2006

Factors influencing the participation in environmental stewardship programs: a case study of the agricultural and forestry sectors in Louisiana

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FACTORS INFLUENCING PARTICIPATION IN ENVIRONMENTAL STEWARDSHIP PROGRAMS: A CASE STUDY OF THE AGRICULTURAL AND FORESTRY SECTORS IN LOUISIANA

A Dissertation
Submitted to the Graduate Faculty of the
Louisiana State University and
Agricultural and Mechanical College
in partial fulfillment of the
requirements for the degree of
Doctor of Philosophy

in

The School of Renewable Natural Resources

by
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December 2006

ACKNOWLEDGEMENTS

First and foremost, I would like to thank my major professor Dr. Richard Vlosky for all the opportunities he has brought into my life. I am ever indebted for the continuous guidance, support, and encouragement he has offered throughout my graduate work and profession at Louisiana State University. My deepest gratitude also goes to Dr. Paul Coreil for his invaluable insight and willingness to help me in every step of my dissertation research. I want to thank the members of my graduate committee Dr. Cornelius de Hoop, Dr. Todd Shupe, Dr. Steve Henning, and Dr. Allan Pulsipher.

I would also like to extend special thanks to the LSU AgCenter and the Louisiana Cooperative Extension Service for their financial support during my doctoral studies. I want to thank the Louisiana Department of Environmental Quality for their sponsorship in the dissertation research project.

I honor and appreciate my parents for their never-ending love and support in me chasing my goals and dreams, even though I may have been difficult to tolerate. My sincere love and appreciation to my children Megan and Joshua for allowing their mother to spend countless hours on her career. My sincere gratitude to Ms. Kathryn Toups, who eagerly took on the job of helping to put the research together and kept me sane during this process. Also,a very special thanks to Mr. David Crowley, Jr. who took the time during late hours to review and refine the research and provide encouragement whenever needed.

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ABSTRACT

Considerable research has been conducted to evaluate the adoption of best management practices (BMPs) and their overall impact on improving environmental quality. However, limited studies have been conducted to evaluate the behavioral factors that influence the adoption of these practices in the context of educational programs. The goal of this study is to determine the factors that influence conservation behavior that might lead to an increased probability of improving agriculture and forestry watersheds.

A conceptual model was developed to: 1) identify characteristics that lead to participation in farm and forestry environmental stewardship programs (ESPs), and 2) determine the factors influencing farmers and loggers to participate in ESPs. Areas included in the research are 1) attitudes and perception of ESPs, 2) knowledge and adoption of environmental BMPs, and 3) knowledge and compliance of environmental policies affecting agriculture and forestry. The model has four independent variable constructs: 1) social-psychological, 2) structural, 3) ecological, and 4) institutional. The dependent variable is a bivariate construct of participation in ESPs. The sample frames were drawn from a census of farmers and loggers in Louisiana.

Results indicate that both farmer and logger ESP participants tend to be young and educated. Overall, both groups have mixed attitudes toward government involvement in agriculture and forestry.

Farmers, with strong local organizational relationships, have a greater tendency to participate in ESPs. Farmers with higher incomes, higher total acres farmed, and designated as corporations have a greater tendency to participate. The study also found that farmers who spend more time in a job off-farm and have a family owned operation have a lower tendency to

participate in ESPs. With regard to the theoretical model, only the Social-Psycho local and Institutional constructs were found to be significant predictors of ESP participation.

In the case of logger ESP participation, a unique situation exists in Louisiana in that being a Master Logger is a requirement in most instances to harvest timber. Accordingly, the Institutional construct is the driver for logger ESP participation. In addition, participants tend to be larger operations. Loggers with negative relationships toward regulatory agencies and lending institutions have a lower tendency to participate in ESPs.

CHAPTER 1. INTRODUCTION

1.1 Motivation

In the latter half of the twentieth century, global population increases, technological advances, and increased economic output combined to create challenges to continued natural resource development. Advents in technology and scientific knowledge have created new approaches to manage agricultural and forest resources. In addition, in order to address increasing demand for natural resources in the United States, agricultural and forestry producers are required to meet increasingly stringent state and federal environmental standards.

Federal policies such as the 2002 Farm Bill made a special effort to provide the linkage between the economic, environmental and social components of agriculture (Ray et al. 2003). Other environmental policies have been developed to link agricultural profitability and environmental stewardship.

Nonpoint source pollution assessments by local and federal water quality regulatory agencies implicate agricultural and silvicultural activities as significant contributors to water quality impairment. These impairments are being addressed through pollution budgeting using Total Maximum Daily Load (TMDL) models. The models for a particular pollutant or factor incorporate loads from permitted point sources within the watershed, a calculated load from nonpoint sources, and a margin of error. Management changes necessary to meet the calculated budget within the watershed are addressed through the point source permitting process, and/or nonpoint source reduction strategies. Nonpoint reduction policies include (Hite et al. 2002):

1. voluntary education and technical assistance programs
2. subsidy programs to promote conservation practice adoption
3. regulation
4. compliance mechanisms

Despite the existence of these programs, often farmers, ranchers, and foresters still have little experience or are apprehensive about working within a regulated environmental framework. It has been shown that the negative threat of regulation plays an important role in farmers adopting environmentally friendly production practices (Napier et al., 2000; Ribaudo, 1998). A factor slowing farmer adoption of these practices is that while farmers may agree that water quality problems attributable to agriculture exist, they do not necessarily accept that their own farms are part of the issue (Christensen and Norris 1983; Lichtenberg and Lessley 1992; Pease and Bosch 1994; Napier and Brown 1993). However, farmer perception studies have shown that farmers often recognize that larger scale environmental issues are important for farmers to consider (Musser et al. 1994; Richert et al. 1995).

Thus, challenges for successful environmental stewardship education programs targeting potential nonpoint source polluting sectors such as agriculture and forestry typically attempt to demonstrate business value in pollution mitigation (Napier et al. 2000; Poe et al. 2001; Ribaudo 1998; Ribaudo and Horan 1999) and to foster coordination among agencies providing educational, technical, and financial assistance (Ribaudo 1998; Forster and Rausch 2002). Ray et al. (2003) suggest that programs must be locally oriented due to differing soils, geology, and other watershed characteristics, as well as other factors such as predominant commodity and production infrastructure.

Environmental stewardship programs (ESPs) such as the Louisiana Master Farmer Program and Louisiana Master Logger Program have been developed to link agriculture and forestry profitability and environmental sustainability. The Louisiana Master Farmer Program is an effort to address water quality challenges through the implementation of best management

practices. The Louisiana Master Logger Program addresses water quality but also addresses other factors not examined in this research.

1.2 Research Statement

Considerable research has been conducted to evaluate the adoption of agricultural and forestry best management practices (BMPs) and their overall impact on improving environmental quality. However, limited research has been conducted to evaluate the behavioral factors that influence the adoption of these practices in the context of educational programs (Nowak 1982). The goal of this study is to identify the factors influencing participation in environmental stewardship programs (ESPs) that are intended to improve Louisiana agriculture and forestry watersheds. This goal leads to the following research objectives: 1) identify characteristics that lead to participation in ESPs, and 2) determine the factors influencing agriculture and forestry landowner participation in water quality-focused ESPs.

CHAPTER 2. LITERATURE REVIEW

2.1 An Overview of Agriculture and Forestry Environmental Challenges

2.1.1 Introduction

The next decade promises to be a time of unprecedented change and uncertainty for agricultural and forestry industries. In the United States, problems such as decreasing availability of resources, shifting demographics, varying levels of productivity, and concern for the environment will confront these industries in the coming years. Over the last 50 years, U.S. forestry and agriculture enjoyed remarkable success due to technological advancements and more efficient methods of production. Lu (1982) suggests that the meeting demand for these commodities face challenges in the areas of declining productivity, shortages of energy, water, and soil resources, and deterioration of the natural environment.

These problems are frequently the result of trends occurring in society as a whole including demographic changes (Morrison, 1976), rising family incomes (Miller et al. 1981), information technologies (Baran 1968), domestic policy, world trade, and transportation (Pickrel 1979).

Most choices for the future have both long-term consequences and immediate impacts. Decision-makers often focus on short-term policy matters. However, decisions made now will both affect the future and can be effected by future events. Factors that are viewed as decisive today may not be the most significant factors to consider for the long-term commitment of educational resources or in shaping educational plans and policies (Weaver 1971).

According to the US Department of Agriculture, an array of environmental issues have grown with changes in the structure of agriculture, farm and forest management practices, and

with greater public concern about a wider range of issues (Ray et al. 2003). These concerns include:

- Soil erosion
- Wetland loss
- Diminishing open space
- Nutrient management
- Pesticide use and runoff
- Greenhouse gas emissions and carbon sequestration
- Water conservation and flood mitigation
- Air quality
- Energy production and conservation
- Non-nutrient animal waste concerns, such as water-borne pathogens and antibiotic-resistant bacteria
- Lack of access to natural forestland

A broad array of policy tools and instruments, ranging from regulation to moral suasion, has been developed to encourage landowners to adopt conservation practices and refrain from production techniques causing conservation and environmental problems (Ray et al. 2003). There are many approaches to address negative effects that agriculture and forestry have on the environment. These approaches can be broadly divided into command-and-control and market-based incentives.

2.1.2 Command and Control

Command-and-Control measures (or direct regulation) are "Institutional measures aimed directly at influencing the environmental performance of polluters by regulating processes and products used, by banning or limiting the discharge of certain pollutants, and/or restricting activities to certain times, areas, etc." (New Zealand Ministry for the Environment 2004).

According to Stavins and Whitehead (1992) “command-and control regulations tend to force all businesses to adopt the same measures and practices for pollution control and thus shoulder identical shares of the pollution control burden regardless of their relative impacts.” Government regulations typically set uniform standards—mostly technology or performance-

based—for all businesses. Within command-and-control, technology-based standards can specify methods and sometimes equipment that businesses must use to comply with a regulation.

The Federal Government has used regulatory policies for a variety of problems from point source, water and air pollution to wetland dredging and fill. For example, the Environmental Protection Agency (EPA) regulates animal waste discharges from large confined livestock operations, and EPA and the U.S. Army Corps of Engineers regulate dredging and fill of wetlands, including wetlands in agricultural and forestry landscapes, under the Clean Water Act. The researcher has summarized these federal programs from the USDA's 2003 Agricultural Resources and Environmental Indicators in Table 1.

Table 1. Federal Water Quality Programs Affecting Agriculture and Forestry

Program Administrator	Regulation	Description
EPA	Clean Water Act	• United States' most important water quality protection law • Originally passed in 1972, the Act's goal is to "restore and maintain the chemical, physical, and biological integrity of the Nation's waters." • The Act contains a number of provisions that affect agriculture.
EPA	Clean Lakes Program	• Reauthorized by Section 314 of the Clean Water Act • Authorizes EPA grants to States for lake classification surveys, diagnostic/ feasibility studies, and for projects to restore and protect lakes.
EPA	Nonpoint Source Program	• Established by Section 319 of the Clean Water Act, requires States and U.S. territories to identify navigable waters that cannot attain water quality standards without reducing nonpoint source pollution and develop management plans to reduce nonpoint source pollution
EPA	National Estuary Program	• Established by Section 320 of the Clean Water Act • Provides for the identification of nationally significant estuaries that are threatened by pollution; for preparation of conservation and management plans • Provides for Federal grants to State, interstate, and regional water pollution control agencies to implement the plans.
EPA	National Pollutant Discharge Elimination System Permit Program	• Established by Section 402 of the Clean Water Act • Controls point-source discharges from treatment plants and industrial facilities (including large animal and poultry confinement operations).

(table continued)

	(NPDES)	
EPA	Coastal Nonpoint Pollution Programs	• In 1990, amendments to the Coastal Zone Management Act, administered by the National Oceanic and Atmospheric Administration and EPA • Required that States with coastal zone management programs develop and implement programs to control nonpoint sources of pollution.
EPA	Safe Drinking Water Act (SDWA)	• Requires the EPA to set standards for drinking water quality and requirements for water treatment by public water systems. • Requires States to establish a wellhead protection program to protect public water system wells from contamination by chemicals, including pesticides, nutrients, and other agricultural chemicals.
EPA	Pesticide Programs	• Established by the Federal Insecticide, Fungicide, and Rodenticide Act (FIFRA), provides the legal basis under which pesticides are regulated
EPA	Comprehensive State Ground-Water Protection Program (CSGWPP)	• Initiated by EPA in 1991, coordinates operation of all Federal, State, tribal, and local programs that address groundwater quality. • States have the primary role in designing and implementing CSGWPP's in accordance with distinctive local needs and conditions
EPA	Total Maximum Daily Loads	• Initiated under the Clean Water Act of 1972 requires that individual states are responsible for cleaning up polluted waterways and are required to meet state water quality standards. • Each state can take action to eventually decrease hypoxic zones in the nation, such as compliance with the Clean Water Act's Total Maximum Daily Load program. • Major focus on agricultural runoff
US Army Corps of Engineers	Flood control Activities	• Include the construction, rehabilitation, and operation of dams, levees, and other facilities for flood control.
US Army Corps Of Engineers	Dredge and Fill Permit Program	• Established by Section 404 of the Clean Water Act • Regulates dredging, filling, and other alterations of waters and wetlands jointly with EPA, including wetlands owned by farmers. • USDA has authority to make wetland determinations on agricultural land.
US Department of the Interior	The Endangered Species Act	• United States' chief statute to conserve endangered or threatened species and their ecosystems. • When a species is designated as threatened with extinction, a recovery plan is developed to protect it from further population declines. • The plan could include restrictions on cropping practices, water use, and pesticide use.

Source: Agricultural Resources and Environmental Indicators 2003

2.1.3. Major Command-and-Control Policies

Currently, there are three natural resource policy initiatives with potential to affect agriculture and forestry profitability. These initiatives are the Clean Water Action Plan, the Unified National Animal Feeding Operations Strategy, and the implementation of the Total Maximum Daily Load (TMDL) provisions of the Clean Water Act. Agriculture and forestry have been relatively minor components of national water quality policies and programs, especially regulatory policies, but they play a major role in several aspects of these three initiatives.

The first policy, the Clean Water Action Plan, is an administrative initiative that is intended to address national water quality challenges. Several of the key actions of the Clean Water Action Plan focus on agriculture, forestry, and federal lands to more effectively control nonpoint source pollution, which are "indirect or scattered sources of pollution that enter a water system from no direct source such as drainage or runoff from agricultural fields, airborne pollution from cropdusting, and runoff from urban areas." One of the specific outcomes of the plan is to set possible deadlines for key actions.

The second policy, also listed in the Clean Water Action Plan, is the development of a national strategy to address waste management in agriculture. One of these segments identifies agricultural animal feeding operations (AFOs). The AFO strategy addresses the operators of these feeding operations who are expected to develop and implement comprehensive nutrient management plans (CNMPs) specific to their operation.

Finally, the policy that has been the biggest concern for agriculture and forestry is the Clean Water Act's Total Maximum Daily Load (TMDL) provision. According to the EPA, a "TMDL or Total Maximum Daily Load is a calculation of the maximum amount of a pollutant that a waterbody can receive and still meet water quality standards, and an allocation of that

amount to the pollutant's sources." (EPA, 2000) States, territories and authorized Tribes have identified over 20,000 polluted waterbodies across America. The EPA states in the paper, "Final TMDL Rule: Fulfilling the Goals of the Clean Water Act" that the goal of the TMDL final rule is to "make thousands more rivers, lakes, and coastal water safe for swimming, fishing, and healthy populations of fish and shellfish," (EPA 2000). The TMDL final rule took effect on October 1, 2001. The article also states that the TMDL final rule will:

- Strengthen states' ability to clean up polluted waters by identifying pollution reductions needed to meet clean water goals;
- Provide for a comprehensive listing of all the Nation's polluted waters;
- Encourage cost-effective clean-up by ensuring all sources of pollution are considered in the development of cleanup plans;
- Assure that TMDLs include implementation plans that define specific actions and schedules for meeting clean water goals (EPA, 2000)

The TMDL program requires states to identify the agriculture and forestry sources that are responsible for water quality impairments. Most agriculture and forestry pollutant sources are classified as nonpoint source pollutants. Nonpoint source pollutants are not subject to the Clean Water Act controls. Required actions of the TMDL program include the implementation of management practices, such as best management practices, to meet state water quality standards. There are three key elements in a TMDL program. These elements contain several components. The TMDL program must contain:

1. The waterbody name and location and identity of the pollutant and water quality standard for the waterbody
2. The amount of a pollutant allowable to meet the required waterbody standards, the load reduction needed to meet the water quality standards, the sources of the pollutant, load allocation for runoff and other sources of pollution; and an implementation plan
3. A margin of safety, consideration of seasonal variation, and allowance for reasonably and foreseeable increases in pollutant loading. (EPA 2000)

TMDL requirements will have a tremendous impact on agriculture and forestry. The TMDL program requires states to identify the agriculture and forestry sources that are responsible for water quality impairments. Most agriculture and forestry pollutant sources are classified as nonpoint source pollutants. In the past, nonpoint source pollutants are not subject to the Clean Water Act controls, however, the new TMDL final rule is requiring states to address both point and nonpoint source pollutants. Required actions of the TMDL program include the implementation of management practices, such as best management practices, to meet state water quality standards (Borel 2001).

The EPA has taken into consideration that the TMDL's will significantly affect agriculture and forestry. Therefore, EPA has implemented a "reasonable assurance" provision into the final rule. According to this provision, reasonable assurance is a "demonstration that TMDLs will be implemented through regulatory or voluntary actions, including management measures or other controls, by Federal, State or local governments, authorized Tribes, or individuals," (EPA 2000).

Water regulatory agencies in Louisiana and Mississippi are developing TMDLs in accordance with consent decrees that followed lawsuits initiated by the environmental community. Both states are using a rotating basin approach to focus their efforts and better utilize resources. State-wide and regional agriculture, forestry, agency, and industrial interests have maintained a strong interest and presence on oversight teams during this process. However, uncertainty continues to exist in the regulated community about water quality issues, existing regulations, available resources, and agency responsibilities (Oldham and Castille 2003).

There are many disadvantages to the command-and-control policy approach. For example, command-and-control strategies do not consider differences among facilities either in

risks, or costs associated with reducing emissions. These approaches are often are considered to expand regulatory bureaucracies; cause expensive oversight, monitoring, and enforcement; set the bar low with little or no incentive beyond minimal compliance; and prescribe on a wide geographic basis that can lead to inappropriate standards. Another criticism is that the approach focuses in on one pollutant rather than several at one period. Finally, command-and-control approaches have sluggish response to the alterations in pollution sources in regards to the population. Some ecologists feel that command-and control regulation never goes far enough, while some economists feel that the approach is not as efficient as incentives (Stavins and Whithead 1992).

In the case of agriculture and forestry, a regulator (usually a government agency) mandates a reduction in emissions or limits an agricultural production activity. Examples are a mandated reduction in nutrient application, or a reduction in emission of a nutrient to streams (Heimlich 2003).

2.1.4. Market-Based Incentives

Market-based approaches, unlike command-and-control policies, train their sights on the overall pollution in a given area. Under this approach, the government establishes financial incentives so that the costs imposed on business drive an entire industry or region to reduce its aggregate level of pollution to a desired level. This approach achieves the same aggregate level of control as might be set under a command-and control approach, but it permits the burden of pollution control to be shared among businesses. Market-based incentive policies are designed to achieve the same level of pollution control, while allowing some flexibility in maximizing profit. A main advantage of market-based incentives is that economic efficiency will increase as a result of lowering costs of emission reduction. A tax on inputs is one frequently cited incentive

measure (Stavins and Whithead 1992). There are many types of market incentive policies in agriculture (Heimlich 2003). They include:

1. Conservation compliance
2. Rental and easement
3. Cost-sharing or incentive payments and technical assistance programs

There is an on-going debate regarding the voluntary adoption of conservation practices. There are criticisms that voluntary programs really are not voluntary, and that "voluntarism is a romantic concept divorced from the political and social realities of agriculture" (Clearfield and Osgood 1986). Many claim that producers' reliance on federal support programs, the increased power of agribusiness and corporate farms, do not allow for producers to have a choice in participation.

Trading/banking/bonding are innovative, market-based approaches that have been advocated by economists and others because of the increased flexibility they would provide to producers in meeting environmental goals. Implementation at the National level has been limited to wetland mitigation banking, allowed under Section 404 of the Clean Water Act, and some limited pilot programs in nonpoint source water pollution abatement. At the State and local levels, transferable development rights (TDR) for farmland protection and environmental performance bonding have had some application (Heimlich 2003).

There are several approaches that are used to control nonpoint source pollution. They are categorized into voluntary and non-voluntary incentives. Voluntary approaches include cost-sharing and incentive payments and educational and technical assistance programs. Non-voluntary incentives include taxes, regulations, and trading between point and nonpoint sources. USDA has reported that educational programs that encourage farmers to voluntarily adopt less

polluting BMPs have been partially successful. Studies have suggested combining educational programs with financial incentives versus using them separately (Oldham and Castille 2003).

Education, research, and data development are aimed at developing an information base and improving conservation practices and program delivery. Examples of these types of programs are the Louisiana Master Farmer and Master Logger Programs, the focus of this dissertation.

