SUSTAINABLE AGRICULTURAL PRACTICES FOR SMALL SCALE FARMERS IN FOUR SOUTHERN STATES

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ACRONYMS

AAFs	African American Farmers
CRP	Conservation Reserve Program
EQIP	Environmental Quality Incentive Program
FLP	Farm Loan Program
FOL	Farm Ownership Loan
FSA	Farm Service Agency
FSC	Federation of Southern Cooperatives
NRCS	Natural Resource Conservation Service
OL	Operating Loans
RD	Rural Development
SAPs	Sustainable Agricultural Practices
SARE	Sustainable Agriculture, Research and Education
TAES	Tennessee Agricultural Extension Service
TFC	Territorial Farm Contracts
USDA	United States Department of Agriculture
VAPG	Value Added Producer Grant

ABSTRACT

SUSTAINABLE AGRICULTURAL PRACTICES FOR SMALL SCALE FARMERS IN FOUR SOUTHERN STATES

The purpose of this study was to investigate the use of sustainable agricultural practices (SAPs) among African American farmers (AAFs) in four states (Alabama, Georgia, Mississippi, and South Carolina). The objectives of this study were to (1) identify the demographic characteristics of small scale AAFs, (2) identify factors that encourage or impede the adoption of SAPs, (3) determine the extent to which these farmers engage in certain SAPs, and (4) determine the extent to which small scale AAFs had access to USDA programs that encourage SAPs. Data were collected by Federation of Southern Cooperatives (FSC) outreach personnel in Alabama, Georgia, Mississippi, and South Carolina in the spring of 2013. Survey data on 128 respondents were analyzed using descriptive statistics and chi-square tests.

The findings revealed that a higher proportion (77%) of the respondents were males; almost half were 64 years or older; and 84% had at least 10 years of farming experience. About 40% practiced row cropping. In addition, a majority (88% and 80%, respectively) used petroleum fuel as a source of energy and used chemical on their crops. Although 95% of the farmers were aware of USDA NRCS programs, a little over 70% did not participate in such programs. The main SAPs included planting cover crops, rotational tillage, and soil testing. However, adoption of SAPs was low; nearly 50% of the farmers planted cover crops and the dominant nutrient management methods were soil testing and application of manure/fertilizer (62%). The key reasons for non-adoption of SAPs included lack of information and cost.

The chi-square tests reflected statistically significant differences among several variables, specifically; marital status, farmer consideration, ownership status, and years of experience, had statistically significant relationships with the gender. Also, farming practice, marketing strategies, management practices, and participation in USDA loans programs had statistically significant relationships with the gender. Further analysis showed that a higher proportion of the female AAFs were widowed or single (never married); majority of males AAFs had more years of experience in farming than their female AAFs counterparts; that fewer females adopted SAPs than males; a higher proportion of female AAFs were not aware of USDA loan programs; majority of the male AAFs market their products through commercial means; and that gender appeared to influence adoption of SAPs and, therefore, should be considered in outreach and education programs. Consequentially, a comprehensive educational program should be aimed at this clientele to help them to transition to SAPs.

CHAPTER I

INTRODUCTION

Background

Most of agricultural producers in the United States are small scale farmers. Smallholder and family farming is the overwhelmingly dominant mode of agricultural and pastoral production. In the United States: 40% of farmers earn less than $2,500; 50% earn less than $5,000, and 60% earn less than $10,000. Also, 32% of farmers own less than 50 acres and 40% own less than 100 acres of land (USDA 2007; United Nations Global Impact 2012). The United States has witnessed African American farms disappear at an alarming rate, with major constraints in both financial and human capital (Zabawa, Siaway & Baharanyi 1990).

In the latter half of the 19th Century, United States farmers depended upon manual labor for crop production. Over time, advancement in agricultural technologies increased the production of food for the economy. The technological advancement in agriculture, even with increases in the production of food, also come with a cost to the environment in soil, air and water, and economy, which may eventually affect future generations. Structural transformation occurred in the 1800s for the US, the population moved from rural areas to urban areas. The number of American farmers has reduced over the past 100 years, from about 40% to about 2% of the population. Out of the 2%, some farmers are part-time farmers (they have off farm work) and yet their production has increased more than ever before. Before the advent of chemical fertilizer a farmer could only feed a minimal number of people. However, today a farmer can feed on average 130 people (USDA NASS 2005).

The word sustainable has its origin in Latin, *sustinere*, meaning to keep in existence, implying permanence or long-term support. There are many definitions of sustainability. According to the Brundtland Commission's report (1987), “it is a development that meets the needs and aspirations of the present without compromising the ability of future generations to meet their own needs". This definition has two key components: (1) the needs, in particular the essential needs of the world's poor; and (2) the idea of limitations imposed by technology and social organization on the environment's ability to meet present and future needs. There is an economic, social welfare and environmental aspect to most definitions of sustainability. In the 1990 Farm Bill, Congress defined sustainable agriculture as “an integrated system of plant and animal production practices having a site-specific application that will last over the long term. All these practices include: (1) satisfying human food and fibre needs; (2) sustaining the economic viability of farm operations; (3) enhancing environmental quality and the natural resource base upon which the agricultural economy depends; (4) making the most efficient use of non-renewable resources and on-farm resources and integrate where appropriate, natural biological cycles and controls; and (5) enhancing the quality of life for farmers and society as a whole.” Similarly, the Sustainable Agriculture, Research and Education (SARE) program, defined sustainable agriculture as “a program that promotes environmental stewardship, generates an acceptable level of income, and maintains stable farm families and communities” (SARE 2005). Poincelot (1990) defined sustainable agriculture as “a system in which: (a) resources are kept in balance with their use through conservation, recycling, and/or renewal, (b) practices preserve agricultural resources and prevent environmental damage to the farm and off-site land, water, and air, (c) production,

profits, and incentives remain at acceptable levels, and (d) the system works in concert with socioeconomic realities." Ikerd, Osburn & Owsky (1997) further explained that this long-term goal serves as a lead towards sustainability for the present and also the future benefit of both the farmers and society.

All these definitions focus on three aspects: economic, environmental, and social, which must be balanced to preserve the viability of resources for future generations (Diver 1996). Ikerd (1994) also argued that sustainable agriculture must be ecologically sound, economically viable, and socially responsible. At the same time, there is some disagreement as to the weight each aspect plays in the sustainability equation. For example, sustainable agriculture can be illustrated graphically as the intersection of economically sound, ecologically viable, and socially responsible approaches (Figure 1A); some agriculturists fear that they will be forced to achieve environmental and social goals at the expense of economics (Figure 1B); a negative perception of agriculture views it as achieving economic goals at the expense of environment and society (Figure 1C); a desirable future would include expansion of the area that achieves all three goals through improved research and practical experience (Figure 1D).

Ikerd, Osburn, & Owsley (1997) describe the requirement of sustainable agricultural concept by concluding that all three aspects of sustainability are necessary and none alone is sufficient. Many studies have looked at sustainability as a whole while others have considered these aspects independently. Zhen et al. (2005), for example, stated that even though the cropping system in China was financially viable, it came with a high cost on the

Sustainability chart

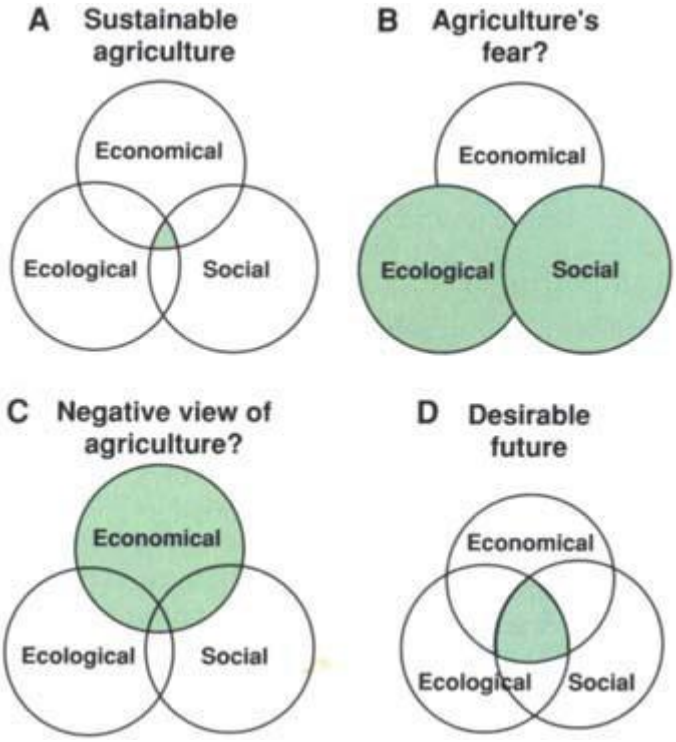

Figure 1.Schematic diagram of various views of agriculture, represented by shaded areas
Source: Auburn and Davis. (1994).

environment, natural resources and humanity. Their findings were subdivided into the three phases. The first phase was the environmental impact assessment. The combination of the lack of knowledge of farmers related to the environmental effects of their water-use practices, an ineffective extension service, and unsuitable or non-existing water-use policies and regulations were detrimental to the environment. The authors reported that about 97% of the farmers observed a decline in the groundwater table. Increased use of both organic and inorganic fertilizers, over the years, improved soil fertility. The second phase was the economic assessment. The findings showed that the cropping system was financially viable but not economical viable because it was at high environmental cost. The third phase focused

on the socio-institutional assessment of the study area which revealed that the current extension services were not adequate and effective.

Small scale in the agriculture sector means the very small end in both physical area of production and economic scale of production. Given the preponderance of small scale farms in the United States, they therefore have a large impact on natural resources; soil, air, and water. These farms have limited positive impacts on the environment due to cultural practices, lack of access to production resources, new technology and outreach programs which include financial as well as technical assistance.

Problem Statement

Based on USDA NASS, (2007) Census of Agriculture, the United States has 2,204,792 farms, of which 30,599 are owned by African American farmers. Forty percent of African-American farmers earn less than $2,500; 65% earn less than $5,000, and 78% earn less than $10,000 from farm sales annually. Also, 50% of African American farms operate on less than 50 acres; these farmers participate to a lesser degree in USDA programs – production, financial, and environmental. Auburn and Davis (1994) noted that the environmental and social goals of sustainable agricultural practices (SAPs) are beyond just the small scale farmers control alone. Given this background, serious questions arise concerning the viability of African-American farmers as economic and sustainable producers in the future. Therefore, this research is focused on the participation, or lack of participation, in USDA programs that promote production and environmental sustainability. Minimal progress has been observed on the adoption of SAPs by small scale farmers. The uniqueness of the reasons for adoption or non-adoption of SAPs warrants further investigation.

Purpose and Objectives

The purpose of this study was to investigate the use of SAPs among African American farmers (AAFs) in four states (Alabama, Georgia, Mississippi, and South Carolina). Specific objectives were to (1) identify the demographic characteristics of small scale AAFs, (2) identify factors that encourage or impede the adoption of SAPs, (3) determine the extent to which these farmers engage in certain SAPs, and (4) determine the extent to which small scale AAFs had access to USDA programs that encourage SAPs.

Organization of the Study

The rest of the study is organized into four chapters. Chapter II covers the literature on SAPs and the impact of these practices. Chapter III discusses the population and sample selection, data collection methods, data sources, and data analysis. Chapter IV presents the major results and discussion of the study in three sections: demographic characteristics, SAPs, and gender issues. Finally, Chapter V covers the summary and conclusion.

CHAPTER II

LITERATURE REVIEW

This chapter consists of two sections. The first section describes SAPs and attitudes towards adoption. The second section deals with examining the impact of SAPs on small scale farmers. The third section deals with women in U.S. Agriculture and the possible relationship of gender to the adoption of SAPs.

Sustainable Agricultural Practices and Attitude towards Adoption

The Nova Scotia Global Environmental Farm Plan (2013), defined, soil conservation practices as a set of processes by which a farmer can use to prevent soil degradation and build organic matter in the soil. Such processes are: nutrient management, insect and weed management, cover-cropping, conservation tillage and crop rotation. EPA (2013) defined nutrient management as the practices of using nutrients wisely for optimum economic benefit while minimizing impact on the environment, for example, soil testing, manure testing, erosion control practices, etc. Insect and weed management is used to manage damaging pests without disturbing the natural balances that exist between pests, natural enemies, and the environment; for example, application of chemicals, creating habitat for beneficial insects, etc. Cover crops are grasses, legumes, or small grains that are grown between regular grain crop production periods for the purpose of protecting and improving the soil, for example, Rye, Clover, and Vetch. Conservation tillage is any method of soil cultivation that

leaves the previous year's crop residue (such as corn stalks or wheat stubble) on fields before and after planting the next crop to reduce soil erosion and runoff, for example, no till and mulch.

Tackie et al. (2009) assessed integrated pest management and protection practices by limited resource farmers (LRFs). They found that farmers use pesticides and other practices to control pests; yet, a majority of the farmers were not familiar with integrated pest management. Also, they found that the majority that use the pesticides used safety precautions.

Zhen et al. (2005) assessed the sustainability of farming practices in the North China Plain. The authors reported that about 97% of the farmers observed a decline of the groundwater table. Increased use of both organic and mineral fertilizers over the years improved soil fertility. The findings showed that farming in North China plain is financially viable but not economical viable because it is at a high environmental cost. Also, Socio-institutional assessment of the study area revealed that the current extension services were not adequate and effective. Findings also indicated that the farmers involved in the study were not encouraged to adopt resource conservation practices. The majority of farmers (65%) preferred to use a combination of organic and inorganic fertilizers. This practice was perceived to be hazardous to human health as about 20% of the farmers reported problems of headache, dizziness, and fatigue. The authors recommended a host of institutional reforms which included the reorientation of the agricultural extension service and a better management of groundwater irrigation.

