori*. These instruments may exhibit lower reliability than scales because they assume that all items in the instrument are related without testing if this is true *a priori* (M.E. Swisher, personal communications, March 2006). I calculated internal consistency with Cronbach's alpha and total inter-item correlation after data collection to determine if the items in the indices were related to each other and to improve reliability of the indices. I removed items from some of the indices to improve the reliability of instruments (Table 3-1).
I also improved the replicability of this study by developing clear operational definitions of the variables and constructs.

I am confident in the validity of some of these instruments. I address construct validity by operationalizing the variables under study and then creating instruments based on the opererationalized definitions. I increase face and content validity by having an expert panel and colleagues help develop the scales and indices and also by referring to past research which tried to measure similar constructs within different settings. Two of the indices became problematic during the data collection process. This reduced the validity of the instruments.

Table 3-1: Cronbach's alpha and item total correlation values for measured indices

Construct	Item total correlation *	Cronbach's Alpha*	Items removed	Items remaining index
Behavior: Use of TAP	0.33	0.79	(1) crop insurance (2) mechanical land preparation (3) pest scouting (4) seeds or cultivators that are readily available commercially	9
Self- efficacy	.49	.88		
Subjective Norm	NONE	NONE	All subjective norm index items except one-item placed with normative beliefs index	1
Normative Beliefs**	.46	.76	(1)Family (2)Other farmers and neighbors (3)Tribal Elders	4
Traditional Self- Identity	.45	.69	(1) I use a small or family business to run my farm. (2) I rely on internal resources available to me on my farm. (3) I am thrifty. (4) I take few risks.	3
Modern Self-identity	.47	.88	(1) I rely on external resources available to me from off my farm (2) I rely on high inputs (3) I take risks. (4) I want to expand the acreage on my farm/garden	9

Table 3-1. Continued

Construct	Item total correlation *	Cronbach's Alpha*	Items removed	Items remaining index
Modern Resource Access	.39	.70	(1) Internet	2
Traditional Resources Access***	--	--	(1)Events (e.g. field days, workshops, conferences, tradeshows) (2)Publications about traditional practices	2
Traditional Control Beliefs	.52	.88	(1) Access to knowledge and advice	8
Modern Control Beliefs	.48	.88	None	9

* These are the final scores after items were removed to improve internal consistency
**Normative beliefs index was completely removed from study due to high non-response by participants. These scores depict reliability scores with participants who did respond to index.
*** Cannot calculate Cronbach's alpha based on two items

Other Questionnaire Items

The self-administered questionnaire included closed response items in addition to the scale and indices (Tashakkori & Teddlie, 1998). I did not develop scales or indices to measure socioeconomic characteristics because reliable instruments have already been developed to measure these variables. Since this research dealt with some sensitive topics, such as income, respondents were asked to answer these questions on their own instead of verbally in an interview setting. This technique aimed to produce less social desirability bias for these items (Fowler 1993) (Appendix C, Table 13).

Interview

I conducted structured interviews with each of the 34 research participants. Interviews allow for clarification and probing and communication with the participants (M.E. Swisher, personal communications, March, 2006). A structured interview entails

developing questions before the interview takes place and during the interview questions are asked in a specific order. "The structure is provided to obtain consistency from one situation to the next" (Sommer & Sommer, 1986, p. 115).

The interview included questions that addressed all variables under study and used scalar response questions and open-response format questions. I took procedural steps to ensure that the interview instruments were valid measurements of the conceptual constructs and that they provided accurate information (M.E. Swisher, personal communications, March, 2006). I began by stating my research hypotheses and included subsections related to each variable understudy explicitly. I then listed the appropriate interview topics for each hypothesis and subsection. I developed several questions for each topic with the help of colleagues and past research related to the topics. I reviewed these questions extensively to eliminate the unnecessary ones. A panel of two experts reviewed the instruments. The experts included a University of Florida professor, with expertise in research design and methods, and Cherokee Nation Natural Resources Department's Agriculture Liaison, who has expertise in local and Cherokee agriculture (Appendix B, Table 14).

The benefits of structured interviews include better reliability and validity than semi-structured or unstructured interviews (Bartels, Nordstrom & Koski, 2006). I increased the reliability by providing written instructions to develop consistency in how the interview was administered and that all participants received the same information (Fowler, 1993). Further, I solely administered the interviews. This contributed to the fairly consistent delivery of the interview questions.

I developed multiple instruments to measure the same construct, such as scales, indices and interviews. This increased concurrent validity and the overall validity of the

instruments. Overall, the indicators appear to measure the concepts. I believe my operationalization makes sense.

Interview data could be subject to measurement error if the interviewer does not elicit cooperation or adequate interpersonal communication. The interviewer can also be a source of error by inconsistent estimates (Fowler, 1993). I was successful at eliciting cooperation from the participants. I taped 32 interviews to reduce measurement error.

Pilot Study

I conducted a pilot study with four Cherokee farmers who represented the case selections I wanted to study. I made slight modifications to the instrument packet. I accounted for these changes during the pilot study. I included pilot study participants' results in the final study due to the slight modifications made to the instrument packet. See Appendix D for the full instrument packet.

Limitations

There are several limitations to this research project. First, using a retrospective case study design limits my ability to determine causality between independent and dependent variables and thus reduces internal validity. I took several measures to overcome this limitation, such as designing comparison groups, assessing multiple cases and measuring the variables with multiple instruments. Secondly, I may not have truly measured what I intended to measure in terms of the outcome variable TAP. TAP may not be mutually exclusive of conventional agricultural practices according to some participants.

Third, I should have elicited more direct feedback from colleagues and the expert panel with the structured interview and pilot-test participants. I did not do this because of my lack of experience as a researcher. Fourth, the sample size is small. This inhibits my

ability to make a more complete evaluation of differences between groups. Fifth, two indices had high levels of non-response and as a result had to either be withdrawn from the study (normative beliefs) or reduced to a one-item question (subjective norm). Non-response may be indicative of sampling bias. This can be due to non-random error where certain types of people are more likely to not respond than others. I do not know how these cases differ than those who did respond. Lastly, pilot test participants were all part of one user group. The instruments would more reliably measure the constructs under study if I pilot tested the instruments with cases representing all user groups.

Data analysis

I tested for differences between the three groups based on the outcome variable TAP using a Mann-Whitney U test. I determined if the groups were different based on the predicator variables to measure the first, second and third hypotheses. I used the Mann-Whitney U test to test difference between groups with ratio, interval and ordinal data. I did not use a student t-test to test for differences between groups with interval and ratio data because the groups had small samples, the sample size as a whole was small, and the number of smalls in the groups were uneven. The Mann-Whitney U test is a more conservative measure of group differences than the student t-tests (Sheskin, 2004). I used Fisher's exact test to test difference between groups with nominal data. I ran a logistic regression to test the fourth hypothesis. I conducted this type of analysis because the outcome variable was converted from an interval measurement to a nominal level of measurement.

Definition

- Attitude: a person's judgment that performing the behavior is good or bad
- Behavior: Behavior is the manifest, observable response in a given situation

- Control beliefs: beliefs about the presence of factors that may facilitate or impede performance of the behavior (traditional and modern agricultural practices) (Ajzen, ND).

- Normative beliefs: the perceived behavioral expectations of important referent individuals or groups (Ajzen, ND).

- Perceived behavioral controls: "people's perceptions of their ability to perform a given behavior" (Ajzen, ND). This definition consists of two parts: a person's confidence and perceived control beliefs over performing behavior

- Self-efficacy: an individual's confidence in his/her capabilities to produce effects

- Self-identity: the salient part of an actor's self which relates to a particular behavior (Stryker, S., & Burkes, 2002). I will use a modified version of Fekadu and Krafts (2001) self-identity measurements.

- Resource access: accessibility and reliability on traditional and non-traditional mass media and interpersonal communication resources

- Subjective norms: "perceived social pressure to engage or not to engage in a behavior" (Ajzen, ND).

- Traditional agricultural practices: those practices which were existent post WWII conventional agricultural practices

CHAPTER 4
RESULTS

Behavior and User Groups

I used an index to measure farmers' use of traditional agricultural practices. Thirty-four farmers' behavior were recorded and scored. The summative score for each farmer was used to determine the group he/she was placed in. I determined *a priori* the manner in which farmers would be placed into different groups. I determined the highest and lowest summative scores possible for the index and then equally dividing those points by three and determined the range of scores that would define each group. The highest possible summative score with the remaining nine questions was 45 points (nine questions x five, the highest response score possible). The lowest score possible was nine points. A total of 36 points were possible. I divided 36 by three which allowed each group 12 points. I placed farmers *posteriori* into a group based on their score. I did not try to base scores on specific TAP. Rather, as discussed previously, I used specific post-WWII practices in the indices. Therefore, low scores indicated high use of TAP. Farmers in this group are high TAP users. Medium scores indicated neither high nor low use of TAP, and farmers in this group are medium TAP users. High scores indicated low use of TAP and farmers in this group are low TAP users.

The distribution for all participants as one group is approximately normal.I placed 6% or two of the participants in the low TAP user group, 21% or seven participants in the medium TAP user group, and 74% or 25 participants in the high TAP user group. No statistical tests can adequately determine if there is a difference between the low TAP

user group and the other groups based on mean scores with a sample size of two for the low TAP user group. Therefore, I combined the low TAP user group with the medium TAP user group, collapsing the three original groups to two. This combined group is now the low TAP user group. Both groups show an approximately normal distribution (Table 4-1).

Table 4-1: Descriptive data summary for Cherokee TAP user groups created from the behavior index measuring use of traditional agricultural practices, Cherokee Nation, Oklahoma, 2005.

	High TAP user Group	Low TAP user group
Range of possible point value	9-21	21.01-45
# of participants	25	9
% of total participants in group	73.53%	26.47%
Mean	15.25	28.34
STD	3.61	5.11
SEM	0.72	1.70
Shapiro wilk W=	0.95	0.89

I ran a Mann-Whitney U test to determine if there was a difference between the high and low TAP user groups. There was a significant difference between groups ($z= -4.39$, $p=<0.01$, $\alpha = 0.05$) (Table 4-2 and Figure 4-1).

I also measured use of TAP with four open response questions in the interview (Table 4-3). The questions were:

- Name what you think are the five most important traditional Cherokee farming/gardening practices?
- You mentioned in the questionnaire that you use practice X. Have you always used this practice?
- What did you use before this?
- Why did you start using this practice?

Table 4-2: Values of U, Z, and p Mann-Whitney U test for behavior index based on high and low TAP user groups (α = 0.05),Cherokee Nation, Oklahoma, 2005

	Rank Sum High TAP Users	Rank Sum Low TAP Users	U	Z	P
Use of TAP	325	153	0.00	-4.39	<0.01

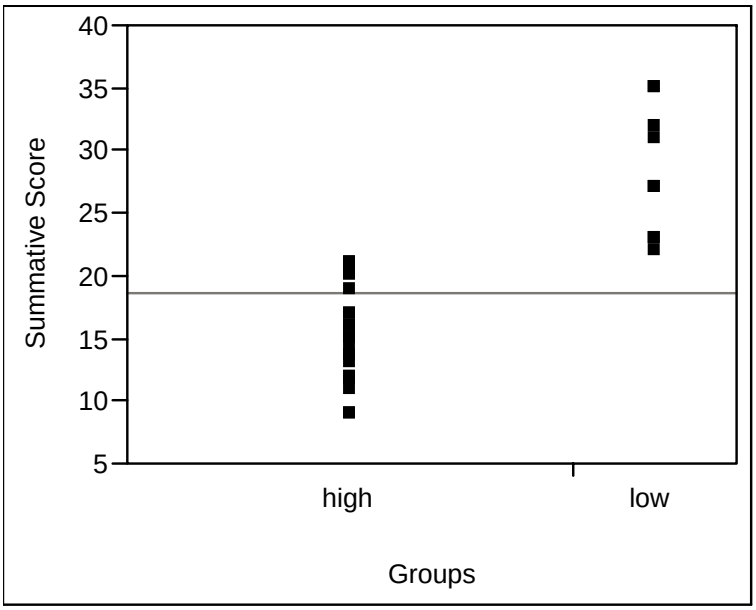

Figure 4-1: Summary score for high and low TAP user groups based on use of traditional agricultural practices, Cherokee Nation, Oklahoma, 2005

Interview responses to question one show a similarity between TAP user groups. Both groups named planting traditional crops and no use of synthetic substances as important traditional Cherokee farming practices. A few participants from the high TAP user group did not know what practices were important traditional Cherokee farming practices. Individuals from both user groups who adopted conventional agricultural practices said they did this because they were easier to use than the practices they previously used. For interview question two, “Have you always used this practice?”,73% of the low TAP user group said they have always used the practice. 68% of high TAP user group members said that they have always used the practice.

Table 4-3: Interview responses of high and low TAP user groups for questions measuring use of traditional agricultural practices, Cherokee Nation, Oklahoma, 2005.

	Low TAP user	High TAP user
# of participants in TAP user group	9	25
five most important TAP*	**(3) plant traditional crops **(3) no use of synthetic substances **(2) use the farmers almanac	**(4) use organic fertilizer **(4) don't know **(3) plant traditional crops **(3)plant a garden **(2) adequate soil preparation **(2) no use of synthetic substances
Why did you start using practice X?*	*(3)easier	*(5) easier

* only practices listed two or more times total by user group participants is listed
** depicts actual number or participants with this response

Hypothesis One

1. A relationship will exist between farmers' socio-economic characteristics and their use of TAP.

On average, participants in the high TAP user group were 53 years old, mostly males (60%) and speak a little Tsalagi or Cherokee. The most consistent level of education completed by this group is high school and the primary occupation is non-farmer/rancher work. These farmers cultivate on average 24 acres and averaged 29 years of experience farming. The five most common crops grown by this group were tomatoes, squash, radishes, onions and corn.

On average participants in the low TAP user group were 66 years old, mostly males (89%) and speak a little Tsalagi or Cherokee. The most consistent level of education completed by this group was two-four year college and primary the occupation is farmer/rancher. These farmers cultivated on average 598 acres of land and averaged 50

years of experience farming. The five crops most commonly grown by this group were tomatoes, corn, cucumbers, squash and soybeans.

I used a self-completion questionnaire and interview to measure socioeconomic characteristics. Items consisted of scalar response questions, one or multiple check-box response and open response questions. I used an alpha level of 0.05 for all tests measuring statistical significance. I used Mann-Whitney U test to measure differences between groups for ratio, interval and ordinal data (Table 4-4). I used the Fisher's Exact test to determine difference between groups for nominal level data that had cell counts of five or higher (Table 4-5 and Table 4-6).

There were no statistical differences between groups for the following socioeconomic variables: participation in agricultural organizations, hired laborers, non-hired laborers, number of total laborers, language use, participation in tribal activities, 2004 household income, 2004 net farm income and gender. There is a difference between user groups ($\alpha = 0.05$) for the following socioeconomic variables: age, hours a week farming, number of years farming, numbers of acres cultivated and selling of crops. Participation in agricultural organizations and participation in tribal activities are worth noting because their of low p-values 0.09 and 0.08, respectively. The low TAP users are older than the high TAP users. The low TAP users spend more time farming than the high TAP users. The low TAP users have farmed longer than the high TAP users. The low TAP users cultivate more acreage than the high TAP users. The low TAP user group is more likely to sell their crops than the high TAP user group.

Table 4-4: Values of U, Z, and p in Mann-Whitney U test for socioeconomic characteristic based on high and low TAP user groups ($\alpha = 0.05$), Cherokee Nation, Oklahoma, 2005

	Rank Sum Low TAP Users	Rank Sum High TAP Users	U	Z	p-level	Valid N Low TAP Users	Valid N High TAP Users
Age	349.5000	211.5000	49.5000	-2.36472	.018050	24	9
Hours/Wk Farming	387.5000	207.5000	62.5000	-1.95180	.050971	25	9
Yrs Farming	341.0000	187.0000	41.0000	-2.39357	.016691	24	8
Acreage Cultivated	278.0000	187.0000	47.0000	-2.14967	.031589	21	9
Participation Agricultural Activity	365.5000	195.5000	65.5000	-1.71796	.085813	24	9
Hired Laborer	399.5000	195.5000	74.5000	-1.48337	.137987	25	9
Non-Hired Laborers	399.5000	195.5000	74.5000	-1.48337	.137987	25	9
Total Laborer	400.5000	194.5000	75.5000	1.44433	.148655	25	9
Language	448.0000	147.0000	102.0000	.40988	.681898	25	9
Participation Tribal Activity	392.0000	203.0000	67.0000	-1.77614	.075720	25	9
Household Income 2004	301.0000	134.0000	70.0000	-.68313	.494530	21	8
Net Farm Income 2004	343.5000	184.5000	67.5000	-1.50887	.131343	23	9

Table 4-5: Contingency Table and Fisher's exact test for gender based on high and low TAP user groups (α = 0.05), Cherokee Nation, Oklahoma, 2005

Count Total % Col % Row %	Males	Females	
High TAP Users	15 44.12 65.22 60.00	10 29.41 90.91 40.00	25 73.53
Low TAP Users	8 23.53 34.78 88.89	1 2.94 9.09 11.11	9 26.47
	23 67.65	11 32.35	34

Test	ChiSquare	Prob>ChiSq
Likelihood Ratio	2.877	0.0899
Pearson	2.523	0.1122

Fisher's Exact Test	Prob	Alternative Hypothesis
Left	0.1184	Prob female is greater for groups =high than low
Right	0.9844	Prob female is greater for groups =low than high
2-Tail	0.2137	Prob female is different across groups

Table 4-6: Contingency Table and Fisher's Exact Test for selling crops based on high and low TAP user groups (α = 0.05), Cherokee Nation, Oklahoma, 2005

Count Total % Col % Row %	Yes	No	
High TAP Users	3 9.09 33.33 12.50	21 63.64 87.50 87.50	24 72.73
Low TAP Users	6 18.18 66.67 66.67	3 9.09 12.50 33.33	9 27.27
	9 27.27	24 72.73	33

Table 4-6 Continued

Test	ChiSquare	Prob>ChiSq
Likelihood Ratio	9.131	0.0025
Pearson	9.682	0.0019

Fisher's Exact Test	Prob	Alternative Hypothesis
Left	0.0047	Prob No is greater for groups =high than low
Right	0.9997	Prob No is greater for groups =low than high
2-Tail	0.0047	Prob No is different across groups

Five of the 14 variables used to evaluate how well the economic model explains Cherokee farmers' use of TAP are significantly different between user groups ($\alpha = 0.05$) (Table 4-4; Table 4-6). Age ($p=0.02$), hours a week farming ($p=0.05$), number of years farming($p=0.02$), numbers of acres cultivated ($p=0.03$) and selling of crops ($p<0.01$) differed between high and low TAP user groups. Five of the socioeconomic variables fail to reject hypothesis one ($\alpha = 0.05$). Nine of the socioeconomic variables show evidence to reject hypothesis one ($\alpha = 0.05$).