2.2 Agriculture in Louisiana

Louisiana is one of the nation's largest producers of cotton, sugarcane, rice, sweet potatoes, and pecans. The state is also a major world producer of soybeans and corn (LSU AgCenter, 2005). The total amount of farmland in Louisiana today is in the neighborhood of 7.8 million acres with the average farm size having around three hundred acres (LSU AgCenter 2005). However, the largest land-based industry in the state is forestry with a total contribution to the state in 2005 of $4.5 billion, including farm gate value and value-added production (LSU AgCenter 2005). Forestry's economic contribution to Louisiana is larger than all other crops combined. Agriculture faces a host of unique issues and problems.

Weather is always a factor for any agricultural process. Between 1998 and 2005, Louisiana's agricultural industry incurred millions of dollars in weather-related losses due to drought, excessive rains at harvest, tropical storms, hurricanes, and a lack of moisture during planting (LSU AgCenter 2005). Compounding this, over the past seven years, almost all Louisiana field crops have experienced continuing and declines in market prices and increased production costs (LSU AgCenter 2005).

As a result, many farmers require an alternative source income in order to survive. Many farms can be utilized for second incomes. In many instances the farm land is not only suitable

but an ideal place for hunting and other forms of recreation. Some farmers are seizing this opportunity by leasing their land for recreational uses in order to subsidize farm incomes. (Giuliano and Thomas 2005).

2.3 Forestry in Louisiana

Forestry in Louisiana has been evolving since the state was claimed for France. During early years of European settlement Louisiana's forested lands were always very lucrative. Houses and businesses have been built by utilizing the trees from Louisiana throughout the years and up into present day. During war times and the early development of the country large amount of forests were harvested for trading, the materials to build ships, and other supplies. Much of the state depended upon the lumber market for jobs and survival.

Like the rest of the natural resources indigenous to the state the forests have in many instances been abused. Louisiana, once almost completely covered in natural forests, today has 13.8 million acres of forests with roughly half softwoods and half hardwoods (Louisiana Department of Agriculture and Forestry 2000). Due to a rising population and repeated use of forests, the older forests that contain the larger trees have almost completely been diminished. In the 1800`s and early 20th century thousands of acres of forests were cleared for agricultural practices and growing towns and cities (USDA 2000).

In addition to natural forests, plantations or tree farms have become common for pines in Louisiana. The term "tree farming" was first used in the 1940`s to introduce the public to sustainable forestry terminology they could easily understand. The term farming implies continual production and stewardship of goods year after year. (Anonymous 2006) When one associates a term like "farming" with trees it enables the issues of forestry to be more easily

communicated between all parties involved. The term "tree farming" implies that trees will not only be harvested, but replaced with new seedlings after the harvesting process is complete.

2.4 Environmental Stewardship Programs

2.4.1 Introduction

Environmental stewardship is the "belief that farmers have a moral obligation to protect natural resources" (Ervin and Ervin 1982; Nowak 1982c). Stewardship is positively associated with the use of conservation practices. Environmental stewardship programs, many times, involve various stakeholders including citizens, producers, local, state and federal government, commodity organizations, and academic institutions. Programs range from education and outreach, to conservation planning and monitoring and research.

2.4.2 Environmental Stewardship Programs in Louisiana

There are several small-scale environmental stewardship programs in Louisiana. Many of them are at the watershed and sub-watershed level, such as the Vermilion River watershed project, whereby conservation efforts for agricultural producers are targeted in a small watershed. Financial and technical assistance are provided in this program for a three year time period. Statewide programs included the Louisiana Master Farmer and Louisiana Master Logger programs, the focus of this dissertation (Oldham and Castille 2003).

2.4.3 The Master Farmer Program

Research and educational programs on environmental issues, agricultural/timber production, and farm management/marketing have been important parts of the land-grant university mission (Oldham and Castille 2003). Agricultural and forested land provides a wide array of environmental and social benefits to all citizens. With these extensive benefits, public concern over the impact these land uses have on environmental quality continues to grow. Best

Management Practices (BMPs) have been developed to minimize the impact of nonpoint source pollution in water bodies. To address TMDL issues through adoption of BMPs, stakeholders from agriculture, silviculture, industrial and municipal facilities, and both urban and rural communities are working to promote stewardship practices that will successfully reduce pollutant loads.

Additionally, the 2002 Farm Bill offers agricultural producers economic incentives to implement conservation practices for all commodities. In the 2002 Farm Bill, over $17 billion was approved for the conservation title alone (Ray et al. 2003). These efforts are directly addressing the challenges of acknowledging agriculture and forestry's environmental impact, finding business value for entering the educational process, and developing commodity-specific, watershed-oriented programming.

To help Louisiana farmers become better environmental stewards, in 2001 the Louisiana State University Agricultural Center developed an Environmental Stewardship educational module in an agricultural proficiency "Master Farmer" program (Oldham and Castille 2003). Another component of this program is the incentive-based financial assistance portion of the program. For this environmental stewardship module, state agencies and advocacy groups developed a three-phase program:

Phase 1. Eight hour environmental stewardship training
Phase 2. Model Farm field day/Virtual Model Farm workshops
Phase 3. Development and implementation of a farm-specific conservation plan

The classroom instruction in Phase 1 presents material on the Clean Water Act, national and Louisiana water quality standards, TMDLs, impacts of nonpoint source pollution in the coastal zone, BMPs, role of Conservation Districts, the Natural Resources Conservation Service planning process, and current conservation programs.

Phase 2 of the Master Farmer certification process consists of a visit to a commodity specific model farm that demonstrates environmental BMPs 'on-the-ground'. In addition, implementation videos and other materials on BMP utilization are being developed. Phase 3 is the development of farm-specific conservation plans in cooperation with local Natural Resource Conservation Service and/or Soil and Water Conservation District.

When all three phases of the environmental stewardship program are completed, certified participants will be presumed in compliance with Louisiana's soil and water conservation requirements according to legislation passed and signed in early 2003. Administration of the certification will be supervised by the Louisiana Department of Agriculture and Forestry.

In July 2002, a significant piece of legislation unanimously passed the Louisiana legislature, called Act 145. Act 145 certifies that producers successfully completing all phases of the Louisiana Master Farmer Program will be presumed in compliance with the Louisiana soil and water conservation requirements. This legislation allows for reasonable assurance that producers are being educated to make better decisions on research-based best management practices, that these practices are being implemented and that producers will verify the implementation of these practices by developing and implementing a comprehensive conservation plan (Oldham and Castille 2003).

Over two thousand farmers have participated in the educational phase of the program, and are continuing in the subsequent phases. Table 2 lists the agencies and advocacy groups sponsoring the Louisiana Master Farmer Program.

Table 2. Sponsors of the Louisiana Master Farmer Program

Louisiana State University AgCenter
Natural Resources Conservation Service – Louisiana
Louisiana Department of Agriculture and Forestry
National Oceanic and Atmosphere Administration
Louisiana Department of Natural Resources
Louisiana Department of Environmental Quality
Louisiana Soybean Association
Louisiana Cattlemen's Association
Louisiana Rice Growers Association
Louisiana Farm Bureau Federation
Potash and Phosphate Institute
American Sugar Cane League
Louisiana Association of Conservation Districts

Following development of a multi-state Extension programming agreement between Louisiana, Arkansas, and Mississippi, the Mississippi State University Extension Service (MSU-ES) was asked to consider developing a program similar to the Louisiana effort. Internal discussions resulted in a needs assessment in February 2003 focused on water quality issues among approximately 200 agricultural stakeholders participating in advisory council processes. Table 3 shows the average knowledge rating of various water quality and environmental topics, which featured in Louisiana's Phase 1 curriculum. Significant knowledge gaps were identified concerning water quality issues, conservation programs, and environmental regulations. Because of the nature of the groups polled, many respondents were presumably exposed to extensive discussions concerning agriculture and the environment such as Extension programs, Farm Bureau educational efforts, Conservation District educational programs, and NRCS outreach, thus the low to mid-range awareness returns on many of the water related issues were surprising (Oldham and Castille 2003).

Additional questions found that fifty-seven percent of the respondents knew the name of their watershed (although no specific hydrological unit range was requested), ninety-three percent indicated interest in participating in a voluntary environmental educational program, and

receiving credit for good stewardship (Oldham and Castille 2003). With an educational need identified, and participant demand expressed by the respondents, MSU-ES administration decided to proceed based on the Louisiana experience.

Table 3. Level of awareness regarding various agricultural/silvicultural environmental issues among Mississippi State University Extension Service clients.

Curriculum Topic	Mean
Water Quality Standards	3.3
Nonpoint Source Pollution	3.1
Clean Water Act	3.1
Nutrient Management Planning	3.0
Environ. Qual. Incentive Program	2.9
Resource Management System	2.8
Locally Led Conservation	2.8
TMDL's	2.7
Environmental Evaluation (NRCS)	2.6
Basin Management Approach	2.3
303(d) List	2.2
Gulf of Mexico Hypoxia	2.1
Coastal Zone Management Act	1.9
CORE 4 Conservation Practices	1.8

Source: Mississippi Cooperative Extension Service
Scale: "1" indicates no knowledge of the topic, "3" indicates participant had some knowledge of the subject, and "5" indicates significant knowledge.

Given these knowledge gaps and potential participant interest, MSU-ES, with Mississippi-based agencies and advocacy groups, began development of a watershed-based agricultural-environmental stewardship educational program. Early implementation activity has focused on coalition development with the Mississippi equivalents of the Louisiana groups in Table 2.3, and curriculum review and design. Current planning called for pilot programs in four counties in early 2004 (Oldham and Castille 2003).

The quick success of the Louisiana environmental stewardship education and financial assistance components of the Master Farmer program, and the demonstrated willingness of surveyed Mississippi producers to participate in the future, indicate agriculture stakeholders are not as reluctant to participate in such programs as previous studies and some prevailing outreach

philosophies suggest. Contributing to this strong public reception is the building of an inclusive, yet extensive coalition of sponsoring groups that minimizes confusion for the general public and increases the efficiency of resources devoted to the effort. Additional effort will be required for continuing quality control and public accountability (Oldham and Castille 2003).

Ying Zhong (2003) studied the effectiveness in the participation of the Master Farmer Program as it relates to the adoption and production of Best Management Practices (BMPs) in the Louisiana sugarcane industry. The study concluded that for soil erosion and sediment control practice and using vegetative field borders or filter strips around fields and along ditches and streams, having heard of the Master Farmer program had a positive impact in the implementation of adopting sugarcane BMPs. Since the Master Farmer Program was created in 2001 and was relatively new when the study was conducted, the variable of having participated in the Master Farmer training curriculum was only significant in one model. However, knowledge of the existence of the Master Farmer program was significant in four models. The study showed that by Extension personnel stressing the importance of the Master Farmer program has added to its recognition.

Results indicate that those who have heard of the Master Farmer Program for sugarcane were more likely to adopt two, three, or four best management practices within the soil erosion and sediment control measure, which had a positive impact on the producers. Producers who owned large, individual operations were more likely to adopt four best management practices after being informed of the Master Farmer program for sugarcane.

Zhong's survey concluded that seventy-four percent of respondents had heard of the Master Farmer program for sugarcane; of this seventy-four percent, thirty-four percent have participated in the training curriculum. Zhong recommends continued education such as the

Master Farmer program to promote BMP adoption by Louisiana sugarcane producers. It is also recommended that additional educational programs through the LSU AgCenter and the continued reliance on the Louisiana Cooperative Extension Service will promote BMPs to producers across the state.

2.4.4 The Master Logger Program

Logging in the United States plays an extremely vital role in our nation's economy as well as the rest of the world. In the U.S. alone it is estimated that there are 25,000 logging firms. Contained within these firms there are approximately 150,000 harvesting professionals (USDA 2000). Logging is the key stage for an industry that makes up seven percent of the nation's manufacturing economy. Nation wide it is estimated that there are about 483 million acres of commercial forests used for industry. Out of these 483 million acres, in the neighborhood of 5 million acres are harvested annually (USDA 2000).

Awareness of forestry issues has been promoted through various programs that concentrate on sustainable forestry (USDA 2000). Sustainable Forestry practices are based on a stewardship ethic that reviews all of the numerous values of wooded land. The practices also consider many non-timber values such as water quality and indigenous wildlife (Makuch 1997).

One of the most recognized expressions of this ethic is the American Forest & Paper Association's (AF&PA) Sustainable Forestry Initiative (SFI). This initiative aims at enhancing professionalism among foresters, timber harvesters, and others that are close knit in the forestry industry. One of the many ways that SFI accomplishes its goals is to focus on the training of loggers and foresters by showing them how to utilize BMP's while the timber harvesting process is under way. At the same time the SFI pushes for compliance with all laws and regulations; forest regeneration; resource conservation; awareness of endangered species; and logging safety.

All of these things combine to create better business management practices (SFI-Anonymous 2006).

Master Logger programs and others like it have been growing more and more popular in the past five to ten years (SFI-Anonymous 2006). Not only is the popularity of these programs on the rise in the forestry industry, in today's world it is becoming almost a necessity to have some type of conservation program in place for all of the various leading spectrums of agriculture.

The overall purpose of these programs is to provide loggers as well as everyday citizens a better understanding of this great natural resource around us. Programs like Master Logger generate the critical thinking skills that are needed by loggers today. These skills help to implement and improve harvesting practices, safe work environments, economic viability, and also aid in protecting the environment for generations to come (SFI-Anonymous 2006).

The training given throughout the course of a Master Logger program influences a host of behavioral changes and helps put into practice BMPs (Best Management Practices) that as a result improve the forests. In addition to educating the loggers, programs such as the Master Logger tackle many public concerns and fears about timber harvesting ("Master Logger" 2006). In many cases these concerns can develop into litigation and very strict harvesting regulations and ordinances. In areas where public concern has grown to stifling levels the existence of forestry as an agricultural practice has indeed become almost nonexistent. Educating the public and producers about the ways through which fears and concerns are being addressed is a means by which this critical industry can continue and thrive (Oldham and Castille 2003).

There are currently twenty states in the US that have forestry environmental stewardship programs. Program titles vary from state to state such as Master Logger, Professional Logging

Manager, Professional Timber Harvester, Certified Logging Professional, Logger Educational Program, Trained Logger Certification Program, Pro-logger, TOP-Timber Operations Professional, and LEAP (Logger Education to Advance Professionalism) ("Forest Certification" 2006). These states include:

- Alabama
- Colorado
- Georgia
- Idaho
- Kentucky
- Louisiana
- Maryland
- Minnesota
- Mississippi
- Montana
- New Hampshire
- New York
- North Carolina
- Oregon
- Pennsylvania
- South Carolina
- Vermont
- Virginia
- Washington
- West Virginia

Source: Southern Regional Extension Forestry

The Louisiana Master Logger designation recognizes those logging contractors who have completed 30 hours of instruction in five Professional Logger Education and Training Seminars. The major focus of this program is to educate loggers on the benefits of implementing conservation practices during harvesting. There are currently 1,103 certified Louisiana Master Loggers ("Master Logger" 2006).

CHAPTER 3. RESEARCH MODEL AND HYPOTHESES

3.1 Objectives

The overarching goal of this study is to determine the factors that influence participation in environmental stewardship programs (ESPs) that improve agricultural and forestry watersheds. The goal leads to the following research objectives: 1) identify farmer and logger demographic characteristics that lead to participation in ESPs, and 2) identify the structural, social and institutional factors that influence participation in ESPs for these two groups.

3.2 Theoretical Framework-Adoption-Diffusion Model

Considerable research has been conducted to examine behaviors that influence landowners to adoption conservation technologies. There are generally two theories that are used; actor-network theory, and adoption-diffusion theory. Actor-network theory suggests that a decision to adopt conservation or other practices occurs within a larger system than only individual actors and their immediate environments. Adoption-diffusion models explain and predict human behavior relative to the adoption and diffusion of technologies and practices.

According to Rogers (1962), who is most credited for his work in the refinement of the model, adoption is defined as “the behavior associated with an individual or group’s deciding whether or not to accept new ideas, practices or products.” Diffusion is defined as “the process by which the adoption of a new idea, practice or product spreads throughout the group.” Furthermore, innovation is included in this model and is defined as “an idea, practice or product that is perceived as new by the individual or group. Rogers also outlined six stages of the adoption process. They include: Awareness of the problem, Interest in more information, Evaluation, Trial, Adoption, and Adaptation.

Nowak (1982) used an expanded adoption-diffusion model to explain the adoption of conservation practices which incorporates the research findings from adoption studies from the last forty years. Nowak includes four major sets of explanatory variables including: 1) social-psychological, 2) farm structural, 3) ecological, and 4) institutional (Nowak and Korshing 1983). Rahelizatovo and Gillespie (2004) applied this method to study the adoption of best management practices in the Louisiana dairy industry. This model will be adapted for this dissertation research.

3.3 The Model

3.3.1 Research Variables

The dependent variable in this research is enrollment in Environmental Stewardship programs (ESPs). Enrollment in either the Louisiana Master Farmer or Master Logger Program is used as the program of analysis to test the model. Independent variables are: 1) social-psychological, 2) structural characteristics, 3) attitude toward environmental stewardship, and 4) institutional barriers and incentives (Figure 1).

3.3.1.1. Social-Psychological Construct

Social-psychological items include demographic variables such as: age, years of farming or logging, education, off-farm/logging employment, and social participation (the number of organizations a respondent belongs to). The effect of age on the adoption of conservation practices has been debated. Some studies find no relationship between age and adoption (Carlson, et al., 1981) while other studies indicate that younger people are more willing to adopt conservation technologies (Nowak and Korshing 1983).

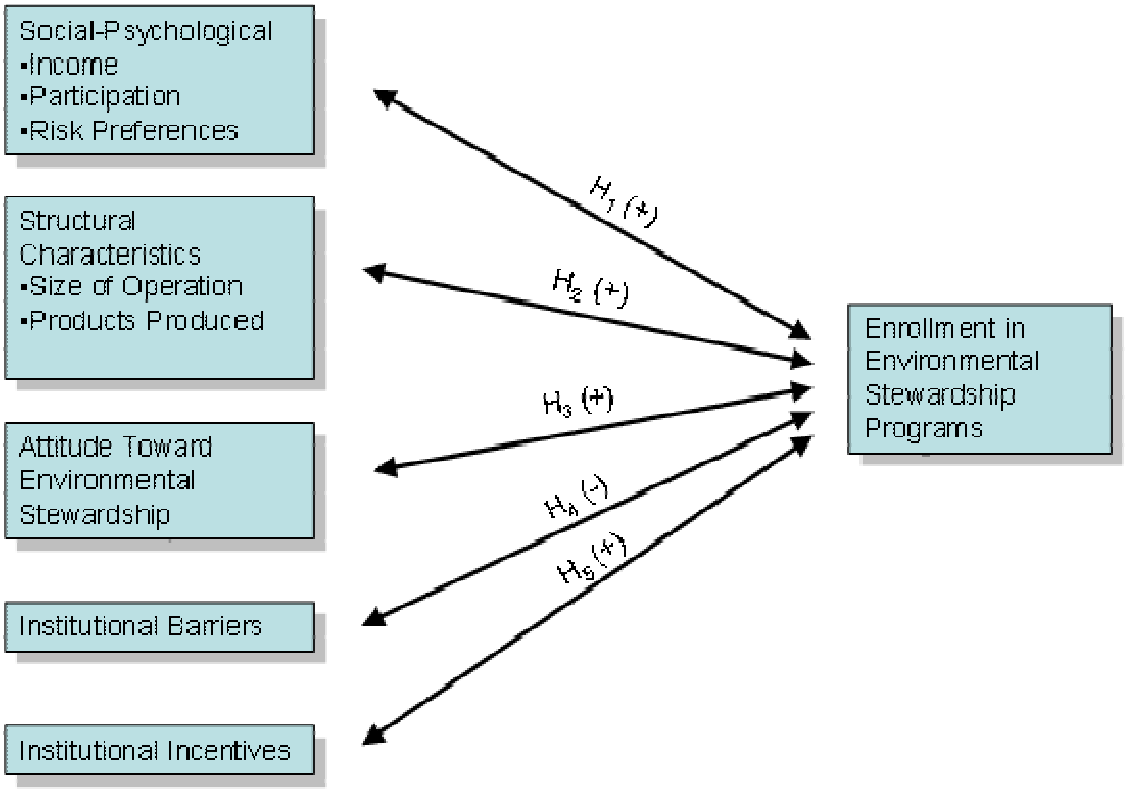

Figure 1. Model of Environmental Stewardship Program Participation

Some studies indicate that females have a a stronger role in developing environmental values (Feldman and Welsh 1995; Aboud, et al. 1996), but many question the strength of this relationship (Christianson and Arcury 1992). Clearfield and Osborne (2003) believe that this relationship exists due to the nurturing and open-minded characteristics of females.

Income and positive environmental attitudes have been found to have a direct relationship (McBeth and Foster 1994). However, Kraft, et al. (1996) found that "farmers with a negative attitude toward governmental involvement with wetland regulations were less likely to want to participate in the Water Quality Incentives Program. Contact with change agents and access to

information has been found to lead to greater adoption of conservation measures (Rogers 1983; Nowak 1987; Kraft et al. 1996).