Alonge & Martin (1995) sought to determine the relationships between innovation perception variables, and their adoption of the selected sustainable agricultural practices. They concluded that the majority of their respondents had very positive perceptions about sustainable agriculture in terms of their profitability and compatibility but they were neutral or had negative perceptions about some of the selected practices such as: soil nitrogen testing, banded application of herbicides, crop rotation, reduced herbicide use and nitrogen fertilizer rates, taking credit for manure in determining nitrogen input, use of nitrification inhibitor, mechanical weeding , and spring/summer application of nitrogen.

Pannell (1999) analyzed uncertainty and adoption of sustainable farming systems. He found that the problem of uncertainty in adoption of sustainable conservational practices is much greater than anticipated. According to Pannell this is due to the following reasons: (a) most farmers are psychologically averse to risk and uncertainty, (b) uncertainty leaves room for misunderstanding and misperceptions about the innovation, and (c) in some cases, there can be an option value from not adopting. Roling (1988) concluded that regardless of the perceived reasons, adoptions of SAPs are often limited by salient reasons such as: (i) individual farm production practices, (ii) perception problems, and (iii) environmental constraints.

Drost et al. (1996) assessed barriers to adopting SAPs. They reported that lack of concern, economic constraints to the transition, and traditional farming practices were major barriers. Farmers did not express alarm over environmental issues. Based on these reasons the authors concluded that farming practices cannot be easily changed among farmers. Comparatively, Lockeretz (1988), Roberts & Lighthall (1992), and Taylor & Dobbs (1990)

came to similar conclusions about reasons why farmers adopt sustainable practices: (1) reduce ground water pollution, (2) be good stewards of the soil, (3) produce quality produce with reduced amounts of chemicals, and (4) reduce health risks to farm families and livestock. Baide (2005) examined the barriers to adoption of SAPs, and found that the major determinant of adoption of SAPs is the social aspect. Farmers' decision to adopt SAPs was mainly because they were willing to try something new and their willingness to embrace a positive change.

Sassenrath et al. (2010) explored the drivers impacting the adoption of sustainable agricultural management practices. They emphasized internal social driver as a principle driver that values the farming lifestyle (what leads people to choose farming). The authors concluded that farming is first and foremost a lifestyle choice, but the choice of what type of production system is partly a lifestyle preference and partly influenced by other external factors which are economic and environmental drivers. They stated economic driver as a second principle driver which only stems from a need to make a living. In their study they showed that farmers in the Northeast take more active role in determining their contract terms than those in the Southeast. Also, the farmers in the Northeast are more aggressive in developing new markets, have a stronger link between farmers and consumers; thus, reinforces the economic sustainability of Northeastern production systems. Northeastern producers bear greater risk, but they have greater freedom to respond to consumer demand.

Alonge & Martin (1995) examined adoption of SAPs. They stressed that the majority of the respondents had very positive perceptions about sustainable agriculture in terms of their profitability and compatibility, but they were neutral or had negative perceptions about

some of the selected practices. The study also showed that educational efforts should be directed towards a sustainable practice's profitability. They further stressed that most farmers were at an information gathering stage so adequate knowledge of the practice will affect the level of adoption. Regression analysis on adoption of sustainable practices showed that the selected indicators were poor predictors of farmers' adoption rates. The authors concluded that to facilitate farmers' transition from conventional to sustainable practices, it is necessary for the process of needs assessment and analysis to be done on a continuous basis. Also, agricultural education plays an important role in farmers deciding whether or not to adopt SAPs.

Baide (2005) studied the barriers to adoption of SAPs in the South from change agents' perspectives. He found that less than half of change agents were involved and knowledgeable about the adoption process. As a result of the difficulty of delivery, adoption has not advanced significantly in the southern states. Ten percent of respondents thought that SAPs have been adopted to a great extent in their state. In addition to this, the change agents also identified economic, cultural, and social factors as the problems to adoption. Economic factors like cost of transitioning, risk and uncertainty of adoption, etc., lack of education or knowledge about this technology was perceived to be a barrier. Cultural shift was a barrier, as farmers were resistant to change traditional old habits, farming culture and mind-set, seeing it as a shift from the norms. A key social barrier was lack of farmer peer example as the farmer has a tendency to cling to the old production paradigm if he/she does not get good examples from his/her peers or technical personnel.

Impact of Sustainable Agricultural Practices on Small Scale Farmers

Based on most of the literature reviewed it can be concluded that the economic aspect is a major determinant of whether or not a farmer is going to adopt SAPs. This leads to farmer participation in group and government programs. Participation occurs in order to have access to loans and to contribute to policy making. Participation in the program depends on education level, income and payment per acreage, and in the long-run, determines the adoption of SAPs (Mclean-Meyinsse & Brown 1994).

Comer et al. (1999) compared the sustainable and conventional farmers' socio-economic characteristics, attitudes, and beliefs. The authors found that participation in outreach programs by farmer groups and organizations significantly affected the farmers' views and perceptions of the different sustainable practices, and in the long-run, their decision on whether or not to adopt these practices. Furthermore, it was observed that younger farmers utilize SAPs whereas the older farmers were more conservative

Gafsi, Nguyen, Legagneux, & Robin (2006) analyzed effectiveness and deficiency of the French procedure of sustainable agriculture. They found that territorial farm contracts (TFCs), a form of financial aid can appeal to all types of farms, depending on their scope and amounts. This conclusion was confirmed by the typology of farms having signed TFCs, in which only farm size and type of farming systems played an important role. The authors also reported that TFCs have had mainly economic effects. The other aspects of sustainability (i.e., environmental and social) were under addressed by TFC implementation. The researchers also concluded that two factors appear to be important in explaining the effects of TFCs. The first factor was farmer motivations, which were guided by obtaining financial aid

and carrying out economic projects. The second factor was the procedure for TFC implementation, especially the major influence of professional farming organizations, which succeeded in heavily orientating TFCs towards the economic aspect, to the detriment of aspects of sustainability.

Asare-Baah (2013) examined the participation in selected USDA programs by socially disadvantaged farmers in selected Black Belt Counties of Georgia and reported a high participation of African American farmers in some of the USDA programs, but not in the environmental programs. This was attributed to complicated requirements to participate.

Pompelli, Morfaw, & English (1995) examined the factors affecting Tennessee farm operators' attitudes about the usefulness of soil conservation information provided by the Tennessee Agricultural Extension Service (TAES). The authors found that average farm operator was 54.5 years old with 29.4 years of experience and a high school education. Also 45% of the operators earned less than 25% of their income from farm sales, while 60% had gross farm sales of less than $15,000 per year. About 44% of operators were from East, 31% were from Middle and 25% were from West Tennessee. Farm operators were generally sceptical about soil conservation information from TAES and three alternative sources. They further attributed this disparity to the extent to which farm operators felt each source understood their farm operations. Farm operators with mortgages consider TAES information useful, while part-time farm operators generally do not consider TAES information useful. There was an overall reluctance shown by the farm operators to consider TAES information as being important, which revealed that a large number of farmers preferred to consult their on-farm advisors rather than external advisors. Also, the authors noted that the study had an

important impact as they found that contact by TAES personnel had a positive effect on the likelihood that a farm operator considers TAES soil conservation information useful.

Drost et al. (1996) found that increasing farmer participation in selecting and conducting of research work would facilitate adoption of new and sustainable practices. Furthermore, Auburn and Davis (1994) found that the environmental and social goals of SAPs are beyond just the small scale farmers control alone, and recommended that the community residents should be involved as their actions will equally affect the environment at large. They concluded that for there to be a smooth transition to sustainability, there is a need for cooperation between farmers and residents.

Srinath et al. (2000) examined group farming for sustainable aquaculture. They found that 80% of farmers reported that their expectations were fulfilled to a great extent, particularly in increasing production and reducing the cost of farming. The knowledge gained in the identification of shrimp species, supplementary feeding and water quality management contributed to the success of farming. It was observed that 25% of the farmers increased production owing to the implementation of some of the recommended practices and correction of past mistakes. Depending upon the extent of implementation of recommended practices, farmers reported a two-to-six-fold increase in the returns obtained. The authors concluded that group farming objectives regarding financial support such as government loans and subsidies and organized marketing could not be achieved due to a lack of understanding of the government licensing procedures and farmers' indebtedness to the informal sources.

Programs provided by the USDA are numerous, and some programs such as Environmental Incentives Program (EQIP), Value Added Producers Grants (VAPG), and Farm Service Agency (FSA) farm loans target African American farmers. EQIP is a voluntary program that provides financial and technical assistance to agricultural producers through contracts up to a maximum term of ten years. Contracts provide financial assistance to help plan and implement conservation practices that address natural resource concerns and for opportunities to improve natural resources (soil, water, air, and humans) on agricultural land and non-industrial private forest land making sure farmers meet Federal, State, Tribal and local environmental regulations. VAPGs may be used for feasibility studies or business plans working capital for marketing value-added agricultural products, and farm-based renewable energy projects (USDA 2005). Though these programs are enacted to assist this group of farmers; studies have shown that some of them fail to patronize the programs. For instance, Asare-Baah (2013) studied the participation of African American farmers and found that for the EQIP program, awareness was as high as 74% but only 31% of these farmers participated in the program. For the VAPG program, awareness was at 41%, whereas participation was 19%. With respect to the farm loans, awareness of the programs was high at 73% for Farm Ownership (FO) loans and 81% for Operating Loans (OL); however, applications for FO and OL were 29% and 62%, respectively, and approvals were 55% and 78%, respectively.

Women in U.S. Agriculture

There has been a fundamental shift concerning the focus of the role of women in US agriculture over the past century, from being mainly farm women, with needs surrounding

family and household needs (USDA 1915), to now being a growing and influential part of farm operatorship. The 2007 Census of Agriculture USDA (2007) confirms a growing presence of women in U.S. agriculture. From the years 1997 to 2007, the number of female-operated farms increased from 209,784 to 306,209, a 46% increase; and acres of land they farmed increased as well from 51 million to 64 million acres of land, an increase of 25%. In 2007, 30% of U.S. farm operators were women and their farms made up 14% of all U.S. farms. Zeuli & King (1998), in a thirteen-state survey found that differences in farm size and type based on gender helped to explain differences in farm characteristics, education, farm financial performance, land tenure, etc., between male- and female-operated farms.

Nationwide, farms with female principal operators tend to be smaller both in terms of size and sales compared to their male counterparts. For example, the average of all farmland size is 418 acres, whereas the average for farmland operated by women operators is 210 acres. Second, in terms of the value of sales for all farms, the average was $134,807, compared to $36,440 for women operators, and a significantly higher percentage earned less than $10,000 versus the nation's average (66 versus 50) (Effland et al. 1998, USDA 2007). Third, on average, 69%of all farm operators were full-owners (operating on owned land only). For women operated farms, 85%were full-owners, an increase from 78%as reported by Effland Hoppe, & Cook 1998). Finally, on average, women operators, like their men counterparts tend towards the older age (56.5 years and 55.8 years, respectively); but while 90% of men operating farms were married, only 50% of women operating farms were married, due, in later years from widowhood (Hoppe 2001b).

Sommer (2001) found that female-operated farms, while growing in number, were small-scale and tend to specialize in livestock. At the same time, while they were similar to male-operated farms in that they depended on off-farm income to survive, fewer considered farming as their main occupation, their farm income was lower than male-operated farms, and they controlled a smaller share of economic resources used in agricultural production. These results are supported by Hoppe (2001a) who reported that less than half of women-operated farms reported farming as their principal occupation as compared to men (28% versus 49%), three times as many men operated farms in the upper sales category (greater than $250,000) than women (8.4% versus 2.8%).

In terms of finance, Hoag, Keske & Goldbach (2010) found female farmers to be more risk averse and less confident compared to male farm operators. More specifically, male farmers have a higher risk preference, and will therefore have higher returns on their investments. Finally, research on farm loan approval rates from 1999 to 2002 by Escalante, Epperson & Raghunathan (2009) found that male-operated farms had larger gross incomes than female-operated farms, while female-operated farms had better loan repayment records than male-operated farms. In terms of government payments, over one-third of farms operated by men (37%) received government payments as compared to 30% by women-operated farms. The reverse is true for participation in farms enrolled in Conservation Reserve Program (CRP), 23% of women-operated farms participated in this program compared to 10% of farms operated by men. For farms where CRP payments were the sole source of gross farm sales, 20% were women-operated versus 4% by men (Sommer 2001).

Taken together, given social, economic and financial positions, farms operated by women are smaller in terms of sales and acres due to age and lack of financial resources that would allow them to increase land, if only through renting, hiring labor, and maintaining a farming system that allows for income through small-scale livestock and government set-aside programs.

CHAPTER III

METHODOLOGY

This chapter will present methods and the model used in this study. This chapter will focus on: (1) population and sample selection; (2) data collection; (3) data sources; and (4) data analysis. The methodology that was employed during this research work was a survey of the small scale farmers in four southern states. It was in two phases. First, an in-depth telephone interview with the farmers was used to obtain the necessary information. Second, data were analyzed and recommendations provided on how to help the farmers using the programs provided by USDA. In this thesis, descriptive statistics are used to explore the demographic factors that affect African American farmers' adoption of SAPs. Similarly, the awareness and knowledge of USDA programs and participation are also explored.

Population and Sample Selection

The target population was small scale farmers in four southern states. The sample was drawn from Alabama, Mississippi, South Carolina, and Georgia. A total sample of 128 farmers was drawn from full-time and part-time small scale farmers affiliated with the Federation of Southern Cooperatives (FSC), based on convenience sampling technique.