Hypothesis Two

2. A strong positive relationship will exist between farmers' attitudes towards the use of TAP, subjective norms, self-efficacy, control beliefs, self-identity and their use of TAP.

Attitudes

I used a scale to measure participants' attitudes toward traditional agriculture. There were 16 items in the scale. I used each farmer's summative score for comparison tests. There were two cases where two responses on a single question were marked. I took the average point value of the responses checked by each of the two participants and scored the missing item with an average point value of the two items checked by participants.

I handled missing responses by reviewing the raw data to determine if there was any consistency among participant's responses and missing datum points. There was none. I did not throw out any questions due to missing data.

For participants with missing datum points, I determined the average of the person's score and used this value to replace with the missing datum. I replaced the missing value because the individual's sum score total was needed to conduct other analyses and because omitting the missing data scores would give the individual a falsely low score.

One participant from the high TAP user group had several missing data. As a result, I did not include this participant's responses for the attitude variable for analysis. There was a total of five missing data points for all other participants. I dealt with each missing point by using the average of the individual's score to replace the individual's missing point.

I then ran a Mann-Whitney U test to determine if there was a difference between groups in relation to their attitudes toward traditional agriculture (Table 4-7). There is a difference between high and low TAP user groups' attitudes towards traditional agriculture ($z=2.46$, $p=0.01$, $\alpha = 0.05$). The high TAP user group has a significantly more positive attitude toward traditional agriculture than the low TAP user group (Figure 4-2).

Two open response questions in the interview were used to measure attitude (Table 4-8). "Which do you think is better, traditional farming or non-traditional/modern farming/gardening?" " Why?"

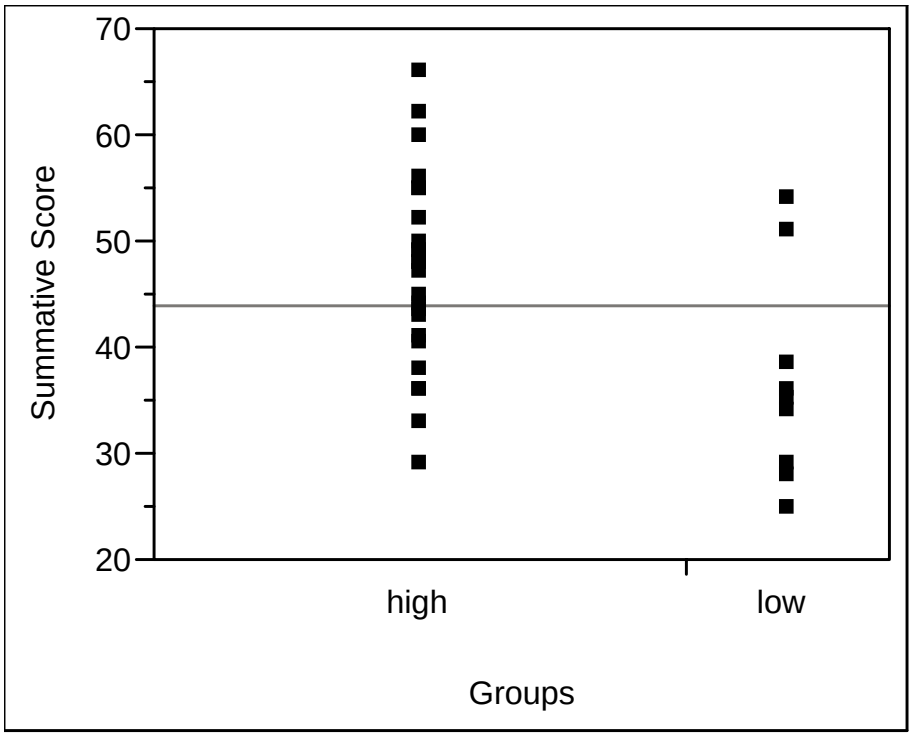

Figure 4-2: Summary score for high and low TAP user groups based on attitude toward of traditional agriculture, Cherokee Nation, Oklahoma, 2005

56% of high TAP users compared to 22% of low TAP users believe traditional farming is better than non-traditional/modern farming. Some members from both user groups believe that traditional farming is better because it is healthier for the body and those are the practices they were taught to use. Additional responses from the high TAP user group for traditional farming is better include its low impact on the environment, preserves the connection with the land/Earth and it is good for their culture. 56% of low TAP users compared to 24% of high TAP users believe non-traditional/modern farming is better than traditional farming. Members from each TAP user group believe that non-traditional/modern farming is better because it is easier to use. Additional responses from the low TAP user group include it's a better methods, it saves time and traditional farming cannot produce enough to feed the population. Some individuals from both groups were neutral or believed both types of practices are good.

Table 4-7: Values of U, Z, and p in Mann-Whitney U test for theory of planned behavior variables based on high and low TAP user groups ($\alpha = 0.05$), Cherokee Nation, Oklahoma, 2005

	Rank Sum High TAP Users	Rank Sum Low TAP Users	U	Z	p-level	Valid N High TAP Users	Valid N Low TAP Users
Subjective Norms	460.5000	100.5000	55.5000	2.12219	.033830	24	9
Attitude	500.5000	94.5000	49.5000	2.45927	.013927	25	9
Self-efficacy	428.0000	167.0000	103.0000	-.37084	.710758	25	9
Self-efficacy Interview	442.0000	153.0000	108.0000	.17566	.860561	25	9
Traditional Identity	428.5000	132.5000	87.5000	.82866	.407301	24	9
Modern Identity	372.0000	223.0000	47.0000	-2.55686	.010567	25	9
Modern Control Beliefs	445.5000	115.5000	70.5000	1.51585	.129568	24	9
Traditional Control Beliefs	394.5000	166.5000	94.5000	-.54571	.585272	24	9
Modern Resource Access	379.0000	149.0000	79.0000	-.73983	.459409	24	8
Traditional Resource Access	405.5000	122.5000	86.5000	.41343	.679291	24	8

Table 4-8: Interview responses of high and low TAP user groups for questions measuring attitudes towards traditional agriculture, Cherokee Nation, Oklahoma, 2005.

	Low TAP user	Why	High TAP user	Why*
Number of participants	9		25	
Traditional Farming	22%	(1) healthier for body (1) can use practices by his/her self; taught how to use them when young	56%	(4) low negative environmental impact (4) preserves connection with land/Earth/ Mother Earth (3) preserves nutrients/ healthier for body (2)good for culture/heritage (1) guidance comes from God (1) don't know (1) replenish soil (1) always practice this way (1) taught that is successful (1) high labor
Non-traditional/ Modern farming	56%	(3) saves time (2) it's a better method(precision agriculture, soil tests, insecticides, herbicides, pesticides) (2) traditional farming cannot produce enough to feed all people (2) its easier (1) no-till saves fuel, energy, labor, increases profits	24%	(1) have some products which help and enhance garden, such as insecticides and fertilizers (1)so much research by agriculture extension done on plants, they know more than 1-2 people (1) have more plant varieties to pick from (1) less work (1) raise more food in smaller area for benefit of people (1) it is easier
Neutral toward question	11%		8%	(1)no point of view (1) looks at moon signs
Both are good	11%	(1)traditional: ancestors made it work and we should take advantage of their knowledge (1)modern: makes good yields and modern varieties could help us	12%	(1) traditional: for personal use, keeps you in touch with land and crops and is more cost efficient (1)nontraditional: for commercial use, can farm more land, less labor intense and get more done (1)don't know difference between traditional and modern farming (1)both have advantages

* depicts actual number or participants with this response

Self-efficacy

I used eight items in the index to determine each participant's self-efficacy score. A potential response option for this index was "no Cherokee practice." Some participants marked this box. As a result, I determined the mean scores for each participant by taking the individual's sum total score and dividing it by the number of responses which excluded the "no Cherokee practice" option. This was important to do because when a participant marks "no Cherokee practice" for an item it implies that he/she believes that the practice (item) listed was not historically developed and used by Cherokees. If I assigned a point value to this belief, the mean score would inaccurately assign a higher or lower mean score than what it should be.

One participant was not included in this analysis because he/she did not believe that any of the practices (items) listed were historically developed and used by Cherokees. Confidence in performing traditional practices cannot be measured if the individual does not believe that the practice is traditional. This is another reason why I compiled the mean scores in the manner described above. There was one missing datum point. I took the participant's average score and replaced the missing datum point with the average score. See Appendix E Table 1 for self-efficacy data.

I then ran a Mann-Whitney U test to determine if there was a difference between groups (Table 4-7). There is no difference between high and low TAP user groups' self-efficacy ($z= -.37$, $p=0.71$, $\alpha = 0.05$). The high TAP user group has a significantly more positive attitude toward traditional agriculture than the low TAP user group (Appendix E, Figure 1).

I used one scalar response question in the interview to measure self-efficacy. "If you wanted to farm/garden traditionally, how well prepared are you to do that?" Both TAP user group members mean responses is that they are somewhat prepared to farm

traditionally. I also ran a Mann-Whitney test to determine if there was a difference between groups based on interview responses. There was no difference between groups ($z=0.17$, $p=0.86$, $\alpha = 0.05$) (Table 4-7).

Modern Control Beliefs

There were nine items in the index used to determine each participant's modern control beliefs score. I used mean scores for analysis. One participant's score was not included in this analysis because the participant wrote on this section of the questionnaire that this section was not applicable. This same respondent wrote this same phrases on numerous other portions of the questionnaire. There was one missing datum point among other participants. I determined the participant's average score for modern control beliefs and replaced the missing datum point with this average score. I ran a Mann-Whitney U test to determine if there was a difference between groups. There is no significant difference between high TAP user and low TAP user group's modern control beliefs ($z=1.52$, $p=0.13$, $\alpha = 0.05$) (Table 4-7; Appendix E, Figure 2).

Traditional Control Beliefs

There were eight items in the index used to determine each participant's traditional control beliefs score. I used mean scores for analysis of traditional control belief. I did not include one participant's score, the same as in modern control beliefs, in this analysis because the participant wrote on this section of the questionnaire that this section was not applicable. There were no missing datum points.

I ran a Mann-Whitney U test to determine if there was a difference between groups. There was no significant difference between high TAP user and low TAP user groups with regards to traditional control beliefs ($z=-0.55$, $p=0.59$, $\alpha = 0.05$) (Table 4-7; Appendix E, Figure 3).

I measured traditional control beliefs with two open response questions in the interview . "What are the kinds of things you can't control that keep you (might keep you) from using traditional farming/ gardening practices?", "Why?" Responses to the first question are provided in Table 4-9.

Table 4- 9: Interview responses of high and low TAP user groups for question measuring traditional control beliefs, Cherokee Nation, Oklahoma, 2005.

	Low TAP user	High TAP user
# of participants in TAP user group	9	25
Prevention from use of TAP	(3) weeds (2)land quality (2)pests (1)time (1)weather (1)amount of space (1) drought (1)nothing (1) erosion	(7) weather (6) drought (5) time (4) land quality (2) weeds (2) health (of farmer) (1)age (1)using herbicides (1) using pesticides (1) lose land (1) don't know

* depicts actual number or participants with this response, some participants provided multiple reasons which are also included here

Both TAP user groups identified weather, drought, land quality, time and weeds as things that could keep them from farming traditionally.

Subjective Norms

The index was not used for analysis because of data for the subjective norms index. There was one item in the questionnaire which measured subjective norms. There was no missing data associated with this scalar response question. I used participants' scores from this one item to measure subject norms. I did not include one participant's responses in the analysis because he/she responded to the question by writing on the questionnaire "I don't know." This was the same participant who responded to the control beliefs indices with "not applicable."

I ran a Mann-Whitney U test to determine if there was a difference between groups. There is a significant difference between high TAP user and low TAP user groups subjective norms (z=2.12, p=0.03, α = 0.05) (Table 4-7).The high TAP user group has a higher subjective norm score than the low TAP user group (Figure 4-3).

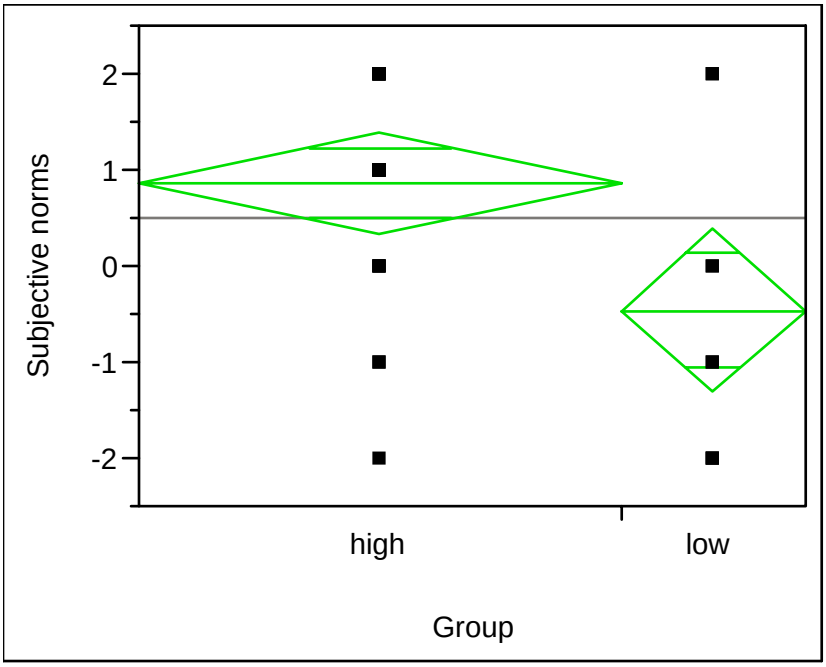

Figure 4-3: Score for high and low TAP user groups based on subjective norms, Cherokee Nation, Oklahoma, 2005

I measured subjective norms with two open response questions in the interview. "Do you think you should use traditional farming/gardening practices?" "Why?" See Table 4-10 for responses.

80% of high TAP users and 67% of low TAP users said they should use traditional farming practices. Some respondents from both TAP user groups related its importance to various aspects of preservation. High TAP users also said that they should use TAP because it is good for the environment, keeps them connected to the earth and they like to farm traditionally. 16% of high TAP users and 22% of low TAP users do not think they should use traditional farming practices. 4% of high TAP users and 11% of low TAP users think they should use traditional farming practices sometimes.

Table 4-10: Interview responses of high and low TAP user groups for question measuring subjective norms, Cherokee Nation, Oklahoma, 2005

	Low TAP user	Why	High TAP user	Why*
Number of participants	9		25	
Yes	67%	(3) keeps old ways alive (1) keep supporting people (1) to survive financially (1) the basics of gardening (1) has worked for many generations (1) worked for grandmother and for him/her	80%	(4) better for environment (3) preserve for future generations (3) stays closer to the earth (3) likes to garden/farm that way (1) safer (1) knows how to do it (1) its small scale (1) learns about/develop traditional sustainable food production (1) to be a successful farmer
Sometimes	11%	(1) safer for environment; harder to do; preserve it for future generations	4%	(1)there are many improvements now to make things easier

* depicts actual number or participants with this response, some participants provided multiple reasons which are also included here

Normative Beliefs

Similar to subjective norms, there were missing data on the normative beliefs index. The index was not used in analysis as a result. Unlike subjective norms, there were no additional items measuring normative beliefs for statistical analysis within the instrument packet.

Two open response questions in the interview were used to measure normative beliefs. “Who supports traditional farming/gardening in your community?” “Why?” Responses to the first question are provided in Table 4-11.

Table 4-11: Interview responses of high and low TAP user groups for question measuring normative beliefs, Cherokee Nation, Oklahoma, 2005.

	Low TAP user	High TAP user
# of participants	9	25
Supporters of traditional farming**	*(7) other farmers	(6)nobody (5)neighbors (3) don't know (3) community

* depicts actual number or participants with this response, some participants provided multiple reasons which are also included here
**only practices listed two or more times total by user group participants are listed

Low TAP users said that other farmers support traditional farming in their community. High TAP users said that nobody, neighbors, and community support traditional farming. Three high TAP users said that they did not know who supported traditional farming in their community.

Traditional Self-Identity

I used three items in the index to determine each participant's traditional self-identity score. I used mean scores for analysis of traditional self-identity. I removed one participant's response from the analysis due to high level of missing data. There were no missing datum points among other participants.

I ran a Mann-Whitney U test to determine if there was a difference between groups. There was no significant difference between high TAP user and low TAP user groups traditional self identity ($z=0.18$, $p=0.41$, $\alpha = 0.05$). (Table 4-7 and Appendix E, Figure 4).

Modern Self-Identity

I used nine items in the index to determine each participant's modern self-identity score. I used mean scores for analysis of modern self-identity. I removed two participant's responses from the analysis. One participant's responses had high levels of missing data. The other participant responded to this index as not applicable. This was

the same participant that responded in the same manner to the control beliefs measures. There were no missing data among other participants.

I ran a Mann-Whitney U test to determine if there is a difference between groups. There is a significant difference between high TAP user and low TAP user groups modern self-identity ($z=-2.56$, $p=0.01$, $\alpha = 0.05$). The low TAP user group has a higher modern self-identity scores than the high TAP user group (Figure 4-4).