Participation in local organizations, such as commodity groups, has a positive relationship with the adoption of conservation technologies (Abd-Ella et al. 1981; Clearfield 1983; Korsching et al. 1981). Furthermore, landowners who are local opinion leaders have a greater probability of adoption (Lovejoy and Parent 1981). Local leaders tend to be better-educated, manage larger operations, and have a good understanding of environmental concerns. The investigator predicts younger, more educated landowners are willing to adopt conservation measures (Clearfield and Osborne 2003).

In assessing willingness to adopt conservation technologies, it is important to evaluate producers' risk preferences or the tendency for a producer to seek or avoid risk when making decisions about conservation. Producers will be asked to rank the level of risk he or she is willing to take when investing in new technologies (Clearfield and Osborne 2003).

3.3.1.2. Structural Construct

Land ownership characteristics are also an important factor which may impact the decision to adopt new practices and participate in conservation programs. An assessment of family and non-family members working on the operation may also be an indicator of labor available to implement new practices as well as size of the operation.

3.3.1.3. Attitude Toward Environmental Stewardship Construct

Attitude toward the environment is a major focus of the study. Respondents were asked to indicate their level of agreement about questions pertaining to how they feel about the environment. Questions pertain to awareness of environmental problems caused by agriculture and forestry. Elicitation of producers' attitudes toward the environment constituted the last section of the survey. Some questions were adapted from the New Environment Paradigm bank

of questions developed by Dunlap et al. (2000). The set of questions takes in to account five features of an ecological worldview: the reality of limits to growth; the anti-anthropocentrism view; the fragility of nature's balance; rejection of exemptionalism; and the possibility of an ecocrisis (Dunlap et al. 2000, p. 432). These questions help to evaluate environmental attitude and willingness to participate in conservation programs.

3.3.1.4. Institutional Barriers and Incentives Constructs

This construct relates to the participation in government funded conservation programs and voluntary watershed conservation programs (including the Master Farmer and Master Logger Programs). Institutional barriers and incentives are difficult to define. Incentives may include cost-share programs and technical assistance programs. Barriers might include regulations, penalties or lack of cost-share assistance. Many researchers find these variables to have the most influence on the adoption of conservation technologies and participation in conservation programs (Clearfield and Osborne 2003).

3.4. Propositions and Hypotheses

Relationships between factors influencing environmental stewardship program (ESP) participation, specifically watershed conservation-based programs, were hypothesized from the points of view of farmers and loggers. Accordingly, the following propositions (P) and hypotheses (H) were formulated:

Relationship between social-psychological attributes and participation in ESPs

P_1: Research indicates that age, education, income, participation in local organizations, and other social-psychological factors are related to adoption of conservation technologies and conservation programs. Thus it is expected that respondents with higher levels of education and income are more willing to participate in ESPs.

H_1: There is a positive relationship between social-psychological attributes and participation in ESPs.

Relationship between structural variables and participation in ESPs

P_2: Studies indicate that individuals with larger operations and own of the land in which the commodity is produced or activity takes place are more willing to adopt conservation practices and are also more willing to take risks. Thus it is expected that respondents with larger operations, that own the land, are more willing to participate in ESPs.

H_2: There is a positive relationship between structural variables and participation in ESPs.

Relationship between respondents' environmental stewardship and participation in ESPs

P_3: The more a respondent is concerned about environmental quality, the more willing he or she is to adopt conservation activities and participate in ESPs. The more a respondent accepts responsibility for their actions, the more willing he or she is to implement conservation practices, which are part of ESPs.

H_3: There is a positive relationship between respondents' environmental stewardship attitudes and participation in ESPs.

Relationship between institutional variables and participation in ESPs.

P_4: If a respondent experiences difficulties participating in conservation programs due to institutional barriers, he or she is less willing to participate in ESPs. Conversely, if a respondents experiences ease in participating in conservation programs, he or she is more willing to participate in ESPs.

H_{4a}: There is a negative relationship between institutional barriers and participation in ESPs.
H_{4b}: There is a positive relationship between institutional incentives and participation in ESPs.

CHAPTER 4. RESEARCH METHODOLOGY

4.1. Research Design

In this study, an adoption-diffusion model was used to determine the factors influencing agriculture and forestry landowners to participate in watershed conservation programs. A survey was conducted to identify behavior that influences farmer/logger conservation behavior that might lead to an increased probability of adopting practices to improve agriculture and forestry watersheds. The survey/questionnaire for Louisiana agricultural and forestry producers addressed the following criteria: 1) awareness of environmental quality concerns in their local watershed, statewide and nationally, 2) knowledge of environmental best management practices for agriculture and forestry, 3) knowledge of environmental policies affecting agriculture and forestry, and 4) participation in the Louisiana Master Farmer Program or the Louisiana Master Logger Program. The survey instrument consisted of questions that evaluate the various factors that influence conservation behavior.

Likert-type scales and rating type questions were included in the questionnaire as well as open-ended question to discern most important issues in the implementation of agricultural best management practices (BMPs) which are integral components of the Louisiana Master Farmer Program and Master Logger Programs.

Although a number of questions were unique to the Master Farmer and Master Logger instruments, there was a core bank of questions common to both instruments for subsequent comparative analysis.

4.2. Research Populations

The populations for the research were all farmers and loggers in Louisiana participating in the Master Farmer and Master Logger Programs, respectively. These groups include approximately 1,103 participants in the Louisiana Master Logger Program and approximately

1,600 agricultural producers participating in the Louisiana Master Farmer Program. The lists were obtained from the LSU AgCenter's Master Farmer Program database and the Louisiana Master Logger participant list maintained by the Louisiana Forestry Association. In addition, 900 farmers that are not participants in the Master Farmer program were surveyed for comparative purposes. This non-participant group was drawn from a list of all Louisiana farmers purchased from Best Lists, Inc., a national list provider.

The study was conducted using mail surveys. A survey instrument was developed for each group. The survey list for Master Farmer participants was slightly different from the survey of Master Logger participants due to differences in production practices and in participation in their respective program. Dillman's Tailored Design Method (2000) was used. This included: pre-notification postcards, first mailing reminder postcard, and a second mailing. Content validity and clarity of the questionnaire was evaluated through pretesting from a random selection of ten members from each population, commodity group leaders and Louisiana Cooperative Extension county agents. After pretesting, revisions to the questionnaire were made.

4.3. Survey and Measures

The questionnaire (Appendix I) was developed based on existing constructs from the literature when available. If constructs were not available for the construct of interest, new constructs were built based on theories and items from the literature. Before hypothesis testing, all constructs were checked for validity and reliability, and modified as necessary, through factor analysis. Likert-type scales were used when applicable, anchored by 1= strongly disagree, 3= somewhat agree, 5= strongly agree. Following is a list of topics for questions of each section of the farmer survey.

Section I. Company Background
• Legal Structure
• Management structure (2 items)
• Gross income from agriculture or forestry
• Operational characteristics (2 items)
• Commodities producing most gross sales
• Non-farm activities (2 items)
• Acreage
• Risk Perception (2 items)
• Agency/Organization Relationships (10 items)

Section II. Environmental Issues
• Water Quality Policy Perception (4 items)
• Water Quality Information Sources (12 items)
• Gross income from agriculture
• Perceptions of relationships between humans and the environment (9 items)
• Commitment to environmental stewardship (7 items)

Section III. Conservation/Best Management Practice Adoption
• Best Management Practice Awareness/Implementation (3 items)
• Types of Best Management Practices
• Importance of Conservation (4 items)
• Best Management Practice Adoption Levels (16 items)
• Institutional barriers/Incentives (4 items)

Section IV. ESP Participation
• Participant Level
• ESP Importance (7 items)
• ESP Perception (5 items)
• ESP Influences (14 items)

Section V. Demographics
• Gender
• Age
• Ethnicity
• Marital Status
• Education
• Residence
• Primary Occupation
• Membership in environmental organizations

The logger questionnaire was divided into the following sections: 1) Logging Business, 2) Environmental Issues, 3) Conservation/Best Management Practice Adoption, 4) ESP Participation, and 5) Participant Information. Following is a list of topics for questions of each section.

Section I. Company Background
• Business Structure
• Management Structure (8 items)
• Agency/Organization Relationships (11 items)

Section II. Environmental Issues
• Water Quality Policy Perception (4 items)
• Water Quality Information Sources (12 items)
• Gross income from agriculture or forestry
• Perceptions of relationships between humans and the environment (9 items
• Commitment to environmental stewardship (7 items)

Section III. Conservation/Best Management Practice Adoption
• Best Management Practice Awareness/Implementation (3 items)
• Types of Best Management Practices
• Importance of Conservation (4 items)
• Best Management Practice Adoption Levels (16 items)
• Institutional barriers/Incentives (4 items)

Section IV. ESP Participation
• Participant Level
• ESP Importance (7 items)
• ESP Perception (5 items)
• ESP Influences (14 items)

Section V. Demographics
• Gender
• Age
• Ethnicity
• Marital Status
• Education
• Residence
• Primary Occupation
• Membership in environmental organizations

4.4. Data Analysis

The data were coded and entered using Microsoft Excel® and the Statistical Package for the Social Sciences® (SPSS) for data analysis and interpretation. The data were categorized and analyzed in a number of ways including:

- Descriptive analysis and graphical representation of the data
- Factor analysis for construct confirmation and data reduction
- Correlation analyses to test antecedents for factors influencing participation in ESPs
- Binary logistic regression

Data analysis procedures are described for each research objective. In all cases, the alpha level of statistical significance was set a priori at .05. Whenever it was necessary to interpret the magnitude of findings presented as correlation coefficients, the descriptors developed by Davis (1971) were used as follows:

- .70 or higher indicates very strong association
- .50 - .69 indicates substantial association
- .30 - .49 indicates moderate association
- .10- .29 indicates low association
- .01 - .09 indicates negligible association.

The first step was to describe the characteristics of participants in ESPs on selected demographic variables. The characteristics included gender, age, marital status, length of time in business, income derived by agriculture or forestry, and educational status. Characteristics that were measured on categorical scales were summarized using frequencies. Educational status was treated as a continuous variable. Characteristics measured continuous scales were summarized using means and standard deviations. These characteristics included business structure, income, years in agriculture and/or forestry.

Objective two was to determine the factors that influence participation in ESPs. Many of the questions were posed using five-point Likert-type scales. These scales were treated as interval scale measurements for data analysis purposes; and therefore, individual item means and standard deviations, as well as sub-scale means and standard deviations were reported in summary data analyses. In addition, a factor analysis was conducted on each of the sub-scales to determine if the items could be confirmed to measure components of a common construct. Finally, each of the confirmed factors was summarized into a sub-scale score which calculated from the mean of the items in the factor.

CHAPTER 5. RESULTS

5.1. Master Farmer Results

5.1.1. Survey Response Rate

Two thousand five-hundred questionnaires were mailed to farmers in Louisiana, representing 1,600 producers participating in the Louisiana Master Farmer Program and 900 non-participants. One-hundred and seventy were either undeliverable or the receiver indicated that he/she did not want to participate. In addition, 558 questionnaires were returned but not appropriate to the study. Thus, 791 surveys were useable resulting in a 45 percent adjusted response rate (Table 4).

Table 4. Farmer Responses

Sent	Useable	Undeliverable	Not Appropriate	Take Off List	Adjusted Response Rate
2,500	791	163	558	7	44.6%

5.1.2. Analysis of Missing Data

In survey research, missing data is often common. Missing data might affect the generalizability of the results through its potential "hidden" biases (Hair et al. 1998). Missing data may also impact the sample size available for analysis if remedies for missing data are not applied (Hair et al. 1998). The main reasons for missing data are respondents' refusal to respond, and data entry errors.

Among all cases, missing data varied from zero to five percent per case. Overall, missing data was infrequent and random throughout the questionnaire. For multivariate analysis, mean replacement was chosen as the most suitable imputation option for the infrequent and random missing data (Hair et al. 1998). Missing data for univariate analyses such as descriptives and *t*-

tests) was remedied through pair-wise exclusion of missing data, in other words; all available data was used in these analyses.

5.1.3. Analysis of Non-Response Bias

Non-response bias was assessed by independent samples two-tailed *t*-tests between respondents from the first and second mailings. Since the respondents from the second mailing required prompting to respond and therefore can be perceived to be less eager to respond, they are likely to be similar to non-respondents (Adams 1986; Donald 1960). If respondents from the first and second mailings significantly differ, research results might not be generalizable to the sample frame.

To investigate non-response bias, these two groups were compared on their participation in the Master Farmer program. Levene's test statistics were calculated to check for equal variance between the respondent groups. If the significance value of the Levene's test was not significant ($p>0.05$), then *t*-test results that assume equal variances were used. If the test statistic was significant ($p<0.05$), *t*-test results not assuming equal variance were used.

To determine the extent to which the respondents are representative of the total population, the variables were compared using chi-square analysis for categorical variables. The variables indicating type of business structure, program participation and education were found to be significant between the early and late respondents, at the $\alpha=0.05$ level. The variables indicating income derived from agricultural sales, age, ethnicity and marriage were considered to be non-significant. Using *t*-test statistics for independent samples, continuous variables including non-farm income and respondent relationship scores were calculated and considered significant at the $\alpha=0.05$ level. Therefore, the results should be considered to be representative of the respondents group only.

5.1.4. Farmer Demographics

Sample characteristics comprised a number of measures including ethnic background. Respondents indicating they were Caucasian comprised the majority of the group (n = 723), 94.6 percent). Native Americans and African-Americans comprised 2.1 percent and 2.6 percent of respondents, respectively. Twenty-nine respondents did not answer this question.

Most respondents (63.1 percent), live in a rural area in Louisiana, while the balance live in a very small city, town, or village in Louisiana in 2005 (Figure 2).

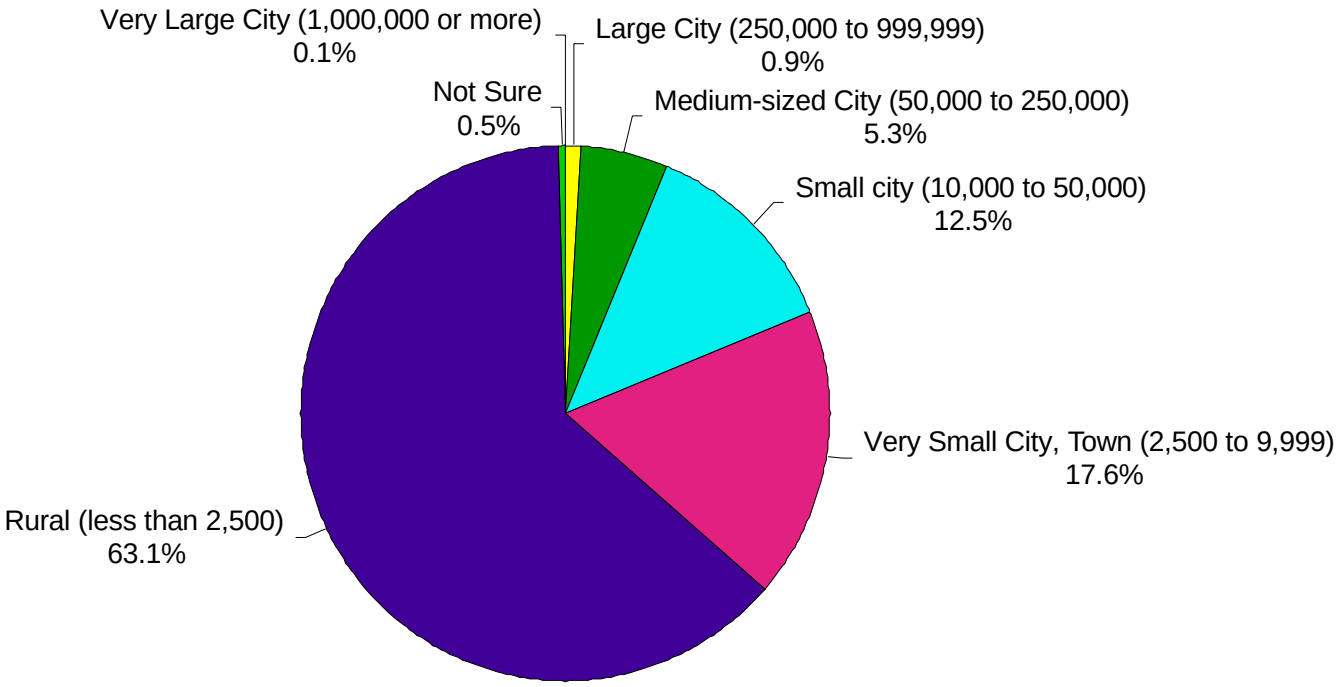

Figure 2. Farmer Residency Type (Percent of Respondents) (n = 761)

Using Figure 3 as a reference map of Louisiana, 64 percent of respondents were represented by the 20 parishes (Figure 4). The largest number of respondents surveyed had a farm located in Vermilion parish (7.9 percent) followed by St. Landry parish (5.5 percent).

Figure 3. Louisiana Parishes

Beef Cattle producers accounted for almost half all respondent commodity sales in 2005 with 46.9 percent. Rice was second (16.1 percent) followed by soybeans and poultry, both with 11.6 percent of total sales (Figure 5). Multiple responses were possible.

Often agricultural producers have additional employment beyond their farming operation. Nearly 50 percent of respondents said they did not work away from their operation in 2005, while 27.6 percent said they worked at least two hundred days with an average of four hours per day away from their operation (Figure 6).

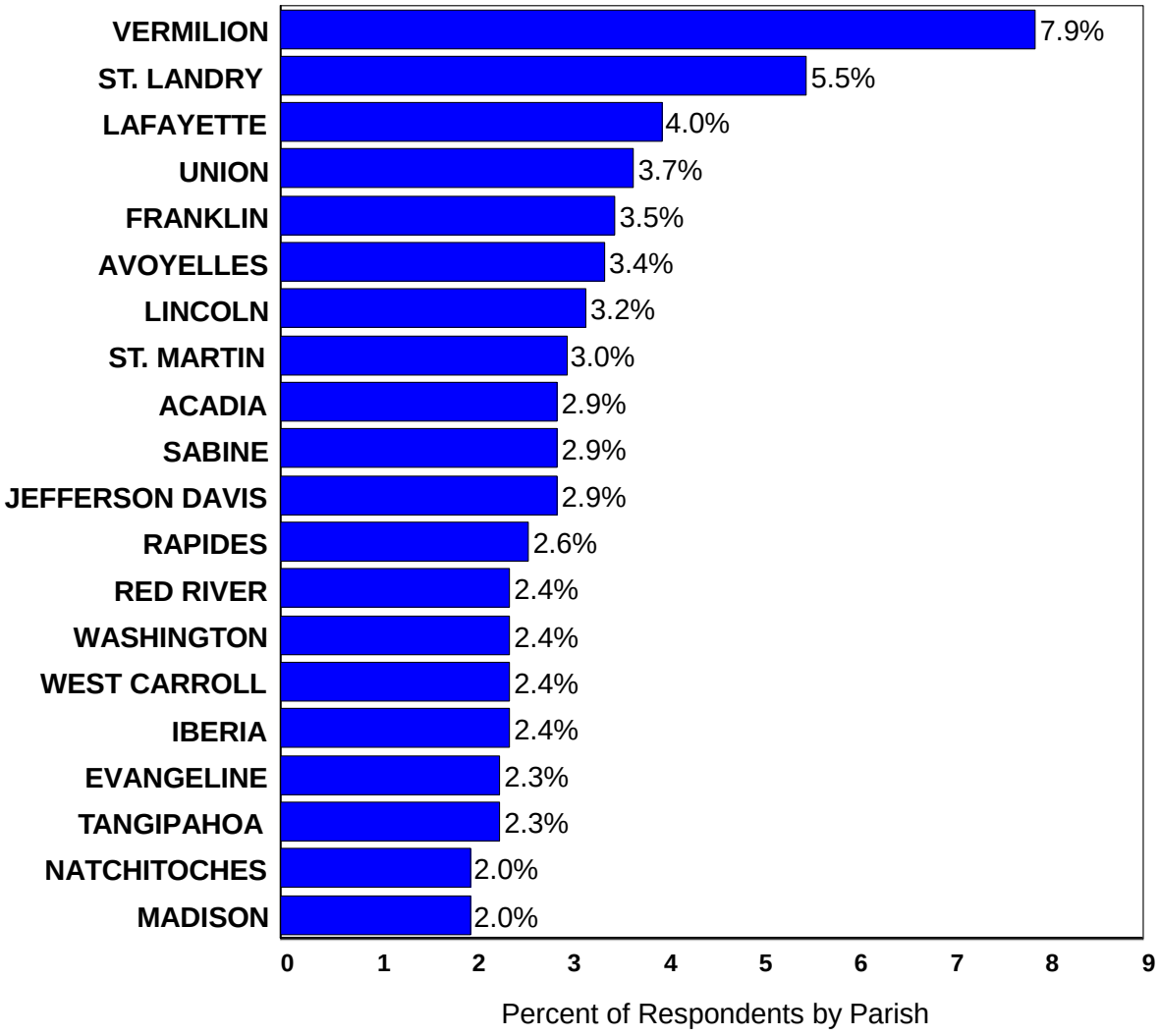

Figure 4. Respondent Farm Locations in the Top Twenty Parishes (n=759)

One of the objectives of the study was to describe social-psychological factors that are related to adoption of conservation technologies and conservation programs in Louisiana on selected demographic characteristics and perceptional measures. One of the social-psychological characteristics of the respondents examined was gender. Six hundred and ninety-eight (91.2 percent) indicated that they were male, while sixty seven (8.8 percent) indicated they were female. There were twenty eight respondents who did not choose to answer this question.