Convenience sampling is used in exploratory research where the researcher is interested in getting an inexpensive approximation of the truth. This type of sampling technique was selected because it is convenient. Though this is a non-probability sampling method, it can still be used during preliminary research efforts to get a gross estimate of the

results, without incurring the cost or time required to select a random sample. According to Freedman (n.d.) the downside of this technique is that the sample selected may not represent any definable population larger than itself, which can lead to under-representation or over-representation of a particular population. Nevertheless, it is still used to get quick and inexpensive results (Statpak 2007). The convenience sampling technique was used in this case-study because it was the most appropriate approach as the data collected was compared to the 2007 national census data and they were similar in distribution.

Data Collection

A survey instrument was developed to collect the data (see Appendix A). The surveys contained socio-economic questions (age, gender, marital status, numbers of children, farming status (full-time farmers, part-time farmers), land ownership (acres owned, or rented), product sales (market alternatives or opportunities) farm practices, and awareness of USDA programs. Data from a total of 128 African American farmers (AAFs) were collected in the spring of 2013 through telephone interviews by the FSC personnel. FSC personnel assisted with the data collection because of the established connection with farmers. The 128 respondents included 26 farmers from Alabama, 31 from Georgia, 33 from Mississippi, and 38 from South Carolina.

Data Sources

Data used to evaluate the total number and locations of AAFs in the U.S. were collected from the USDA (2007) census data. According to the census, the four states accounted for 39.9% of all AAFs and 39% of all farm lands were operated by AAFs. In

addition, the farms averaged 102 acres; 35% were part-time farmers (200+ days off farm work); and 64% had some form of off farm employment (see Table 1).

Table 1. Numbers of Farmers in the Four Southern States

TYPE	Mississippi	Alabama	Georgia	South Carolina	Total
Numbers of Farmers	5306	2709	2072	2108	12195
Off-farm Employment	3471	1696	1354	1326	7847
Part-time Farmers	1888	876	803	676	4243

Distribution of African American Farmers

Figure 2 shows a map of the distribution of AAFs in the four Southern states studied. This map was based on data collected from the 2007 USDA census of agriculture USDA (2007). The GIS software was used to create this map and it shows that the largest numbers of AAFs are from Mississippi, and the farmers are evenly distributed across the counties. Also, a relatively larger number AAFs in Alabama are in the Black Belt Counties. The AAFs in Georgia and South Carolina are fewer than the two other states and they look more evenly distributed.

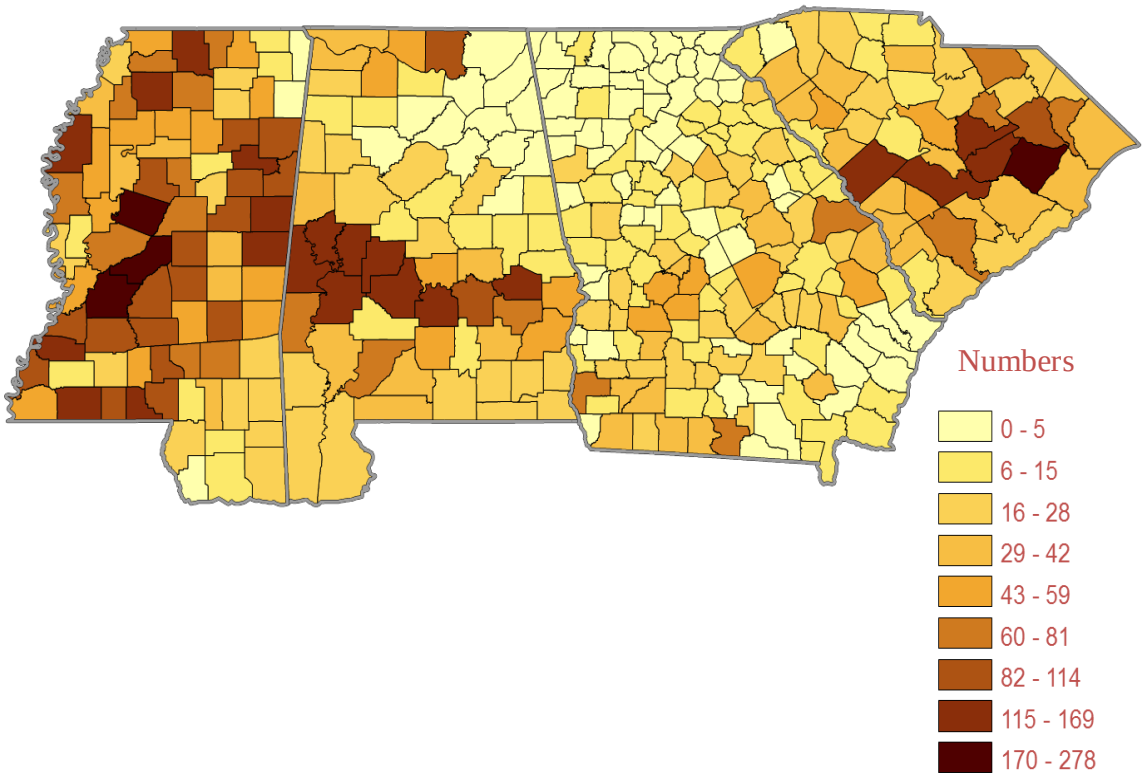

Figure 2. Numbers of African American Farmers in Four States

Data Analysis

Descriptive statistics such as frequency distributions, percentages, and chi-square were used to assess and quantify small scale farmers' responses to the survey questions. The data collected through the survey instrument were inputted into the Microsoft Excel Software and frequencies and percentages were assessed. Data from the national agricultural census were used to compare with the research sample to provide a basis for generalization.

Chi-square tests were used to compare the impact of gender on the adoption of SAPs as well as knowledge and use of USDA programs for small scale farmers. The chi-square test was used to determine whether the observed frequencies markedly differed from expected

frequencies (Statpak 1997). Every cell in a table contributes something to the overall chi-square statistic. If a given cell differs markedly from the expected frequency, then the contribution of that cell to the overall chi-square is large. If a cell is close to the expected frequency for that cell, then the contribution of that cell to the overall chi-square is low. A large chi-square statistic indicates that the observed frequencies differ markedly from the expected frequencies. It is an indicator that significance is present. Then one can visually examine to spot the cells that are responsible for the difference. With the chi-square statistic and its associated degrees of freedom, the software reports the probability that the differences between the observed and expected frequencies occurred by chance. Generally, a probability of .05 or less is considered to be significant (Kirkman 1996). Calculations were based on the chi square calculator developed at the College of Saint Benedict and Saint John's University (Kirkman 1996).

To determine the chi- square, the formula below is used:

$$\chi^2_{Obs} = \sum_{cells} \frac{(\mathrm{O} - \mathrm{E})^2}{\mathrm{E}}$$

χ^2= chi-square

O= observed frequency

E = expected frequency

$\sum$ = summation

If the observed chi- square value is greater than the expected value, the chi-square value is said to be significant and an interpretation of cell frequencies is necessary. If the observed chi-square value is less than the expected value, then no effects were discovered. In

this case, an interpretation of the cell frequencies is not essential, because the value could have been obtained by mere chance alone.

CHAPTER IV

RESULTS AND DISCUSSION

The objectives of this study were to identify the demographic characteristics of small scale AAFs, identify factors that encourage or impede the adoption of SAPs, determine the extent to which these farmers engage in certain SAPs, and determine the extent to which small scale AAFs had access to USDA programs that encourage SAPs. The demographic and farming practices data were collected in a survey of AAFs affiliated with the FSC. In this chapter, descriptive statistics of the survey data are presented to describe the demographic characteristics of the farmers as well as their use of SAPs. Next, chi-square test results are presented to show if gender plays a significant role in their use of SAPs.

Demographic Characteristics

According to the 2007 Census of Agriculture, AAFs were older (68% were over 55 years of age), predominantly male (86% versus 14% female) and experienced, with 72% having over 10 years of farming experience (USDA 2007). For this study, a total of 128 respondents, minority farmers took part in the minority farmers' survey.

Table 2 shows the demographic and environment profile of the respondents in regards to their gender, age range, farming experience, acres, off-farm work, and gross sales. Results indicated that majority of AAFs were male (76.6%) whereas 23.4% indicated they were females; older, 36.7% were between 55 to 64 years of age, 35.2% were

Table 2. Demographic Characteristics of Respondents (n= 128)

Variables	Sample Percentages	USDA Percentages
Gender		
Female	23.40	14.47
Male	76.60	85.50
Total	100	100
Age range		
35–44	0.78	8.50
45–54	14.06	21.80
55–64	36.72	31.90
64 – 74	35.16	23.10
75 and above	13.28	14.70
Total	100	100.0
Farming experience		
Below 10 years	16.40	28.30
10 years +	83.60	71.70
Total	100.00	100.00
Acres		
1 to 9	6.80	13.36
10 – 49	33.90	39.11
50 – 179	40.70	36.98
180 – 499	18.60	10.55
Total	100.00	100.00
Off – Farm work		
Full-time	34.00	36.10
Part-time	66.00	63.90
Total	100.00	100.00
Gross sales		
(Not Answered)	3.90	0.00
Less than $1,000	14.70	31.90
$1,000 to $2,499	17.10	17.50
$2,500 to $4,999	27.10	15.10
$5,000 to $9,999	17.80	14.30
$10,000 to $24,999	10.90	11.50
$25,000 and above	8.60	9.70
Total	100.00	100.00

between 64 to 74 years of age, 14.1%, and 13.3% were 75 years of age and above; and experienced, 83.6% of the farmers had 10 or more years of experience in farming. In terms of land ownership, about 6.8, 33.9, 40.7, and 18.6% of the respondents owned between 1 to 9 acres of land, 10 to 49 acres of land, 50 to 179 acres of land, and 180 to 499 acres of land, respectively. These findings are similar to the 2007 USDA census. Furthermore, a majority of the responding farmers considered themselves as part-time farmers (66%) compared to full-time farmers (34%). The same holds for the 2007 USDA census where 63.9% considered themselves as full-time farmers.

In terms of the gross income of these farmers; nearly 4% of the respondents did not answer, whereas 14.7% earned Less than $1,000, 17.1% earned between $1,000 to $2,499, 27% of the respondents earned between $2,500 to $4,999, 17.8% earned between $5,000 to $9,999, 10.9% earned between $10,000 to $24,999, and about 9% earned above $25,000. Table 2 compares the farmers in the study with national averages.

The demographics reflects larger number of male participants, relatively older participant group, a higher proportion were highly experienced farmers, with a relatively fewer farm land to work on, higher proportion were part-time farmers (had off-farm income), and relatively lower annual gross sale or income.

Cooperative membership

Figure 3 indicates the response of the farmers to their membership to a cooperative. About 59% of the respondents were found to have membership in a cooperative in which the sole objective was to aid in buying farm inputs and selling of their products. While 41% was not part of any cooperative.

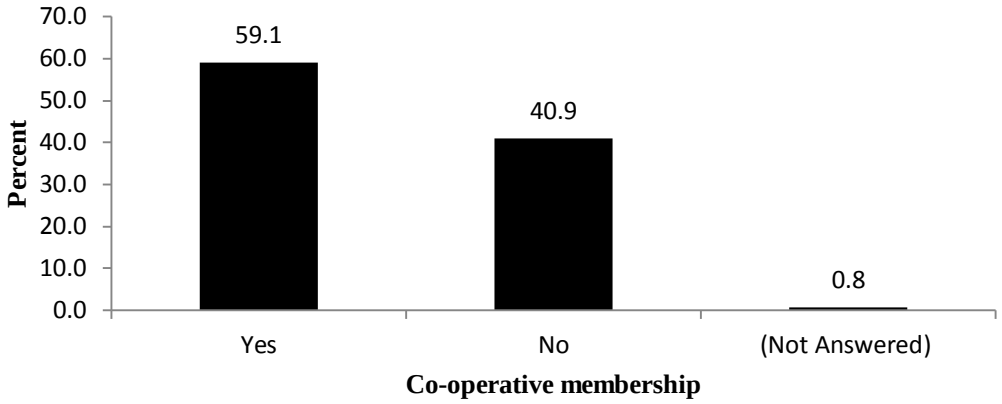

Figure 3. Co-operative memberships

Farming practices

Figure 4 indicates the response of the farmers to farming practices. Forty percent engaged in Row crops (commodities), 35.7% grew truck crops (fruits and vegetables) and, 22.7% raised livestock/Poultry. The studied farmers were evenly distributed across the three farming practices so there is a fair representation of the three farming strategies.

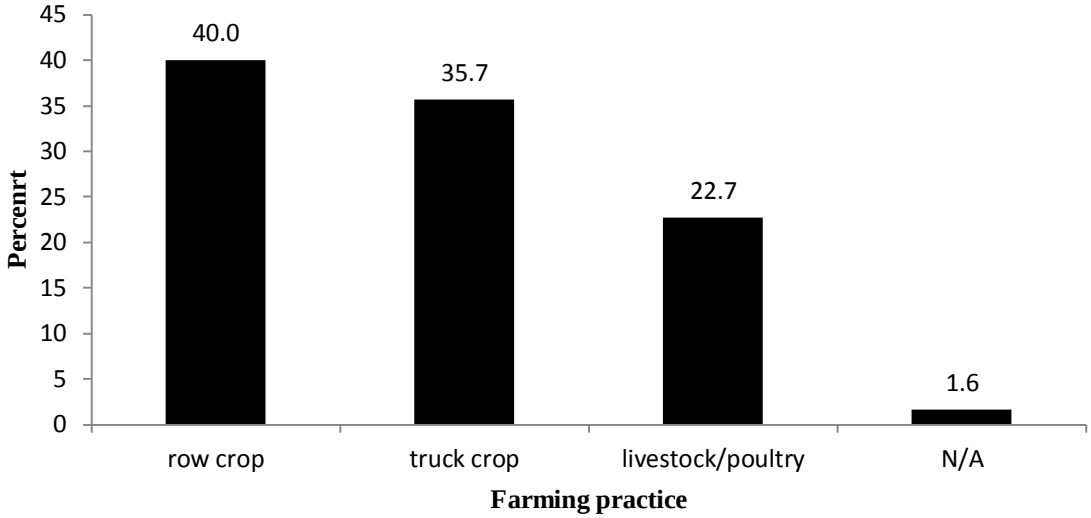

Figure 4. Response to farming practices

Marketing and selling of farm product

Figure 5 describes how the respondents marketed and sold their products. The results indicated that 73.2% used direct (such as farmers market and community-supported agriculture), 16.7% used commercial (grocery stores, institutions, brokers, and restaurants), and 10.1% didn't use any.