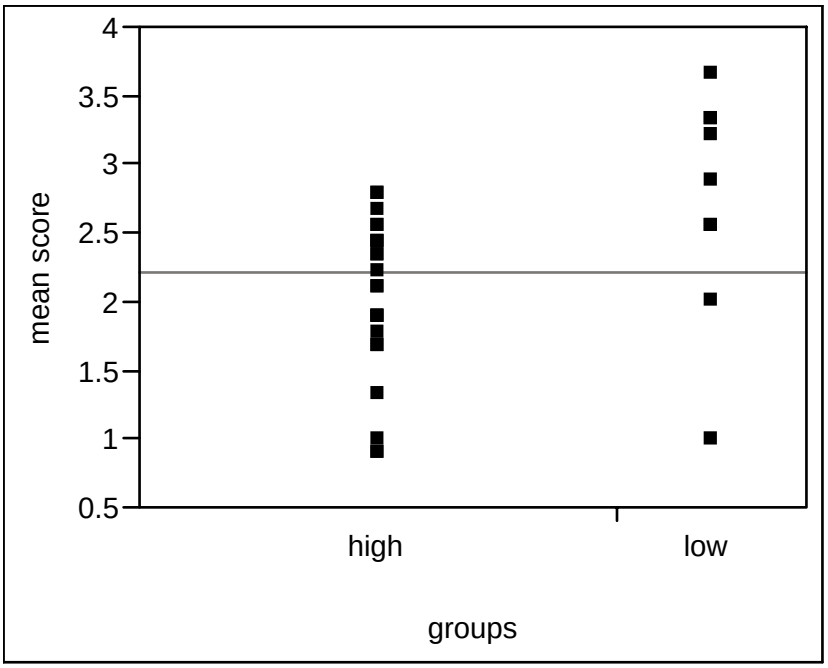

Figure 4-4: Mean score for high and low TAP user groups based on modern self-identity, Cherokee Nation, Oklahoma, 2005

I used five open response questions in the interview to measure traditional and modern self-identity.

- Do you think of yourself as a traditional farmer/gardener or as a modern (non-traditional) farmer/gardener?
- Why?
- What does traditional or non-traditional/modern farmer mean to you?
- Do you like it (or would you like it) when/if people call you a traditional farmer/gardener or non-traditional/ modern farmer/gardener?
- Why or why not?

Table 4-12 provides user group responses to "Do you think of yourself as a traditional farmer/gardener or as a modern (non-traditional) farmer/gardener?" and "Why?"

Table 4-12: Interview responses of high and low TAP user groups for questions measuring self-identity, Cherokee Nation, Oklahoma, 2005.

	Low TAP user	Why*	High TAP user	Why*
# of participants in TAP user group	9	N/A	25	N/A
Considers self traditional farmer	22%	(1)shares knowledge (1) done it this way for long time (1) way parents do it	52%	(4) uses TAP (2)don't use machinery, use hands (2) always done it that way (1) don't know (1) uses few modern techniques (1) gets information about gardening from God
Considers self non-traditional/ Modern farmer	33%	(1)use no till and irrigation (1)farm to survive (1)try to use most improved method	20%	(2) uses modern tools (1) don't know (1)takes short cuts – can't always plant according to moon
Considers self both traditional and modern farmer	44%	(2) uses both types of agriculture practices (2) easier to use modern tools + (2)grows like elders/ancestors	16%	(3) uses both type of practices (1) traditional is healthier (1)but don't have enough knowledge, expertise to consider self traditional
Considers self neither traditional nor modern farmer	0%	N/A	12%	(2) don't know (1) does not garden much

* depicts actual number or participants with this response

52% of high TAP users and 22% of low TAP users identify themselves as traditional farmers. A shared response as to why they use this practices is that they have always farmed in a traditional manner. 20% of high TAP users and 33% of low TAP users consider themselves as modern farmers. Interestingly, 44% of low TAP users and 16% of high TAP users see themselves as both traditional and modern farmers.

Respondents from both user groups said that they consider themselves as both traditional and modern farmers because they use both types of practices.

Three of the seven variables used to evaluate how well the theory of planned behavior explains Cherokee farmers' use of TAP are significant differences between user groups ($\alpha = 0.05$). Three of the measured TPB (Table 4-7). Attitudes ($p=0.01$), subjective norms ($p=0.03$), and modern self-identity ($p=0.01$) differed between high and low TAP user groups. High TAP users had a more positive attitude toward traditional farming than low users. High TAP users had higher subjective norms than low users to farm traditionally. Low TAP users had a more positive modern self-identity than high TAP users. Three of the measured TPB variables fail to reject hypothesis two. Four of the measured TPB variables show evidence to reject hypothesis two (Table 4-7).

Hypothesis Three

3. A positive relationship will exist between farmers' access to resources and their use of TAP.

Traditional Resource Access

I used two items in the index to determine each participant's traditional resource access score. I used summative scores for analysis of traditional resource access. I removed two participant's responses from the analysis. I removed one participant's responses due to high levels of missing data. The other participant responded to this index as not applicable. This was the same participant who responded in the same manner to the control beliefs measures. There were no missing data among other participants.

I ran a Mann-Whitney U test to determine if there was a difference between groups. There was no significant difference between high TAP user and low TAP user groups

traditional resource access based (z=-0.41, p=0.68, α = 0.05) (Table 4-7 and Appendix E, Figure 5).

Modern Resource Access

I used two items in the index to determine each participant's modern resource access score. I used summative scores for analysis of modern resource access. I removed one participant's responses from the analysis due to responding to this index as not applicable. This was the same participant who responded in the same manner to the control beliefs measures. There were no missing data among other participants.

I ran a Mann-Whitney U test to determine if there was a difference between groups. There was no a significant difference between high TAP user and low TAP user groups modern self-identity (z=-0.74, p=0.46, α = 0.05) (Table 4-7 and Appendix E, Figure 6).

I measured access to resources, in general, with two open response questions in the interview. "Where do you go to get information about farming/gardening?" "Where (or to whom) do you go to when you have issues or concerns about your farm/garden?" Table 4-13 provides responses to these questions

Table 4-13: Interview responses of high and low TAP user groups for questions measuring resource access, Cherokee Nation, Oklahoma, 2005.

	Low TAP user	High TAP user
Number of participants	9	25
Get information**	(5)OSU Extension (2)Elders (2)other farmers (2) farm magazines (2) USDA outreach	(5) nowhere (5) internet (5)parents (3)elders (3)books (3)moon (2) OSU Extension
Issues or concerns**	(3)Extension (2) Nowhere (2)other farmers (2) elders	(8) family (7)nowhere (4)friends (2)elders

* depicts actual number or participants with this response, some participants provided multiple reasons which are also included here
**only practices listed two or more times total by user group participants are listed

Respondents from both TAP user groups said that they get information about farming from elders and OSU Extension. Low TAP users also said that they get information from USDA outreach office, other farmers and farm magazines. High TAP users said that they get information from nowhere, the internet, parents, books and the moon. Both TAP user group members said that they go nowhere and elders when they have issues related to farming.

Zero of the two variables used to evaluate how well the Diffusion Innovation model explains Cherokee farmers' use of TAP are significant differences between user groups ($\alpha = 0.05$). There is significant evidence to reject Hypothesis Two (Table 4-7).

Hypothesis Four

4. The theory of planned behavior will better explain why farmers' use TAP than any of the other theoretical models.

I ran a logistic regression with four of the five socioeconomic characteristics, hours a week farming, years farming number of acres cultivated and selling crops which showed differences between groups. I did not run the model with age. When I included the five variables in the model, the model became unstable. This is because the sample size is small. To run the model with all five variables a larger sample is needed. I looked at correlation between all of these variables. Age was more often correlated with other socioeconomic variables among both TAP user groups than any other variable. Therefore, I removed age from the model (Appendix F).

I ran the model to determine which of these variables are the most important predictors of farmers' use of TAP and to determine how strong of a predictor of behavior the socioeconomic model is (Appendix F). The logistic regression shows that none of the four socioeconomic variables are significant predictors of behavior ($\alpha = 0.05$). However,

number of acres cultivates (p=0.12) is worth noting. The uncertainty coefficient reduces the log likelihood by 59% (r^2= 0.59) at a p-value >0.01.

I then ran a logistic regression with the three TPB variables, attitude, subjective norms and modern identity, which showed differences between groups (Appendix F). The logistic regression shows that none of the three TPB variables are significant predictors of behavior (α = 0.05). The uncertainty coefficient reduces the log likelihood by 18% (r^2= 0.18) at a p-value= 0.10. It worth indicating that the p-value is 0.10 for this model.

I did not run a logistic regression with any of the diffusion innovation variables because none of them showed a difference between user groups. The variables provide no explanation or predictive value between independent and dependent variables.

This hypothesis is rejected based on the logistic regressions ran for selected socioeconomic characteristics and TPB variables. The socioeconomic characteristics were more significant predictors of farmer behavior than the TPB variables (α = 0.05).

CHAPTER 5
DISCUSSION

Hypothesis One

1. A relationship will exist between farmers' socioeconomic characteristics and their use of TAP.

The results show that there is a relationship between some of the measured socioeconomic characteristics and farmers' use of TAP. Socioeconomic characteristics have some predictive value as a model of Cherokee farmers' choice of farming practices. Age, years farming, hours per week farming, number of acres cultivated and selling of crops were the only socioeconomic characteristics that illustrate a difference between TAP user groups.

Adesina and Chianu's (2002) and Pattnayak, Mercer, Sills and Yang's (2003) research observations show that farmer's age and experience farming positively correlate with farmer adoption behavior. The latter research implies that experience farming can alleviate unknown risk and uncertainty in the market environment and new technologies. Other research (Casey, 2004; Mathijs, 2003) indicates that there is no correlation or a negative correlation between agricultural adoption behavior and age and farming experience. Casey (2004) says that, although older farmers have more experience farming, they may be more set in their ways and less willing to adopt new technologies. My results do not support this latter explanation. The low TAP user group is older and more experienced in farming than the high TAP user group. The average age of low TAP user group is 65 and years of experience is 50 years. The green revolution took place in

the 1960s. The low TAP user group may have more exposure to conventional agricultural technologies than the high TAP user group who may have began farming when second generation problems were evident. The high TAP users may be less inclined to use conventional agricultural practices.

There was a difference between use of TAP and number of hours a week working on the farm. This is inconsistent with Mathij's research (2003), where a negative correlation exists between farmer adoption behavior and number of hours a week farming. However, McNamara and Wetzstein (1991) suggest that there may be a positive correlation between these variables because those farmers who spend more time farming may spend more time learning about new agricultural technologies. Competition with off-farm employment may compete with the time needed to learn and adopt new technologies. Those who farm more are therefore more likely to adopt new technologies. My results do corroborate McNamara and Wetzstein's interpretation.

The use of new agricultural technologies positively correlates with land size based on Pattnayak, Mercer, Sills and Yang's (2003) research. My research corroborates the results of their study. The low TAP user group cultivates more land than the high TAP user group ($p=0.03$). Small scale farmers may be home gardeners rather than farmers trying to make a profit. If this is true, generating an income from crop sales may not be as important to them as it is to larger scale farmers who rely on farming as a source of income. Other data support this interpretation of the results. The high TAP user group's most consistent primary occupation was non-farm/ranch work, while the low TAP user group's most consistent primary occupation was farming/ranching.

The number of agricultural organizations and tribal activity that TAP user groups participated in, although not statistically significant, merits discussion because they have fairly low p-values, 0.09 and 0.08, respectively. This is consist with Mathijis' research (2003). His results show a positive correlation between use of new technologies and organizational involvement. The low TAP users were more likely to participate in agricultural organizations and tribe-related activities than the high user group. This suggests these organizations do influence adoption behavior. These organizations may support the use of conventional technologies over more traditional ones.

Net farm income for 2004, although not statistically significant, also merits discussion because of its low p-value 0.13. This is consistent with Pattnayak, Mercer, Sills and Yang (2003) and McNamara and Wetzstein's (1991) research which shows that there is a correlation between farm income and adoption behavior. The low TAP user group has a higher net farm income than the high TAP user group. This makes sense when considering the variable selling of crops. Those farmers, low TAP users, who sell their crop's are also more likely to have a higher net farm income.

The high and low TAP user groups were similar to each other based on the variables number of laborers, household income 2004 and gender. My results do not corroborate previous findings that show that the number of laborers on farms is correlated with use of new agricultural technologies (Thangata & Alavalapati, 2003). The lack of difference between groups may be associated with historical components related to farming. A few farmers from the high TAP user group said that it was important to preserve farming to maintain their culture during interviews. Preservation may be associated with including other individuals in the farming process. Since low users

cultivate more land, they need laborers. While both groups show similar labor requirements, their reasons for needing labor may differ. This may be why groups did not differ in total labor use

Household income similarities may be because farmers are not the sole contributors to total income. Another member of the household may be working in the non-farm sector. Further, high TAP users' primary occupation is not farming, so income from this group is likely generated off farm. Other research findings are inconsistent in terms of the relationship between household income and farming adoption behavior (Pattnayak, Mercer, Sills, & Yang, 2003; Thangata & Alavalapati, 2003)

There is no difference between groups based on gender, a finding that is similar to that of Schaefer, Epperson and Nauta's research (1997). Some research shows that there are differences between male and female adoption of new farming technologies. This difference is often associated with uneven access to resources, such as land, labor or extension services (Doss & Morris, 2001). Women did not have the same opportunities as males to receive an agricultural education historically. Beginning in the 1930s, women have had more exposure to agricultural education. For example, the USDA has a small farms program that provides access to agricultural education and capital to women farmers. This implies that Cherokee women do have similar access to different resources and opportunities as males when it comes to larger scale farming. Regardless of TAP user group, farming was once a female oriented activity. There may be an association of preservation of culture with women in both user groups.

The inconsistencies with many of the socioeconomic characteristics and TAP user group behavior may exist because many TAP user group members did not actually adopt

new technologies. Many member of high and low TAP user groups during the interviews said that they always used the same agricultural practices measured in the behavior index. Most literature focuses on differences between behavior and socioeconomic characteristics as they relate to adoption behavior as opposed to persistence behavior.

Each TAP user group does appear to have a few distinctive characteristics that differentiate them based on socioeconomic characteristic. The high TAP user group tends to be less educated, younger, smaller scale farmers. They do not rely upon farming as their primary source of income or as a primary occupation. It seems that this group consists more of home gardeners than large scale commercial farmers. My direct observations support this last implication. Low TAP user group members are more educated, older, culitvate more acreage, rely more upon farming as a sources of income and as primary profession. These farmers appear to consist more of commercial farmers than home gardeners.

Hypotheses Two and Three

2. A strong positive relationship will exist between farmers' attitudes towards their use of TAP, subjective norms, self-efficacy, control beliefs, self-identity and their use of TAP.
3. A positive relationship will exist between farmers' access to resources and their use of TAP.

The results show that there is a relationship between some of the TPB variables and farmers' use of TAP, but the TPB has little value as a model for explaining Cherokee farmers' choice of farming practices. Some TPB variables differ between the two TAP user groups while others do not. There was a difference between groups based on attitude, subjective norms and modern self-identity. The results show that there is no relationship between diffusion innovation variables and farmers' use of TAP. Neither the

traditional nor modern resource access variables differ between groups. Although results provide some support for hypothesis two, they do not corroborate hypothesis three.

The results in this research show a difference between groups based on attitudes toward traditional farming. The high TAP user group has a more positive attitude towards traditional agriculture than the low TAP user group. This is consistent with previous findings. Luzar and Diagne (1999), Lynne, Shonwiler and Rola (1998) and Zubair and Garforth (2006) show that attitudes correlate with decision-making and adoption behavior. Interview responses are consistent with Likert scale results. Some members from both user groups viewed traditional agriculture as better practices than non-traditional practices because they are "healthier". Some members from the high TAP user group also believe that traditional agriculture is better than conventional agriculture because TAP impacts the environmental positively, preserves the connection with land/Earth/ Mother Earth and is good for culture and heritage. Some of the low TAP user group members said that non-traditional agriculture is better than traditional agriculture because it is easier to use, saves time, is a better method due to technology advancement and can feed the population. The responses by TAP user groups make sense in light of socioeconomic characteristics. Low TAP user group members are more likely to be commercial farmers. The use of techniques which maximize efficiency is probably important to them. Armitage and Christian (2003) discuss the lack of consistency that previous research shows in determining the effectiveness of attitudes as predictors of behavior. However, this research shows that attitudes do affect behavior.

TAP user groups' subjective norms were also different. The high TAP user group had more positive subjective norms than the low TAP user group towards using TAP.

This is consistent with Brickell, Chatzisarantis and Pretty's (2006) research, which shows that there are positive correlations between subjective norms and intentions to use certain behaviors. However, in other research, subjective norms are an insignificant indicator of behavior (Luzar & Diagne, 1999). The interview data reflect the Mann-Whitney U test results to some degree. However, this may be due to measurement error. A one item measure may not accurately capture subjective norms. Interview responses show that TAP user groups' subjective norms influence their behavior more than the ordinal question. 67% of low TAP users and 80% of high TAP users said that they should farm traditionally. Reasons given among TAP user groups' members for why they should farm traditionally highlight the importance that some farmers place on preservation. Further, high TAP user group members mention that they should farm traditionally because it is better for the environment. Pressure to comply with referents reveals participants' desire to preserve practices and the belief that those practices are environmentally sound. Likewise, low TAP users may not use TAP because of the desire to comply with referents who believe that TAP are undesirable behaviors. This research suggests that social pressure to comply with important referents is a relevant explanatory factor in understanding differences between TAP user groups.