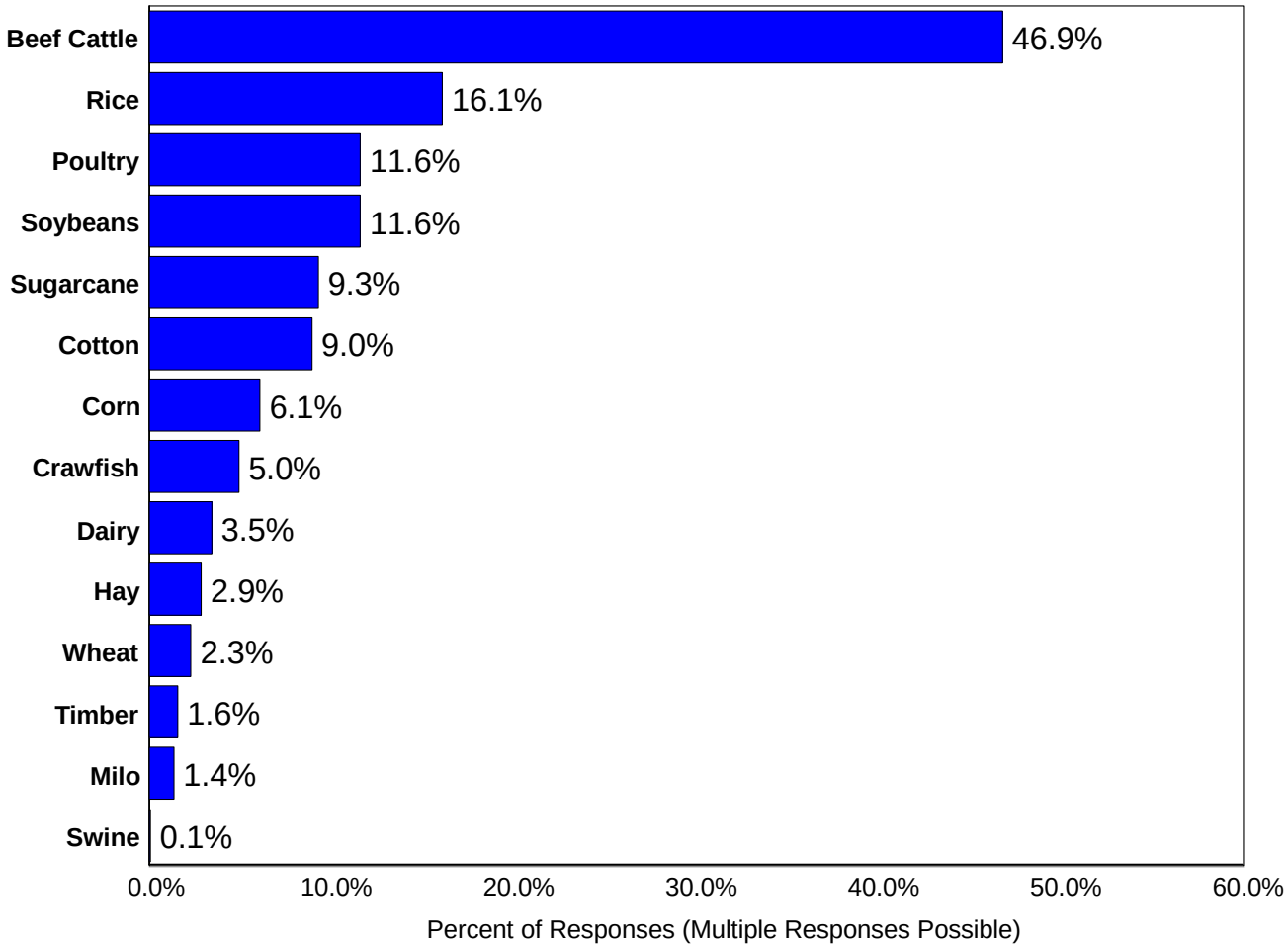

Figure 5. Commodity Produced by Respondent (n=760)

Age of respondents was another important demographic characteristic. The data were summarized in age categories; the largest group of respondents (n = 234, 30.5 percent) reported ages in the 46-55 year category. Generally, respondents were uniformly distributed across the range of age classes represented in the study (Figure 7).

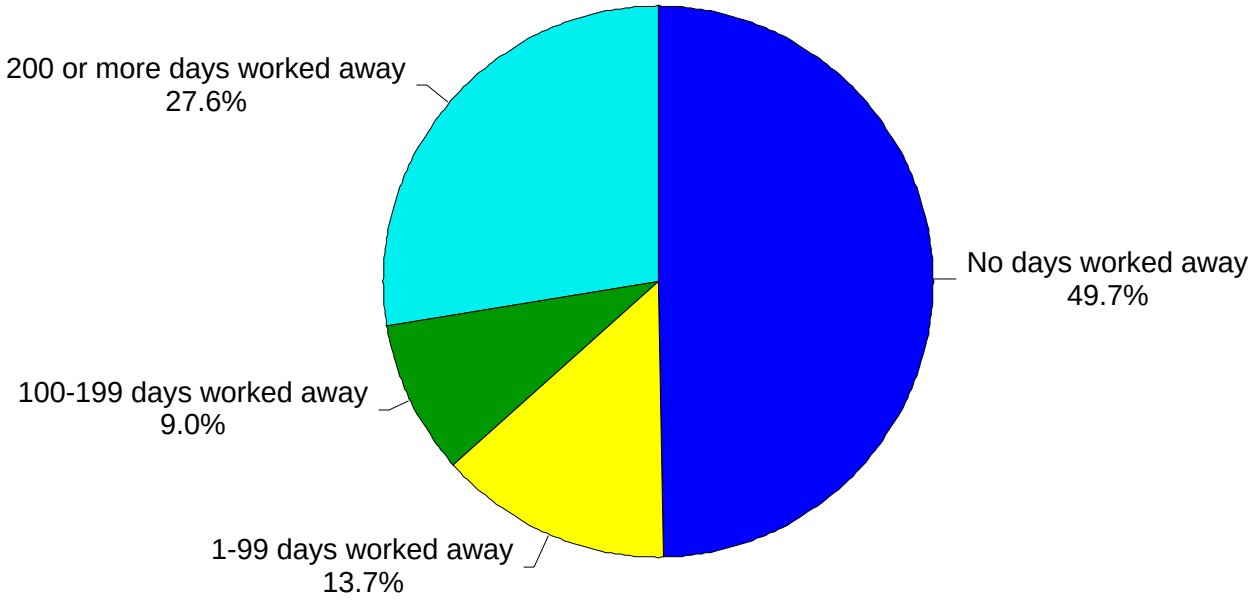

Figure 6. Number of Days Worked at Least Four Hours per Day Away From Farming Operations (Percent of Respondents) (n = 793)

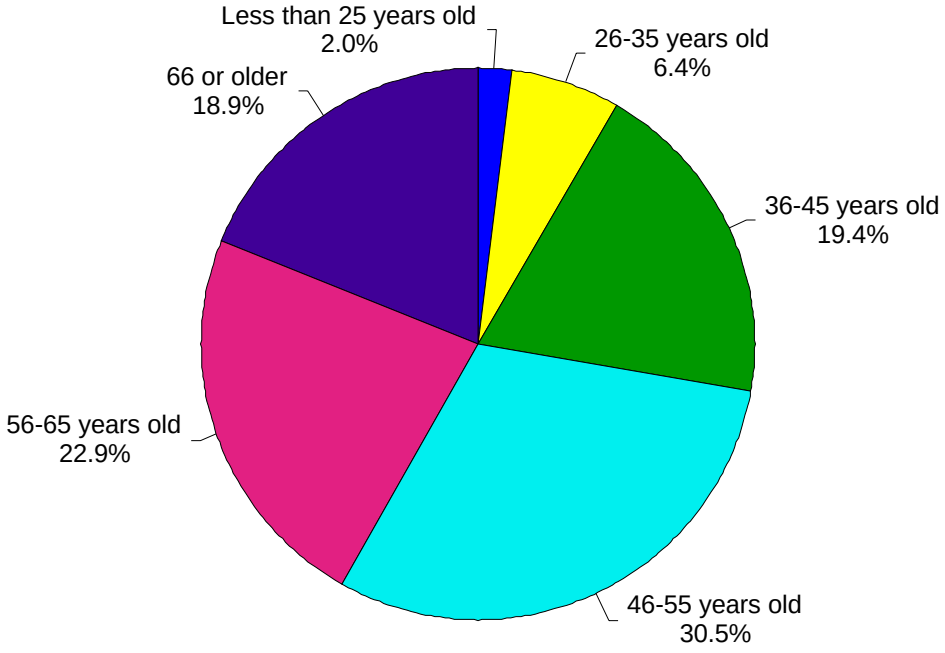

Figure 7. Ages of Farmer Respondents (Percent of Respondents) (n = 768)

With regard to education level, 30 percent of respondents had a college degree in 2005 while 29.9 percent had a high school diploma or equivalent (Figure 8).

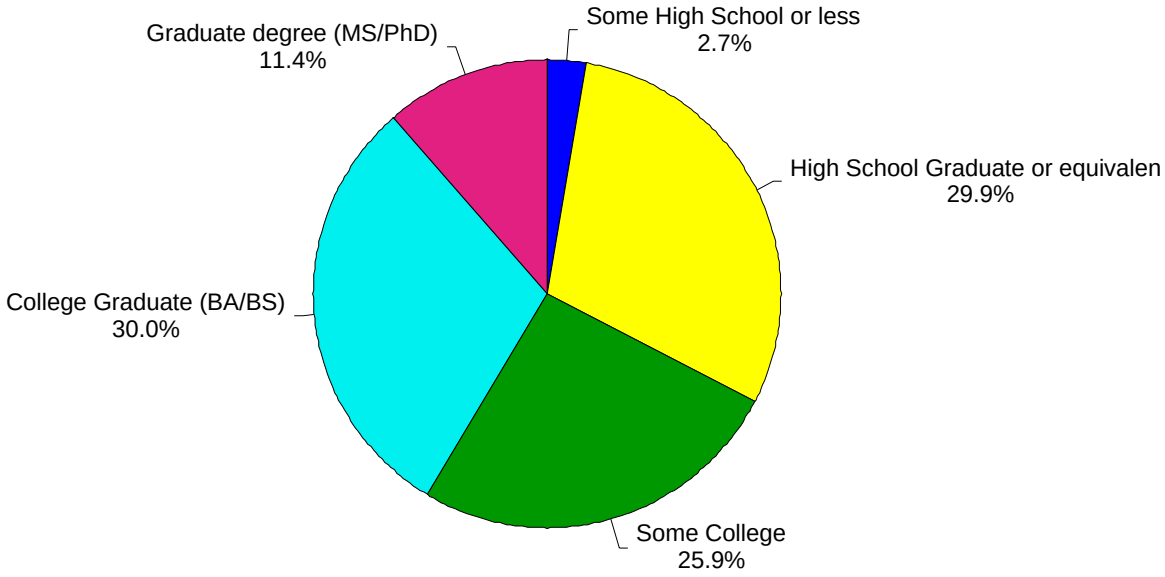

Figure 8. Education Level of Farmer Respondents (Percent of Respondents) (n = 769)

43.3 percent of respondents' gross farm income was over one hundred thousand dollars in 2005 (Figure 9).

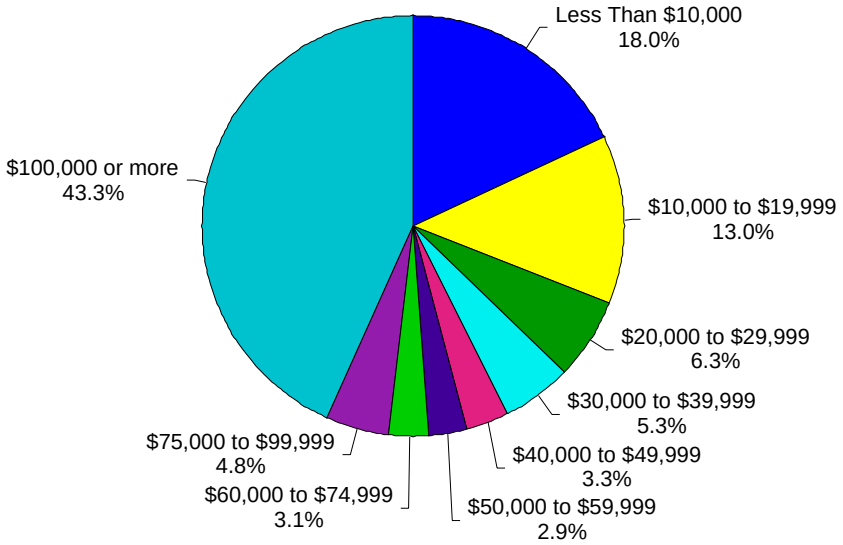

Figure 9. Income Level of Farmer Respondents (Percent of Respondents) (n = 769)

5.1.5. Hypothesis Testing

5.1.5.1. Test of Hypothesis 1

H_1: There is a positive relationship between social-psychological attributes and participation in ESPs.

A social-psychological characteristic that described study participants was the importance of relationships to local organizations. They were asked to answer the question, "With respect to your farming operation, on a scale of 1 to 5, please rate the importance of each of the following relationships to you as a farmer." Respondents were asked to respond to ten items. Responses were entered on a Likert-type scale of 1 to 5 with 1 = Not Important at All, 3 = Neither Unimportant Nor Important, 5 = Very Important.

Mean responses of the items were classified using the researcher established interpretive scale as "Very Important" and "Important" with values ranging from 3.69 to 4.40 (Table 5). The item with which the respondents had the highest level of importance was "Farming Industry" (mean = 4.40, SD= .897).

Table 5. Farmer Respondent Relationships with Organizations

Organization	N	Mean	Interpretation	Std. Deviation
Farming industry	757	4.40	Very Important	0.897
Extension Service (county agents)	765	4.35	Very Important	0.923
Farmland owners	754	4.34	Very Important	0.960
Other Louisiana farmers	762	4.15	Important	0.920
Lending institutions (banks)	764	4.05	Important	1.270
Regulatory agencies	756	3.97	Important	1.037
Local communities	760	3.95	Important	1.068
Neighbors who are non-farmers	760	3.88	Important	1.093
State legislators	765	3.81	Important	1.199
Congressional delegations	759	3.69	Important	1.262

- **Factor Analysis**

To further examine the "Farmer Relationships" sub-scale, an exploratory factor analysis was conducted with the ten organization items to determine if underlying constructs existed in the sub-scale. The method used was the principal components analysis with a varimax rotation. Prior to interpreting the factor analysis, the researcher first examined the anti-image correlation matrix to determine the appropriateness of applying the factor analysis procedure to the data set. This was accomplished by examination of the measure of sampling adequacy (MSA) for each of the individual items in the scale. According to Hair et al. (1998) if the MSA's are above .50, factor analysis is an appropriate procedure for use with the data. When the MSA's were examined for the items in the "Farmer Relationships" scale, the values ranged from .561 to .779, indicating that the factor analysis was appropriate for use with this scale.

The first step in conducting the factor analysis was to determine the appropriate number of factors to be extracted. A combination of the latent root criterion and the screen plot criterion was used to make this decision. When the items in this sub-scale were analyzed, one factor was extracted with an eigenvalue of 2.50. This factor accounted for 50 percent of the variance in the sub-scale. In addition, all the factor loadings for all of the items were acceptable with values ranging from .94 to .78 (Table 6).

"Validity" refers to the extent the measures correctly represent the concept or construct intended and how well the construct is defined by the measures (Hair et al. 1998). The factor solution demonstrated good convergent validity, where items measure their intended constructs and no other, by having the items load strongly ($\geq$.60) on one factor. With respect to discriminate validity, which refers to how a construct differ from other constructs, the items loaded high on their corresponding factor construct than on their cross-loadings.

Table 6. Factor loadings for the one factor solution of the farmer relationships

Relationship	Factor 1[a] loadings
Other Louisiana farmers	0.779
Local communities	0.765
Farming industry	0.752
State legislators	0.739
Regulatory agencies	0.722
Farmland owners	0.715
Congressional delegations	0.696
Neighbors who are non-farmers	0.665
Extension Service (county agents)	0.648
Lending institutions (banks)	0.561

[a] Eigenvalue = 2.50, Percent of Variance Explained = 50.0

Based on the results of the factor analysis, the items in the "Farmer Relationships" sub-scale were combined into a single score defined as the mean of the ten sub-scale items. The "Farmer Relationships" Cronbach's α reliability score for the study participants was .89 (Table 5.4). According to the interpretive scale established by the researcher, this overall "Farmer Relationships" score was classified in the "Very Important" category.

Reliability refers to a measure's ability to yield consistent values if multiple measurements are taken over time (Hair et al. 1998). Cronbach's α is a measure of reliability that ranges from 0 to 1, with value of .60 generally deemed the lower limit of acceptability (Hair et al. 1998). All the internal consistency (Cronbach's α) measures (Table 7) are above the recommended level of .60 for the identified factors and hence were satisfactory. Accordingly, high (≥.60) Cronbach's alphas indicate that the measures are reliable and would yield consistent values in multiple measurements.

Table 7. Farmer Relationship Scale Reliability Analysis (Cronbach's alpha)

	Farmer Relationships
Cronbach's alpha	0.8873
n	729
Number of Variables	10
Scale min/max	3.6/4.4
Scale mean	4.0653
Scale standard deviation	0.0593

- **Correlation Analysis**

A correlation is a measure of linear relationship between variables. A correlation coefficient of zero indicates no linear relationship exists. Pearson's correlation coefficients measure the strength of association between two variables measured at an interval or ratio level. Pearson's correlation requires parametric data because it is based upon the average deviation from the mean (Field 2000). When data is not measured at interval or ratio level and hence do not follow normal frequency distribution, they are said to be non-parametric and Pearson's correlation is not appropriate (Field 2000). Therefore, the Spearman correlation coefficients were used to measure the association between "Louisiana Master Farmer Program Participation" and two variables measured on ordinal level, "age" and "education." Both "age" and "education" categories can be ordered in a meaningful way hence justifying the use of Spearman correlation coefficients as seen in Table 8.

Table 8. Correlations between Social-Psychological Characteristics and Master Farmer Program Participation

Social-Psychological Characteristic	r	p	n
Farmer Relationship Score$_a$	0.207**	.000	755
African American or Not African American$_a$	-0.121**	.001	769
Caucasian or Not Caucasian$_a$	0.108*	.003	769
Age$_b$	-0.086*	.018	754
Education$_b$	0.085*	.020	755
Native American or Not Native American$_a$	-0.052	.150	769
Amount of Non-farm Income$_a$	-0.037	.311	769

$_a$Pearson's Product Moment Correlation
$_b$Spearman's Rank Order Correlation Coefficient

Findings for hypothesis one showed three significant positive correlation between Farmer Relationship Score, r = .207, Caucasian, r = .108 and education, r = .085 as indicators of participation in the Master Farmer Program, indicating that respondents with higher levels of participation in local organizations, of Caucasian ethnicity, and with higher levels of education tended to participate in ESPs. Findings also showed two significant negative correlations

between African-American, r = -.121 and age, r = -.086 indicating that respondents of African-American ethnicity and higher age levels have a lower tendency to participate in ESPs. This hypothesis was partially supported by the data.

5.1.5.2. Test of Hypothesis 2

H_2: There is a positive relationship between structural variables and participation in ESPs.

Structural characteristics were used to test Hypothesis 2. For example, respondents were asked to indicate the crops or animals which they produce, as well as average production by value in 2005. Land ownership characteristics are also an important factor which may impact the decision for producers to adopt new practices; therefore, respondents were asked to indicate ownership. An assessment of family and non-family members working on the operation may also be an indicator of labor available to implement new practices as well as size of the operation.

Respondents were also asked to list if he or she is comfortable implementing new practices and technologies. Following are summary results.

- Respondents surveyed indicated that, on average they had been a farm manager for 28 years and a Louisiana farmer for 25 years.
- 72.9 percent of the respondents indicated that they live on their farm, while 27.1 percent do not live on the farm that they operate.
- Respondents surveyed indicated the mean percentage of sales from non-farm income is 14 percent.
- Mean total acres in operation in 2005 is 1,053 acres.
- 93.0 percent of respondents are willing to implement new BMPs, whereas 7.0 percent are not.
- 75% of respondents said their farm was family operated or individually operated. Partnerships was the second most cited structure with 12.6 percent and 11.8 percent were corporations.

When asked whether they were willing to take farm-related investment risks, 50.5 percent of respondents (n=761) said they avoid taking risks if possible. Nineteen percent said they take substantial risks and the balance said the neither seek nor avoid risk. This variable is an

important indicator of the willingness of a producer to take risks on his/her operation, which could also include sn investment in best management practices. Many cost-share programs require the producer to implement the best management practice first to receive cost-share assistance and reimbursement for the practice.