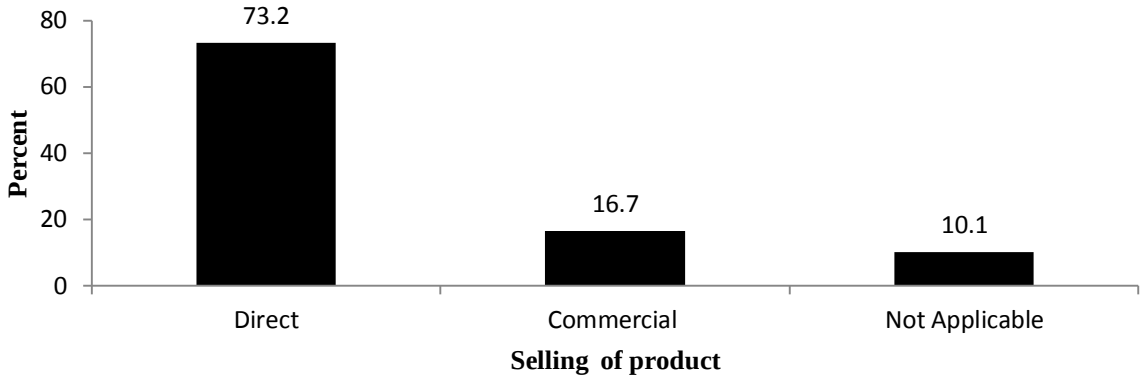

Figure 5. Means of marketing and selling farm products

Sustainable Agricultural Practices (SAPs)

Insect and management practices

Forty-eight percent of the surveyed farmers applied chemicals to their crops, while 33.0% employed physical removal, 5.9% shaded out weeds (SCSE), and 4.3% planted the insect habitat to control insects, 2.2% planted trap crop, 5.9% found this question not applicable, and less than one percent did not answer this question (Figure 6). This is similar to findings of Tackie et al (2009), who found that majority of farmers applied chemicals to control pests; yet, a majority of the farmers were not familiar with integrated pest management.

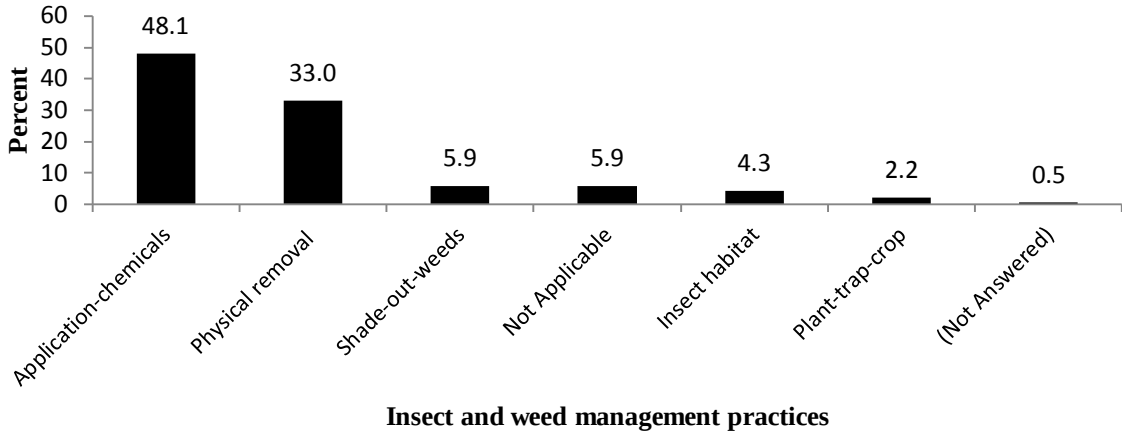

Figure 6. Insect and weed management practices

Management-intensive or rotational grazing system

Almost two-fifths of the respondents (41%) found management-intensive or rotational grazing not applicable to their farming system, whereas 31% used the practice, and 27% did not use the practice (Figure 7). A lower proportion of AAFs practice this system.

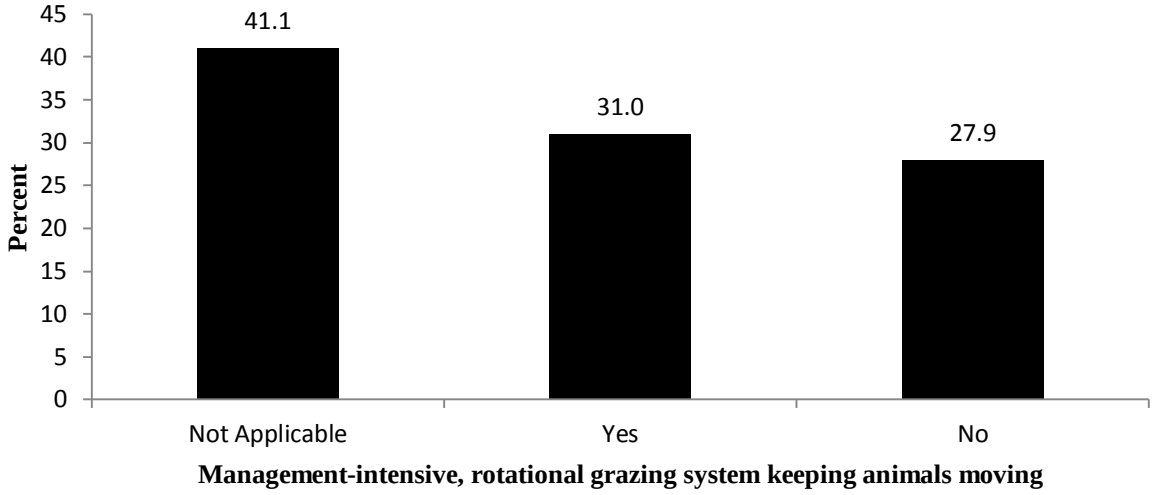

Figure 7. Management-intensive or rotational grazing systems

Conservation Tillage Method Employed on Farms

About 43% used rotational tillage system on their farms, while 15.9% used mulch-till, 12.8% used strip-till, whereas 11.6% found these practices not applicable to their farming system, 11.0% practiced ridge-till on their farms, and 6.1% practiced No-till on their farms (Figure 8).

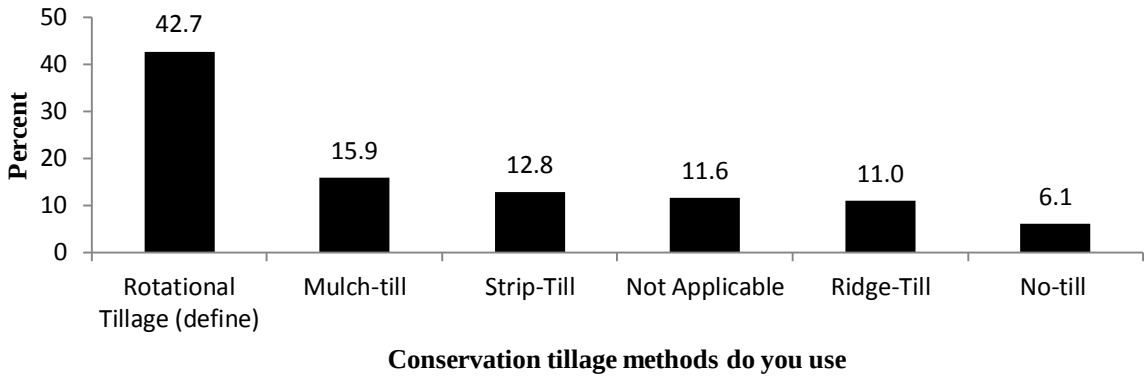

Figure 8. Conservation tillage methods employed

Planting of cover crops after harvest

Figure 9 shows whether or not they plant cover crops. Forty-eight percent answered yes to planting cover crops after harvesting cash crop, 39.5% did not and 12.4% found this not applicable. About 52% of the respondent did not plant or did not find this topic to be useful. This is similar to Zhen (2005) who found that farmers were not encouraged to adopt conservation practices.

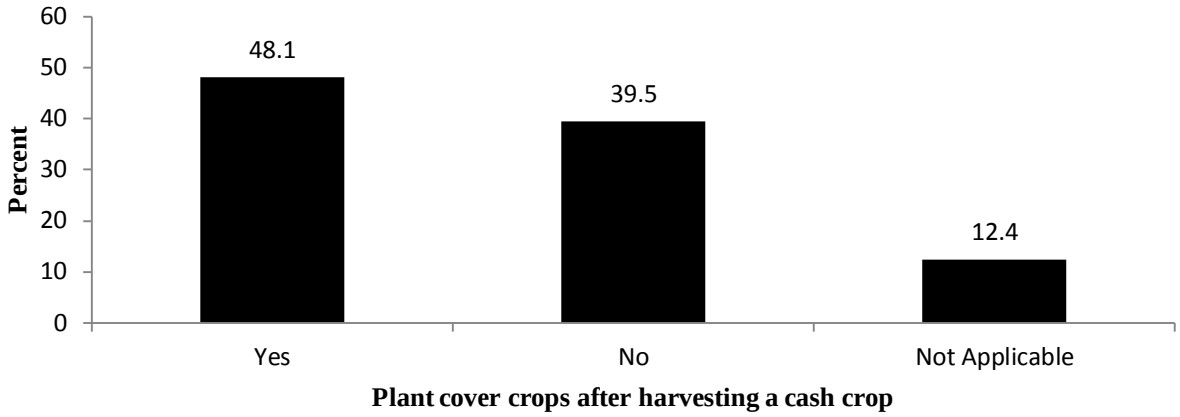

Figure 9. Planting of cover crops

Types of crops planted

Figure 10 shows the types of cover crops planted by the surveyed farmers. About 39% planted Rye, 26.4% responded not applicable 11.1% planted Clover, 1.4% planted Vetch, 4.2% planted other types of cover crop, and 18.1% did not answer this question.

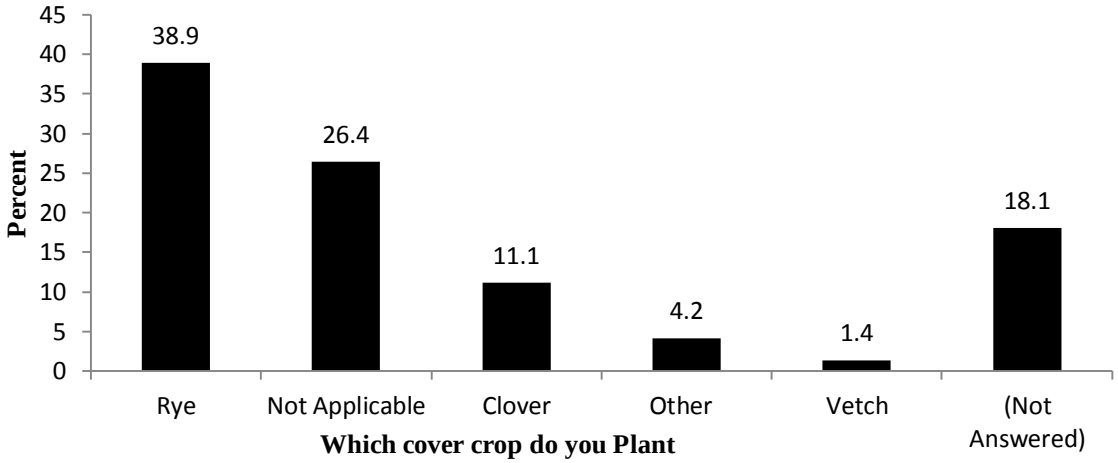

Figure 10. Types of cover crops planted

Acres of land for cover crops

Figure 11 shows the acres of land on which the farmers plant the cover crops. About 10% had between 1 to 9 acres, 21% had between 10 to 49 acres, 10.1% had between 50-179 acres, while 5.4% had between 180-499 acres of land and 1.6% had 500+ acres of land, and 52% did not answered the question.

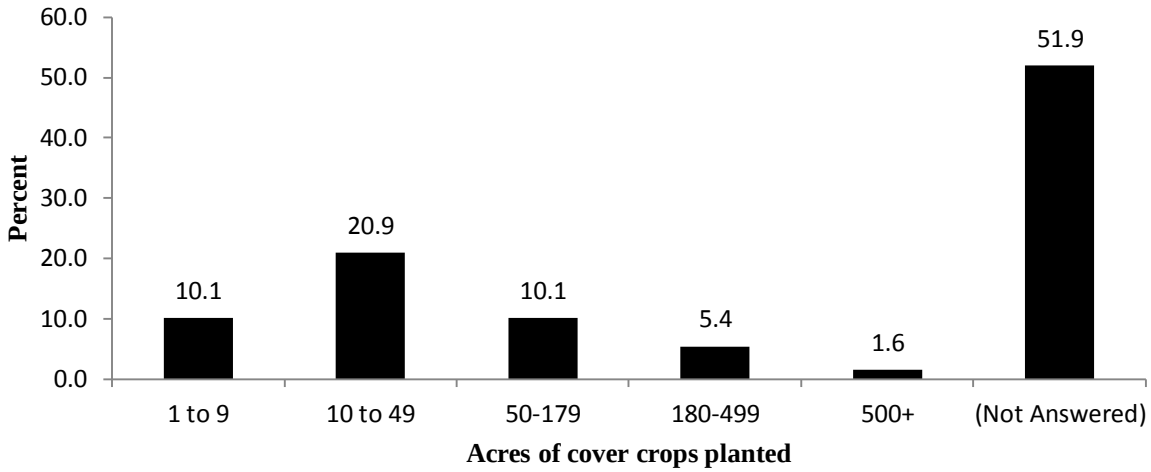

Figure 11. Acreage with cover crops

Method of planting

Figure 12 describes the methods respondents used to plant crops. About 33.0% used chemicals to grow their crops, 14.7% used organic method, 47.3% used low application of chemicals to grow their crops, 1.6% were vegan, and 3.9 % did not answer the question.