The results related to self-identity variables are interesting. Modern self-identity differed between groups based on the Mann-Whitney U test. Traditional self-identity did not. The high TAP user group was less likely to orient themselves as modern farmers than the low TAP user group. However, both TAP user groups had a neutral identity as traditional farmers. Lower TAP users might view themselves as modern farmers and also maintain an identity as traditional farmers, similar to high TAP users. They may be able

to identify with their heritage, but this identity with heritage does not determine their overall identity. A portion of the interview supports this interpretation. The most consistent responses among low TAP user groups were that farmers identified themselves as both traditional and modern farmers. The rest of the interview data reveal a different finding. The biggest difference between TAP user groups based on self-identity is self-identification as a traditional farmer. The majority of high TAP users see themselves as traditional farmers, while a much smaller percentage of low TAP users see themselves as traditional farmers only. Less difference is evident between modern identities. The interviews imply that there is a difference between groups based on traditional self-identity. The discrepancy between the Mann-Whitney U test and interview responses may be because of measurement error or that people, based on different measures, have multiple identities.

Research about identity show that identity is complex and that people can maintain multiple identities based on the context. Different measures yield inconsistent responses. The Mann-Whitney U test shows a difference between groups exist based on modern identity, while the interview responses show that a difference between groups exist based on traditional identity and dual identities. Identity theory implies that people will behave in ways that conform with their self-image. The stronger a person's self identity, the more likely the individual will behave consistently with that identity (Stryker & Burke, 2002). Wilson, Urban, Graves, and Morrison's (2003) research shows a relationship between farmers' performing and persisting in the use of certain behaviors that reinforce farmers' sense of self identity. Identities can be connected to daily agricultural practices.

According to the Mann-Whitney U test, those who are farmers by occupation are able to more strongly identify with being a modern farmer than those who are not farmers by occupation. According to the interview responses, the high TAP users identify themselves as traditional farmers. The type of practices farmers see themselves using, such as improved methods or no till may reflect farmers identifying themselves as modern. "Farmers engage in practices with attributes that signify both who they are and who they are not" (Wilson, Urban, Graves & Morrison, 2003, p.7). Like Wilson's research this research shows significant findings related to the importance of identities being maintained by use of certain agricultural practices.

The results related to perceived behavioral controls and resource access are especially interesting due to the lack of difference between groups. A great deal of research incorporating the TPB shows that self-efficacy is often the prime determinant of behavior (McGinty, 2006; Armitage & Christian, 2003; Sanderson, 2004).

Research findings indicate the importance of control beliefs in predicting behavior (Pavlou & Fygenson, 2006; Brickell, Chatzisaratis, & Pretty, 2006). TAP users' traditional and modern control beliefs did not differ between groups. Interestingly, for both control belief measures TAP user groups' mean responses were neutral toward the proposed inhibitors to farm traditionally or conventionally. Some interview responses among both TAP user groups show items related to weather and lack of time as obstacles to farming traditionally. Both of these responses are more pronounced in the high TAP user group. Weather cannot be controlled. Further, it may be difficult to find the time for high TAP users to farm because their primary occupations are not farming or ranching. Regardless, both groups believe farming traditionally requires more time than they have.

High TAP users noted drought as preventing people from farming traditionally. This may allude to resource access in that there may not be adequate nor reliable resources to get information about how to irrigate crops in a traditional manner.

Self-efficacy or confidence in using TAP also showed no differences between groups in the index. This is consistent with interview responses. Most individuals from both TAP user groups felt somewhat confident that they could farm traditionally. Schaefers, Epperson, and Nauta's (1997) research show that self-efficacy was a significant predictive factor in influencing an individual to persist in using a behavior. McGinty's (2006) research extends self-efficacy theory (PCB) by showing that both control beliefs and self-efficacy are significant predictors of farmer's decision-making and land use practices. However, the results from this research are not consistent with these researchers' findings. The poor predictive power of perceived behavioral controls may be related to volitional control. The perceived behavioral controls predict behavior in situations when performing the behavior is perceived to not be under the control of the individual (Ajzen, N.D.). Perhaps TAP users today believe that they have full control over whether they use TAP or not, although historical data show that this was not true in the past. If this is true, then the theory of reasoned action might be a better model to explain differences between TAP user groups than the theory of planned behavior.

Access to resources was also not significantly different between groups. Resource access scores on both traditional and modern resource indices were highly variable. This implies that neither TAP user group could consistently identify information resources as either traditional or modern. This could also imply that traditional and modern resources used by participants are actually different from what expert panel members believe them

to be. However, upon review of interview data, the majority of resources individuals listed as important sources for information are consistent with index items. Interestingly, high TAP users and low TAP users in the interview mention similar resources for getting information, such as elders and Extension offices. Two variables from the socioeconomic model, participation in tribal and agricultural activities, may allude to potential resource access of TAP user groups. Both variables show a noteworthy difference between groups. In both cases, the low TAP users show higher participation in activities. Participation in these activities may provide information about farming.

There was also a consistency between TAP user groups' responses to whom or where individuals go when they have concerns about farming. Members from both groups said they either go nowhere or to elders. The response of "nowhere" may imply that there are no adequate resources that farmers believe they can seek. This could also mean that they do not believe they need to seek other resources for information. There was no consistency among either group in terms of whom or what resources they used and relied upon related to farming. This may mean that neither group has a reliable information source where they can consistently find information or discuss concerns about farming.

Past research shows inconsistent findings in support of access to resources as a predictor of behavior. For example, Nowak's research (1987) shows the importance of resource access, such as Extension agents, as increasing with the complexity of agricultural innovations used. My results differ from this because the low TAP users use of more complex technologies, but still do not differ from high TAP users in resource

use. On the other hand, Hooks, Napier and Carter's (1983) research shows no correlation between use of certain farm technologies and resource access.

There may be some association between building one's confidence and control beliefs and having the ability to build skills and knowledge by having access to resources (Sanderson, 2004). For example, high TAP users, who are younger and less educated, do not have reliable and consistent access to traditional resources. They may also not have the knowledge about how to access traditional resources. Thus, even if high TAP users want to use TAP, they may only be somewhat confident and feel somewhat in control of their ability to do so because of lack of resource access. They do not differ from low TAP user groups members because low TAP user groups do not necessary need to access traditional resources about farming.

Hypothesis Four

4. The theory of planned behavior will better explain why farmers' use TAP than any of the other theoretical models.

My research results do not corroborate this hypothesis, based on the logistic regression. Socioeconomic characteristics are a better predictor of Cherokee farmers' use of TAP than either TPB or diffusion innovation variables. Subjective norms, attitudes and modern self-identity were different between groups. However, none of these variables individually were significant predictors of behavior in a regression model. The model as a whole was not predictive of behavior.

The socioeconomic characteristics, acreage cultivated, hours per week working on farm, number of years farming and selling of crops were significant predictors of behavior as a whole. However, none of the variables were individually significant predictors of behavior. In both regressions the individual variables probably have high

multicollerarity between variables. This is observed especially among socioeconomic data. Unfortunately, due to small sample size, I was unable to run other types of analysis to determine association between variables.

When considering the importance of the economic model as a predictor of behavior it is important to reconsider the historical context of the study group. The historical context shows that there is distinction between two farming groups. The wealthier farmers rapidly adopted and adapted many facets of Western farming and ranching. The poorer group does not do so as quickly or fully. The results from this research rediscover this distinction between groups - some components of group differences persist.

Research illustrates various effects of the influence of socioeconomic characteristics in predicting behavior. Adoption of new technologies are often considered a function of economics (Marra, Pannell, Gaudim, 2003).Research does indicate that many economic models are enhanced in predicting decision-making behavior when considering other factors, such as attitudes (Luzar & Diagne, 1999; Lynne, Shonkwiler, & Rola, 1988) and access to resources (Floyd, et al, 2003). My research indicates that components of the TPB may strengthen the predictive power of the economic model.

The majority of research examining rational decision-making focuses on adoption behavior as opposed to persistence behavior, especially those which may not have direct observable benefits. I discuss my results in light of this research by interpreting low TAP users as the adopters of new technologies. However, as previously discussed, I have some reservations about this interpretation due to interview responses. Many participants who do use conventional agricultural technologies indicated that they have always used them. So, these individuals may also be persisters as opposed to adopters. Overall

current research does not adequately explain why people persist in using certain agricultural technologies

Summary

I tested four hypotheses in this research:

1. A relationship will exist between farmers' socio-economic characteristics and their use of TAP.
2. A strong positive relationship will exist between farmers' attitudes towards their use of TAP, subjective norms, self-efficacy, control beliefs, self-identity and their use of TAP.
3. A positive relationship will exist between farmers' access to resources and their use of TAP.
4. The theory of planned behavior will better explain why farmers' use TAP than any of the other theoretical models.

Overall, my results do not corroborate any of my hypotheses. Few to no variables associated with each theory show that a relationship exists between TAP user groups. The economic model was the strongest predictor of behavior over the TPB. However, no one variable could significantly explain Cherokee farmers' persistent use of TAP.

The results do allow me to offer a painting of the overarching characteristics of each user group. The high TAP user group consists of small-scale farmers who do not rely upon farming as a primary occupation or providing a major source of income. These farmers may be home gardeners or hobby farmers. They sometimes identify themselves as traditional farmers and have a positive attitude about traditional agriculture. Social pressure urges them to use TAP. Confidence, control beliefs and access to resources do not strongly influence their decision-making to use TAP. This may be indicative of their overall lack of access to reliable and consistent sources of knowledge and resources, other than elders, related to TAP. This research indicates that

these Cherokee farmers'persistent use of certain agricultural technologies are defined by benefits which are not necessarily tangible nor immediate , such as, cultural/heritage preservation and environmental conservation.

The low TAP user group consists of large scale commercial farmers who are farmers by occupation, rely upon farming as a primary income source and cultivate more land. They tend to be more educated, participate in more tribal-related and agricultural organizational activities, are more experienced, older farmers, and spend more time farming than the high TAP group. Their use of conventional technologies may be associated with their desire to maximize efficiency. The low TAP users have a less positive attitude towards traditional farming and identify themselves as modern farmers or a combination of both traditional and modern farmers. They feel less social pressure to use TAP. Like high TAP users this group may not have adequate access to resources about conventional and traditional farming. This is surprising because this group is more educated than high TAP users. Education is usually associated with having more access to resources. This research indicates Cherokee farmers', who are low TAP users, persistent use of certain agricultural technologies are defined by economic direct incentives.

CHAPTER 6
CONCLUSION

Future Directions

Traditional agricultural practices developed from a culmination of knowledge and beliefs that evolved by adaptive processes (Berkes, 1999). TAP are not necessarily practices static in nature. This is evident in this research. Development of a common definition of Cherokee TAP may never be fully realized due to differences in perspective and opinion of participants. However, the examination of farmers' persistent use of certain farming technologies provides insight into farmers' perceptions, beliefs and identities related to TAP.

Research should examine the markers that define traditional by the practices consistently identified by research participants as traditional. Assessing commonly referenced traditional practices are more accurate measures of behaviors. They also provide insight about the meaning of traditional to a specific community.

What influences farmers to maintain or reject traditional beliefs and values exhibited by using TAP? This study offers a partial answer to this question. The ability to sustain using certain agricultural behaviors may require different methods for different types of agricultural systems. If maintaining conventional agricultural technologies is a primary goal, then enhancing components that increase socioeconomic status and direct benefits may encourage continued use of these technologies. On the other hand, if maintaining traditional agricultural practices is important, increasing awareness and

promoting values and beliefs towards indirect benefits, such as cultural preservation and environmental conservation, may support persistent use of TAP.

Researchers explain farmer adoption behavior based in rational thinking primarily through socioeconomic characteristics. In this study these factors are able to explain some of Cherokee farmers' behavior or use of traditional agricultural practices. Nowak (1987) states "what farmers should do according to economic theory is not the same as what farmers actually do in adopting a new technology. Therefore, instead of stopping with the legitimate deduction that economies are important in the adoption of conservation practices, we must go on to the equally important task of explaining variability among farmers in terms of their pursuing conservation objectives" (p. 218). Although this statement refers to adoption of conservation behaviors, it readily applies to this research. The economic model offers a framework with which to begin looking at persistence behavior. However, it is an incomplete explanation of Cherokee farmers' agricultural behaviors. Cherokee farmers' array of agricultural behaviors still needs further investigation and scrutiny.

If most participants are persisters, then the differences between TAP user groups are not adequately nor fully explained by the theory of planned behavior or the diffusion innovation model. Like the economic model, they are able to better explain adoption behaviors that have observable direct benefits. Behavioral models that have gained acceptance in psychology and sociology disciplines provide implications for improving the economic model to assess Cherokee farmers' use of TAP.

However, researchers need to develop an integrated behavioral theory, as it relates to persistence behavior. Research should draw upon the most successful predictors of

behavior and also explore less examined predictors from multiple disciplines. An interdisciplinary perspective will allow a diverse community of researchers to examine behavior and add additional insight into the nature of persistence behavior.

Within economics, ecological economists explore the intrinsic value or non-use value that people place on landscapes and incorporate these in land use model. These values are indirect values where no financial gains are made. According to Osinski, Kantelhardt & Heissenhuber (2003) land use models "portrait the most important relationships and explain complex systems such as a cultural heritage landscapes" (p. 478). The examination of farmer persistence behavior could benefit by incorporating this non-use value component.

Within the theory of planned behavior, examining attitudes, subjective norms and identities related to environmental conservation or cultural preservation might provide more insight into farmer behavior. Examining farmers' knowledge of different agricultural technologies may contribute to better understanding of the risks associated with those practices, farmers' confidence toward using those technologies and the type of resources that may be useful to farmers. The presence, absence and level of support of traditional ecological knowledge among participants and communities could be knowledge that increases comprehension of persistence behavior.

The examination of farmers' connection and identities tied to place, since the use of TAP are suggested as being place-specific adaptation, could be another source of insight into farmer behavior. For example, researchers could examine how community differences and location, such as the degree of isolation, correlate with use of TAP.

Geographic information systems can help identify and better unravel the multiple effects of location on farmer decisions about technology and land use.

Lastly, researchers could explore the effects that the biophysical environment can have on persistence behavior. For example, some studies show that farmers are more willing to adopt new technologies when they are faced with poor biophysical conditions, such as erosion and slope (Pattnayak, Mercer, Sills & Yang, 2003). This implies that farmers persist in using certain behaviors under poorer physical conditions. The effects of isolation or the proximity to certain natural resources such as lakes and rivers may hinder or facilitate the use of certain preferred agricultural technologies.

Limitation

There was one major limitation to this study. A small sample size for each TAP user group, especially the low TAP user group, reduced the amount and potential range of responses for all measured variables. It also reduced the number of statistical tests that I could perform. Further, this small size may not be representative of the association between predictor and outcome variables and affect the theoretical generalizability of the results.

APPENDIX A
CHEROKEE NATION'S 14 COUNTY JURISDICTION: NUMBER OF AMERICAN INDIAN FARM OPERATORS BY COUNTY

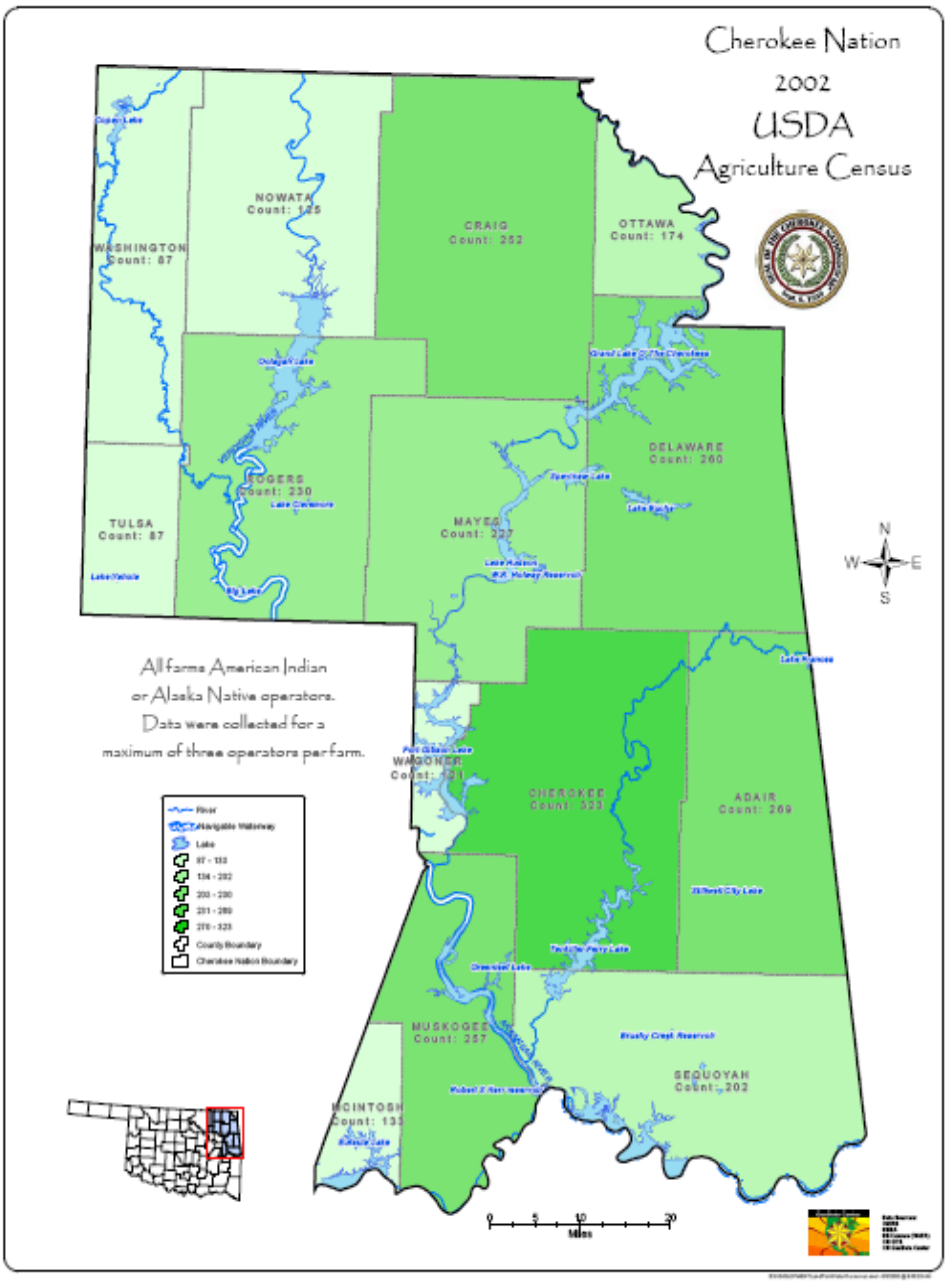

Figure A-1: Permission to use by Cherokee Nation

APPENDIX B
INSTRUMENT OUTLINE: CONCEPTS, VARIABLES AND INTRUMENTAL MEASUREMENTS

Concept	Variable	Instrumental Measurement
Attitude	General attitude toward traditional farming	Scale(Q)* Open response format question (I)**
Subject Norm	Subject norms towards using TAP	Index (Q)* Open response format question (I)**
Normative Beliefs	Normative beliefs towards using TAP	Index (Q)* Open response format question (I)**
PBC: Self-efficacy	confidence in using TAP	Index (Q)* Open response format question (I)** Scalar response format(I)**
PBC: Control Beliefs	Modern control beliefs (hindrance to use modern agriculture practices) Traditional control beliefs (hindrance to use TAP)	Indices(Q)* Open response format question (I)**
Self-Identity	Modern Self-identity (identity as modern farmer) Traditional Self-identity (identity as traditional farmer)	Indices(Q)* Open response format question (I)**
Access to Resources	Modern resources Traditional resources	Indices (Q)* Open response format question (I)**
Socioeconomic characteristics	Age Household Income Farm Income Gender Education Level Language Farming Experience Amount of acres under cultivation Farm ownership structure Hours/week farming Martial Status Crop Use Number of Laborers Participation in Tribal Organizations Participation in Agricultural Organizations Primary Occupation	Closed response one check box response format(Q)* Closed response multiple check box format(Q)* Open response format question(I)**
Behavior	Use of traditional agricultural practices	Index (Q)* Open response format question (I)**

*Administered in Self-completion Questionnaire
**Administered in Structured Interview

APPENDIX C
INSTRUMENTS ADMINISTERED BY VARIABLE

Table C-1: Likert scale of attitude toward traditional farming

Please indicate how much you agree or disagree with each statement presented below.