Table 9 presents Pearson correlation coefficients for "Number of Crops Produced," "Years as a Farm Manager" and "Nonfarm Income", Spearman correlation coefficients for "Total Sales," "Total Acres," "Amount of Time Spent in a Job Off-farm," "Investment Risks," and point-biserial correlation coefficients for "Type of Structure", "Live on Farm" and "Willingness to Implement New BMPs."

Testing of Hypothesis 2 resulted in three significant positive correlations between total sales, r = .277, total acres, r = .165 and incorporated legal structure of operation, r = .116 as indicators of participation in the Master Farmer Program, indicating that respondents with higher income resulting from farming, higher total acres in production, and a farm corporation legal structure tended to have higher participatation in ESPs. Findings also showed two significant negative correlations between amount of time spent in an off-farm job, r = -.127 and family owned operations, r = -.088 indicating that respondents who spend more time in a job off-farm and have a family owned operation have a lower tendency to participate in ESPs. This hypothesis was partially supported by the data.

Point-biserial correlation coefficient is used to estimate relationships between naturally occurring dichotomous nominal variables "Louisiana Master Farmer Program Participation" and an interval scale (commodities) (Field 2000). To calculate the point-biserial correlation coefficients, Master Farmer participation was coded as "1" for yes and "0" for no. Table 10 presents the results of point biserial correlation coefficients for commodities.

Table 9. Correlations between Farm Structural Characteristics and Master Farmer Program Participation

Farm Structural Characteristic	r	p	n
Total Sales[a]	0.277**	.000	745
Total Acres[a]	0.165**	.000	754
Amount of Time Spent in a job off-farm[a]	-0.127**	.000	767
Incorporated[b]	0.116**	.001	769
Number of Crops Produced[c]	0.091	.012	769
Family owned[b]	-0.088*	.014	769
Years as a farm manager in Louisiana[c]	-0.057	.116	759
Years as a farm manager[c]	-0.054	.133	763
Investment Risks[a]	-0.052	.158	753
Nonfarm Income[c]	-0.037	.311	769
Live on Farm[b]	0.028	.441	766
Partnership, LLC[b]	0.021	.565	769
Willingness to implement new BMPs[b]	0.012	.772	561

[a]*Spearman's Rank Order Correlation Coefficient
[b]*Point-biserial Correlation Coefficient
[c]*Pearsons Product Moment Correlation Coefficient

There were four significant positive correlations between the commodity(s) produced including poultry, r = .129, sugarcane, r = .113, dairy, r = .086, and rice, r = .079, indicating that respondents who produce these commodities have a higher tendency to participate in ESPs. Findings also showed one significant negative relationship between beef cattle respondents, r = -.113, indicating that these respondents tend to have a lower level of participation in ESPs.

Table 10. Correlations between Commodity and Master Farmer Program Participation

Commodity	R	P	N
Poultry	0.129**	.000	769
Sugarcane	0.113**	.002	769
Beef Cattle	-0.113**	.002	769
Dairy	0.086*	.017	769
Rice	0.079*	.028	769
Crawfish	0.065	.072	769
Corn	-0.026	.474	769
Wheat	-0.022	.538	769
Swine	0.019	.597	769
Soybeans	-0.018	.627	769
Milo	-0.016	.661	769
Cotton	0.014	.695	769

*Point-biserial Correlation Coefficient

5.1.5.3. Test of Hypothesis 3

H_3: There is a positive relationship between respondents' environmental stewardship attitudes and participation in ESPs.

Table 11 summarizes responses to New Environmental Paradigm statements. Agreement with the statements numbered 1, 3, 4, 6, and 8 and disagreement with the statements numbered 2, 5, 7, and 9 imply a pro-environmental view. Using a 5-point Likert-type scale with 1= strongly disagree to 5 equals strongly agree, a summated score was calculated for each respondent. The maximum score of 75 indicates a strong pro-ecological position. The average score of 46 indicates a fairly neutral attitude toward ecological issues by farmer respondents.

Further analysis of the data reveals more about the range of respondent ecological attitudes. The frequency distribution showed that more than 35 percent of respondents indicated a pro-ecological view toward statements 2, 3, 4, 6, 7, and 8. More than 75 percent of respondents believed that humans are still subject to the laws of nature despite our special abilities (statement 8). Statements 1 and 5 indicate more than 50 percent of respondents with an anti-ecological view. To be more specific, 51 percent of respondents thought that we are NOT approaching the limit of the number of people the earth can support; and 63 percent of respondents believe that the Earth has plenty of natural resources if we just learn how to develop them.

Statement 9 received a higher percentage of "somewhat agree" responses. Thirty-nine percent of the respondents "somewhat agree" that the so-called "ecological crisis" facing humankind has been greatly exaggerated.

Table 11. Level of Agreement with NEP Statements-Farmers (n=766)

	NEP Statements	**Percent of Respondents**				
		Strongly Disagree		**Somewhat Agree**		**Strongly Agree**
1	We are approaching the limit of the number of people the earth can support	25.0	26.0	32.3	8.6	8.1

(table continued)

2	Humans have the right to change the natural environment to suit their needs	25.5	23.8	34.4	9.8	6.6
3	When humans interfere with nature it often produces disastrous consequences	5.7	16.4	30.4	20.2	27.4
4	Humans are severely abusing the environment	9.0	19.2	32.3	19.5	20.1
5	The earth has plenty of natural resources if we just learn how to develop them	3.2	8.2	25.3	30.5	32.8
6	Plants and animals have as much right as humans to exist	13.8	20.0	27.5	18.2	20.5
7	The balance of nature is strong enough to cope with the impacts of modern industrial nations	21.4	37.1	27.0	9.9	4.7
8	Despite our special abilities, humans are still subject to the laws of nature	1.0	2.8	18.3	32.1	45.8
9	The so-called "ecological crisis" facing humankind has been greatly exaggerated	10.4	17.9	39.3	19.6	12.9

Table 12 presents the results of the correlation coefficients for willingness to participate in the Louisiana Master Farmer program related to their environmental attitudes. Results indicate that respondents who have stronger agreement toward the statements "Humans are severely abusing the environment" and "Plants and animals are have as much right as humans to exist" are less likely to participate in the Master Farmer Program. Respondents with strong agreement toward the statement "We are approaching the limit of the number of people the earth can support" are less likely to participate in the Master Farmer Program.

Table 12. Correlations between NEP Statements and Master Farmer Program Participation

NEP Statement	r	p	n
Humans are severely abusing the environment	-0.115**	.002	763
Plants and animals have as much right as humans to exist	-0.091*	.012	760
We are approaching the limit of the number of people the earth can support	-0.072*	.047	763
The so-called "ecological crisis" facing humankind has been greatly exaggerated	0.064	.081	749
The earth has plenty of natural resources if we just learn how to develop them	0.048	.189	765
When humans interfere with nature it often produces disastrous consequences	-0.046	.202	761
Humans have the right to change the natural environment to suit their needs	0.040	.274	763
Despite our special abilities, humans are still subject to the laws of nature	-0.021	.557	764
The balance of nature is strong enough to cope with the impacts of modern industrial nations	-0.008	.818	757

Findings for Hypothesis 3 showed three significant negative correlations between respondents who have strong agreement toward the statements (using the New Environmental Paradigm scale) "Humans are severely abusing the environment", r = -.115, and "Plants and animals are have as much right as humans to exist", r = -.091, are less likely to participate in the Master Farmer Program. Respondents with strong agreement (also negatively correlated) toward the statement "We are approaching the limit of the number of people the earth can support," r = -.072, are less likely to participate in the Master Farmer Program. Hypothesis 3 is partially supported by the data.

"By reducing a data set from a group of interrelated variables into a smaller set of uncorrelated factors, factor analysis achieves parsimony by explaining the maximum amount of common variance in a correlation matrix using the smallest number of exploratory concepts" (Field 2000). Principal component factor analysis with varimax rotation was conducted to identify the underlying dimensions of attitudes that respondents have toward the environment. Orthogonal varimax rotation was used to disperse the factor loadings within the factors to achieve a more interpretable solution (Field 2000).

The principal component factor analysis identified strong intercorrelations among the attitudinal variables and resulted in two unique dimensions that could be used to describe respondent environmental attitudes. The latent root criterion was used in extracting the factors. The result from the latent root criterion was confirmed by investigating the scree-plot, which supported the appropriateness of the two factor solution. The two factors explain 46 percent of the variance in the nine variables (Table 13). Additionally, Cronbach's alpha of 0.62 indicates that the measures are reliable and would yield consistent values in multiple measurements.

Table 13. Factor Analysis for NEP Statements-Farmer Respondents (n=747)

Extraction Sum of Squared Loadings				Rotation Sum of Squared Loadings		
Factor	Eigenvalue	% of Variance	Cumulative %	Total	% of Variance	Cumulative %
1	**2.818**	**31.316**	**31.316**	**2.530**	**28.106**	**28.1**
2	**1.292**	**14.356**	**45.671**	**1.581**	**17.565**	**45.7**
Extraction Method: Principal Component Analysis with varimax rotation						

5.1.5.4. Test of Hypothesis 4

H_{4a}: There is a negative relationship between institutional barriers and participation in ESPs.
H_{4b}: There is a positive relationship between institutional incentives and participation in ESPs.

This section relates to the participation in government funded conservation programs and voluntary watershed conservation programs (including the Master Farmer and Master Logger Programs). These variables are the most difficult to define and minimal research has been conducted on this topic. However, many researchers find these variables to have the most influence on the adoption of conservation technologies and participation in conservation program (Clearfield and Osborne 2000).

Results indicate that 93 percent of respondents are aware of the Clean Water Act's nonpoint pollution clauses, while the remaining 7 percent are unaware of the issue. Results also indicate that 60 percent of respondents changed their operation because of the Clean Water Act. Twenty-seven percent of respondents did not change their operation because of the Clean Water

Act, while the remaining 13 percent respondents claimed the Act was not applicable to their farm operations. Just over one-third (36 percent) of respondents are very supportive of BMPs, while 33 percent are somewhat supportive of BMPs (Figure 10).

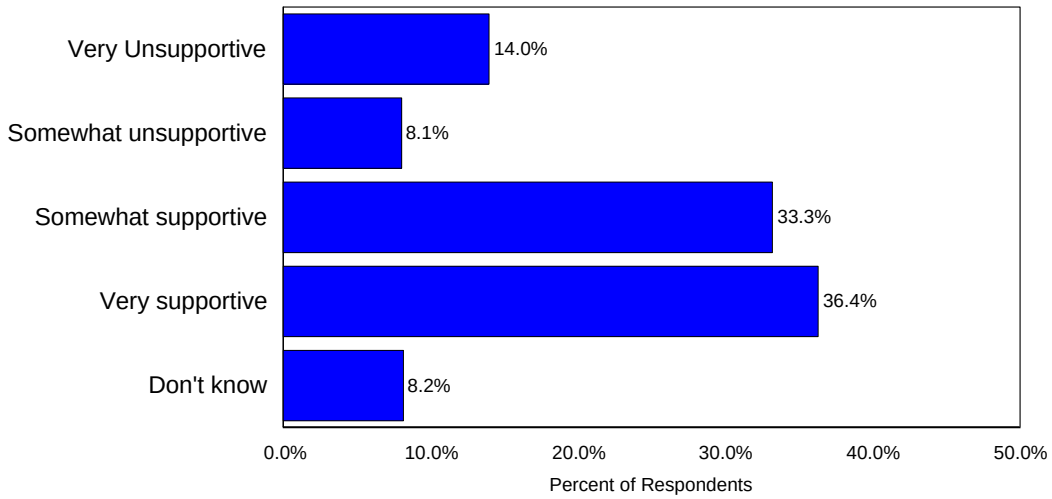

Figure 10. Farmer Respondent Support for BMPs (n = 558)

Forty percent of respondents believe that government support for BMPs is somewhat under-funded, while 31.8 percent believe that BMPs are somewhat adequately funded by the government (Figure 11). Mean response was 4.2 (n=557) on 5-point Likert scale anchored on 1=not important at all to 5=very important for importance of the availability of government cost-share.

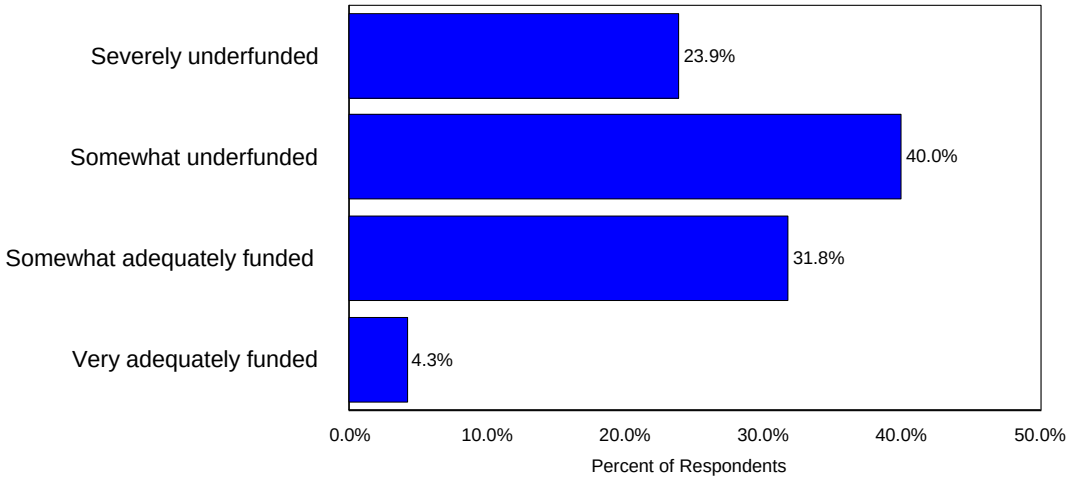

Figure 11. Farmer Respondent Opinions of Cost-Share/Government Support for BMPs (n = 557)

As seen in Table 14, ten significant positive correlations were found between respondent relationships with regulatory agencies, r = .201, relationship with Louisiana farmers, r = .194, relationship with the Louisiana Cooperative Extension Service, r - .165, relationship with local communities, r = .147, relationship with industry, r = .139, relationship with neighbors who are non-farmers, r = .136, relationship with other Louisiana farmers, r = .135, relationship with bankers and lenders, r = .123, relationship with congressional delegation, r = .121, and relationship with state legislators, r. = .119 as indicators of participation in the Master Farmer Program, indicating that respondents of with higher levels of participation in local organizations tended to participate in ESPs, thus viewed upon as institutional incentives. Findings also showed two significant negative correlations between respondents modification to managing the operation due to the Clean Water Act, r = -.331, and respondents awareness of efforts to control non-point source pollution through the Clean Water Act, r = -.325, have a lower tendency to participate in ESPs, thus viewed upon as institutional barriers. Hypothesis 4 was partially supported by the data.

Table 14. Relationship between Institutional Incentives and Barriers and Whether or Not the Respondent Participated in the Master Farmer Program

Institutional Incentive/Barrier	r	p	N
Modification to managing the operation due to the Clean Water Act	-0.331**	.000	761
Awareness of efforts to control non-point source pollution through the Clean Water Act	-0.325**	.000	765
Relationship with Regulatory Agencies	0.201**	.000	744
Relationship with Louisiana Farmers	0.194**	.000	749
Relationship with Louisiana Cooperative Extension Service	0.165**	.000	753
Relationship with Local Communities	0.147**	.000	747
Relationship with Industry	0.139**	.000	745
Relationship with neighbors who are non-farmers	0.136**	.000	748
Relationship with other Louisiana farmers	0.135**	.000	742
Relationship with bankers and lenders	0.123**	.001	752
Relationship with congressional delegation	0.121**	.001	747
Relationship with state legislators	0.119**	.001	752
Importance of availability of cost share assistance	0.044	.307	551
Feelings toward the level of government cost-share for funding the implementation of BMP's	-0.036	.393	558

(table continued)

Landowner support (if leased land) for the implementation of BMP's	0.018	.668	549

*Pearson's Correlation

5.1.6. Binary Logistic Regression

The final analysis was to determine if a model exists explaining a significant portion of the variance in the social-psychological, structural, environmental attitudes, and institutional incentives and barriers that influence participation in ESPs. Due to the dichotomous nature of the dependent variable, to test the model, variables were entered into a binary logistic model, The dependent variable was coded as "1" for participation and "0" for non-participation in the Louisiana Master Farmer Program. Additionally, variables were entered in an exploratory manner to determine only those factors that explained variance in the model. In conducting the regression analysis, the variables were entered into the analysis in a hierarchical manner.

Social-psychological variables were entered in the first block to control for the effects of this variable on factors that influence participation. The structural variables were entered as the second block. These variables included both categorical and scale level variables. The third block consisted of two factors indicating producers' environmental attitudes on a Likert scale. The final block consisted of institutional barriers and incentives that respondents indicated influenced participation in ESPs.

When the "Participation in ESPs" dependent variable was examined using binary logistic regression analysis, a total of 22 variables were entered into the explanatory model with a resulting overall R^2 value of 0.134. This model resulted in a -2 Log likelihood value of 270.27, which is a significant reduction ($\chi^2 = 26.693$, $p < 001$) from the initial -2 Log likelihood value of 296.961. Additionally, this model was determined to be the model of best fit on the basis of the Hosmer and Lemeshow Test results ($\chi^2 = 11.379$, $p = 0.181$). This indicates that there was no significant difference between the predicted model and the observed model. Hair et. al. (1998)

suggest that a non-significant, The Hosmer and Lemeshow test result is indicative of a good model fit.

When the explanatory model was examined, findings indicate that the control factor, participation in the Master Farmer Program was not a significant contributor to the model (Wald = 0.000, p = 0.988). However, when the social-psychological variables were entered into the model, specifically if the respondent had graduated from high school, it was found to be a significant contributor to the model (Wald = 6.535, p = 0.011). Additionally, the other social-psychological variables that were found to be significant contributors to the model included the variable if a respondent had another job outside of farming (Wald = 8.055, p = 0.005) and the variable that indicated how many years the respondent had been managing the farm (Wald = 16.234, p = 0.000). The nature of this contribution was such that respondents who had graduated from high school, did not have a job outside of farming, and had less years as a farm manager were more likely to participate in the Louisiana Master Farmer Program.

One factor from the institutional incentives and barriers included in the analysis during the stepwise block entered the model as a significant contributor to the explanatory model. This factor included the respondents' awareness of the Clean Water Act (Wald = 8.357, p = 0.004). Respondents that were award of the Clean Water Act were more likely to participate in the Louisiana Master Farmer Program. Results of this logistic regression analysis are presented in Table 15.

Table 15. Binary Logistic Regression Analysis of Respondent Willingness to Participate in the Louisiana Master Farmer Program Relative to Social-Psycholgical, Structural, Environmental Attitudes and Institutional Barriers and Incentives

	χ^2	df	Sig.		
Model	11.379	8	1.81		
Variables in the Equation					
Variable	**Wald**	**Sig**	**B[a]**	**SE**	
Graduated from high school	6.535	0.011	1.060	0.415	
Job outside of farming	8.055	0.005	-0.369	0.130	
Number of years managing the farm	16.234	0.000	-0.054	0.013	

Awareness of the Clean Water Act	8.357	0.004	1.783	0.617

[a] Constant = .022

The classification results were examined for the identified regression model to determine the effectiveness of the model in correctly classifying subjects as to whether or not a respondent participated in the Louisiana Master Farmer Program. Overall, 91.1 percent of respondents included in the analysis were correctly classified using the identified statistically significant model. The classification results are presented in Table 16.

Table 16. Classification Results for Producers Participating in the Louisiana Master Farmer Program

Observed	Not Participating	Predicted Participating	Total
Not Participating	5	41	46 (10.9%)
Participating	1	423	424 (99.8%)

Note. Overall percentage of correctly classified cases = 91.1%

Possible interpretations of the outcomes from the initial logistic regression analysis on participation identified by the researcher include: The positive impact of high school education is a very logical outcome since producers who are more educated are more inclined to want to learn new information and are able to participate in classroom style lectures over an extended period of time. The positive impact of the awareness of the Clean Water Act is also logical in that producers that are aware of the potential enforcement of these regulations will be more inclined to participate in ESPs that can teach them how to comply with these regulations. The research also agrees with the findings that a producer that has a job off of the farm is less likely to participate in ESPs due to limited time as well as not willing to make an investment in something he/she may consider only a hobby versus income. A finding that was somewhat surprising was the less time a producer has been managing the farm, the more likely he/she will participate in the Louisiana Master Farmer Program. One reason may be that farmers who have been managing the farm for longer amounts of time or more "set in their ways" and less willing to make changes on the farm.

5.1.7. Open-ended Questions

The survey included two open-ended questions. The first question asked respondents to list factors not covered elsewhere in the questionnaire that influenced their decision to enroll in the Master Farmer Program. A total of 123 responses were received and 32 percent (n = 39) of respondents indicated that they enrolled in the program to become more educated about environmental concerns and best management practices (BMPs). Eight percent (n = 10) indicated that they enrolled to lessen the likelihood of enforced regulations in the future, while 7 percent enrolled to be better environmental stewards. Cost share availability was also listed as a factor by 5 percent of respondents. Other lesser-cited factors include better public perception of farming and public relations and to maintain the land and natural resources for their children and grandchildren.