Agro- forestry techniques

Figure 13 indicates the Agro-forestry technique employed by the farmers. Four percent did not answer the question, 18.6% practice mix forest and livestock farming, 6.2% were practiced mix forest and crop production, and 71.3% found this not applicable.

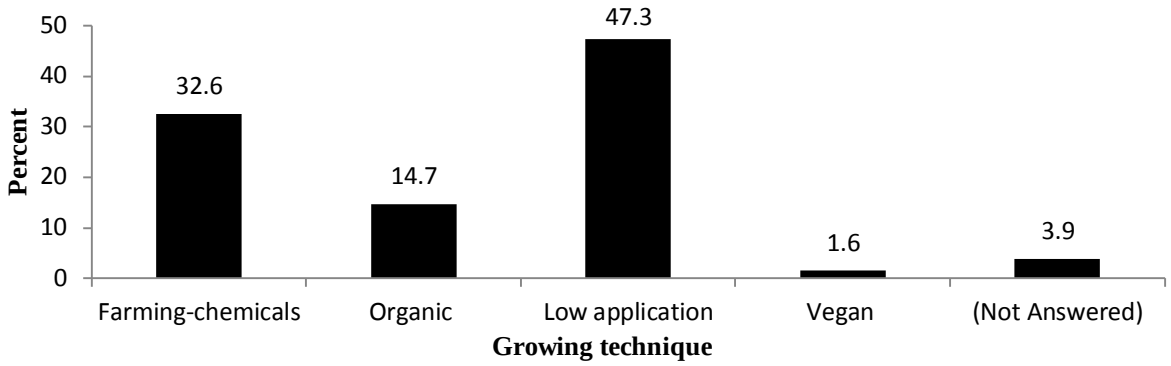

Figure 12. Growing techniques

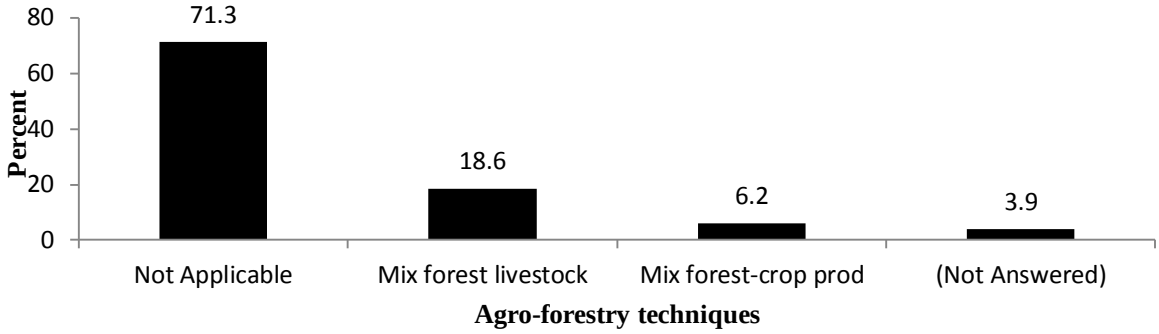

Figure 13. Agro- Forestry techniques used

Nutrition management process

Figure 14 shows the nutrient management process; 36.2% did soil testing, 26.2% did time their soils, 15.4% did erosion control, 16.3% did manure testing, 3.2% found this not applicable, 2.3% did plant testing, and less than 1% did not answer.

Types of energy used

Figure 15 indicates the type of energy used. Eighty-eight percent were still using the traditional source of energy (diesel/gas), 5.4% used Bio-fuel (i.e. ethanol), 3.1% used solar power, 1.6% did not answer, and 1.6% of the farmers used other sources of energy. This

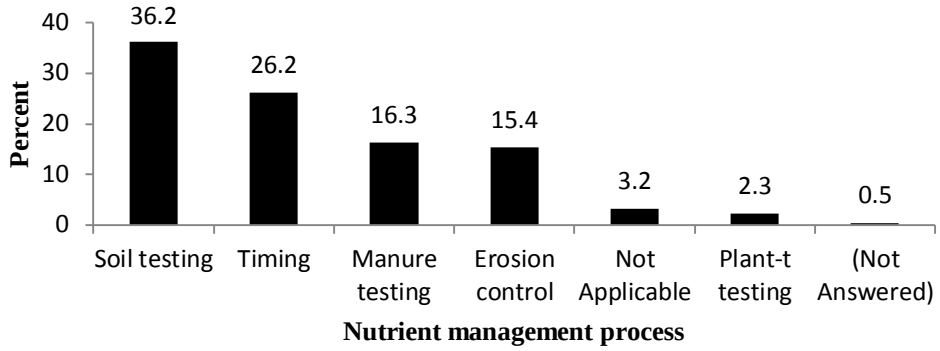

Figure 14. Nutrient management process

group of farmers are not so sustainable and it could be because most of them are older farmers. It appears the older farmers are not embracing SAPs and this is supported by Comer et al. (1999); they found that younger farmers (not older farmers) are more receptive to adoption of SAPs, whereas the older farmers are more conservative.

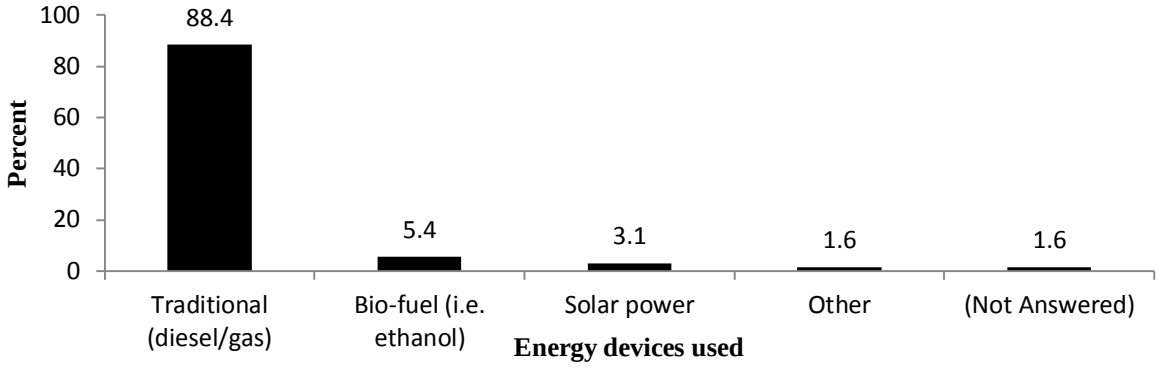

Figure 15. Source of energy used

Reasons for not practicing SAPs

Figure 16 indicates reasons why farmers were not adopting SAPs. Twenty-two percent lacked the funds to implement SAPs, 19% lacked information about some of the SAPs, 15.2% didn't find it necessary to change their current methods, 11.8% lacked the equipment for SAPs, 9.5% lacked necessary farm help to implement SAPs, 8.5% could not afford the interruption to their current methods, 8.1% thought this was not applicable to them 3.8% were not convinced about the SAPs, 1.4% had other reasons, and less than 1% did not answer. These findings corroborate with the impediments reported in previous studies; these include the social aspects and economic constraints (an example of social constraint was lack of farmer peer example, and the list of economic constraint were; cost of transitioning, risk and uncertainty of adoption, Lack of education or knowledge about this technology) to the transition to SAPs and the fact that it is difficult for farmers to switch from the traditional farming practices that they have become accustomed to (Drost et al. 1996; Baide 2005).

Farmers interest on relevant topics

Figure 17 shows the farmers interest on different topics. Twenty-eight percent had interest in marketing technique, 14% were interested in cover crops, 12.4% had interest in insect &weed management, 9.3% were more interested in conservation tillage, 8.5% had interest in management-intensive, rotational system, 8.5% were interested in nutrient management, 7.8% were interested in on farm energy conservation, 6.2% were interested in crops and livestock, and 5.4% did not respond.

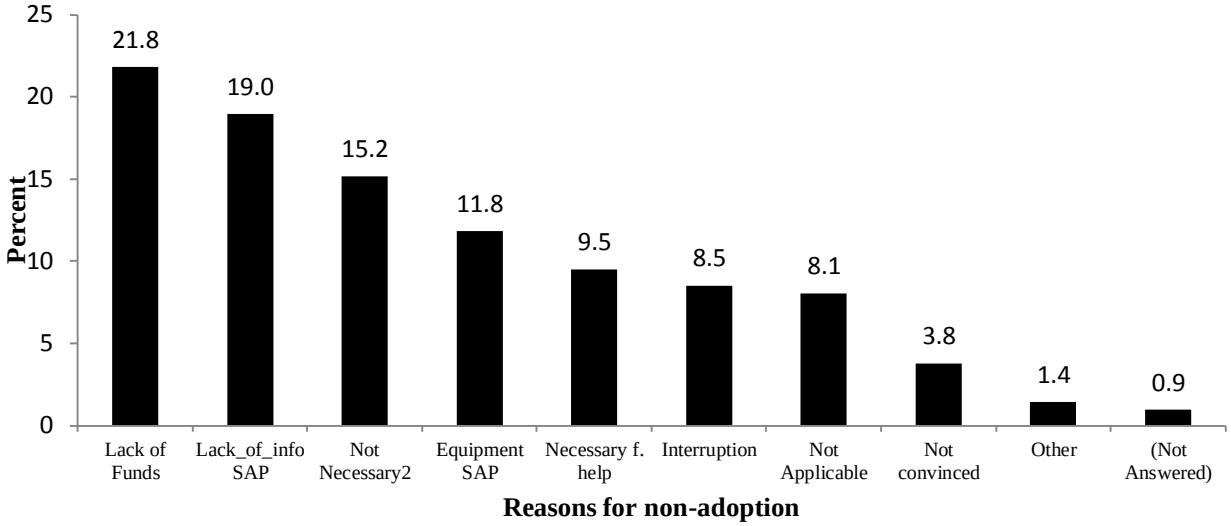

Figure 16. Reasons for non-adoption of sustainable agricultural practice

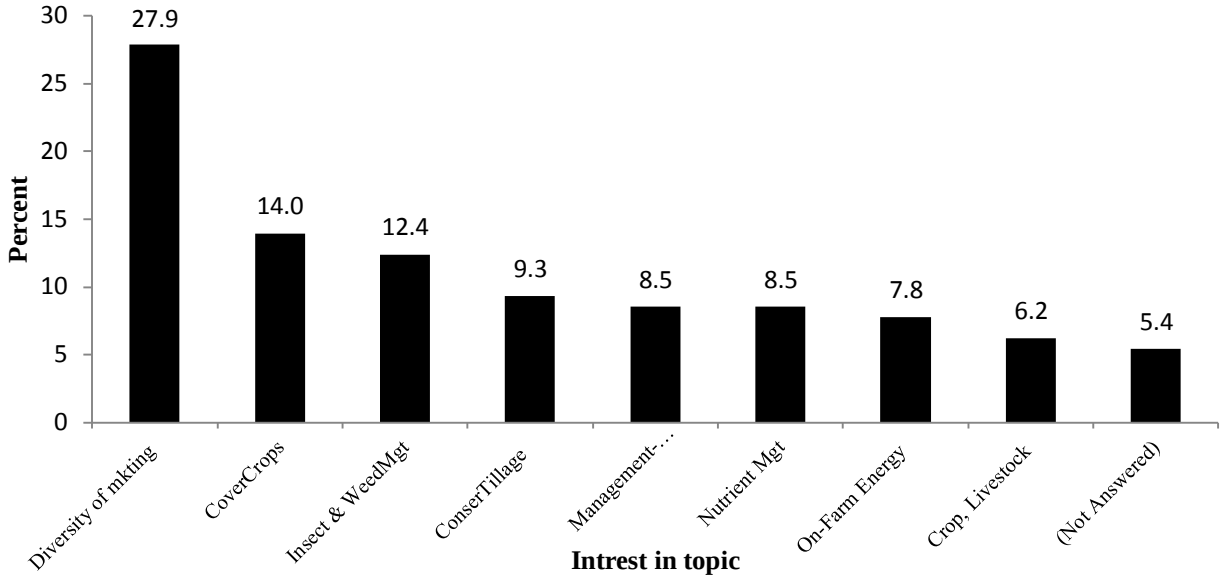

Figure 17. Farmers interest in relevant topics

Farmers with USDA loans or loan guarantees

Figure 18 indicates that 66.9% did not have USDA loans, 28.3% had access to USDA loans, 4.7% were not aware of the loan program, and 1.6% did not answer. This is similar to

the findings in recent research by Asare-Baah (2013) who found that socially disadvantage farmers did not participate in USDA programs available to them. The AAFs are the least represented in national programs.

Farmers with USDA Natural Resources Conservation Service

Figure 19 focused on USDA Natural Resources Conservation Service (NRCS) programs. Seventy-three percent did not have access to NRCS programs, 19.4% had access to this program, and 5.4% were not aware of it, and 2.3% did not answer this question at all.