	Strongly Disagree	Disagree	Indifferent	Agree	Strongly Agree
The way we farmed before was lots better than this "modern" farming.					
The old ways were the best.					
People should stay away from the old ways of farming.					
Modern farming is bad for big farmers.					
Modern farming uses too much labor.					
People who think ahead always use modern farming practices.					
The new ways of farming makes thing easier for small farmers.					
The new ways of farming are great for Indian farmers.					
I wish the new ways of farming would go away.					
Farmers get poor using modern farming practices.					
Modern farming practices advance Indian farmers.					
Modern farming practices make farmers broke.					
Modern farming pays off.					
Modern farming is terrible for the soil.					
Modern farming practices help animals.					
Modern farming practices are the best thing ever.					

Table C-2: Behavior index

How often do you use the following techniques or practices on your farm/garden?

	Almost Never	Rarely	Sometimes	Often	Almost Always
Synthetic herbicides					
Synthetic insecticides					
Synthetic fertilizers					
Mechanical land preparation					
Genetically modified crop or seed varieties					
Drip or overhead irrigation					
Sap testing to determine fertilizer needs					
Soil or tissue testing to determine fertilizer needs					
Pest scouting					
Hedging, futures or coop marketing					
Crop Insurance					
Insect, weed, or pathogen identification services					
Seed or cultivars that are readily available commercially					

Table C-3: Two dimensional subjective norm index

Do you think there are practices HISTORICALLY DEVELOPED and USED by the Cherokee to do the following? Please check the "Yes" or "No" box next to each item below.

For each item checked "Yes," please indicate the degree to which you think YOU SHOULD use the historically developed practices used by Cherokee rather than practices introduced to the Cherokee.

	Yes	No	Almost Never	Rarely	Sometimes	Often	Almost Always
Manage weeds							
Manage insects and pests							
Prepare land for planting							
Determine plant nutrient needs							
Improve and select crop and seed varieties							
Meet plant moisture needs							
Meet plant nutrient needs							
Identify and classify insects, weeds and pathogens							

Table C-4: Subjective norm scalar response item

How do the following people feel about traditional and modern approaches to farming/gardening?

	Very positive towards traditional farming/ gardening	Positive towards traditional farming/ gardening	Neutral towards traditional and modern farming/ gardening	Positive towards modern farming/ gardening	Very positive towards modern farming/ gardening
You					

Table C-5: Two dimensional normative beliefs index

Think about the people and groups whose opinion about farming/gardening you value. Then, rank the following groups in order of importance to you. 1= most important, 7= least important

____ Family
____ Other farmers and neighbors
____ Feed and seed retailers
____ Extension Agents and other government officials
____ Lenders
____ Farm groups
____ Tribal Elders

How do the following people feel about traditional and modern approaches to farming/gardening?

	Very positive towards traditional farming/ gardening	Positive towards traditional farming/ gardening	Neutral towards traditional and modern farming/ gardening	Positive towards modern farming/ gardening	Very positive towards modern farming/ gardening
Family					
Other farmers and neighbors					
Feed and seed retailers					
Extension Agents and government officials					
Lenders					
Farm groups					
Tribal Elders					

Table C-6: Self-efficacy index

How confident are you that you can perform the following practices HISTORICALLY DEVELOPED and USED by the Cherokee? If you believe that a practice listed below was not historically developed or used by the Cherokee, then check the box "No Cherokee practice."

	Not confident at all	Not confident	Neutral	Confident	Very confident	No Cherokee practice
Manage weeds						
Manage insects and pests						
Prepare land for planting						
Determine plant nutrient needs						
Improve and select crop and seed varieties						
Meet plant moisture needs						
Meet plant nutrient needs						
Identify and classify insects, weeds and pathogens						

Table C-7: Two dimensional modern resource index

How often do you use the following sources to get information about farming/gardening?

	Almost Never	Rarely	Sometimes	Often	Almost Always
Government or commercial publications (e.g. farm journals, books, newsletters)					
Mass media (e.g. TV, radio, movies, magazines, newspaper)					
Internet					
Events (e.g. field days, workshops, conferences, tradeshows)					
Publications about traditional practices					

How reliable do you think these following sources of information for farming/gardening are?

	Not reliable	Not very reliable	Somewhat reliable	Very reliable
Government or commercial publications (e.g. farm journals, books, newsletters)				
Mass media (e.g. TV, radio, movies, magazines, newspaper)				
Internet				
Events (e.g. field days, workshops, conferences, tradeshows)				
Publications about traditional practices				

Table C-8: Two dimensional traditional resource index

How often do you use the following sources to get information about farming/gardening?

	Almost Never	Rarely	Sometimes	Often	Almost Always
Tribal leaders					
Elders					

How reliable do you think these following sources of information for farming/gardening are?

	Not reliable	Not very reliable	Somewhat reliable	Very reliable
Tribal leaders				
Elders				

Table C-9: Modern self-identity index

To what degree do you disagree or agree with the following statements? Please check the box which best describes your opinion.

	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
I am not the type of farmer/ gardening oriented towards using traditional farming/ gardening practices.					
I am up-to-date with current regulations, products and technologies.					
I rely on modern technology and mechanization.					
I rely on external resources available to me from off my farm/garden.					
I rely on high inputs.					
I take risks.					
I make investments.					
I use a corporate or business model to run my farm.					
My main objective is to maximize profit per unit production.					
I specialize in producing 1 or 2 crops.					
I want to expand the acreage on my farm/ gardening.					
I want to contract with large corporations.					

Table C-10: Traditional self-identity index

To what degree do you disagree or agree with the following statements? Please check the box which best describes your opinion.

	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
Being a farmer/ gardening who uses traditional practices is an important part of who I am.					
I am not the type of farmer/ gardening oriented towards using traditional farming/ gardening practices.					
I do not heavily rely on modern farming technologies.					
I grow crops traditionally.					
I use a small or family business to run my farm.					
I rely on internal resources available to me on my farm.					
I am thrifty.					
I take few risks.					

Table C-11: Modern control beliefs index

If you wanted to use MODERN farming/gardening practices, how likely would the following factors below keep you from using them?

	Not at all likely	Not likely	Neutral	Likely	Very likely
Access to knowledge and advise					
Access to capital and credit					
The price I get for my products					
Low profitability					
Pressure to abandon farm					
Access to information (e.g. local experts and literature)					
Geographic location and topography					
Access to equipment, tools, and technologies					
Access to labor					

Table C-12: Traditional control beliefs index

If you wanted to use farming/gardening practices HISTORICALLY DEVELOPED and USED by the CHEROKEE, how likely would the following factors below keep you from using them?

	Not at all likely	Not likely	Neutral	Likely	Very likely
Access to knowledge and advise					
Access to capital and credit					
The price I get for my products					
Low profitability					
Pressure to abandon farm					
Access to information (e.g. local experts and literature)					
Geographic location and topography					
Access to equipment, tools, and technologies					
Access to labor					

Table C-13: Questionnaire items measuring socioeconomic characteristics.

1. Which of the following statements best describes how well you speak the Cherokee (Tsalagi) language?

____ I do not speak Cherokee (Tsalagi).
____ I speak a little bit of Cherokee (Tsalagi).
____ I can carry on a conversation in Cherokee (Tsalagi).
____ I speak Cherokee (Tsalagi) fluently.

2. How often do you participate in tribal activities?

____ Almost Never
____ Rarely
____ Sometimes
____ Often
____ Almost Always

3. Do you participate in any tribal organizations? Please check the line(s) that best describes your response. If you mark "yes" please provide the number of organizations you participate in the blank space provided.

____ Yes, I am a MEMBER of _____ (number) tribal organizations.
____ Yes, I am an OFFICIAL of _____ (number) tribal organizations.
____ No, I am not a member of any tribal organizations.

4. What is your sex?

____ Male
____ Female

5. What is the highest level of education you have completed?

____ Eighth grade or below
____ High school/GED
____ Some college
____ 2 to 4 year college degree (Associates or Bachelor's Degree)
____ Master's Degree
____ Doctoral Degree
____ Professional Degree (MD, JD)

6. What is your current marital status?

____ Single, Never Married
____ Married
____ Divorced
____ Widowed
____ Separated

7. How many hours a week do you spend working in the garden/farm?

_____ hours per week

8. How long have you been a farmer/gardener?

_____ years

9. What is your age?

_____years

10. How much land do you cultivate? Please specify in acres OR square feet.

_____None _____acres OR _____square feet

11. What is your primary occupation?

____ Farming/Ranching
____ Hired manager of farm/ranch
____ Non-farm work/Non-ranch work
____ Retired and still farming/ranching/gardening
____ Other, please specify_____

12. Do you sell the crops you grow?

____ Yes
____ No

13. Which of the following broad categories best describes your total household income?

____ under $2,500
____ $2,501 to $5,000
____ $ 5,001 to $10,000
____ $10,001 to $20,000
____ $20,001 to $35,000
____ $35,001 to $50,000
____ $50,001 to $100,000
____ More than $100,001

14. What is the ownership structure of the farm/garden?

____ Individual
____ Family
____ Partnership
____ Cooperative
____ Tribal
____ Other, please specify_____

15. Which of the following describes the land you cultivate? Check all that apply.

____ I rent it from someone else.
____ I own it.

16. What was the net farm/garden income for 2004?

____ No income generated
____ Cost exceed income
____ Broke even
____ $0 - $2,500
____ $2,501 to $5,000
____ $ 5,001 to $10,000
____ $10,001 to $20,000
____ $20,001 to $35,000
____ $35,001 to $50,000
____ $50,001 to $100,000
____ More than $100,001

17. Which of the following agricultural education trainings have you participated in? Check all that apply.

____ 4-H
____ Vocational agriculture program (high school)
____ Vocational agriculture program (night school)
____ Attendance to an agricultural college
____ Graduation from an agricultural college
____ None
____ Other, please specify_____

18. Which of the following organizations do you belong to or activities do you engage in currently or have in the past? Check all that apply.

____ General farm organizations (e.g. Grange, Farm Bureau, National Farmers Union, American Agricultural Movement)
____ Commodity producers' associations (e.g. National Wheat Producers Association)
____ Sustainable/Organic agriculture organizations
____ Cooperative Extension activities (e.g. 4-H, county board)
____ None
____ Other, please specify_____

Table C-14: Structured interview questions with associated constructs

Construct	Associated Questions
Attitude	Which do you think is better, traditional farming or non-traditional/modern farming/gardening? Why?
Self- Efficacy	If you wanted to farm/garden traditionally, how well prepared are you to do that? Choices: Not prepared, Somewhat prepared, Well prepared What are some of the things you (or someone else) need to do to farm/ garden traditionally?
Subjective Norms	Do you think you should use traditional farming/gardening practices? Why?
Control Beliefs	What are the kinds of things you can't control that keep you (might keep you) from using traditional farming/ gardening practices? Why?
Access to Resources	Where do you go to get information about farming/gardening?

Table C-14 continued

Construct		Associated Questions
Access to Resources		Where (or to whom) do you go to when you have issues or concerns about your farm/garden?
Self-Identity		A. Do you think of yourself as a traditional farmer/gardener or as a modern (non-traditional) farmer/gardener? Why?
	Choose term based on how respondent defines self in A.	What does traditional or non-traditional/modern farmer mean to you?
	Choose term based on how respondent defines self in A.	Do you like it (or would you like it) when/if people call you a traditional farmer/gardener or non-traditional/ modern farmer/gardener? Why or why not?
Normative Beliefs		Who supports traditional farming/gardening in your community? Why?
Socioeconomic Characteristics		What county do you garden/farm in?
		How long have you lived at your current residence?
		What community are you a part of?
		Do you have hired help on the farm/garden?
		(IF YES) How many people?
		What crops do you grow?
		A. What do you do with the crops you grow?
	If says sells crop in A	Where or to whom do you sell them to?
	If says sells crop in A	B. Do you or a vendor label or present your products in a way that let buyers know that they are buying it from an Indian?
	If yes to B	How are the product presented which let buyers know that they are from Indians?
	If says sells crop in A	C. Do you make your decisions about what products to sell based on their association with the Cherokee Nation?
	If responds yes to C	What are the main products you sell based on their association with the Cherokee Nation?
		D. Do people who are not paid help you with the farm/garden?
	If responds yes to D	How many people?
Behavior		Name what you think are the 5 most important traditional Cherokee farming/gardening practices?
		A. You mentioned in the questionnaire that you use practice X.
		Have you always used this practice? (use practices that are sometimes, often, and almost always)
	If respond No to A	What did you use before this?
	If respond No to A	Why did you start using practice X?

APPENDIX D
COMPLETE INSTRUMENT PACKET

Dear participant,

I am an associate researcher at the University of Florida, Gainesville in the School of Natural Resources and Environment. As part of my research project I am conducting interviews and observations, to learn about Cherokee farmers' opinions about the use of agricultural practices. The interview will last approximately 45 minutes. We are also asking that you fill out a questionnaire that will take approximately 30 minutes. You do not have to answer any question you do not want to answer. I will conduct the interview in person at a time that is convenient for you. With your permission I would like to audio record the interview. Only I will have access to the recording that I will personally transcribe, omitting any identifiers during the transcription. The recording will then be erased and your identity will not be revealed in the final report.

There are no anticipated risks, compensation or other direct benefit to you as a participant in this interview. You are free to withdraw your consent to participate and may discontinue your participation in the interview at any time without consequence. Your identity will be kept confidential to the extent provided by law.

If you have any questions about this research protocol, please contact me at (352) 392-1987 ext. 267 or my faculty advisor, Dr. M.E. Swisher at (352) 392- 2202 ext 256. Questions or concerns about your rights as a research participant may be directed to the UFIRB office, University of Florida, PO Box 112250, Gainesville FL 32611; ph. (352) 392- 0433.

By signing this letter, you give us permission to report your responses confidentially in the final manuscript to be submitted to our faculty supervisor for possible publication.

Mital Shah

I have read the procedure described above. I voluntarily agree to participate in the interview and complete the questionnaire and I have received a copy of this description.

_____ _____

Signature of participant Date

Self-Completion Questionnaire

1. **Do you consider yourself to be the person who makes day-to-day decisions about the farm/garden?**

   ____ Yes

   ____ No → if you checked this line, please return the survey to the interviewer. You do not have to answer any of the remaining questions. Thank you for your time.

I. Please check the box that best describes your answer to the following questions.

2. **How often do you use the following techniques or practices on your farm/garden?**

	Almost Never	Rarely	Sometimes	Often	Almost Always
Synthetic herbicides					
Synthetic insecticides					
Synthetic fertilizers					
Mechanical land preparation					
Genetically modified crop or seed varieties					
Drip or overhead irrigation					
Sap testing to determine fertilizer needs					
Soil or tissue testing to determine fertilizer needs					
Pest scouting					
Hedging, futures or coop marketing					
Crop Insurance					
Insect, weed, or pathogen identification services					
Seed or cultivars that are readily available commercially					

3. Please indicate how much you agree or disagree with each statement presented below.

	Strongly Disagree	Disagree	Indifferent	Agree	Strongly Agree
The way we farmed before was lots better than this "modern" farming.					
The old ways were the best.					
People should stay away from the old ways of farming.					
Modern farming is bad for big farmers.					
Modern farming uses too much labor.					
People who think ahead always use modern farming practices.					
The new ways of farming makes thing easier for small farmers.					
The new ways of farming are great for Indian farmers.					
I wish the new ways of farming would go away.					
Farmers get poor using modern farming practices.					
Modern farming practices advance Indian farmers.					
Modern farming practices make farmers broke.					
Modern farming pays off.					
Modern farming is terrible for the soil.					
Modern farming practices help animals.					
Modern farming practices are the best thing ever.					