The second open-ended question asked respondents if they had any additional comments they may have about the Master Farmer Program and the adoption of BMPs. Most respondents recommended additional topics that should be covered in the program, such as cost analyses of implementation of BMPs, while other respondents indicated that the program should be required to be able to farm.

5.1.8. Revised Model

Figure 12 is a revised model indicating the factors influencing participation in the Louisiana Master Farmer Program. Results indicate that social-psychological, structural and institutional incentives are the primary factors influencing participation. As a result of the coefficient correlations and binary regression analysis, the following variables influence participation in the Louisiana Master Farmer Program: age, education, ethnicity, job off-farm, number of years managing the farm in Louisiana, relationship with organizations, income,

acreage, legal structure, and awareness of the Clean Water Act. Results are consistent with the literature cited in previous chapters.

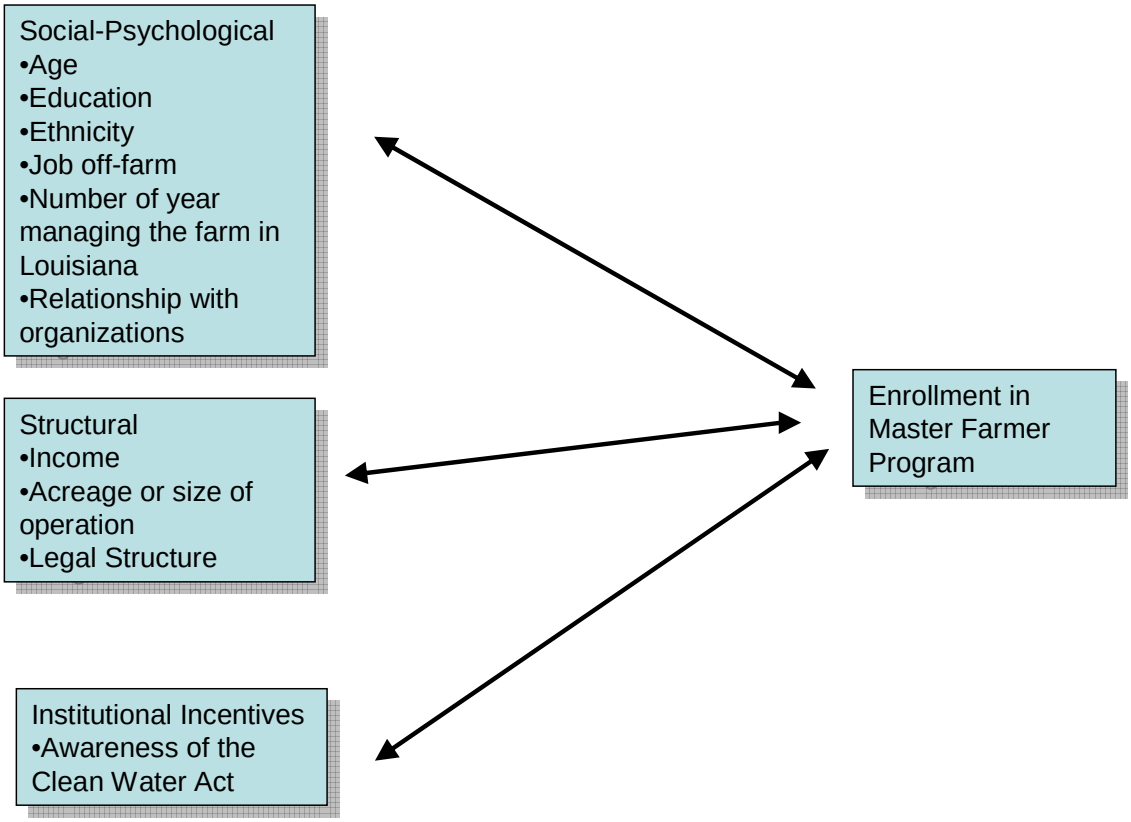

Figure 12. Factors Influencing Participation in the Louisiana Master Farmer Program

5.2. Master Logger Results

5.2.1. Survey Response Rate

Six hundred and seventy-two questionnaires were mailed to loggers in Louisiana representing both producers participating in the Louisiana Master Logger Program and non-participants of the Louisiana Master Logger Program. Of the 672 surveys mailed, 11 were either undeliverable or the receiver indicated that the producer did not want to participate. A total of 295 questionnaires were returned, however, 75 were not appropriate. Thus, the adjusted sample size was 209, resulting in a 35.7 percent adjusted response rate (Table 17).

Table 17. Master Logger Responses

Sent	Useable	Undeliverable	Not Appropriate	Take Off List	Adjusted Response Rate
672	209	9	75	2	35.7%

5.2.2. Analysis of Missing Data

In survey research, missing data is often common. Missing data might affect the generalizability of the results through its potential "hidden" biases (Hair et al. 1998). Missing data may also impact the sample size available for analysis if remedies for missing data are not applied (Hair et al. 1998). The main reasons for missing data are respondents' refusal to respond and data entry errors.

Among all cases, missing data varied from 0 to 5 percent per case. Missing data by variable in the first section of the questionnaire ranged from 0 to 5 percent. Overall, missing data was infrequent and random throughout the questionnaire. For multivariate analysis, mean replacement was chosen as the most suitable imputation option for the infrequent and random missing data as list-wise or pair-wise exclusion of data would decrease the already scarce sample size (Hair et al. 1998). Missing data for univariate analyses (descriptives, *t*-tests) was remedied

through pair-wise exclusion of missing data, in other words; all available data was used in the analyses.

5.2.3. Analysis of Non-Response Bias

Non-response bias was assessed by independent samples two-tailed *t*-tests between respondents from the first and second mailings. Since the respondents from the second mailing required prompting to respond and therefore can be perceived to be less eager to respond, they are likely to be similar to non-respondents (Adams 1986; Donald 1960). If respondents from the first and second mailings significantly differ, research results might not be generalizable to the sample frame.

To determine the extent to which the respondents are representative of the total population, the variables were compared using chi-square analysis for categorical variables. To investigate non-response bias, these two groups were compared on their participation in the Master Logger program. Levene's test statistics were calculated to check for equal variance between the respondent groups for Master Logger participation, age, ethnicity, education, and marital status. If the significance value of the Levene's test was not significant ($p>0.05$), then *t*-test results that assume equal variances were used. If the test statistic was significant ($p<0.05$), *t*-test results not assuming equal variance were used.

The *t*-test statistics for independent samples did not indicate significant group mean differences between the early and late respondents at the $\alpha=0.05$ level. Hence, no evidence of non-response bias was found and the research results are considered to be generalizable to the sample frames.

5.2.4. Logger Demographics

Sample characteristics comprised a number of measures including ethnic background. Of the 216 respondents, 84 percent, were of Caucasian ethnicity; 9.4 percent were Native American and 6.6 percent of surveyed respondents were African-American.

Of the surveyed respondents, 73.2 percent operate one crew, while 14.8 percent operate two crews. Surveyed respondents indicated that they own between one and fourteen crews (Figure 18).

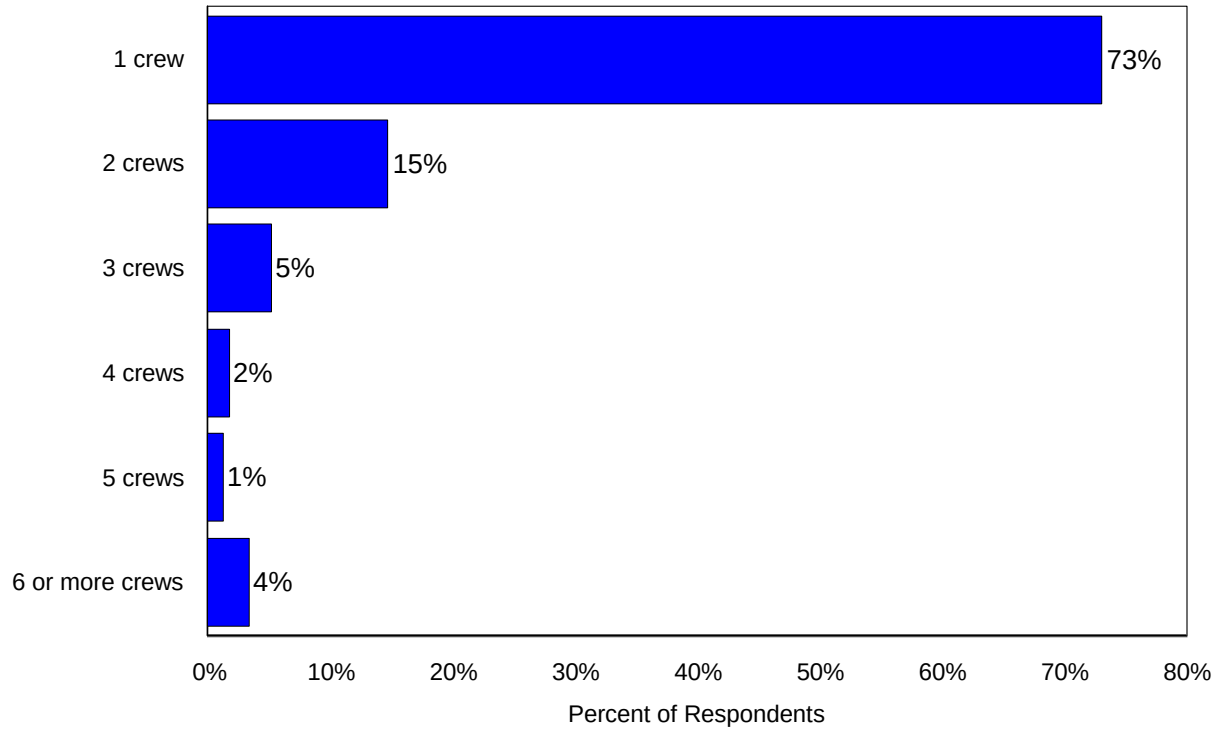

Table 18. Number of Crews Currently Operated By Surveyed Respondent (n = 216)

Respondents were asked to record all circumstances that apply concerning the product produced by their crew. 98.6 percent of surveyed respondents produce roundwood (saw logs, poles, pulpwood, Chip-N-Saw, etc.), while 1.9 percent produce Chips. With regard to the type of harvesting conducted by their crews, 82.9 percent of respondents use clear-cut harvesting, 71.8

percent use thinning, and 46.8 percent use plantation thinning (multiple responses possible). Six and a half percent recorded other methods including cutting bog timber and thinning.

Seventy-four percent of respondents cut/haul both pine and hardwood, 23.1 percent cut/haul only pine, and 3.2 percent cut/haul only hardwood. Just over one-third of respondent crews work between 226-250 days per year while 28 percent work over 250 days per year (Figure 13). Forty-six percent of respondent crews typically make four to five product sorts, while 41.9 percent typically make three or less product sorts (Figure 14).

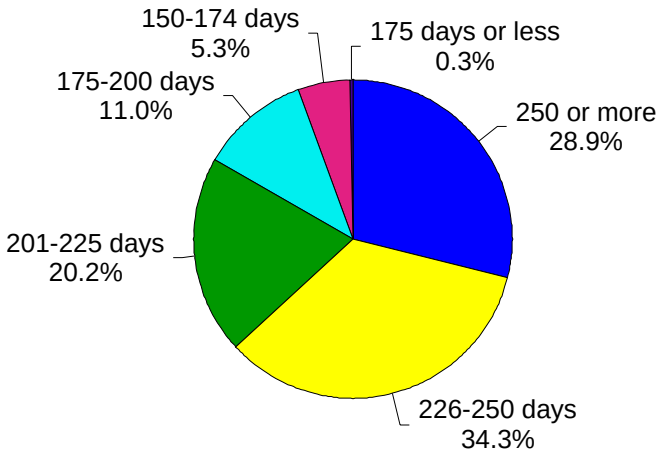

Figure 13. Days/Year Respondents Crews Work (n = 214)

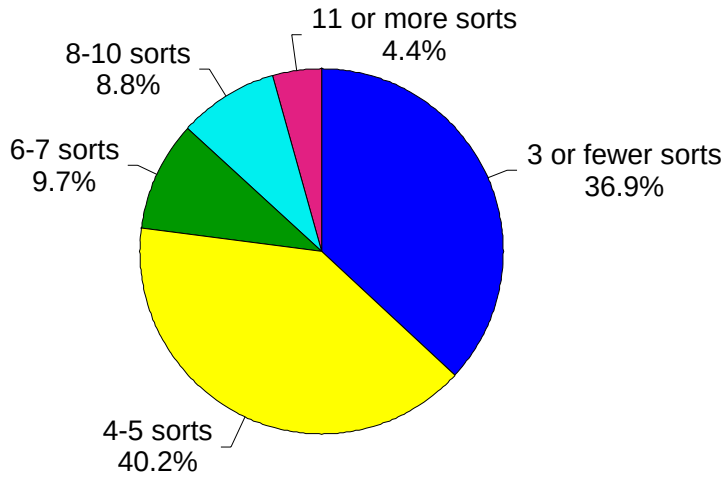

Figure 14. Number of Product Sorts Made By Surveyed Respondent Crews (n = 216)

Results indicate 19.8 percent of respondent crews produce forty one to fifty loads per week, while 17.9 percent produce thirty-one to forty loads per week (Figure 15).

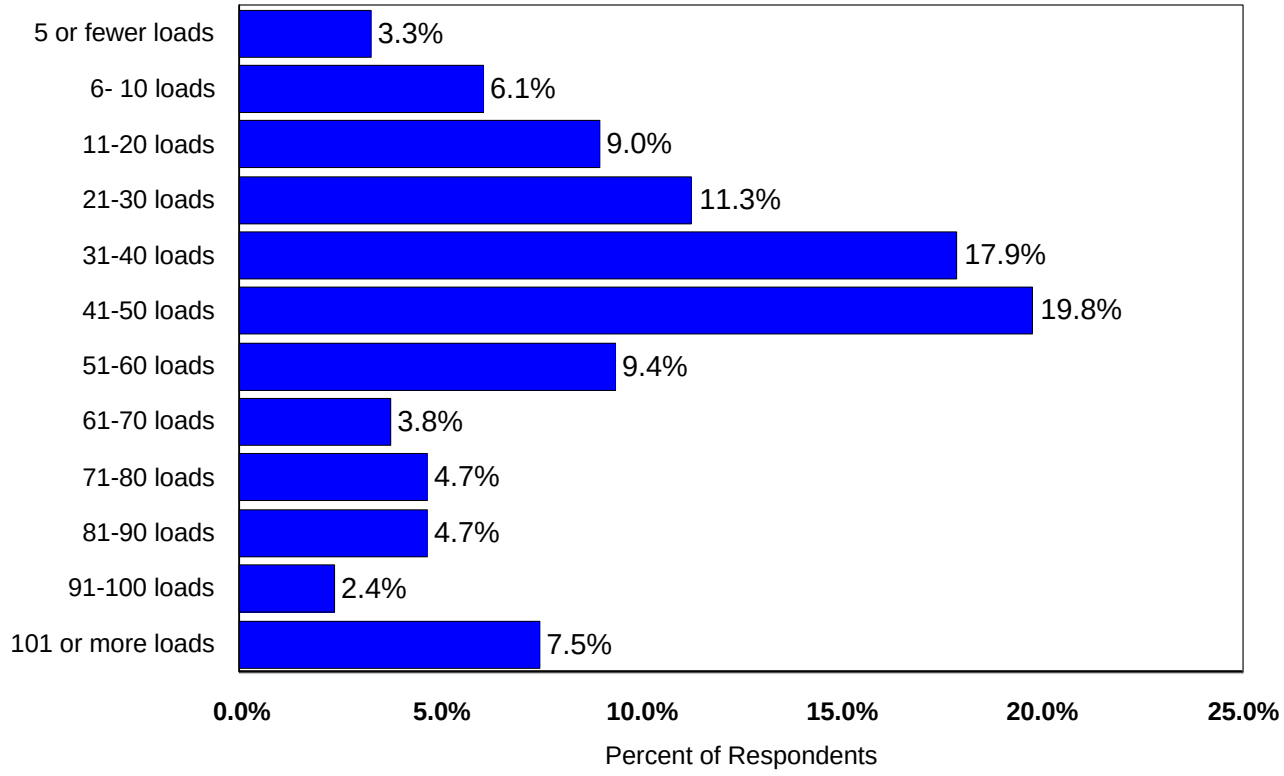

Figure 15. Loads per Typical Week Produced By Surveyed Respondents Crews (n = 216)

Respondents were asked to indicate best management practices (BMPs) used. The most commonly used best management practice was to pick up litter, in which 94.9 percent practice. Streamside management zones and removing logging debris from streams were the next best management practice, in which 90.7 percent of surveyed respondents claimed they practice. Results indicate that 89.4 percent of respondents use water bars/dips, 86.6 percent remove temporary stream crossings, 84.3 percent minimize the number of skid trails, 83.3 percent keep their equipment out of stream bottoms, and 81.5 percent use roadside ditches. Results also found 81 percent of respondents use portable mats and practice spreading slash back into the forest. Wing ditches were used by 76.4 percent of respondents and 72.2 percent conducted a landowner

conference before harvest as well as running trails at an angle instead of straight up and down the hills (Figure 16).

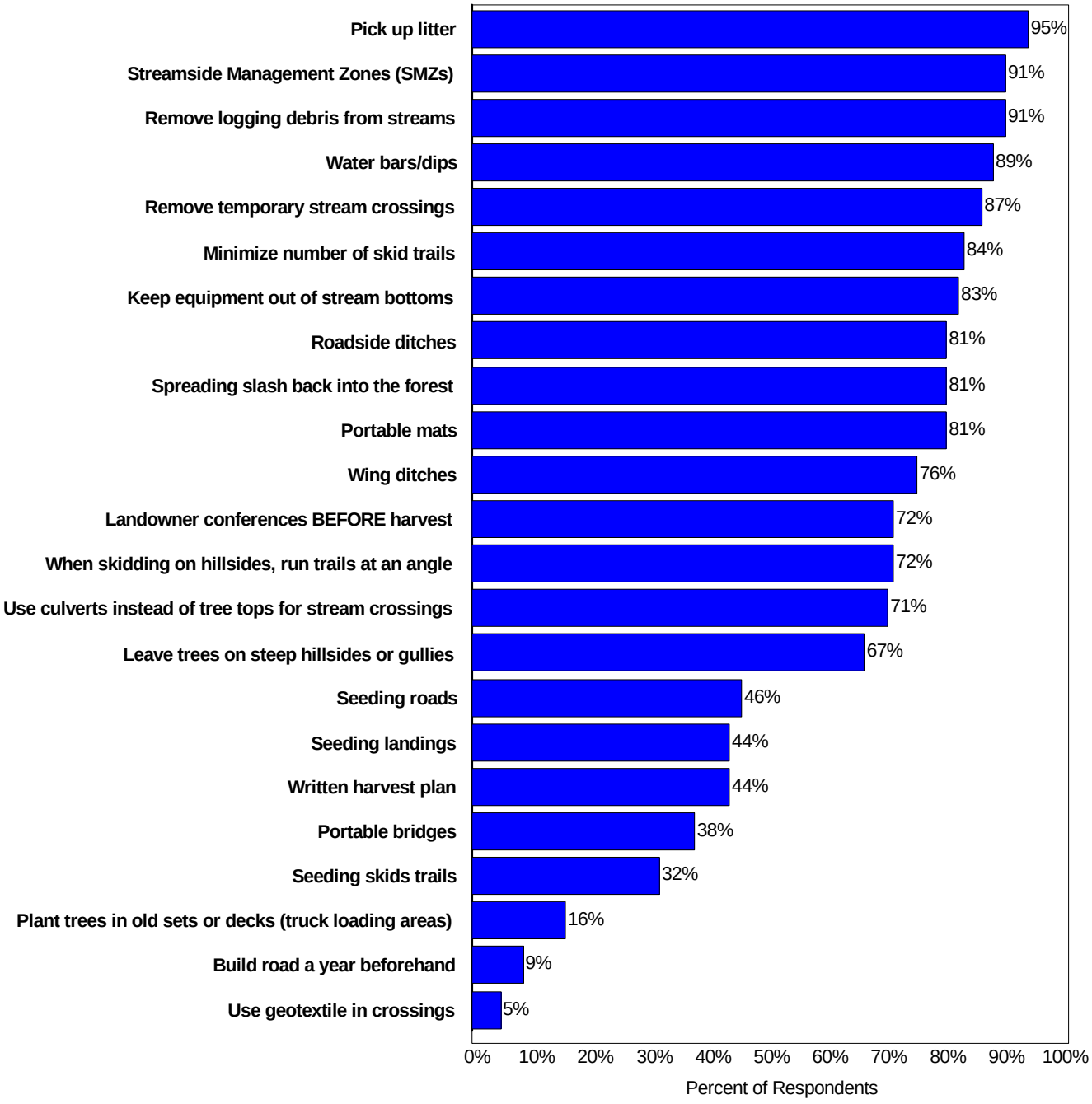

Figure 16. Best Management Practices Adopted On Respondent Operations (n=216) Multiple Responses Possible)

Fifty-eight percent of respondents live in a rural area, which was defined as a population with less than 2,500 residents. Results also indicate that 25 percent of respondents live in a very small city, town, or village with 2,500 to 9,999 residents; 12.7 percent live in a small city with 10,000 to 50,000 residents; 2.4 percent live in a medium-sized city with 50,000 to 250,000 residents, and 1.4 percent live in a large city with 250,000 to 999,999 residents. A small percent of respondents, 0.5 percent, were not sure of the size of their city, and none of the respondents live in a very large city with one million residents or more (Figure 17).