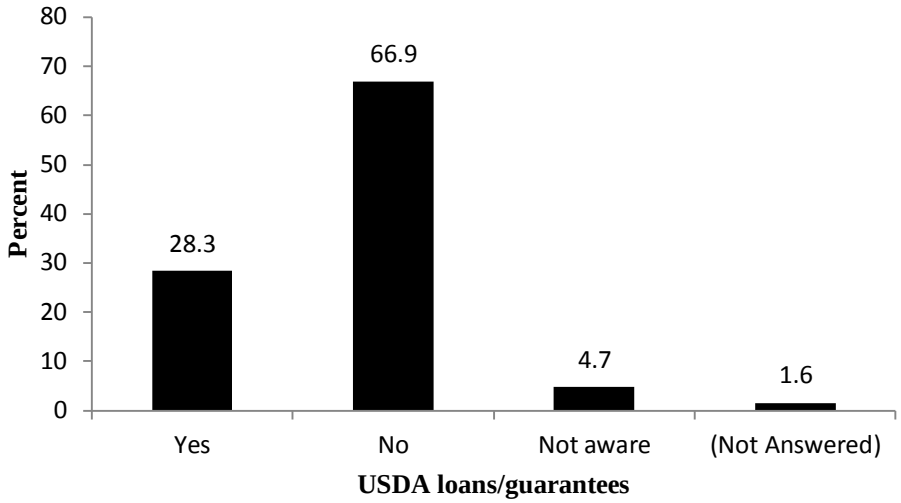

Figure 18. Access to USDA Loans or Loan Guarantees

Gender Issues: Female and Male

Given the increasing numbers of female farmers, thirteen different comparisons were made concerning the differences and the SAPs described earlier. A series of tables were developed to show the relationships of gender and selected characteristics or other demographic and SAPs. In addition, chi-square test were used to determine if there were any statistically significant differences between gender and selected characteristics.

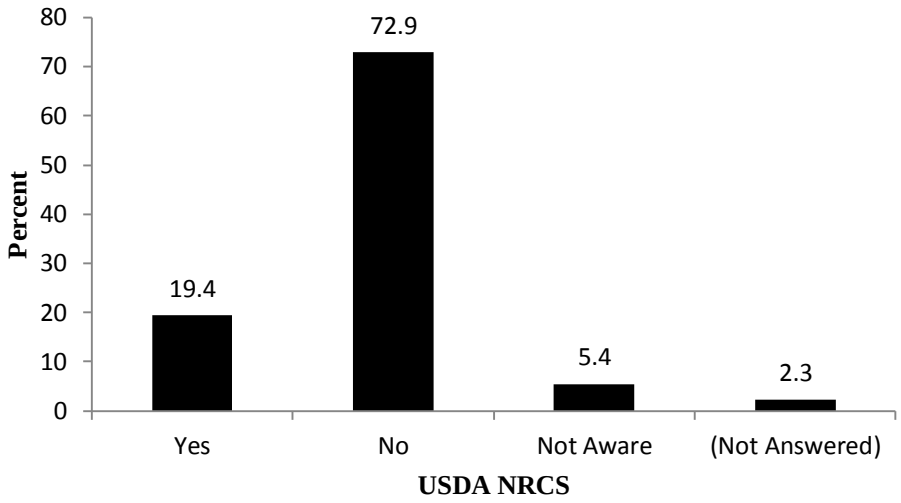

Figure 19. Farmer Access to USDA Natural Resources Conservation Service

Other Demographic Characteristics

Table 3 provides an overall examination of the role of gender in both other demographic characteristics and selected farming practices. In nine cases gender played a significant role at the 0.05 level or better, while in the remaining four cases, the significant level was between 0.06 and 0.1. More specific examination of the role of gender is found in Tables 4 – 16.

Marital status

Figure 4 shows the marital status of the respondents. The majority of male farmers were married (77.6%) compared to female farmers (43.3%). however, more women were single (16.7%), separated (6.7%), and widowed (26.7%) versus men (5.1, 1.0 and 6.1 %, respectively). The results were significant at the 1% level.

Table 3.Chi-square Result of Gender by Other Demographic Characteristic & SAPs

Variables	Chi-square	P-value (probability)
Marital status	20.1**	0.01
Farmer Considerations	20.4**	0.01
Ownership Status	8.81**	0.01
Acreage owned	9.23	0.06
Acreage Rent	10.9*	0.05
Experience	10.7*	0.03
Farming practices	12.8**	0.01
Marketing strategies	10.5 **	0.01
Management practices	15.9**	0.01
Conservational methods used	8.99	0.10
Acres of Cover crops planted	7.93	0.09
Prevention from adoption	13.8	0.08
USDA loans	7.21*	0.02

Note: *significant at p< .05 level. ** significant at p < .01 level.

Type of farmers

While the majority of the male and female farmers considered themselves either as full-time or part-time farmers, significantly more women were either hobby or other farmers (Table 5). This was also found to be significant at the 1% level.

Table 4. Marital status of Sample Farmers by Gender

Marital status	**Female (%)**	**Male (%)**
Single	16.67	5.10
Married	43.33	77.55
Separated	6.67	1.02
Divorce	6.67	10.20
Widow	26.67	6.12
Total	100	100

n= 128; χ^2= 20;. d.f= 4; p= 0.000

Table 5. Farmer Status of by Gender

Farmer Considerations	**Female (%)**	**Male (%)**
Full-time farmer	23.33	39.80
Part-time farmer	43.33	53.06
Hobby farmer	13.33	2.04
Retired	3.33	4.08
Other	16.67	1.02
Total	100	100

n= 128; χ^2= 20.4; d.f.= 4;. p = 0.000

Ownership type

Table 6 indicates that majority of male AAFs were sole owners of farm land (78.6%) compared to 53.3% of females who were sole owners too. Significantly there were more

females (36.7%) into partnerships compared to males in partnerships (13.3%). The relationship was significant at the 1% level.

Table 6. Ownership Status by Gender

Ownership Status	Female (%)	Male (%)
Sole owner	53.33	78.57
Partnership	36.67	13.27
Corporation(define)	0.00	0.00
Other	10.00	8.16
Total	100	100

n= 128; χ^2= 8.81; d.f= 2; probability = 0.012

Land acreage owned

Table 7 compares female to male AAFs in terms of land acreage owned. Of the respondents, significantly more males (38.8%) owned between 50 – 179 acres, so also 19.5% had land between 180 to 499 acres compared to the respondents who were women, 33.3% had between 50 to 179 acres and, 10% had between 180 to 499 acres. Comparatively, majority of female farmers (16.7%) significantly had between 1 to 9 acres compared to 3.1% of male farmers. This relationship was statistically significant at the 5% level.

Land acreage rented

Table 8 compares female to male AAFs in terms of land acreage rented. Of the farmers surveyed, about 25% of Women rented between 10 to 49 acres of land compared to about 8.3% of males, also about 7.1% of females rented land compared to 1.0% of male who

rented. The relationship was statistically significant at the 5% level which indicates that significant number female rented farm lands compared to the male.

Table 7. Acreage Owned by Gender

Acreage Owned	Female (%)	Male (%)
1 to 9	16.67	3.06
10 to 49	30.00	31.63
50 to 179	33.33	38.78
180 to 499	10.00	19.39
500+	0.00	0.00
NA	10.00	7.14
Total	100	100

n= 129; χ^2 = 9.23; d.f.= 4; p = 0.05

Table 8. Acreage Rented by Gender

Acreage Rent	Female (%)	Male (%)
1 to 9	0.00	4.12
10 to 49	25.00	8.25
50 to179	3.57	5.15
180 to 499	7.14	1.03
500 +	3.57	2.06
NA	60.71	79.38
Total	100	100

n= 128; χ^2= 10.9; d.f.= 5; p = 0.052

Farming experience

Table 9 compares the relationship between farming experience and gender. Significantly more males (88.8%) respondents had between 10 to 15 + years of farming

experience, whereas 67% female had between 10 to 15 + years of farming experience,. For respondents with less experience (below 9 years), about 33% were females compared to 11% that were males. This trend shows that significantly, more female farmers had lower years of experience in farming than males. This relationship was found to be statistically significant at the 5% level.

Table 9. Farming Experience by Gender

Farming Experience	Female (%)	Male (%)
1 to 3 years	10.00	1.02
4 to 6 years	13.33	7.14
7 to 9 years	10.00	3.06
10 to 15 years	13.33	15.31
15 years +	53.33	73.47
Total	100	100

n= 128; χ^2 = 10.7; d.f. = 4; p= 0.030

Farming practices applied

Table 10 describes the farming practices applied by male African American farmers and female African American farmers. The comparison shows that significantly majority of male farmers (41.8%) planted row crops. Also, for the farmers who planted truck crops, majority are male farmers; 38.3% of male farmers who planted truck crops compared to 27.9% of female farmers who planted truck crops. Additionally, of the respondents who practiced livestock and poultry: significantly, majority of female respondents practiced livestock (30.2%) compared to19.9%. The relationship between farming practices and gender was found significant at the 1% level.

Table 10. Farming Practices Applied by Gender

Farming practices applied	Female (%)	Male (%)
Row crops(commodities)	34.88	41.84
Truck crops(fruits and vegetables)	27.91	38.30
livestock/Poultry	30.23	19.86
NA	6.98	0.00
Total	100	100

n= 185; χ^2 = 12.8; d.f. = 3; p = 0.005

Marketing strategies

Table 11 compares the relationship between the farmers' marketing strategies and their gender. Seventy-six percent of the male respondents did direct marketing whereas 65.6% of females used direct marketing strategies. For respondents using commercial marketing strategy, 18.1% were males, whereas 9.4% were females. This trend shows that male farmers were more aggressive in marketing compared to female farmers. Significantly, majority of the males market their products through commercial and direct means. This was found to be statistically significant at the 1% level.

Table 11. Marketing Strategies by Gender

Marketing strategies	Female (%)	Male (%)
Commercial(grocery, institution)	9.38%	18.10%
Direct (farmers market)	65.63%	76.19%
Not applicable	25.00%	5.71%
Total	100	100

n= 138; χ^2 = 10.5; d.f.= 2; p = 0.005

The demographic data showed that majority of the females were single never married or single as a result of the death of a spouse. Also, most of the female farmers were hobby farmers and into some kind of partnership to maintain ownership of their farms. It is important to note that their farms were smaller in size. In addition, these female farmers produced livestock and poultry which usually require less labor than row crops. Also they tended to adopt the direct marketing strategy which seems to be a less labor intensive method to sell their products.

Sustainable Agricultural Practices (SAPs)

Management practices used

Table 12 shows the management practices used by the farmers relative to gender. About 48% of males applied chemicals compared to 47.2% females, 34.7% of males physically removed weed compared to 27.8% females, 6.8% of males selected crops that smother weeds compared to 2.8% females, 4.8% of males created habitat for beneficial insects compared to 2.8% females, and 2.7% of males planted trap crops compared to 0.0% females. Significantly, more men practiced management practices than females. This was found to be statistically significant at the 1% level.

Conservational methods used

Table 13 shows the results of analysis between gender and conservational methods used. More females (18.2%) practiced strip-till versus males (11.5%), whereas more males (16.2%) practiced mulch-till and ridge-till (13.8%) compared to females (12.1%) and (0.00%), respectively. This was not found to be statistically significant.

Table 12. Management Practices by Gender

The management practices you use	Female (%)	Male (%)
Plant trap crop	0.00%	2.72%
Physical removal of weeds	27.78%	34.69%
Application of chemicals	47.22%	48.30%
Selecting crops that smother	2.78%	6.80%
Creating habitat for beneficial	2.78%	4.76%
NA	19.44%	2.72%
Total	100	100

n= 185; χ^2 = 15.9; d.f = 5; p = 0.007

Table 13. Conservational Methods Used by Gender

Conservational methods used	Female (%)	Male (%)
No-till	6.06%	6.15%
Strip-till	18.18%	11.54%
Mulch-till	12.12%	16.15%
Rotational-tillage	42.42%	43.08%
Ridge-till	0.00%	13.85%
NA	21.21%	9.23%
Total	100	100

n= 164; χ^2 = 8.99; d.f. = 5; p = 0.109

Acres of Cover crops planted

Table 14 compares the acres of cover crops planted to gender. About 71.4% of female farmers planted cover crops on less than 50 acres of land while 61.7% of male farmers planted cover crop on less than 50 acres of land. About 38.3% of male farmers planted cover

crops on 50 acres or more land, whereas 28.6% of females planted cover crops on 50 acres or more land. This was found to be statistically significant at the 10% level.

Table 14. Acres of Cover Crops Planted by Gender

Acres of C.crops planted	**Female (%)**	**Male (%)**
1 to 9	42.86%	14.89%
10 to 49	28.57%	46.81%
50 to179	28.57%	19.15%
180 to 499	0.00%	14.89%
500 +	0.00%	4.26%
Total	100	100

n= 129; χ^2 = 7.93; d.f. = 4; p = 0.094

Reasons for non-adoption of SAPs

Table 15 shows the results of analysis between gender and perceived reasons for non-adoption. For the females, the highest ranked reason for non-adoption of SAPs was lack of information (23.7%) compared to 18% for males. About 21.1% females compared to 22.2% of males indicated lack of funding as a reason for non-adoption of SAP, 7.9% of females compared to 12.6% of males indicated lack of equipment as a reason for non-adoption of SAPs, 5.3% of females compared to 10.2% of males indicated lack of necessary farm help as a reason for non-adoption of SAP, and 7.9% females compared to 17.4% of males did not find it necessary to change. The relationship between gender and reasons for non-adoption was found to be statistically significant at the 10% level.