4. **Do you think there are practices HISTORICALLY DEVELOPED and USED by the Cherokee to do the following? Please check the "Yes" or "No" box next to each item below.**

   For each item checked "Yes," please indicate the degree to which you think YOU SHOULD use the historically developed practices used by Cherokee rather than practices introduced to the Cherokee.

	Yes	No	Almost Never	Rarely	Sometimes	Often	Almost Always
Manage weeds							
Manage insects and pests							
Prepare land for planting							
Determine plant nutrient needs							
Improve and select crop and seed varieties							
Meet plant moisture needs							
Meet plant nutrient needs							
Identify and classify insects, weeds and pathogens							

5. **Think about the people and groups whose opinion about farming/gardening you value. Then, rank the following groups in order of importance to you. 1= most important, 7= least important**

   ____ Family
   ____ Other farmers and neighbors
   ____ Feed and seed retailers
   ____ Extension Agents and other government officials
   ____ Lenders
   ____ Farm groups
   ____ Tribal Elders

6. How do the following people feel about traditional and modern approaches to farming/gardening?

	Very positive towards traditional farming/ gardening	Positive towards traditional farming/ gardening	Neutral towards traditional and modern farming/ gardening	Positive towards modern farming/ gardening	Very positive Towards modern farming/ gardening
Family					
Other farmers and neighbors					
Feed and seed retailers					
Extension Agents and government officials					
Lenders					
Farm groups					
Tribal Elders					
You					

7. How confident are you that you can perform the following practices HISTORICALLY DEVELOPED and USED by the Cherokee? If you believe that a practice listed below was not historically developed or used by the Cherokee, then check the box "No Cherokee practice."

	Not confident at all	Not confident	Neutral	Confident	Very confident	No Cherokee practice
Manage weeds						
Manage insects and pests						
Prepare land for planting						
Determine plant nutrient needs						
Improve and select crop and seed varieties						
Meet plant moisture needs						
Meet plant nutrient needs						
Identify and classify insects, weeds and pathogens						

8. How often do you use the following sources to get information about farming/gardening?

	Almost Never	Rarely	Sometimes	Often	Almost Always
Extension or other government agencies					
Events (e.g. field days, workshops, conferences, tradeshows)					
Government or commercial publications (e.g. farm journals, books, newsletters)					
Publications about traditional practices					
Other farmers					
Farm organizations (e.g. Farm Bureau, Coops, Farm groups, NGO's)					
Mass media (e.g. TV, radio, movies, magazines, newspaper)					
Internet					
Tribal leaders					
Elders					

9. How reliable do you think these following sources of information for farming/gardening are?

	Not reliable	Not very reliable	Somewhat reliable	Very reliable
Extension or other government agencies				
Events (e.g. field days, workshops, conferences, tradeshows)				
Government or commercial publications (e.g. farm journals, books, newsletters)				
Publications about traditional practices				
Other farmers				
Farm organizations (e.g. Farm Bureau, Coops, Farm groups, NGO's)				
Mass media (e.g. TV, radio, movies, magazines, newspaper)				
Internet				
Tribal leaders				
Elders				

10. To what degree do you disagree or agree with the following statements? Please check the box which best describes your opinion

	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
Being a farmer/ gardening who uses traditional practices is an important part of who I am.					
I am not the type of farmer/ gardening oriented towards using traditional farming/ gardening practices.					
I do not heavily rely on modern farming technologies.					
I grow crops traditionally.					

11. To what degree do you disagree or agree with the following statements? Please check the box that best describes your opinion.

	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
I use a small or family business to run my farm.					
I rely on internal resources available to me on my farm.					
I am thrifty.					
I take few risks.					
I am up-to-date with current regulations, products and technologies.					
I rely on modern technology and mechanization.					
I make investments.					
I use a corporate or business model to run my farm.					
My main objective is to maximize profit per unit production.					
I specialize in producing 1 or 2 crops.					
I want to expand the acreage on my farm/ gardening.					
I want to contract with large corporations.					

12. **If you wanted to use MODERN farming/gardening practices, how likely would the following factors below keep you from using them?**

	Not at all likely	Not likely	Neutral	Likely	Very likely
Access to knowledge and advise					
Access to capital and credit					
The price I get for my products					
Low profitability					
Pressure to abandon farm					
Access to information (e.g. local experts and literature)					
Geographic location and topography					
Access to equipment, tools, and technologies					
Access to labor					

13. **If you wanted to use farming/gardening practices HISTORICALLY DEVELOPED and USED by the CHEROKEE, how likely would the following factors below keep you from using them?**

	Not at all likely	Not likely	Neutral	Likely	Very likely
Access to knowledge and advise					
Access to capital and credit					
The price I get for my products					
Low profitability					
Pressure to abandon farm					
Access to information (e.g. local experts and literature)					
Geographic location and topography					
Access to equipment, tools, and technologies					
Access to labor					

II. The following section includes questions about your household composition and farm/garden activities.

14. Which of the following statements best describes how well you speak the Cherokee (Tsalagi) language?

____ I do not speak Cherokee (Tsalagi).

____ I speak a little bit of Cherokee (Tsalagi).

____ I can carry on a conversation in Cherokee (Tsalagi).

____ I speak Cherokee (Tsalagi) fluently.

15. How often do you participate in tribal activities?

____ Almost Never

____ Rarely

____ Sometimes

____ Often

____ Almost Always

16. Do you participate in any tribal organizations? Please check the line(s) that best describes your response. If you mark "yes" please provide the number of organizations you participate in the blank space provided.

____ Yes, I am a MEMBER of_____(number) tribal organizations.

____ Yes, I am an OFFICIAL of_____ (number) tribal organizations.

____ No, I am not a member of any tribal organizations.

17. What is your sex?

____ Male

____ Female

18. What is the highest level of education you have completed?

____ Eighth grade or below

____ High school/GED

____ Some college

____ 2 to 4 year college degree (Associates or Bachelor's Degree)

____ Master's Degree

____ Doctoral Degree

____ Professional Degree (MD, JD)

19. What is your current marital status?

____ Single, Never Married

____ Married

____ Divorced

____ Widowed

____ Separated

20. How many hours a week do you spend working in the garden/farm?

_____ hours per week

21. How long have you been a farmer/gardener?

_____ years

22. What is your age?

_____years

23. How much land do you cultivate? Please specify in acres OR square feet.

_____None

_____acres OR _____square feet

24. What is your primary occupation?

____ Farming/Ranching

____ Hired manager of farm/ranch

____ Non-farm work/Non-ranch work

____ Retired and still farming/ranching/gardening

____ Other, please specify_____

25. Do you sell the crops you grow?

____ Yes

____ No

26. Which of the following broad categories best describes your total household income?

____ under $2,500

____ $2,501 to $5,000

____ $ 5,001 to $10,000

____ $10,001 to $20,000

____ $20,001 to $35,000

____ $35,001 to $50,000

____ $50,001 to $100,000

____ More than $100,001

27. What is the ownership structure of the farm/garden?

____ Individual

____ Family

____ Partnership

____ Cooperative

____ Tribal

____ Other, please specify_____

28. Which of the following describes the land you cultivate? Check all that apply.

____ I rent it from someone else.

____ I own it.

29. What was the net farm/garden income for 2004?

____ No income generated

____ Cost exceed income

____ Broke even

____ $0 - $2,500

____ $2,501 to $5,000

____ $ 5,001 to $10,000

____ $10,001 to $20,000

____ $20,001 to $35,000

____ $35,001 to $50,000

____ $50,001 to $100,000

____ More than $100,001

30. Which of the following agricultural education trainings have you participated in? Check all that apply.

____ 4-H

____ Vocational agriculture program (high school)

____ Vocational agriculture program (night school)

____ Attendance to an agricultural college

____ Graduation from an agricultural college

____ None

____ Other, please specify_____

31. Which of the following organizations do you belong to or activities do you engage in currently or have in the past? Check all that apply.

____ General farm organizations (e.g. Grange, Farm Bureau, National Farmers Union, American Agricultural Movement)

____ Commodity producers' associations (e.g. National Wheat Producers Association)

____ Sustainable/Organic agriculture organizations

____ Cooperative Extension activities (e.g. 4-H, county board)

____ None

____ Other, please specify_____

This is the end of the self-completion questionnaire! Thank you for your time and participation. The next portion of the meeting includes a brief interview.

Thank you again for your participation

Date_____

#_____

County _____

Interview

Thank you for filling out the questionnaire. Do you have any questions about it? We will now continue with the interview portion. The primary reason doing this interview is to be to gain a deeper understanding about your views towards the use traditional agricultural practices. Do you mind if I tape record our discussion? Shall we begin? Reminder: Everything we talk about will remain confidential

1. How long have you lived at your current residence?

2. What's your zip code?

3. What community are you a part of?

4. What do you do with the crops you grow?

(IF SELL CROPS) Where or to whom do you sell them to?

5. (IF SELL) Do you or a vendor label or present your products in a way that let buyers know that they are buying it from an Indian?

(IF YES) How are the product presented which let buyers know that they are from Indians?

6. (IF SELL) Do you make your decisions about what products to sell based on their association with the Cherokee Nation?

(IF YES) What are the main products you sell based on their association with the Cherokee Nation?

7. What crops do you grow?

8. Do you have hired help on the farm/garden?

(IF YES) How many people?

9. Do people who are not paid help you with the farm/garden?

(IF YES) How many people?

How are these people related to you?

10. You mentioned in the questionnaire (#2) that you use practice X
have you always used this practice? (use practices that are sometimes, often, and almost always)

(IF NO) What did you use before this?

Why did you start using practice X?

Practice X	Uses the practice?	Always use the practice?	(IF NO) What was used before this?	Why did you start using practice X?
Synthetic Herbicides		Y/N		
Synthetic Insecticides		Y/N		
Synthetic Fertilizers		Y/N		
Mechanical land preparation		Y/N		
Genetically Modified crop or seed varieties		Y/N		
Drip or overhead irrigation		Y/N		
Sap testing to determine fertilizer needs		Y/N		
Soil or tissue testing to determine fertilizer needs		Y/N		
Pest scouting		Y/N		
Hedging, futures or coop marketing		Y/N		
Crop Insurance		Y/N		
Insect, weed, or pathogen identification services		Y/N		
Seed or cultivars that are readily available commercially		Y/N		

11. Name what you think are the 5 most important traditional Cherokee farming/gardening practices?

12. Which do you think is better, traditional farming or non-traditional/modern farming/gardening?

Why?

13. If you wanted to farm/garden traditionally, how well prepared are you to do that?

Choices: Not prepared
Somewhat prepared
Well prepared

14. What are some of the things you (or someone else) need to do to farm/ garden traditionally?

15. What are the kinds of things you can't control that keep you (might keep you) from using traditional farming/ gardening practices?

Why?

16. Who supports traditional farming/gardening in your community?

Why?

17. Do you think you should use traditional farming/gardening practices?

Why?

18. Where do you go to get information about farming/gardening?

19. Where (or to whom) do you go to when you have issues or concerns about your farm/garden?

20. Do you think of yourself as a traditional farmer/gardener or as a modern (non-traditional) farmer/gardener?

Why?

21. (Based on response for #20) What does (traditional/ non-traditional or modern farmer) mean to you?

22. (Based on response for #20) Do you like it (or would you like it) when people call you a (traditional farmer/gardener) non-traditional or modern farmer/gardener)?

Why or why not?

23. Other contacts?

If you would like to receive a short report of the results from this research, please provide your contact information below. Thanks for your help.

APPENDIX E
SUMMARY SCORES FOR LOW AND LOW TAP USER GROUPS BASED ON VARIOUS VARIABLES

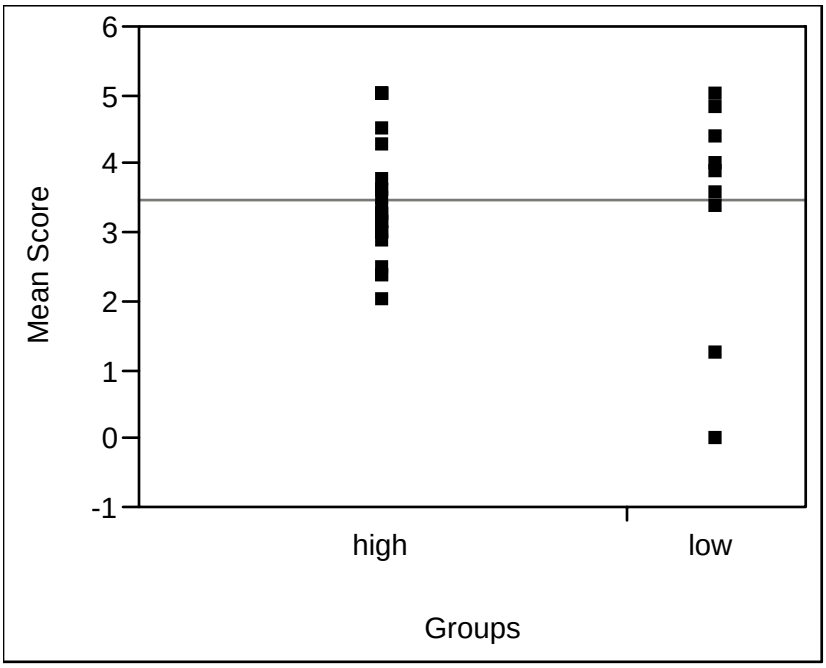

Figure E-1: Summary score for high and low TAP user groups based on mean self-efficacy scores, Cherokee Nation, Oklahoma, 2005

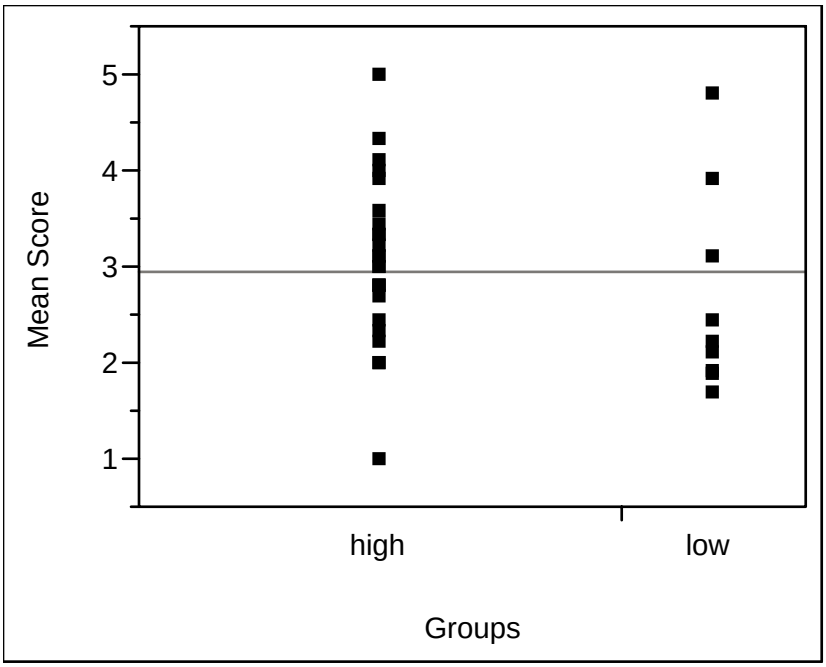

Figure E-2: Summary score for high and low TAP user groups based on mean modern control beliefs scores, Cherokee Nation, Oklahoma, 2005

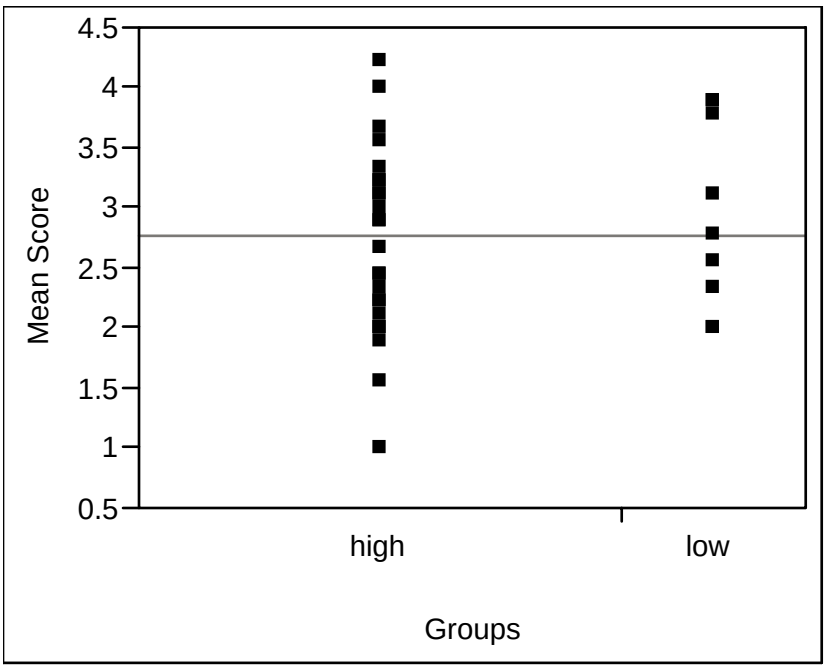

Figure E-3: Summary score for high and low TAP user groups based on mean traditional control beliefs scores, Cherokee Nation, Oklahoma, 2005