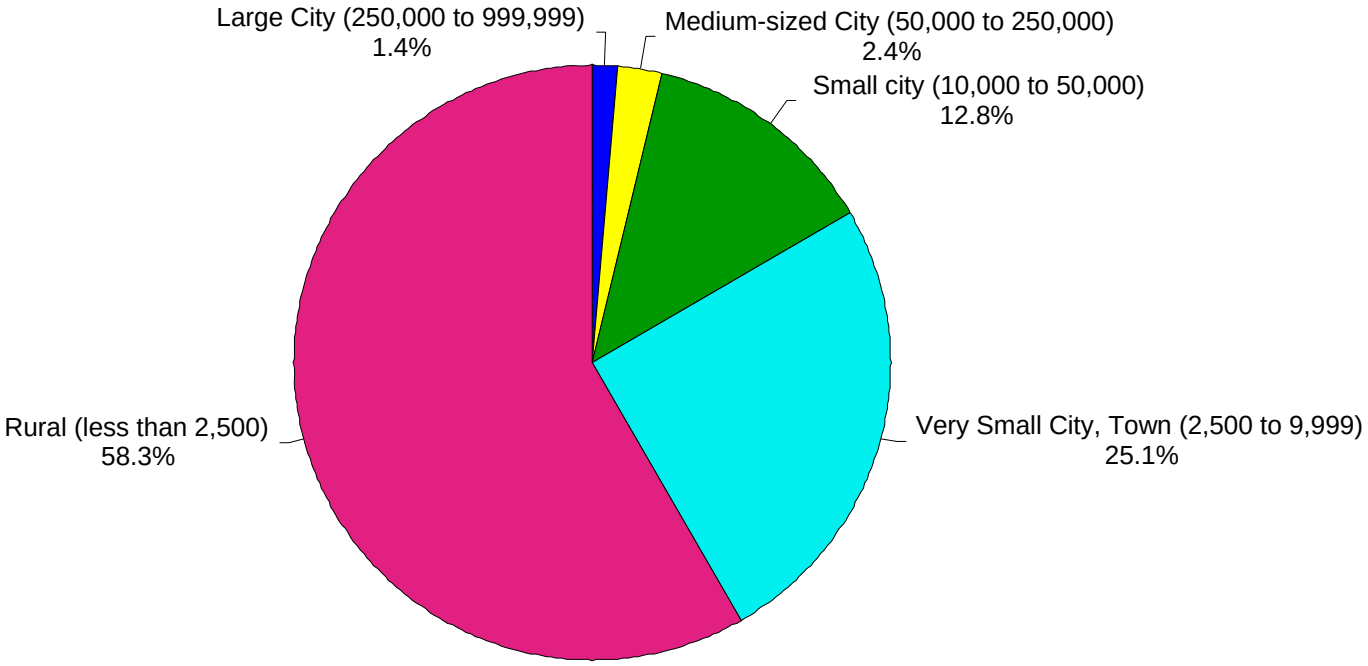

Figure 17. Residency of Respondents (n = 216)

The literature indicates that age, education, income, participation in local organizations, and other social-psychological factors are related to adoption of conservation technologies and conservation programs. Thus, it is expected that highly educated producers with higher incomes, that participate in local organizations are more willing to participate in ESPs. One of the objectives of the study was to describe social-psychological factors that are relate to adoption of

conservation technologies and conservation programs in Louisiana on selected demographic characteristics and perceptional measures. Below are the results of respondent characteristics that contributed to analyses.

One of the social-psychological characteristics examined was gender; 91.2 percent indicated that they were male and 8.8 percent indicated they were female. There were 28 respondents who did not choose to answer this question.

Respondent age was another demographic characteristic included. Age data were summarized in categories with the largest group of respondents reported ages in the 36-45 category (34.8 percent of respondents) (Figure 18).

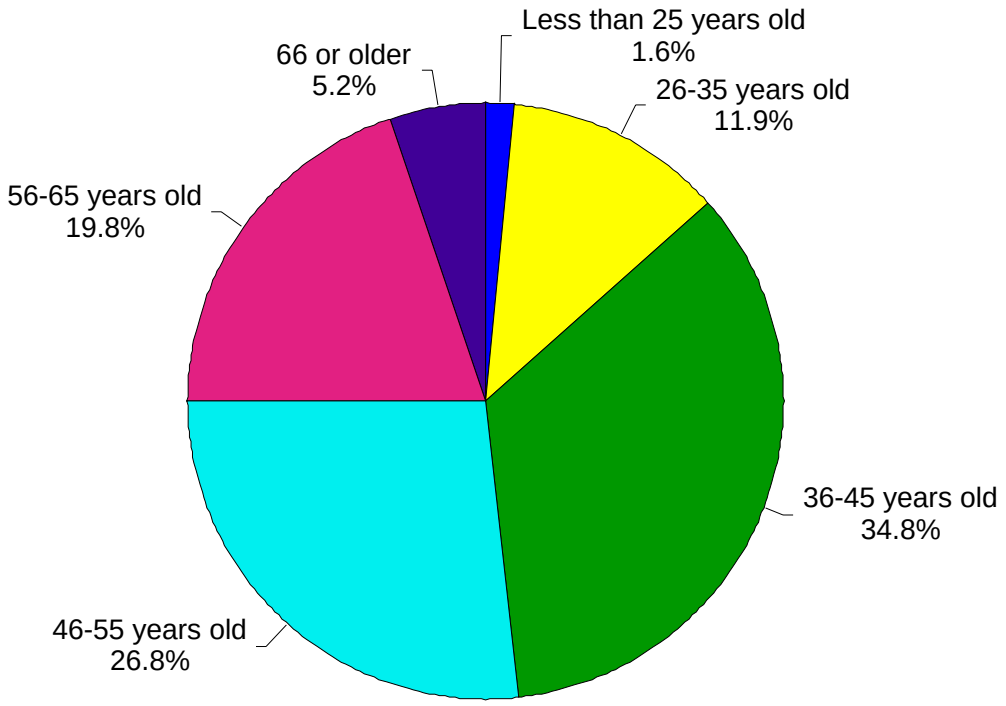

Figure 18. Age of Respondents (n = 216)

More than half of respondents (55.4 percent) have a high school diploma or equivalent. None of the respondents had a graduate degree (Figure 19).

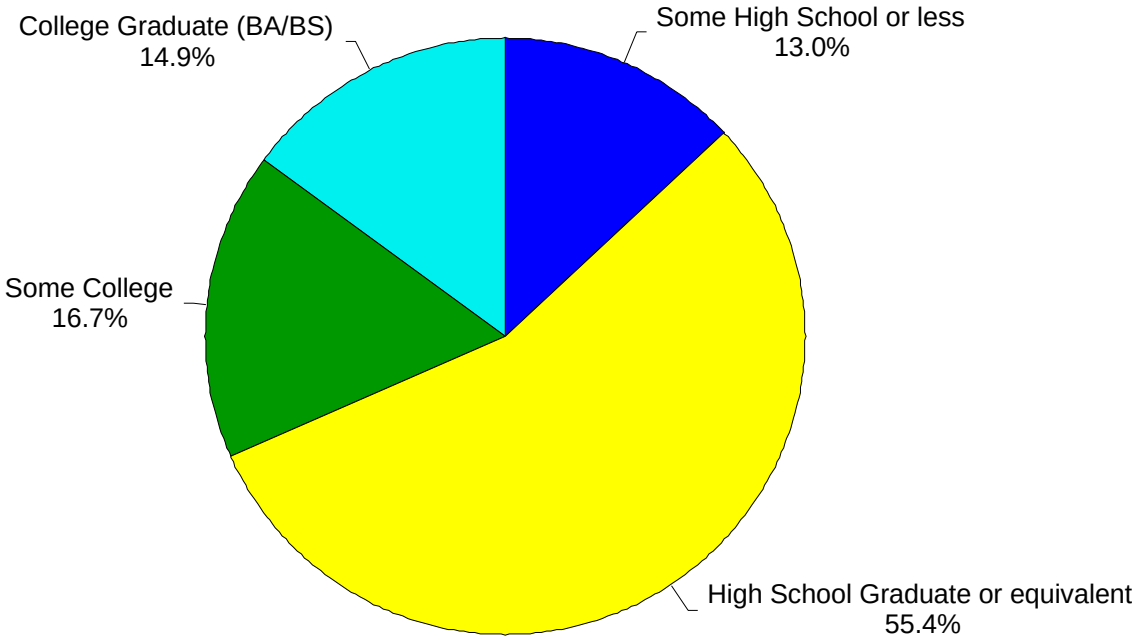

Figure 19. Education Level of Respondents (n = 216)

5.2.3. Hypothesis Testing

5.2.3.1. Test of Hypothesis 1

H_1: There is a positive relationship between social-psychological attributes and participation in ESP's.

A social-psychological characteristic that described study participants was the importance of relationships in local organizations. They were asked to answer the question, "With respect to your farming operation, on a scale of 1 to 5, please rate the importance of each of the following relationships to you as a farmer." Regarding "Farmer Relationships" respondents were asked to respond to ten items. Responses were entered on a Likert-type scale of 1 to 5 with 1 = Not Important at All, 3 = Neither Unimportant Nor Important, 5 = Very Important.

Mean responses to all of the items were classified using the researcher established interpretive scale as "Important" with values ranging from 3.46 to 4.78 (Table 19). The item with

which the respondents had the highest level of importance was "Forest Landowners (mean = 4.67 D= .900).

Table 19. Relationship between Logger Relationships and Participation in the Master Logger Program

Organization	n	Mean	Interpretation	SD
Forest Landowners	211	4.78	Very Important	0.546
Forest Products Industry	210	4.72	Very Important	0.611
Lending Institutions	210	4.63	Very Important	0.780
Local Communities	211	4.39	Very Important	0.873
Other Louisiana Loggers	212	4.33	Very Important	0.834
Regulatory Agencies	211	4.26	Very Important	0.926
Non-Logger Neighbors	208	4.04	Important	1.065
State/Private Foresters	209	4.00	Important	1.116
Consultants	210	3.63	Important	1.239
State Legislators	206	3.59	Important	1.156
Extension Service County Agents	208	3.56	Important	1.194
Congressional Delegations	210	3.46	Important	1.331

Note. Response based on Likert-type scale with values: 1 – 1.79 = Not Important At All, 1.80 – 2.59 = Not Important, 2.60 – 3.39 = Neither Unimportant Nor Important, 3.40 – 4.19 = Important, 4.20 – 5.0 = Very Important

- **Factor Analysis**

To further examine the "Logger Relationships" sub-scale, an exploratory factor analysis was conducted with the ten items to determine if underlying constructs existed in the sub-scale. The method used was the principal components analysis with a varimax rotation. Prior to interpreting the factor analysis, the researcher first examined the anti-image correlation matrix to determine the appropriateness of applying the factor analysis procedure to the data set. This was accomplished by examination of the measure of sampling adequacy (MSA) for each of the individual items in the scale. According to Hair et al. (1998) if the MSA's are above .50, factor analysis is an appropriate procedure for use with the data. When the MSA's were examined for the items in the Logger Relationships scale, the values ranged from .865 to .952 indicating that the factor analysis was appropriate for use with this scale.

The first step in conducting the factor analysis was to determine the appropriate number of factors to be extracted. A combination of the latent root criterion and the screen plot criterion

was used to make this decision. When the items in this sub-scale were analyzed, one factor was extracted with an eigenvalue of 2.50. This factor accounted for 50 percent of the variance in the sub-scale. In addition, all the factor loadings for all of the items were acceptable with values ranging from .627 to .796 (Table 20).

Validity refers to the extent the measures correctly represent the concept or construct intended and how well the construct is defined by the measures (Hair et al. 1998). The factor solution demonstrated good convergent validity, where items measure their intended constructs and no other, by having the items load strongly (≥.60) on one factor. With respect to discriminant validity, which refers to does a construct differ from other constructs, the items loaded high on their corresponding factor construct than on their cross-loadings.

Table 20. Factor loadings for the one factor solution of the Logger Relationships

Relationship	Factor 1[a] loadings
Forest landowners	0.796
Local communities	0.792
Other Louisiana loggers	0.790
Regulatory agencies	0.779
Forest Products industry	0.777
Extension Service (county agents)	0.741
Lending institutions (banks)	0.737
Neighbors who are non-loggers	0.720
State/Private foresters	0.715
Consultants	0.653
State legislators	0.628
Congressional delegations	0.627

a Eigenvalue = 2.50, Percent of Variance Explained = 50.0

Based on the results of the factor analysis, the items in the "Logger Relationships" sub-scale were combined into a single score defined as the mean of the ten sub-scale items. The "Logger Relationships" reliability score for the study participants was .92. According to the interpretive scale established by the researcher, this overall "Logger Relationships" score was classified in the "Very Important" category.

Reliability refers to a measure's ability to yield consistent values if multiple measurements are taken over time (Hair et al. 1998). Cronbach's α is a measure of reliability that ranges from 0 to 1, with value of .60 generally deemed the lower limit of acceptability (Hair et al. 1998). All the internal consistency (Cronbach's α) measures (Table 21) are above the recommended level of .60 for the identified factors and hence were satisfactory. Accordingly, high (≥.60) Cronbach's alphas indicate that the measures are reliable and would yield consistent values in multiple measurements.

Table 21. Logger Relationship scale reliability analysis (Cronbach's alpha)

	Relationships
Cronbach's alpha	0.9202
n	216
Number of Variables	11
Scale min/max	3.4/4.7
Scale mean	3.9969
Scale standard deviation	0.2303

- **Correlation Analysis**

A correlation is a measure of linear relationship between variables. A correlation coefficient of zero indicates no linear relationship exists. Pearson's correlation coefficients measure the strength of association between two variables measured at an interval or ratio level. Pearson's correlation requires parametric data because it is based upon the average deviation from the mean (Field 2000). When data is not measured at interval or ratio level and hence do not follow normal frequency distribution, they are said to be non-parametric and Pearson's correlation is not appropriate (Field 2000). Therefore, the Spearman correlation coefficients were used to measure the association between "Louisiana Master Logger Program Participation" and two variables measured on an ordinal level "age" and "education." Both "age" and "education" categories can be ordered in a meaningful way hence justifying the Spearman correlation coefficients as seen in Table 22.

Table 22. Relationship between Social-Psychological Characteristics and Participation in the Master Logger Program

Social-Psychological Characteristic	r	p	n
Caucasian or Not Caucasian	0.179**	.009	216
Education$_b$	0.178**	.010	212
Age$_b$	-0.109*	.012	212
Native American or Not Native American$_a$	-0.099	.149	216
Logger Relationship Score$_a$	-0.050	.469	212
Married or Not Married$_a$	0.042	.540	216
African American or Not African American$_a$	-0.031	.456	216
Divorced or Not Divorced$_a$	-0.026	.702	216
Never Married or Not Never Married$_a$	-0.020	.769	216
Widow or Not Widow$_a$	-0.020	.769	216

$_a$*Pearson's Product Moment Correlation
$_b$*Spearman's Rank Order Correlation Coefficient

Findings for hypothesis one showed two significant positive correlations between Caucasian and education as an indicator of participation in the Master Logger Program, Caucasian r = .179 and education r = .178 indicating that respondents of Caucasian ethnicity and with higher levels of education tended to participate in ESPs. Findings also showed a significant negative correlation between age and participation r = -.109 indicating that respondents of higher age levels have a lower tendency to participate in ESPs. This hypothesis was partially supported by the data.

5.2.3.2. Test of Hypothesis 2

H_1: There is a positive relationship between structural variables and participation in ESP's.

Respondents were asked to indicate the type of management structure that they have, as well as their harvesting procedures in 2005. The respondent was also asked to list if he or she is comfortable implementing new management techniques. Results indicate that:

- 92.6 percent of respondents are willing to implement new BMPs, whereas 7.4 percent are not.
- 53.6 percent of respondents claim they avoid taking logging related investment risks.

- 24.6 percent of respondents neither seek nor avoid taking logging related investment risks, while 21.8 percent take substantial levels of logging related investment risks.

An important variable that was included in the analyses were the number of loads per week loggers hauled to the mill. This is a good indication of the size of the loggers operation and is also considered a structural variable in the model. Table 23 presents the number of loads per week produced by respondents.

Table 23. Relationship between Loads per Week Produced and Participation in the Master Logger Program

Loads per week produced	r	p	n
41-50 load per week	0 .142*	0.038	216
10-20 load per week	0.103	0.132	216
31-40 loads per week	-0.055	0.423	216
21-30 loads per week	-0.042	0.540	216
51-60 loads per week	-0.038	0.579	216
111 or more loads per week	-0.031	0.648	216
6-10 loads per week	-0.030	0.661	216
71-80 loads per week	-0.026	0.702	216
81-90 loads per week	-0.026	0.702	216
61-70 loads per week	-0.023	0.734	216
5 or less loads per week	-0.022	0.751	216
91-100 load per week	-0.018	0.789	216
101-110 load per week	-0.011	0.867	216

Another important variable that was included in the analyses were the number of sorts made by the logging crews. This is also good indication of the size of the loggers operation, the diversity of the logging operation, and is also considered a structural variable in the model. Table 24 presents the number of loads per week produced by respondents.

Table 24. Relationship between Sorts Made by Crews and Participation in the Master Logger Program

Sorts made	r	p	N
3 or less products sorts made by crew	0.063	.360	216
6-7 product sorts made by crew	-0.041	.549	216
4-5 product sorts made by crew	-0.027	.698	216
8-10 product sorts made by crew	-0.011	.867	216
More than 10 product sorts made by crew	-0.008	.906	216

Test of Hypothesis 2 resulted one significant positive correlation between loggers who produced forty one to fifty loads per week , r = .142 as an indicator of participation in the Master Logger Program, indicating that respondents who produced larger loads per week tended to participate in ESPs. Findings also showed a significant negative correlation between loggers conducting clear-cut harvesting practices, r = -.156 indicating that respondents using this practice have a lower tendency to participate in ESPs. This hypothesis was partially supported by the data.

Table 25. Relationship between Structural Characteristics and Participation in the Master Logger Program

Structural Characteristic	r	p	N
Conduct clear-cut harvest	-.0156*	.022	216
Willingness for respondents to implement BMPs	.0121	.085	202
Conduct thinning harvest	-.0101	.138	216
Mill owns timber to cut	0.080	.244	216
Species of wood hauled by crew	-0.071	.299	216
Deliver through wood supplier/dealer	-0.071	.297	216
Logging related investment risks	0.049	.483	211
Use plantation thinning	0.047	.489	216
Number of crews operated	-0.042	.544	216
Producer buys timber to cut	-0.017	.806	216
Chips produced by crew	-0.016	.812	216
Roundwood produced by crew	0.014	.837	216
Wood dealer/supplier buys timber to cut	-0.009	.894	216
Mill buys timber to cut	0.007	.917	216

*Correlation is significant at the 0.05 level (2-tailed).
**Correlation is significant at the 0.01 level (2-tailed).

5.2.5.3. Test of Hypothesis 3

H_3: There is a positive relationship between respondents' environmental stewardship attitudes and participation in ESPs.

Table 26 presents a summary of the distribution of the Louisiana logger respondent responses to the NEP statements. Agreement with statements 1, 3, 4, 6, and 8 and disagreement with statements 2, 5, 7, and 9 imply a pro-environmental view. Using a scale of 1 to 5, with 1=strongly disagree to 5=strongly agree, a summated score was calculated for each respondent.

Further analysis of the data reveals more about the range of ecological attitudes of the respondents. The frequency distribution showed that more than thirty-nine percent of respondents indicated a pro-ecological view toward statements 2, 3, 6, 8 and 9. More than 70 percent of respondents believed that humans are still subject to the laws of nature despite our special abilities (statement 8). Statements 1, 4 and 5 found more than 34 percent of respondents to have an anti-ecological view. To be more specific, 41 percent of respondents thought that we are NOT approaching the limit of the number of people the earth can support; 34 percent thought that humans are NOT severely abusing the environment; and 78 percent of respondents believed that the earth has plenty of natural resources if we just learn how to develop them.

Statement 7 received higher proportions of "somewhat agree" responses. Thirty-nine percent of respondents were unsure about the belief that the balance of nature is strong enough to cope with the impacts of modern industrial nations.