Table 15. Reasons for Non-Adoption of SAPs by Gender

Reasons for non-adoption	Female (%)	Male (%)
Lack of information	23.68	17.96
Funding necessary	21.05	22.16
Equipment necessary	7.89	12.57
Necessary Farm help	5.26	10.18
Wasn't necessary to change	7.89	17.37
Interruption of current method	7.89	8.98
Not convinced	5.26	3.59
NA	21.05	5.39
Others	0.00	1.80
Total	100	100

n= 211; χ^2 = 13.8; d.f.= 8; p = 0.087

USDA loans or loan guarantees

Table 16 shows the results of analysis between gender and access to USDA loans or loan guarantees. The results indicate that 68.4% of male farmers had no loans or loan guarantees from the USDA compared to 60.7% female farmers. About 29.6% of male farmers had loans or loan guarantees from the USDA compared to 25% of female farmers. Additionally 2% of male farmers were not aware of the loans or loan guarantees from the USDA compared to 14.3% of female farmers, a higher proportion of female AAFs were not aware of USDA loan programs. This was found to be statistically significant at the 5% level.

Recent research by Asare-Baah (2013) stated that majority of AAFs were not participating in USDA loans programs.

Table 16. USDA Loans or Loan Guarantees by Gender.

USDA loans or loan guarantees	**Female (%)**	**Male (%)**
Yes	25.00	29.59
No	60.71	68.37
Not aware	14.29	2.04
Total	100	100

n= 129; χ^2 = 7.21; d.f. = 2; p = 0.027

The chi-square results between gender and SAPs show that fewer women practiced management practices relative to males and this may be because they were widowed and single; were not aware of the practices; or lacked the necessary help to implement the practices. Implementing SAPs was more prominent in married households than in single person households. Additionally, the majority of men were married and they used SAPs more than the single, separate or widowed women. Also, the same holds for conservation methods as more men practiced conservational methods compared to the women. Again, more men planted cover crops on 10 or more acres of land whereas more women planted on less than 9 acres of land. This may be due to female farmers having less acres of land to farm compared to men. Female farmers may also lack funds and labor they need to plant cover crops. More women lacked the information and training in SAPs compared to men which may likely lead

to non-adoption of SAPs. Finally, significantly majority of female respondents were not aware of USDA loans and guarantees versus their male counterparts.

CHAPTER V

SUMMARY AND CONCLUSION

The purpose of this study was to investigate the use of SAPs among African American farmers (AAFs) in four states (Alabama, Georgia, Mississippi, and South Carolina). Specific objectives were to identify the demographic characteristics of small scale AAFs, identify factors that encourage or impede the adoption of SAPs, determine the extent to which these farmers engage in certain SAPs, and determine the extent to which small scale AAFs had access to USDA programs that encourage SAPs. Data were collected using a convenience sampling method employed by Federation of Southern Cooperatives (FSC) outreach personnel in Alabama, Georgia, Mississippi, and South Carolina in the spring of 2013. The research sample was 128 farmers affiliated with the FSC. The data were analyzed using descriptive statistics and chi-square tests.

The Findings show that a majority (77%) of the respondents were males, almost half were 64 years or older, 84% had at least 10 years of farming experience, and 66% had part-time jobs. Also, a majority (88%) of the respondents practiced using traditional petroleum fuel as the source of energy. Additionally, almost 80% applied farming chemicals on their crops. Approximately 40% of the respondents reported that they practiced row cropping; about 36% produced vegetables-truck crops, and 23% are involved in livestock and poultry. A little more than 70% did not participate in USDA NRCS programs while most (95%) were aware of such programs. Thus, awareness for the USDA NRCS was high but not surprisingly, and based on previous research, the participation was lower for AAFs. The

results also revealed that adoption of SAPs was low. In the case of cover crops, 48% of the farmers planted cover crops after harvesting cash crops, 39.5% did not plant cover crops, while 18% felt that cover crops were not applicable to their farm operations. The adoption rates for the various nutrient management methods were as follows: soil testing (36.2%), application of manure/fertilizer (26.2%), manure testing (16.3%), erosion control practices (15.4%) and plant tissue testing (2.3%). Well over half of the respondents considered their production methods to be between organic and traditional practices. Survey results revealed a number of reasons for non-adoption of sustainable agricultural practices including lack of funding and lack of adequate information about SAPs; some respondents also stated that they were simply not convinced that there were sufficient reasons to change their current practices and to switch to SAPs. The findings corroborate the impediments reported in previous studies; these include the social aspects and economic constraints to the transition to SAPs, and the fact that it is difficult for farmers to switch from the traditional farming practices that they have become accustomed to (Baide 2005; Drost et al. 1996). About 59% of the respondents were found to have membership in a cooperative in which the sole objective was to aid in buying farm inputs and selling of their products. The majority of the respondents sold their products directly at the farmers markets (83%) while 17% sold directly to grocery stores, schools and other institutions.

The farmers who used SAPs (a) were members of a cooperative or organization, (b) were younger in age; and (c) had a higher level of education. Comer et al. (1999) reported that participating with different organizations influences the farmer's use of a sustainable

agricultural system. The authors also observed that younger farmers are more receptive to adoption of SAPs compared to the older farmers who were more conservative.

The chi-square tests revealed that years of experience, marital status, and type of ownership had statistically significant relationship with the gender. The analysis also showed that males had more years of experience in farming than their female counterparts; that fewer females adopted SAPs than males; and that gender appeared to influence adoption of SAPs and, therefore, should be considered in outreach and education programs. Further analysis showed that females and less experienced farmers were less receptive to the adoption of SAPs relative to males and more experienced farmers. In addition, a majority of males marketed their products through commercial means, and a higher proportion of the females were widowed or single (never married). Also, a higher proportion of females were not aware of USDA loan programs compared to their male counterparts.

Based on the findings of this study, the traditional role of the cooperative was in the areas of purchasing inputs and marketing produce, but more emphasis should be placed on agricultural training. Agricultural training of AAFs will make the transition to SAPs easier. The training should include the benefits of SAPs and participation in USDA loan programs. Practical illustration on how AAFs should implement the SAPs should be done during the training, and also helping AAFs to fill out forms for federal loan programs. Asare-Baah (2013) also reported that awareness of the AAF was very low on some of the programs because of the complex application process. It was suggested that taking the farmer through the application process could increase farm participation.

There is also a need to formulate appropriate policies that stress the need for more SAPs. Agricultural programs could raise awareness on the environmental and health effects of traditional agricultural practices. One way to get older farmers (not ready to change to SAPs) to adopt SAPs would be to take advantage of the fact that many of them are already members of a cooperative. Agricultural extension workers could work hand in hand with these cooperatives, integrating modern methods of agricultural production into training sessions. This would help the older famers become more aware of the risks associated with traditional methods and benefits of adopting SAPs, thereby leading to more farmers adopting SAPs. Education and benefits of adopting of SAPs (to the farmers and to the environment) should be directed to entire households, since everyone should be aware, for example, of the effects of overuse of pesticides on their health. Also, particular attention should be given to women minority farmers. Comprehensive educational programs should be aimed at this clientele to help them to transition to SAPs.

APPENDICES

APPENDIX A

SARE GRANT QUESTIONAIRE

Section 1: Demographics

1. What is your age?
   1 35 to 44
   2 45 to 54
   3 55 o 64
   4 64 to 74
   5 75 and above

2. Gender?
   1 Female
   2 Male

3. Marital status?
   1 Single
   2 Married
   3 Separated
   4 Divorce
   5 Widow

4. Number of children on the farm?
   1 Zero
   2 One
   3 Two
   4 Three
   5 Four
   6 Five
   7 Six
   8 Seven
   9 Eight
   10 Nine
   11 Ten

5. Number of children off the farm?
   1 Zero
   2 One
   3 Two
   4 Three
   5 Four
   6 Five
   7 Six
   8 Seven
   9 Eight
   10 Nine
   11 Ten

6. Off-farm work

1	not answer	3	part-time
2	fulltime		

7. In what state or states do you farm

1	Alabama	3	South Carolina
2	Georgia	4	Mississippi

8. Are you a member of a cooperative?

	Yes	2	No

9. If you are a member of a cooperative is it for

1	Purchasing	3	Both purchasing and marketing
2	Marketing		

SECTION 2: Farming status

10. Do you consider yourself to be a

1	Full-time farmer	4	Retired
2	Part-time farmer	5	Other
3	Hobby farmer		

11. What type of ownership?

1	Sole owner	3	Corporation (define)
2	Partnership	4	Other

12. How many acres do you own?

1	1-9	4	180-499
2	10-49	5	500+
3	50-179	6	NA

13. How many acres do you rented?

1	1-9	4	180-499
2	10-49	5	500 +

3	50-179	6	NA

14. Do you farm on an heir property?

1	Yes	3	No

15. If answer to 14 is yes, how many acres?

1	1-9	4	180-499
2	10-79	5	500 +
3	80-179		

16. Do you have a will or is there another estate plan for your farm

1	Yes	3	NA
2	No		

17. How long have you been farming?

1	1- 3 years	4	10 – 15
2	4 – 6 years	5	15 +
3	6 – 10 years		

18. Which of the following apply to your farming practice?

1	Row crop (commodities)	3	Livestock / Poultry
2	Truck crop (fruits and vegetables)	4	Not applicable

19. Which of the insect and weed management practices do you use? (Check all that apply)

1	Plant trap crops for insect pest	4	Selecting crops that smother or shade out weeds
2	Physical removal of weeds and insects	5	Creating habitat for beneficial insects
3	Application of chemicals	6	Not Applicable

20. How do you market and sell your products

1	Commercial (grocery stores, institutions, brokers, restaurant)	3	Not applicable

2	Direct (farmers market, WIC, CS community-supported agriculture

21. Do you use the management- intensive, rotational grazing system keeping animal moving?

1	Yes	3	NA
2	No		

22. Which of the conservation tillage methods do you use? (Choose all that apply)

1	No-till - Never use a plow, disk, etc. ever again. Aims for 100% ground cover.	4	Rotational Tillage (define)
2	Strip-Till	5	Ridge-Till
3	Mulch-till	6	Not Applicable

23. Do you plant cover crops after harvesting a cash crop?

1	Yes	3	NA
2	No		

24. What type of cover crops do you plant?

1	Rye	4	Others
2	Clover	5	Not applicable
3	Vetch		

25. If your answer to 20 is yes, how many acre of cover crop do you plant annually?

1	1-9	4	180-499
2	10-79	5	500 +
3	80-179		

26. How do you grow your crops? (Choose all that apply)

1	Farming with chemicals	3	Somewhere in between (low application of chemicals)
2	Organic (no chemicals)	4	Vegan (no chemicals no animal products used)

27. Do you use any of the following agro-forest techniques?

1	Mix forest and livestock	3	Not Applicable
2	Mix forest and crop production		

28. Which of the following nutrient management process do you use? (Choose all that apply)

1	Soil testing	4	Erosion control practices
2	Plant tissue testing	5	Timing of fertilizer/manure application
3	Manure testing	6	Not Applicable

29. Which of the following energy devices do you use on your farm (Check all that apply)

1	Traditional (diesel/gas)	4	Bio-fuel (i.e. ethanol)
2	Windmills	5	Other
3	Solar power		

30. What factors prevents you from adopting any of the above sustainable practices

1	Lack of information about a particular sustainable practice.	6	Can't afford the interruption to my current method of farming.
2	Funds necessary to implement a particular sustainable practice.	7	Not convinced that a particular sustainable practice will work on my farm or ranch.
3	Equipment necessary to implement a particular sustainable practice.	8	Not Applicable
4	Necessary farm help to implement a particular	9	Other
5	Don't find it necessary to change my current method of farming or ranching.		

31. On scale of 1 to 10, how do you rate your interest in the following topics?

1	Diversity of mkting	5	Cover Crops
2	Insect &WeedMgt	6	Crop, Livestock
3	Management-intensive	7	Nutrient Mgt
4	ConserTillage	8	On-Farm Energy Conserv

32. Do you use now, or have you ever used the USDA farm service agency's loan?

1	Yes	3	Not aware of program
2	No		

33. Do you now or have you ever use the USDA farm services agency's rural youth loan?

1	Yes	3	Not aware of program
2	No		

34. Do you now or have you ever use the USDA rural development's VAPG loan?

1	Yes	3	Not aware of program
2	No		

35. Do you now or have you ever used the USDA rural development's loan?

1	Yes	3	Not aware of program
2	No		

36. Do you now or have you ever use the USDA's EQUIP loan?

1	Yes	3	Not aware of program
2	No		

37. How do you rate federal agriculture program

1	Excellent	4	Poor
2	Good	5	No opinion
3	Fair		

38. What were your gross sales for last full year available?

1	(Not Answered)	5	$5,000 to $9,999
2	Less than $1,000	6	$10,000 to $24,999
3	$1,000 to $2,499	7	$25,000 to $49,999
4	$2,500 to $4,999	8	$100,000 to $249,999

APPENDIX B

Chi-square test result

1. The results of a contingency table X^2 statistical test performed for marital status

data: contingency table

	A	B	
1	5	5	10
2	13	76	89
3	2	1	3
4	2	10	12
5	8	6	14
	30	98	128

expected: contingency table

	A	B
1	2.34	7.66
2	20.9	68.1
3	0.703	2.30
4	2.81	9.19
5	3.28	10.7

Chi-square=20.1.