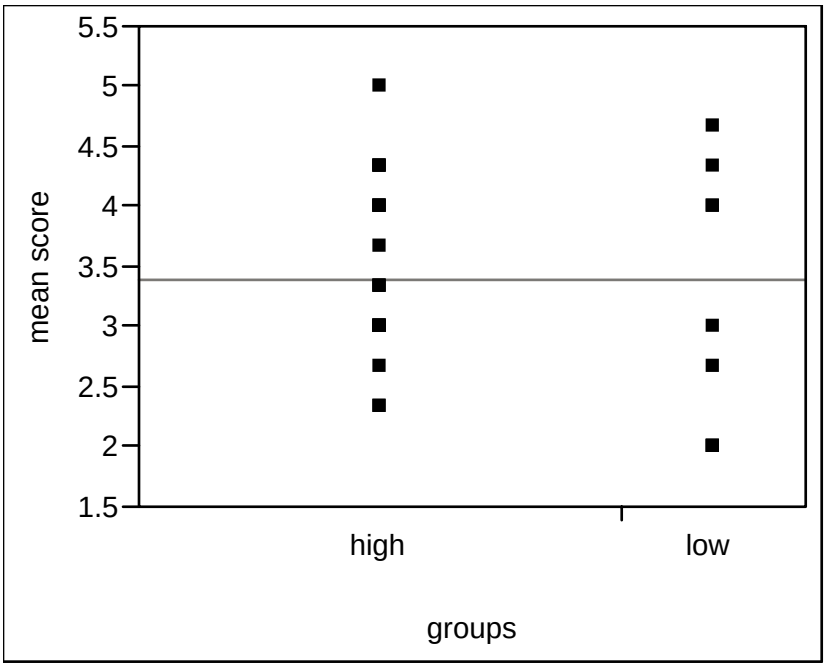

Figure E-4: Summary score for high and low TAP user groups based on mean Traditional self-identity scores, Cherokee Nation, Oklahoma, 2005

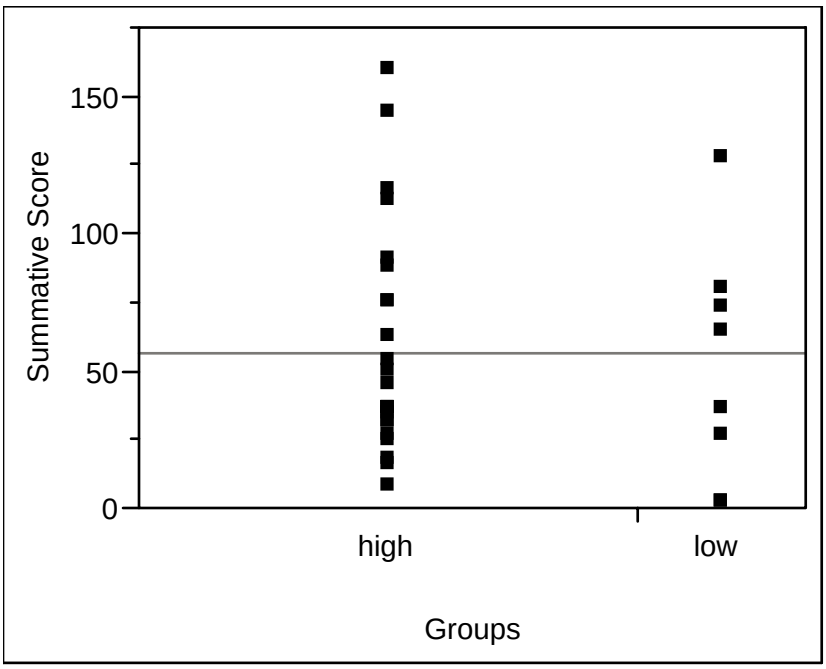

Figure E-5: Summary score for high and low TAP user groups based on summative traditional resource access scores, Cherokee Nation, Oklahoma, 2005

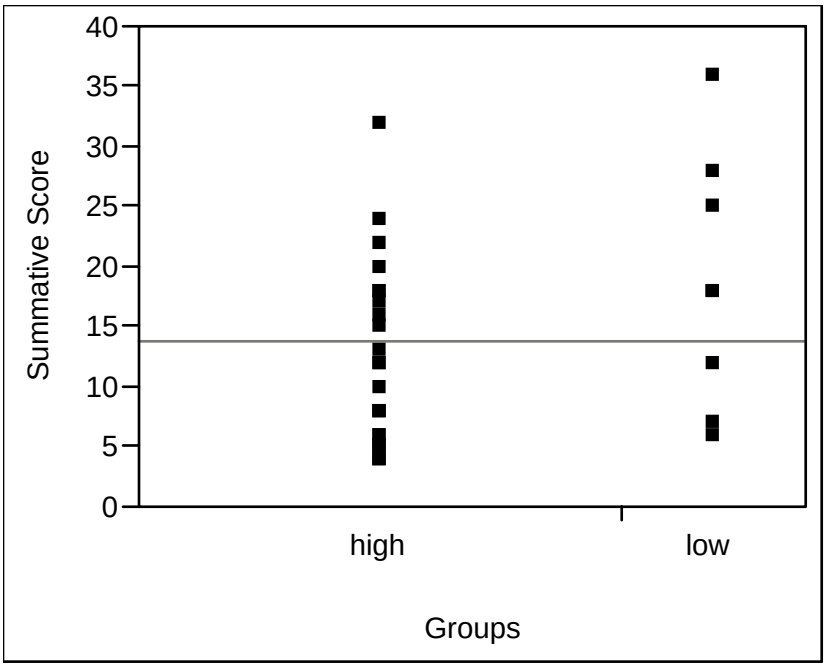

Figure E-6: Summary score for high and low TAP user groups based on summative modern resource access scores, Cherokee Nation, Oklahoma, 2005

APPENDIX F
CORRELATION BETWEEN SOCIOECONOMIC CHARACTERISTICS AND LOGISTIC REGRESSIONS FOR SOCIOECONOMIC AND THEORY OF PLANNED BEHAVIOR VARIABLES

Table F-1: Correlations between socioeconomic characteristics for the high TAP user group, Cherokee Nation, Oklahoma, 2005

	Hours/wk farming	Yrs farming	Age	Acres cultivated	Selling Crops
Hours/wk farming	1.0000	-0.2511	-0.3150	0.9536	-0.5916
Yrs farming	-0.2511	1.0000	0.6781	-0.2117	0.0444
Age	-0.3150	0.6781	1.0000	-0.2341	0.2557
Acres cultivated	0.9536	-0.2117	-0.2341	1.0000	-0.5458
Selling Crops	-0.5916	0.0444	0.2557	-0.5458	1.0000

Table F-2: Correlations between socioeconomic characteristics for the low TAP user group, Cherokee Nation, Oklahoma, 2005

	Hours/wk farming	Yrs farming	Age	Acres cultivated	Selling Crops
Hours/wk farming	1.0000	-0.3257	-0.5201	0.3647	-0.4182
Yrs farming	-0.3257	1.0000	0.8174	-0.1314	0.3203
Age	-0.5201	0.8174	1.0000	-0.2610	0.5034
Acres cultivated	0.3647	-0.1314	-0.2610	1.0000	-0.4061
Selling Crops	-0.4182	0.3203	0.5034	-0.4061	1.0000

Table F-3: Nominal logistic regression results for socioeconomic variables based on high and low TAP user groups, Cherokee Nation, Oklahoma, 2005

Model	-LogLikelihood	DF	ChiSquare	Prob>ChiSq
Difference	9.661681	4	19.32336	0.0007
Full	6.746041			
Reduced	16.407722			

RSquare (U)	0.5888
Observations (or Sum Wgts)	27

Converged by Gradient Lack Of Fit

Source	DF	-LogLikelihood	ChiSquare
Lack Of Fit	22	6.7460411	13.49208
Saturated	26	0.0000000	Prob>ChiSq
Fitted	4	6.7460411	0.9185

Parameter Estimates

Term	Estimate	Std Error	ChiSquare	Prob>ChiSq
Intercept	2.75509494	3.3515088	0.68	0.4111

Term	Estimate	Std Error	ChiSquare	Prob>ChiSq
Hours/wk farming	0.27171053	0.2255246	1.45	0.2283
Yrs farming	-0.1005532	0.0766078	1.72	0.1893
Acres cultivated	-2.3190358	1.4872937	2.43	0.1189
Selling Crops	-0.039653	0.0326025	1.48	0.2239

For log odds of high/low

Effect Wald Tests

Source	Nparm	DF	Wald ChiSquare	Prob>ChiSq
Hours/wk farming	1	1	1.45152673	0.2283
Yrs farming	1	1	1.72284364	0.1893
Acres cultivated	1	1	2.43120437	0.1189
Selling Crops	1	1	1.47928101	0.2239

Table F-4: Nominal logistic regression results for theory of planned behavior variables based on high and low TAP user groups, Cherokee Nation, Oklahoma, 2005

Model	-LogLikelihood	DF	ChiSquare	Prob>ChiSq
Difference	3.150419	3	6.300837	0.0979
Full	14.551286			
Reduced	17.701704			

RSquare (U)	0.1780
Observations (or Sum Wgts)	31

Converged by Gradient

Lack Of Fit

Source	DF	-LogLikelihood	ChiSquare
Lack Of Fit	27	14.551286	29.10257
Saturated	30	0.000000	Prob>ChiSq
Fitted	3	14.551286	0.3559

Parameter Estimates

Term	Estimate	Std Error	ChiSquare	Prob>ChiSq	Odds Ratio
Intercept	1.20408485	5.1097644	0.06	0.8137	.
Attitudes	0.05075138	0.0819062	0.38	0.5355	8.01092685
modern identity	-0.8692393	0.9919136	0.77	0.3809	0.08117598
Subjective Norm	0.13783751	0.5115934	0.07	0.7876	1.73559458

For log odds of high/low

Effect Wald Tests

Source	Nparm	DF	Wald ChiSquare	Prob>ChiSq
Attitudes	1	1	0.38393885	0.5355
modern identity	1	1	0.76794667	0.3809
Subjective Norm	1	1	0.07259136	0.7876

LIST OF REFERENCES

Adams, G.R., & Marshall, S.K. (1996). A developmental social psychology of identity: understanding the person-in-context. *Journal of Adolescence*, *19 (5),* 429-442.

Adesina, A.A. & Chianu, J. (2002). Determinants of farmers adoption and adaptation of alley farming technology in Nigeria. *Agroforestry Systems*, *55 (2),* 99-112.

Adler, M., & Ziglio, E. (1996). *Gazing into the oracle: the Delphi Method and its application in social policy and public health*. London: Jessica Kingsley Publications.

Ajzen, I. (1991). The theory of planned behavior. *Organizational Behavior and Human Decision Processes*, *50*, 179-211.

Ajzen, I. (nd). *The Theory of Planned Behavior*. Retrieved March 15, 2005, from http://www.people.umass.edu/aizen/index.html

Ajzen, I., & Fishbein, M. (1980). *Understanding Attitudes and Predicting Social Behavior.* Englewood Cliffs, NJ: Prentice-Hall.

Ahuja, M.K., & Thatcher, J.B. (2005). Moving beyond intentions and towards the theory of trying: effects of work environment and gender on post-adoption information technology use. *MIS Quarterly*, *29(3),* 427-459.

Alteri, M.A. (2001). *Traditional Agriculture*. Retrieved March 14, 2006, from http://www.cnr.berkeley.edu/~christos/articles/traditional_ag.html

Alteri, M.A. (1999). The ecological role of biodiversity in agroecosystem. *Agriculture, Ecosystems and Environment*, *74*, 19-31.

Armitage, C. & Christain, J. (2003). From attitudes to behavior: basic and applied research on the theory of planned behavior. *Current Psychology*, *22(3),* 187-195.

Atewell, P. (1992). Technology diffusion and organizational learning: the case of business computing. *Organization Science*, *3(1),* 1-19.

Babbie, E. (1998a). Unobtrusive research. *The Practice of Social Research*. Wadsworth: Belmont, CA.

Babbie, E. (1998b). Field research. *The Practice of Social Research (*pp. 279-307). Wadsworth: Belmont, CA

Bandura, A. (Ed.). (1995). *Self-efficacy in Changing Societies.* Cambridge University Press NY, NY.

Bartel, L.K., Nordstrom, C.R. & Koski, J.A. (2006). A structured interview demonstration. *Teaching of Psychology*, *33(1),* 55-57.

Berkes, Fikret. (1999). *Sacred Ecology: Traditional Ecological Knowledge and Resource Management.* Philadelphia, PA: Taylor & Francis.

Berndt, E.R., Pindyck, R.S., & Azoulay, P. (2003). Consumption externalities and diffusion in pharmaceutical markets: antiulcer drugs. *The Journal of Industrial Economics, 51(2),* 243-270.

Berzonsky, M.D. (1989). Identity style: conceptualization and measurement. *Journal of Adolescent Research*, *4,* 267-281.

Borman, K.M., LeCompt, M.D., & Teddlie, C. (1998). "Part I: paradigms and politics of research." *Mixed Methodology: Combining Qualitative and Quantitative Approaches*. Sage Publications: Thousand Oaks, CA. 1-58.

Bowman, D.M., Woinarski, J.C., Sands, D.P., Wells, A., & McShane, V.J. (1990). Slash-and-burn agriculture in the wet coastal lowlands of Papua New Guinea: response of birds, butterflies and reptiles. *Journal of Biogeography*, *17(3)*, 227-239

Brickell, T.A., Chatzisarantis, N.L., & Pretty, G.M. (2006). Autonomy and control: augmenting the validity of the theory of planned behavior in predicting exercise. *Journal of Health Psychology*, *11(1),* 51-63.

Caracelli, V.J., & Green, J.C. (1993). Data analysis strategies for mixed-method evaluation designs. *Educational Evaluation and Policy Analysis*, *15(2),* 195-207.

Carletto, C., de Janvry, A., Sadoulet, E. (1999). Sustainability in the diffusion of innovations: smaller nontraditional agro-exports in Guatemala. *Economic Development and Cultural Change, 47(2),* 345-369.

Carmines, E.G. & Zeller, R.A. (1979). *Reliability and Validity Assessment.* Beverly Hills: Sage Publications.

Casey, J. (2004). Agroforestry adoption in Mexico: using Keynes to better understand farmer decision-making. *Journal of Post Keynesian*, *26(3),* 505-521.

Champagne, D. (ed.). (1999). *Contemporary Native American Cultural Issues.* Altamira Press: Walnut Creek, CA.

Codd, R.T., & Cohen, B. N. (2003). Predicting college student intention to seek help for alcohol abuse. *Journal of Social & Clinical Psychology*, *22(2),* 168 – 191.

Conner, M., & Armitage, C. J. (1998). Extending the theory of planned behavior: a review and avenues for further research. *Journal of Applied Social Psychology*, *28(15),* 1429- 1465.

Debo, A. (1951). *The Five Tribes of Oklahoma Report of Social and Economic Conditions.* Philadelphia, PA: The Indian Rights Organization.

De Vaus, D. (2001). *Research Design in Social Research*. Sage Publications: Thousand Oaks, CA.

DeWalt, B.R., & Barkin, D. (1987). Seeds of change: the effects of hybrid sorghum and agricultural modernization in Mexico. In H.R. Bernard & P. Pelto (Eds.), *Technology and Social Change* (2nd ed.), (pp. 138-165). Prospect, IL: Waveland Press, Inc.

Dodge, J. R., Ford, M.A., & Perko, M. A. (2003). From ephedra to creatine: using theory to respond to dietary suspplement use in young athletes. *American Journal of Health Studies*, *18 (2/3),* 111 -117**.**

Doss, C.R., & Morris, M.L. (2001). How does gender affect the adoption of agricultural innovations? The case of improved maize technology in Ghana. *Agricultural Economics*, *25(1),* 27-39.

Duffy, D., & Stubben, J. (1998). An assessment of Native American economic development: putting culture and sovereignty back in the models. *Studies in Comparative International Development*, *32(4),* 52-79.

Eicher, C.K., & Staatz, J.M. (Eds.). (1998). *International Agricultural Development* (3rd ed.). Baltimore, Maryland: The John Hopkins University Press.

Ellis, L., Robb, B., Burke, D. (2005). Sexual orientation in United States and Canadian college students. *Archives of Sexual Behavior, 34(5),* 569-581.

Fekadu, Z., & Kraft, P. (2001). Self-identity in planned behavior perspective: past behavior and its moderating effects on self-identity- intention Relations. *Social Behavior and Personality, 29(7),* 671-686.

Fischer, M., Irlenbusch, B., & Sadrieh, A. (2004). An intergenerational common pool resource experiment. *Journal of Environmental Economics and Management, 48 (2),* 811-836.

Floyd, C., et al. (2003). Household adoption and the associated impact pf multiple agricultural technologies in the western hills of Nepal. *Agricultural Systems, 76,* 715-738.

Fogelson, R.D. & Kutshe. (1961). Cherokee economic cooperative: the Gadugi. In W. N. Fenton & J. Gulick (Eds.), *Symposium on Cherokee and Iroquois Culture* (Smithsonian Institution Bureau of American Ethnology Bulletin No. 180, pp. 83-124). Washington, DC: U.S. Government Printing Office.

Food and Agriculture Organization of the United Nations. (2004). World food day, biological biodiversity for food security, October 16, 2004. *Biological Diversity in Food and Agriculture*. Retrieved April 5, 2005 at http://www.fao.org/biodiversity/index.asp

Fowler, F. (1993). Survey interviewing. *Survey Research Methods* (pp. 105-122). Sage Publications: Thousand Oaks, CA.

Fujisaka, S., Hurtado, L., & Uribe , R. (1996). A working definition of slash-and burn agricultural systems. *Agroforestry Systems*, *34(2),* 151-169.

Freed, S.A., & Freed, R.S. (2002). *Green Revolution: Agricultural and Social Change in an North Indian Village.* The Anthropological Papers of American Museum of Natural History, 85.

Gagnon, M., Godin, G., Gagné, C., Fortin, J., Lamothe, L., Reinharz, D., & Cloutier, A. (2003). An adaptation of the theory of interpersonal behaviour to the study of telemedicine adoption by physicians. *International Journal of Medical Informatics*, *71(2-3),* 103-115.

Gearing, F. (1958). The Structural Poses of 18th Century Cherokee Villages. *American Anthropologies*, 60(6), 1148-1157.

Gliessman, S.R.(2003). *Sustainability in Traditional Agroecosystems: Ecologically Sound Practices that Sustain Traditional Agriculture.* Retrieved January 30, 2005, at http://www.agroecology.org/principles/tradsust.htm

Gollin, D., Morris, M., & Byerlee, D. (2005). Technology adoption in intensive post-green revolution systems. *American Journal of Agricultural Economics, 87(5),* 1310-1316.