Degrees of freedom=4

probability = 0.000

2. The results of a contingency table X^2 statistical test performed on farmer considerations

data: contingency table

	A	B	
1	7	39	46
2	13	52	65
3	4	2	6
4	1	4	5
5	5	1	6
	30	98	128

expected: contingency table

	A	B
1	10.8	35.2

2 15.2 49.8
3 1.41 4.59
4 1.17 3.83
5 1.41 4.59
chi-square = 20.4
degrees of freedom = 4
probability = 0.000

3. The results of a contingency table X^2 statistical test performed for ownership status
data: contingency table

	A	B	
1	16	77	93
2	11	13	24
3	3	8	11
	30	98	128

expected: contingency table

	A	B
1	21.8	71.2
2	5.63	18.4
3	2.58	8.42

chi-square = 8.81
degrees of freedom = 2
probability = 0.012

4. The results of a contingency table X^2 statistical test performed for acreage owned
data: contingency table

	A	B	
1	5	3	8
2	9	31	40
3	10	38	48
4	3	19	22
5	3	17	20
	30	108	138

expected: contingency table

	A	B
1	1.74	6.26

2 8.70 31.3
3 10.4 37.6
4 4.78 17.2
5 4.35 15.7
chi-square = 9.23
degrees of freedom = 4
probability = 0.056

5.The results of a contingency table X^2 statistical test performed for acreage rented
data: contingency table

	A	B	
1	0	4	4
2	7	8	15
3	1	5	6
4	2	1	3
5	1	2	3
6	17	77	94
	28	97	125

expected: contingency table

	A	B
1	0.896	3.10
2	3.36	11.6
3	1.34	4.66
4	0.672	2.33
5	0.672	2.33
6	21.1	72.9

chi-square = 10.9
degrees of freedom = 5
probability = 0.052

6. The results of a contingency table X^2 statistical test performed for farming Experience
data: contingency table

	A	B	
1	3	1	4
2	4	7	11
3	3	3	6
4	4	15	19

5	16	72	88
	30	98	128

expected: contingency table

	A	B
1	0.938	3.06
2	2.58	8.42
3	1.41	4.59
4	4.45	14.5
5	20.6	67.4

chi-square = 10.7
degrees of freedom = 4
probability = 0.030

7. The results of a contingency table X^2 statistical test performed farming practices applied
data: contingency table

	A	B	
1	15	59	74
2	12	54	66
3	13	28	41
4	3	0	3
	43	141	184

expected: contingency table

	A	B
1	17.3	56.7
2	15.4	50.6
3	9.58	31.4
4	0.701	2.30

chi-square = 12.8
degrees of freedom = 3
probability = 0.005

8. The results of a contingency table X^2 statistical test performed for marketing strategies
data: contingency table

	A	B	
1	3	19	22
2	21	80	101

3	8	6	14
	32	105	137

expected: contingency table

	A	B
1	5.14	16.9
2	23.6	77.4
3	3.27	10.7

chi-square = 10.5
degrees of freedom = 2
probability = 0.005

9. The results of a contingency table X^2 statistical test performed management practices used
data: contingency table

	A	B	
1	0	4	4
2	10	51	61
3	17	71	88
4	1	10	11
5	1	7	8
6	7	4	11
	36	147	183

expected: contingency table

	A	B
1	0.787	3.21
2	12.0	49.0
3	17.3	70.7
4	2.16	8.84
5	1.57	6.43
6	2.16	8.84

chi-square = 15.9
degrees of freedom = 5
probability = 0.007

10. The results of a contingency table X^2 statistical test performed for conservational methods you use
data: contingency table

	A	B	
1	2	8	10
2	6	15	21
3	4	21	25
4	14	56	70
5	0	18	18
6	7	12	19
	33	130	163

expected: contingency table

	A	B
1	2.02	7.98
2	4.25	16.7
3	5.06	19.9
4	14.2	55.8
5	3.64	14.4
6	3.85	15.2

chi-square = 8.99
degrees of freedom = 5
probability = 0.109

11. The results of a contingency table X^2 statistical test performed acres of cover crops planted

data: contingency table

	A	B	
1	6	7	13
2	4	22	26
3	4	9	13
4	0	7	7
5	0	2	2
	14	47	61

expected: contingency table

	A	B
1	2.98	10.0
2	5.97	20.0
3	2.98	10.0

4 1.61 5.39
5 0.459 1.54
chi-square = 7.93
degrees of freedom = 4
probability = 0.094

12. The results of a contingency table X^2 statistical test performed for prevention from adoption
data: contingency table

	A	B	
1	9	30	39
2	8	37	45
3	3	21	24
4	2	17	19
5	3	29	32
6	3	15	18
7	2	6	8
8	8	9	17
9	0	3	3
	38	167	205

expected: contingency table

	A	B
1	7.23	31.8
2	8.34	36.7
3	4.45	19.6
4	3.52	15.5
5	5.93	26.1
6	3.34	14.7
7	1.48	6.52
8	3.15	13.8
9	0.556	2.44

chi-square = 13.8
degrees of freedom = 8
probability = 0.087

13. The results of a contingency table X^2 statistical test performed for USDA loans or loan guarantees

data: contingency table

	A	B	
1	7	29	36
2	17	67	84
3	4	2	6
	28	98	126

expected: contingency table

	A	B
1	8.00	28.0
2	18.7	65.3
3	1.33	4.67

chi-square = 7.21

degrees of freedom = 2

probability = 0.027

LITERATURE CITED

Alonge, A. J. & Martin, R. A. (1995). Assessment of the adoption of sustainable agriculture practices: Implications for agricultural education. *Journal of Agricultural Education*, 36(3), 34-42.

Asare-Baah, L. (2013). Participation in selected USDA programs by socially disadvantaged farmers in selected Black Counties of Georgia.MS Thesis, Department of Agriculture and Environmental Sciences, Tuskegee University, Tuskegee, AL.

Auburn, J.S., & Davis, U.C. (1994). Farming in Transition Overview: Society Pressures Farmers to Adopt more Sustainable Systems. *California Agriculture*, 48(5), 7-10.

Baide, J.M.R. (2005). Barriers to the Adoption of Sustainable Agricultural Practices in the South: Change Agents Perspective. MS Thesis, Department of Rural Sociology, Auburn University, Auburn, AL.

Brundtland Commission Report (1987). Report of the World Commission on Environment and Development: Our Common Future. Retrieved April 19, 2014 from http://conspect.nl/pdf/Our_Common_Future-Brundtland_Report_1987.pdf.

Comer, S., Ekanem, E., Muhammad, S., Singh, S., & Tegegne, F. (1999). Sustainable and Conventional Farmers: A Comparison of Socio-Economic Characteristics, Attitude, and Belief. *Journal of Sustainable Agriculture*, 15(1), 29-45.

Diver, S. (1996). Towards a Sustainable Agriculture. *New Renaissance*, 6(2), 19-21.http://www.ru.org/artagri.html.

Drost, D., Long, G., Wilson, D., Miller, B., & Campbell, W. (1996). Barriers to Adopting Sustainable Agricultural Practices. Journal of Extension, 34(6). http://www.joe.org/joe1996december/al.php.

Effland, A. B. W., Hoppe, R.A. & Cook, P. R (1998). Minority & Women Farmers in the U.S. *Agricultural Outlook*/May 1998.

Escalante, C.L., Epperson J. E., & Raghunathan U. (2009). Gender Bias Claims in Farm Service Agency's Lending Decisions. *Journal of Agricultural and Resource Economics*, 34(2), 332-349.

Freedman, D.A. (n. d.). Sampling, Department of Statistics, University of California Berkeley. Retrieved April 29, 2014 from http://www.stat.berkeley.edu/~census/sample.pdf.

Gafsi, M., Nguyen, G., Legagneux, B., & Robin, P. (2006). Towards Sustainable Farming Systems: Effectiveness and Deficiency of the French Procedure of Sustainable Agriculture. *Agricultural Systems*, 90, 226–242.

Hoag, D. L. K., Keske, C., & Goldbach, R. (2011). Risk Individuality in Crisis Planning: the Case of Gender in American Agriculture. *Journal of Risk Analysis and Crisis Response*, 1(1), 21-28.

Hoppe, R. A. (2001a). Structural and Financial Characteristics of U.S. Farms: Attributes of Small and Large Farms. *Family Farm Report*, 768, 6-20.

Hoppe, R. A. (2001b). Structural and Financial Characteristics of U.S. Farms: Farm Household Income and Wealth. *Family Farm Report*, 768, 59-66.

Ikerd, J. (1994). Assessing the Health of Agroecosystems from a Socioeconomic Perspective. Presented at 1st International Symposium on Ecosystem Health and Medicine, Ottawa, Ontario, Canada, June 19-23, 1994.

Ikerd, J. E., Osburn, D. & Owsley, J.C. (1997). Some Missouri Farmers' Perspectives of Sustainable Agriculture. Department of Agriculture, Food and Natural Resources, University of Missouri, Columbia, MO. Unpublished manuscript. Retrieved April 15, 2013 (http://www.ssu.agri.missouri.edu/faculty/jikerd/papers/tsu-surv.htm).

Kirkman, T.W. (1996). Statistics to Use. Retrieved April 19, 2014 from http://www.physics.csbsju.edu/stats/.

Lockeretz, W. (1988). Open Questions in Sustainable Agriculture. American *Journal of Alternative Agriculture*, 3, 174-181.

Mclean-Meyinsse, P., & Brown, A. (1994). Survival Strategies of Successful Black Farmers. *The Review of Black Political Economy*, 22 (4): 73-83.

Nova Scotia Environmental Farm Plan. (2013). Fact Sheets. Retrieved February 20, 2013 from (http://perennia.ca/Fact%20Sheets/Other/Soils/Soil_conservation.pdf)/.

Pannell, J. (1999). Uncertainty and Adoption of Sustainable Farming Systems. Australian Agricultural and Resource Economics Society Conference, (43th).

Poincelot, R.P. (1990). From the Editor. *Journal of Sustainable Agriculture*, 1, 1-3.

Pompelli, G., Morfaw, C., & English, B. (1995). Tennessee Farm Operators' Attitudes about Extension Service Soil Conservation Information. *Journal of Extension*, 33(6).

Roberts, R.S., & Lighthall, D. (1993). A Developmental Approach to the Adoption of Low-Input Farming Practices. *Leopold Center for Sustainable Agriculture*, 2, 93-96.

Roling, N. (1988). Extension Science: Information Systems in Agricultural Development. Cambridge University Press, Cambridge, UK.

SARE [Sustainable Agriculture Research and Education]. (2005). What is Sustainable Agriculture. USDA: National Program Material. Available: http://www.sare.org/Learning-Center/SARE-Program-Materials/National-Program-Materials/What-is-Sustainable-Agriculture.

Sassenrath, G. F., Halloran, J. M., Archer, D., Raper, R. L., Hendrickson, J., Vadas, P., et al. (2010). Drivers Impacting the Adoption of Sustainable Agricultural Management Practices and Production Systems of the Northeast and Southeast United States. *Journal of Sustainable Agriculture*, 34, 680–702.

Sommer, J. E. (2001). Structural and Financial Characteristics of U.S. Farms: Female Farm Operators and Their Farms. *Family Farm Report*, 768, 38-50.

Srinath, K., Sridhar, M., Kartha, P.N.R., & Mohanan, A.N. (2000). Group Farming for Sustainable Aquaculture. *Ocean & Coastal Management*, 43, 557-571.

Statpak. (1997). Significance Test for Counts. Retrieved March 23, 2014 from .http://www.statpac.com/statistics.

Sustainable Agriculture Research and Education. (2002). Exploring Sustainability in Agriculture. Retrieved April 15, 2013 from Sustainable Agriculture Research and Education Program website (http://www.sare.org/publications/explore/index.htm).

Tackie, N., Jackai L. E., Ankumah R., Dingha B. N., Salifu, A., & Ojumu O. (2009). Integrated Pest Management and Protection Practices by Limited Resource Farmers. *Journal of Extension*, [On-line] 47(1). http://www.joe.org/joe/(none)/rb6.shtml/.

Taylor, D.C. & Dobbs, T.L. (1990) Sustainable Agriculture: Focus on producers. South Dakota Farm and Home Research, 40(1), 15-18.

United Nation Global Impact. (2012). Scaling up: Global Food Security and Sustainable Agriculture. Retrieved January 23, 2013 from http://www.unglobalcompact.org/docs/issues_doc/agriculture_and_food/Scaling_Up_Food_Ag.pdf /.

EPA (United State Environment Protection Agency) (2013).Nutrient Management. Ag101 . Retrieved February 20, 2013 from http://www.epa.gov/agriculture/ag101/cropnutrientmgt.html [].

United States Department of Agriculture (USDA) (1915).How the U.S. Department of Agriculture can Better Meet the Needs of Farm Housewives. USDA Report No. 103: Social and Labor Needs of Farm Women. Extracts from Letters Received from Farm

Women in Response to an inquiry or (Washington: Government Printing Office,), 5(10), 42–55.

USDA (United States Department of Agriculture). (2007). Census of Agriculture: U.S. Summary and State Reports.http://www.agcensus.usda.gov/index.php/[Retrieved February 21, 2013].

USDA (United States Department of Agriculture). (2011). Sustainable Agriculture: Definitions and Terms. *NALpublication.* Retrieved February 21, 2013 from http://www.nal.usda.gov/afsic/pubs/terms/srb9902.shtml#toc2/ .

USDA NASS. (2005). NASS FY 2003 and Revised FY 2002 Annual Performance Plans. Retrieved April 10, 2013 from United States Department of Agriculture, National Agricultural Statistics Service website (www.usda.gov/nass).

USDA NASS. (2009). 2007 Census of Agriculture: National Data. Retrieved. From www.agcensus.usda.gov/.../2007/Full...1...

USDA NASS. (2009). 2007 Census of Agriculture: Georgia, Mississippi, Alabama, South Carolina State and County Data. Retrieved from www.agcensus.usda.gov/.../2007/Full...1...State.../.

Zabawa, R., Siaway, A. & Baharanyi, N. (1990). The Decline of Black Farmers and Strategies for Survival. *Southern Rural Sociology*, 7, 106-121.

Zeuli, K.A., & King, R.P. (1998). Gender Differences in Farm Management. *Review of Agricultural Economics*, 20(2), 513-529.

Zhen, L., Routray, J. K., Zoebisch M. A., Chen, G., Xie G., & Cheng, S. (2005). Three Dimensions of Sustainability of Farming Practices in the North China Plain: A Case-Study from Ningjin county of Shandong province, PR China. *Agriculture, Ecosystems and Environment*, 105, 507–522.