Goodwin, G. C. (1977). *Cherokees in Transition*. Chicago, IL: University of Chicago.

Gowdy, J.M. (2004). The revolution in welfare economics and its implications for environmental valuation and policy. *Land Economics*, 80(2), 239-257.

Gockowski, J., & Ndoumbé, M. (2004) The adoption of intensive monocrop horticulture in southern Cameroon. *Agricultural Economics*, 30(3), 195-202.

Graebner, N.A. (1945a). Pioneer Indian agriculture in Oklahoma. *Chronicles of Oklahoma*, *23(3),* 232-248.

Graebner, N.A. (1945b). Provincial Indian society in eastern Oklahoma. *Chronicles of Oklahoma*, *23(4),* 323-327.

Granberg, D., Holmberg, S. (1990). The intentional behavior relationship among U.S. and Swedish voters. *Social Psychology Quarterly*, *53(1),* 44-54.

Harmon D. (1996). Losing species, losing languages: Connections between biological and linguistic diversity. *Southwest Journal of Linguistics,15,* 89–108.

Henrich, J., Boyd, R., Bowles, S., Camerer, C., Fehr, E., Gintis, H., & McElreath, R. (2001). In search of Homo Economicus: behavioral experiments in 15 small-scale societies. *American Economic Review, 91,* 73–78.

Hewes, L. (1942). Indian land in the Cherokee country of Oklahoma*. Economic Geography, 18*, 401-412.

Hooks, G.M, Napier, T.L, & Carter, M.V. (1983). Correlates of adoption behaviors: the case of farming technologies*. Rural Sociology, 43,* 308-323.

Hurt, R.D. (1987). *Indian Agriculture in America: Prehistory to the Present.* Lawrence, KS: University of Kansas Press.

Isaac, S., & Michael, W. (1997). *Handbook in Research and Evaluation*. San Diego, CA: Edits Publishers.

Jackson, C., Smith, R.A., & Conner, M. (2003). Applying an extended version of the theory of planned behavior to physical activity*. Journal of Sports Sciences, 21(2),* 119–134.

Jacobson, S.K, Sieving, K.E., Jones, G.A., & Van Doorn, A. (2003). Assessment of farmer attitudes and behavioral intentions toward bird conservation on organic and conventional Florida farms. *The Journal of the Society for Conservation Biology, 17(2)*, 595-606.

Jameison, S. (2004). Likert scales: how to (a)buse them. *Medical Education*, *38,* 1212-1218.

James Mooney's History, Myths, and Sacred Formulas of the Cherokees (1891- 1900). Ashville, NC: Bright Mountain Books.

Johnson, L.T., Rutstrom, E., & George, J. (in press). Income distribution preferences and regulatory change in social dilemmas. *Journal of Economic Behavior & Organization*.

Jordan, C. F. (2004). Organic farming and Agroforestry: alley cropping for mulch production for organic farms of southeastern United States. *Agroforestry Systems, 61,* 79-90.

Kappler, C.J. (Ed.). (1904). Treaty with the Cherokee, 1791. *In Indian Affairs: Laws and Treaties: Vol. 2.* Washington, D.C.: U.S. Government Printing Office. Retrieved March 10, 2006 at http://digital.library.okstate.edu/Kappler/Vol2/treaties/che0029.htm

Knepler, K. (1942). Eighteen century Cherokee educational efforts. *Chronicles of Oklahoma, 20(1),* 55-61. Retrieved April 22, 2006 at http://digital.library.okstate.edu/Chronicles/contents/v020toc.html

Knowler, D., & Bradshaw, B. (in press). Farmers' adoption of conservation agriculture: A review and synthesis of recent research. *Food Policy.*

Krannich, R.S. and Humphrey, C. (1986). Using key informant data in comparative community research: an empirical assessment. *Sociological Methods and Research,* 14(4), 473-493.

Kuznar, L. and Werner, O. (2001). Ethnographic mapmaking: part I-principles. *Field Methods,* 13(2), 204-213.

Lewis, D.R. (1995). Native American's and the environment: a survey of twentieth-century issues, *American Indian Quarterly*, 19(3), 423-450.

Luszczynska, A., & Schwarzer, R. (2003). Planning and self-efficacy in the adoption and maintenance of breast self-examination: a longitudinal study on self-regulatory cognitions. *Psychology and Health*, *18(1),* 93-108.

Luzar, & Diagne, E.J. (1999). Participation in the next generation of agriculture conservation programs: the roles of environmental attitudes. *Journal of Socio-Economics*, *28(3),* 335-350.

Lynne, G.D., Shonkwiler, J.S., & Rola, L.R. (1988). Attitudes and farmer conservation behavior. *American Journal of Agriculture Economics,* February, 12-19.

Maffi, L. (2005). Linguist, cultural and biodiversity. *Annual Review of Anthropology*, *34*, 599-617.

Marras, M., Pannell, D., Gaudim, A. (2003). The economics of risk uncertainty and learning in the adoption of new agricultural technologies: where are we on the learning curve? *Agricultural Systems*, *75*, 215-234.

Mathijs, E. (2003). Social capital and farmers' willingness to adopt countryside stewardship schemes. *Outlook of Agriculture*, *32(1),* 13-16.

Mauze, M. (Ed.). (1997). *Present is Past: Some Uses of Tradition in Native Societies.* Kanham, Maryland: University of America, Inc.

McGinty, M. (2006) *Agroforestry Adoption and Maintenance: Self-efficacy, Attitudes and Socio-economic Factors*. Gainesville, FL: University of Florida.

McNamara, K.T., Wetzstein, M.E., & Douce, G.C. (1991). Factors affecting peanut producer adoption of integrated pest management. *Review of Agricultural Economics*, *13(1),* 129-139.

Mellor, J.W. (1998). Agriculture on the road to industrialization. In C.K. Eicher & J.M. Staatz (Eds.), *International Agricultural Development* (3rd ed.), (pp. 136-154). Baltimore, Maryland: The John Hopkins University Press.

Meyer, G., Roberto, A. J., Boster, F. J., & Roberto, H. L (2004). Assessing the get real about violence curriculum: process and outcome evaluation results and implications *Health Communication, 16(4),* 451 -475.

Morgan, D.L.1996. Focus groups. *Annual Review of Sociology*, *22*, 129-152.

Morris, M., & Byerlee. (1998). Maintaining productivity gains in post-green revolution Asian agriculture. In C.K. Eicher & J.M. Staatz (Eds.), *International Agricultural Development* (3rd ed.), (pp. 136-154). Baltimore, Maryland: The John Hopkins University Press.

Nabhan, G.P. (1997). *Cultures of Habit*. Washington, D.C.: Counterpoint.

Nagel, J.(1996). *American Indian Ethnic Identity*. New York, NY: Oxford University Press.

Nall, G.L. (1977). King cotton in Oklahoma, 1825-1939. In D.E. Green(Ed.), *Rural Oklahoma* (pp.37-83). Oklahoma City, OK: Oklahoma Historical Society.

Nowak, P.J. (1987). The adoption of agricultural conservation technologies: economic and diffusion explanations. *Rural Sociology*, *52(2),* 208-220.

O'Brien, M. (2001). A Journal of Cherokee history and culture: history of Piney community. In J. Flippo (Ed.), *Cherokee Quarterly*, Fall-Winter. Tulsa, OK: Territorial Book Foundation.

Osinski, E., Kantelhardt, J., & Heissenhuber, A. (2003). Economic perspectives of using indicators. *Agriculture, Ecosystems & Environment. 98 (1-3),* 477-482.

Pattnayak, S.K., Mercer, D.E., Sills, E., & Yang, J. (2003). Taking stock of agroforestry studies. *Agroforestry Systems*, *57(3),* 173-186.

Pavlou, P.A., Fygenson, M. (2006). Understanding and predicting electronic commerce adoption: an extension of the theory of planned behavior. *MIS Quarterly*, 30(1), 115-143.

Pierro, A., Mannetti, L., & Livi, S. (2003). Self-identity and the theory of planned behavior in the prediction of health behavior and leisure activity. *Self & Identity, 2(1),* 47-61.

Pingali, P.P. (1998). Confronting the ecological consequences of the rice Green Revolution in tropical Asia. In C.K. Eicher & J.M. Staatz (Eds.), *International Agricultural Development* (3rd ed.), (pp. 136-154). Baltimore, MD: The John Hopkins University Press.

Perdue, T. (Ed.). (1996). *Cherokee Editor: The Writings of Elias Boudinot*. Athens, GA: Brown Thrasher Books.

Rasul,G., & Thapa, G. (2004). Sustainability of ecological and conventional agricultural systems in Bangladesh: an assessment based on environmental, economic and social perspectives. *Agricultural Systems*, *79*, 327-351.

Robinson, R.P., & Doverspike, D. (2006). Factors predicting the choice of an online versus a traditional course. *Teaching of Psychology*, *33(1),* 64-68.

Rocha, J.M. (2005). Measuring traditional agroecological knowledge: an example from peasants in the Peruvian Andes. *Field Methods*, *17(4),* 356-372.

Rogers, E.M. (1995). *Diffusion of Innovations*. New York, NY: Free Press.

Ruttan, V.W. (1998). Models of agricultural development. In C.K. Eicher & J.M. Staatz (Eds.), International *Agricultural Development* (3rd ed.), (pp. 155-162). Baltimore, MD: The John Hopkins University Press

Sanderson, K. (2004). Extension support for organic farmers in the south: a function of attitude, knowledge or confidence? Gainesville, FL: University of Florida.

Sapp, S.G. (2002). Incomplete knowledge and attitude-behavior inconsistency. *Social Behavior and Personality*, *30(1),* 37-44

Schaefers, K.G., Epperson, D.L., & Nauta, M.M. (1997). Women's career development: can theoretically derived variables predict persistence in Engineering Majors? *Journal of Counseling Psychology, 44(2),* 173-183.

Schwartz, S.J. (2001). The evolution of Eriksonian and neo-Eriksonian identity theory and research: a review and integration. *Identity: An International Journal of Theory and Research*, *1(1),* 7-58.

Schunk, D.H. (1991). Self-efficacy and academic motivation. *Educational Psychologist, 26(3& 4),* 207-231.

Scudder, T. (1982*). No Place to Go: Effects of Compulsory Relocation on Navajos*. Philadelphia, PA: Institute for the Study of Human Issues.

Scudder, T. (1985). A sociological framework for the analysis of new land Settlements. In Ed. M. M. Cernea (Ed.), *Putting People First: Sociological Variables in Rural Development,* (pp.1-575). New York: Oxford University Press.

Sheskin, D.J. (2004). *Handbook of Parametric and Nonparametric Statistical Procedures*, 3rd ed. Boca Raton, FL: Chapman & Hall/CRC.

Skuttnabb-Kangas, T., Maffi, L., & Harmon, D. (2003). *Sharing a World of Difference: the Earth's Linguist, Cultural and Biological Diversity*. UNESCO, TerraLingua, World Wide Fund for Nature. Retrieved March 5, 2005 at http://www.terralingua.org/UNESCO%20publication.pdf

Sommer, R. & Sommer, B.B. (1986). *A Practical Guide To Behavior: Tools and Techniques*. New York, NY: Oxford University Press.

Soothill, K. & Grover, C. (1997). A note on computer searches of newspapers. *Sociology, 31(3),* 591-596.

Sousa, L.H., Galanata, A., Batel, A., & Hespanha, P. (2003). Observing cities' social inequalities: a cartographic case study of Aveiro, Portugal. *Cities*, *20(4),* 241-252.

Staatz, J.M., & Eicher, C.K. (1998). Agricultural development ideas in historical perspective. In C.K. Eicher & J.M. Staatz (Eds.), *International Agricultural Development* (3rd ed.), (pp. 136-154). Baltimore, MD: The John Hopkins University Press.

Stryker, S., & Burke, P. J. *(2002).* The past, present, and future of an identity theory. *Social Psychology Quarterly*, *63(4),* 284-298.

Sullivan, T.J. (2001). *Methods of Social Research*. Orlando, FL: Harcourt.

Swedberg, R. (1998). Max Weber's vision of economic sociology. *Journal of Socio-Economics*, *27(4),* 535-555.

Talhouk, S., Zurayk R., & Khuri, S. (2001). Conservation of the coniferous forests of Lebanon: past, present, and future prospects. *Oryx*, *35(3),* 206-215.

Tashakkori, A., & Teddlie, C. (1998). Part 1: Paradigm and Politics of Research." Pp. 1-58 in *Mixed Methodology: Combining Qualitative and Quantitative Approaches*. Thousand Oaks, CA: Sage Publications.

Tesser, A., Shaffe, D.(1990). Attitude and attitude change. *Annual Review of Psychology, 41*, 479-523

Thangata, P., & Alavalapati, J. (2003). Agroforestry adoption in southern Malawi: the case of mixed intercropping of *Gliricidia sepium* and maize. *Agricultural Systems*, *78(1),* 57-71.

Thoburn, J.B. &Wright, M.H. (1929). *A History of the State and Its People (Vols. 1-2)* OK: Lewis Historical Publishing Company, Inc.

Thomas, R. K. (1961). The Redbird smith movement. In W. N. Fenton & J. Gulick (Eds.), *Symposium on Cherokee and Iroquois Culture* (Smithsonian Institution Bureau of American Ethnology Bulletin No. 180, pp. 83-124). Washington, DC: U.S. Government Printing Office.

United States Department of Agriculture, National Agricultural Statistics Service (2002a). *2002 Census of Agriculture,* Volume 1 Chapter 1: U.S. National Level Data Table 1. Historical Highlights: 2002 and Earlier Census Years. Retrieved March 15, 2005 at http://www.nass.usda.gov/census/census02/volume1/us/st99_1_001_001.pdf

United States Department of Agriculture, National Agricultural Statistics Service (2002b). *2002 Census of Agriculture*, Volume 1 Chapter 2: Oklahoma County Level Data Table 43. Retrieved March 15, 2006 at http://www.nass.usda.gov/census/census02/volume1/ok/st40_2_043_043.pdf

United States Department of Agriculture, National Agricultural Statistics Service (2005). *2002 Census of Agriculture*., Special Report: Part 1 Operators by Race, revised April 2005. Retrieved April 15, 2006 at http://www.nass.usda.gov/census/census02/operatorsbyrace/opbyrace.pdf

United States Department of Agriculture, National Organic Program (2003). *National Organic Program Standards*. Retrieved May 15, 2006 at http://www.ams.usda.gov/nop/NOP/standards.html

Wahrhaftig, A. (1966). Community and the caretakers. *New University Thought 4(4),* 54-76.

Wahrhaftig, A. (1978). Making do with the dark meat: a report on the Cherokee Indians in Oklahoma. In S. Stanley (Ed.), *World Anthropology* (pp. 410-509). Paris: Morton Publishers.

Weber, R.P. (1990). *Basic Content Analysis* (2nd ed.). Beverly Hills, CA: Sage Publications, Inc.

Weir, S., & Knight, J. (2004). Externality effects of education: dynamics of the adoption and diffusion of an innovation in rural Ethiopia. *Economic Development and Cultural Change*, *53*, 93-113. Well, R.N. (1994). Native American resurgence and renewal: a reader and bibliography. *Native American Resources Series, No.3*. London: The Scarecrow Press, Inc.

Wilson, D., Urban, M., Graves, M., & Morrison, D. (2003). Beyond the economic: farmer practices and identities in Central Illinois, USA. *The Great Lakes Geographer*, *10(1),* 21-33

Wilson, G., Stacey, E. (2003). Online interaction impacts on learning: teaching the teachers to teach Online. In G. Crisp, D. Thiele, I. Scholten, S. Barker, & J. Baron (Eds.), *Interact, Integrate, Impact: Proceedings at the 20th Annual Conference of the Australasian for Computers in Learning in Tertiary Education* (pp. 541-551). Adelaide, Australia: Ascilite.

Wubeneh, N.G., & Sanders, J.H. (in press). Farm-level adoption of sorghum technologies in Tigray, Ethiopia. *Agricultural Systems*.

Yin, R.K. (2003). *Case Study Research: Design and Methods (3rd ed.).*Thousand Island, CA: Sage Publications, Inc.

Zubair, M., & Garforth, C. (2006). Farm level tree planting in Pakistan: the role of farmers' perceptions and attitudes. *Agroforestry Systems*, *66,* 217-229.

Zafirovski, M., & Levine, B.B. (1999). A socio-economic approach to market transactions. *The Journal of Socio-Economics*, *28*, 309-334.

Zorary, D. (2001). *Domestication of Plants in the Old World* (3rd ed.). New York, NY: Oxford University Press.

BIOGRAPHICAL SKETCH

Mital S. Shah was born in Bridgeport, CT. She received her Bachelor of Arts degree in world religions from Emory University in Atlanta, GA, in May 2000. After receiving the degree she volunteered on various farms in Europe. Upon her return she worked on the Tohono O'Odham Reservations as a GED/ABE instructor in Sells, AZ. Since then and until her pursuit of a master's degree in 2004 she has also interned with the National Park Service as an interpretative park ranger at Kenai Fjords National Park in Alaska. She also interned with the US Geological Survey in Cape Cod. She then worked for the USGS as an Education Specialist. Also, during this time Mital was a coordinator of Puran News, a non-profit Indian women's organization aimed to help Indian women share, learn and support each other's endeavors to continue the legacy and heritage of the Indian culture.

In 2004 Mital began graduate school at the University of Florida, Gainesville, FL. She is pursuing her master's degree in interdisciplinary ecology through the School of Natural Resources and Environment. She conducted research under the supervision of Dr. M.E. Swisher in Oklahoma with Cherokee farmers. The purpose of the research was to determine what factors influence Cherokee farmers to use traditional agricultural practices. Currently, Mital is co-president of the Ethnoecology Society at the University of Florida. She recently received the David Boren Graduate Student Fellowship and will travel to India to conduct research with Himalayan tribal Indian farmers.