Table 26. Frequency Distributions Associated with NEP Statements, Louisiana Forestry Respondents

No	NEP Statements	Percentage of Responses				
		SD	MD	S	MA	SA
1	We are approaching the limit of the number of people the earth can support	20.2	21.6	35.2	8.5	4.6
2	Humans have the right to change the natural environment to suit their needs	26.0	22.8	34.9	8.8	7.4
3	When humans interfere with nature it often produces disastrous consequences	10.7	15.0	31.3	14.5	28.5
4	Humans are severely abusing the environment	14.0	20.9	33.0	15.8	16.3
5	The earth has plenty of natural resources if we just learn how to develop them	.9	3.7	16.7	31.9	46.8
6	Plants and animals	10.7	15.3	31.6	11.6	30.7

(table continued)

	have as much right as humans to exist					
7	The balance of nature is strong enough to cope with the impacts of modern industrial nations	16.3	23.3	40.0	14.0	6.5
8	Despite our special abilities, humans are still subject to the laws of nature	1.4	3.3	25.1	27.9	42.3
9	The so-called "ecological crisis" facing humankind has been greatly exaggerated	8.5	16.0	34.7	23.0	17.8

Table 27 presents the findings for Hypothesis 3. Results indicated no significant correlations between environmental attitudes as an indicator of participation in the Master Logger Program. This hypothesis was not supported by the data.

Table 27. Relationship between (NEP) Environmental Attitudes and Participation in the Master Logger Program

NEP Statement	R	p	n
Despite our special abilities, humans are still subject to the laws of nature	0.075	.274	215
Humans are severely abusing the environment	-0.070	.304	215
The so-called "ecological crisis" facing humankind has been greatly exaggerated	-0.066	.335	213
Plants and animals have as much right as humans to exist	0.057	.407	215
The balance of nature is strong enough to cope with the impacts of modern industrial nations	0.049	.474	215
The earth has plenty of natural resources if we just learn how to develop them	-0.034	.617	216
Humans have the right to change the natural environment to suit their needs	0.030	.660	215
When humans interfere with nature it often produces disastrous consequences	0.008	.912	214
We are approaching the limit of the number of people the earth can support	0.000	.996	213

- **Factor Analysis**

Principal component factor analysis with varimax rotation was conducted to identify the underlying dimensions of attitudes that respondents have toward the environment for data reduction and for input for binary logistic regression analysis. "By reducing a data set from a group of interrelated variables into a smaller set of uncorrelated factors, factor analysis achieves parsimony by explaining the maximum amount of common variance in a correlation matrix using the smallest number of exploratory concepts" (Field 2000).

The principal component factor analysis identified strong intercorrelations among the attitudinal variables and identified two unique dimensions that could be used to describe respondents' environmental attitudes. The latent root criterion was used in extracting the factors. The result from the latent root criterion was confirmed by investigating the scree-plot, which confirmed the appropriateness of the two factor solution.

The two factors explain 47 percent of the nine variables (Table 28). Orthogonal varimax rotation was used to disperse the factor loadings within the factors to achieve a more interpretable solution (Field 2000). Additionally, the Cronbach's alphas (.6211) indicated that the measures are reliable and would yield consistent values in multiple measurements.

Table 28. Factor Analysis of Environmental Attitude Variables

Extraction Sum of Squared Loadings				Rotation Sum of Squared Loadings		
Factor	Eigenvalue	% of Variance	Cumulative %	Total	% of Variance	Cumulative %
1	**2.891**	**32.120**	**32.120**	**2.242**	**24.911**	**24.911**
2	**1.362**	**15.130**	**47.249**	**2.010**	**22.339**	**47.249**
Extraction Method: Principal Component Analysis (n = 210)						

5.2.3.4. Test of Hypothesis 4

This section relates to the participation in government funded conservation programs and voluntary watershed conservation programs including the Master Logger Program. Results indicate that 95.8 percent of respondents are aware of the Clean Water Act's nonpoint pollution

source components, while the remaining 4.2 percent are unaware of the issue. Results also indicate that 87.7 percent of respondents changed their operation because of the Clean Water Act. Over five percent of respondents did not change their operation because of the Clean Water Act, while the remaining 7.1 percent of respondents said the Act was not applicable to their logging operations.

Less than half of respondents, 48.1 percent, are very supportive of implementing best management practices (BMPs) on the land they log, while 38.3 percent are somewhat supportive of implementing BMPs on the land they log (Figure 20).

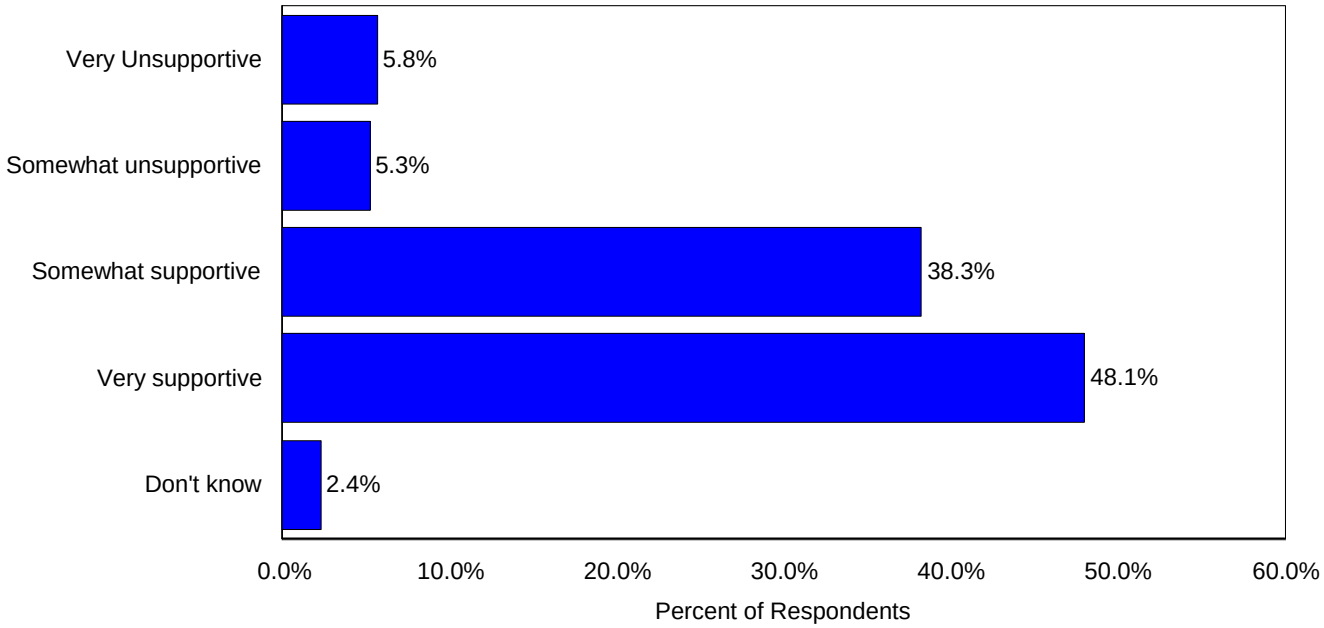

Figure 20. Landowner Support of Implementing Best Management Practices On Land Respondents Log (n = 206)

Government support and cost-share funding availability questions were asked in the questionnaire. This is an important variable that can help determine if government support is perceived as an incentive or barrier to loggers. The majority of respondents, 64.8 percent, believe that government support and cost share funding for BMPs is severely under-funded (Figure 21)

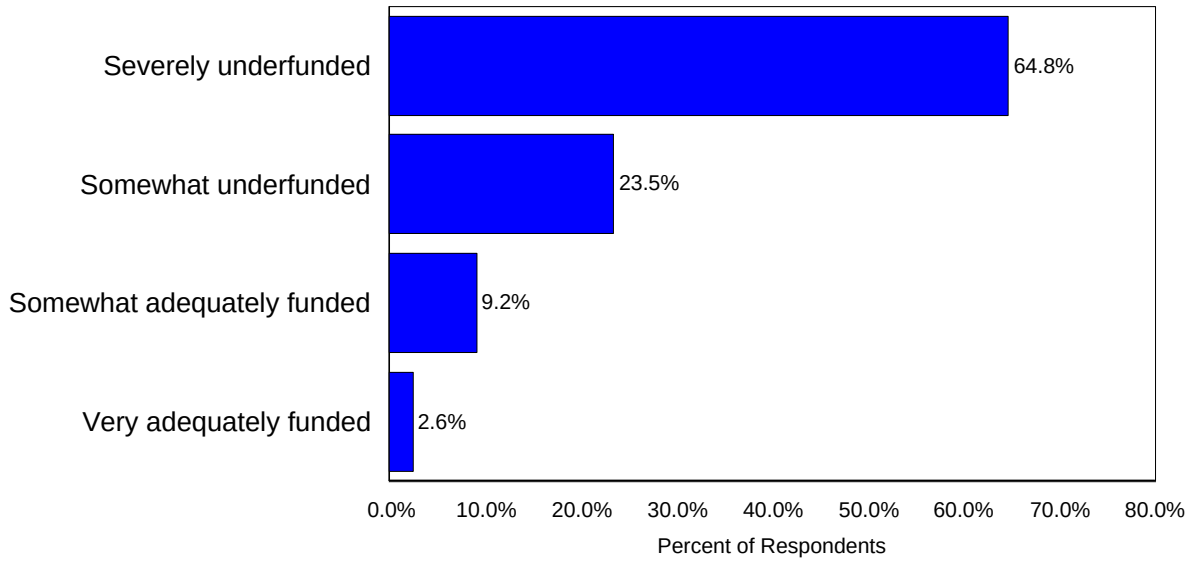

Figure 21. Level of Government Support/Cost Share Funding for Best Management Practices (n = 196)

Table 29 indicates the relationship between institutional incentives and institutional variables that influence participation in the Louisiana Master Logger Program. Findings showed two significant negative correlations between respondents relationship with lending institutions, r= -.148, and relationship with regulatory agencies, r = -.163 indicating that respondents with negative relationships toward these organizations have a lower tendency to participate in ESPs, thus viewed upon as institutional barriers. This hypothesis was partially supported by the data.

Table 29. Relationship between Institutional Incentives and Barriers and Participation in the Master Logger Program

Institutional Incentive/Barrier	r	p	n
Relationship with lending institutions	-0.148*	0.033	207
Relationship with regulatory agencies	-0.163*	0.018	211
Relationship with local communities	-0.054	0.439	211
Availability of government cost-sharing when deciding whether to use a new conservation practice to help protect water quality	0.050	0.477	201
Landowner support for implementing BMPs	0.044	0.534	206
Modified management because of CWA	-0.042	0.538	212
Relationships with state or private foresters	0.036	0.609	209
Relationship with consultants	-0.029	0.674	210
Relationship with state legislators	-0.027	0.702	206
Level of government support/cost share funding for BMPs	-0.026	0.714	196

(table continued)

Relationship with forest landowners	-0.025	0.721	208
Aware of efforts to control non-point sources of water pollution through the CWA	-0.025	0.717	215
Relationship with Extension Service county agents	-0.023	0.744	208
Relationship with congressional delegations	0.019	0.784	210
Relationship with the forest products industry	-0.011	0.871	210
Relationship with neighbors who are non-loggers	-0.005	0.944	208
Relationship with other Louisiana loggers	0.000	0.995	212

*Pearson's Correlation

5.2.4. Binary Logistic Regression

The final analysis was to determine if a model exists explaining a significant portion of the variance in the social-psychological, structural, environmental attitudes, and institutional incentives and barriers that influence participation in water quality ESPs. To test the model, the variables were entered into a binary logistic model, due to the dichotomous nature of the dependent variable. The dependent variable was coded as "1" for participation and "0" for non-participation in the Louisiana Master Logger Program. Additionally, selected variables were entered in the analysis in an exploratory manner to determine if those factors added to the explained variance in the variables. In conducting the regression analysis, the variables were entered into the analysis in a hierarchical manner to accomplish the research objective. Social-psychological variables were entered in the first block to control for the effects of this variable on factors that influence participation. The structural variables were entered as the second block. These variables included both categorical and scale level variables that indicated the structure of the operation. The third block consisted of two factors indicating respondents' environmental attitudes on a likert scale. The final block consisted of institutional barriers and incentives that respondents indicated in participation in ESPs.

When the variable, whether or not the respondent participated in ESPs was examined using binary logistic regression analysis, a total of twenty-two variables was entered into the explanatory model with an overall R^2 value of .178 (Nagelkerke R^2 = .178). This model resulted

in a -2 Log likelihood value of 25.598, which is a significant reduction (χ^2= 5.116, p = .024) from the initial -2 Log likelihood value of 30.714. This indicates that there was no significant difference between the predicted model and the observed model. Hair et. al. (1998) suggest that a non-significant, Hosmer and Lemeshow test result is indicative of a good model fit.

When the explanatory model was examined, the findings indicated that the control factor, participation in the Master Logger Program was a significant contributor to the model (Wald = 49.880, p = .000). Additionally, when the social-psychological variables were entered into the model, specifically if the respondent had some high school education, it was found to be a significant contributor to the model (Wald = 5.006, p = .025). This was the only variable found to have increase the likelihood of participating in the Louisiana Master Logger Program.

The classification results were examined for the identified regression model to determine the effectiveness of the model in correctly classifying subjects as to whether or not a respondent participated in the Louisiana Master Logger Program. Overall, 98.4% of the respondents included in the analysis were correctly classified using the identified statistically significant model. The classification results are presented in Table 5.25.

Table 30. Binary Logistic Regression Analysis of Respondent Willingness to Participate in the Louisiana Master Logger Program Relative to Social-Psychological, Structural, Environmental Attitudes and Institutional Barriers and Incentives

Observed	Not Participating	Predicted Participating	Total
Not Participating	0	3	3 (.0%)
Participating	0	183	183 (100%)

Note. Overall percentage of correctly classified cases = 98.4%

Potential interpretations of the outcomes from the initial logistic regression analysis on participation identified by the researcher include: The positive impact of having a high school education is a very logical outcome since respondents who are more educated are more inclined to want to learn new information and are able to participate in classroom style lectures over an extended period of time. The primary observation from the results is the high participation rate of

Louisiana loggers in the Louisiana Master Logger Program. This is due to the fact that the logging industry requires respondents to obtain the certification or they are unable to sell their products to the mills.

5.2.5. Open-ended Questions

Included in the survey were two open-ended questions for respondents to answer. The first question asked respondents to list factors that influenced their decision to enroll in the Master Logger Program, that weren't covered in the survey. A total of sixty three responses were received and about eighty-nine percent (n = 56) of the respondents indicated that they enrolled in the program because it was required by the industry in order to sell their products. Eleven percent (n = 7) indicated other factors, such as, the need to become more educated on environmental issues and best management practices and the desire to be environmental stewards of the land.

The second question asked respondents to provide additional comments they may have about the Master Logger Program and the adoption of BMPs. Many respondents listed the need to have cost-share programs for loggers to implement forestry best management practices. Many indicated that there is not enough support from the government to help pay for the costs of conservation and that they must pay for the implementation of best management practices themselves.

5.2.6 Revised Model

Figure 22 is a revised model indicating the factors influencing participation in the Louisiana Master Logger Program. Results indicate that social-psychological, structural and institutional barriers are the primary factors influencing participation. As a result of the coefficient correlations and binary regression analysis, the following variables influence participation in the Louisiana Master Logger Program: age, education, ethnicity, load size,

relationship with regulatory agencies and relationship with lending institutions are consistent with the literature cited in previous chapters.

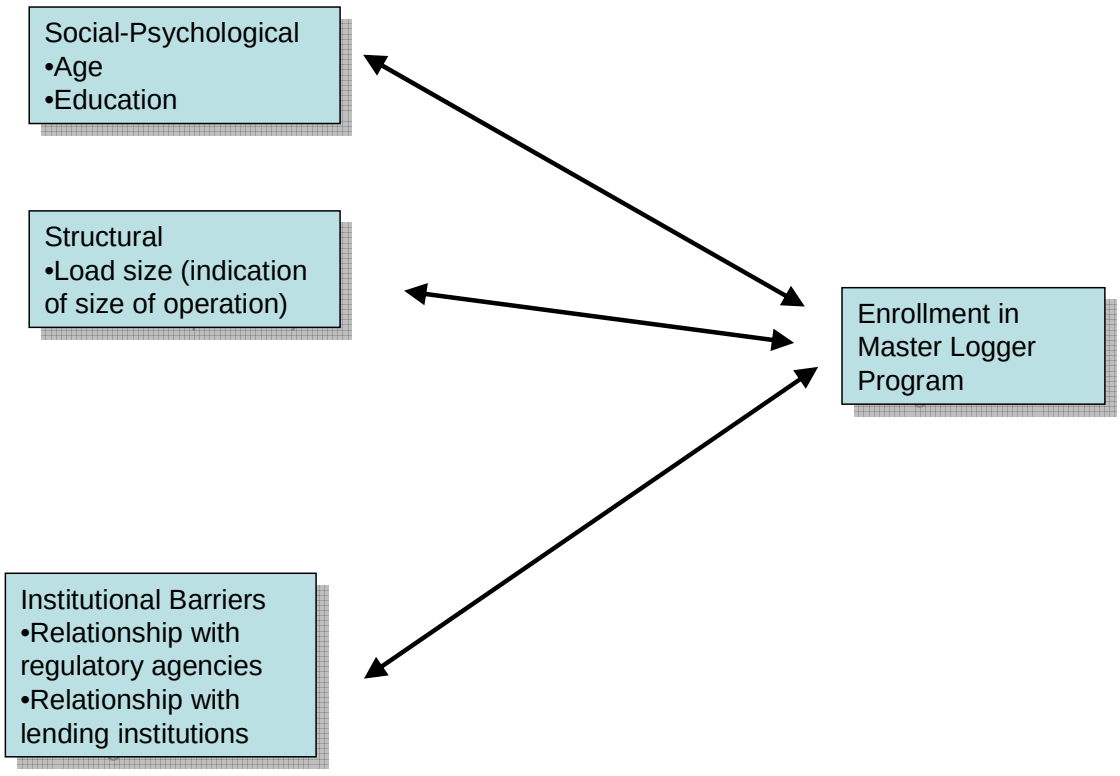

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Figure 22. Factors Influencing the Participation in the Louisiana Master Logger Program

5.3. Results Summary

5.3.1. Social-Psychological Construct

Conservation adoption researchers have subcategorized social-psychological variables. These subcategories include individual characteristics of the landowner and attitude variables. Characteristics of respondents include demographic variables such as: age, years of

farming/logging, education, off-farm/logging operation employment, and social participation (membership in organizations).

This study indicates that both farmer and logger respondents that are younger, more educated, and Caucasian have a higher propensity to participate in environmental stewardship programs (ESPs), specifically the Louisiana Master Farmer and Master Logger Programs, which, in turn, leads to a greater level of implementation of conservation practices. This conclusion is supported by earlier research which indicated that a positive association has been found between education and the use of conservation practices (Carlson et al. 1981; Ervin and Ervin, 1982; Pampel and van Es 1977).

The study also indicates that respondents with strong local organization relationships have a greater tendency to participate in ESPs. This conclusion is also supported by earlier research which indicated that social participation such as membership in local organizations has a positive relationship with the use of conservation practices (Abd-Ella et at. 1981; Clearfield, 1983; Korsching et al. 1981).

5.3.2. Structural Construct

Structural variables related to the adoption of conservation practices include: size of operation, net income/sales debt levels, tenure, and specialization/diversification. Structural characteristics for farmer respondents included types of crops or animals they produce, as well as production levels. Structural characteristics for forestry respondents include a measure of the amount of land they log, number of loads logged annually and size of operation measured by number of crews. Loggers that produced larger loads per week, which is an indicator of size, tended to participate in ESPs.

Land ownership characteristics are also an important factor which may impact the decision for respondents to adopt new practices. An assessment of family and non-family

members working on the operation may also be an indicator of labor available to implement new practices as well as size of the operation. Results indicate that respondents with higher income resulting from farming/logging, higher total acres , and a corporation legal structure tend to have higher participation in ESPs.

The study also indicates that respondents who spend more time in a job off-farm/logging operation and have a family owned operation have a lower tendency to participate in ESPs. This conclusion is supported by earlier research which indicated that off-farm/logging operation employment is negatively related to both the use of conservation practices (Ervin and Ervin 1982) and the decision to adopt conservation practices (Taylor and Miller 1978).

5.3.3. Stewardship Construct

The study indicates those respondents who have stronger agreement toward the New Environmental Paradigm scale items: “Humans are severely abusing the environment” and “Plants and animals have as much right as humans to exist” are less likely to participate in the Master Farmer and Logger Programs. Respondents with strong agreement toward the statement “We are approaching the limit of the number of people the earth can support” are less likely to participate in these programs.

5.3.4. Institutional Incentives/Barriers Construct

Results show that, overall, respondents that have had to modify their operations to meet Clean Water Act requirements have a lower tendency to participate in ESPs. This indicates that the Act is viewed as an institutional barrier by respondents. Results also indicate that respondents with negative relationships toward regulatory agencies and lending institutions have a lower tendency to participate in ESPs. Respondents have mixed attitudes toward government involvement in agriculture and forestry. This is supported by earlier studies that indicate that there is general lack of support for legally mandated water pollution controls.

CHAPTER 6. CONCLUSIONS, AND RECOMMENDATIONS

The primary purpose of this study was to develop and test a model that identified the factors that influence participation in environmental stewardship programs (ESPs). Populations used to test the model were Louisiana farmers and loggers. Specific objectives were to identify Louisiana farmer and logger characteristics that lead to participation in the Louisiana Master Farmer and Louisiana Master Logger Programs, respectively. An expanded adoption-diffusion model was used to explain the adoption of conservation practices.

Of all the variables affecting the participation in ESPs, institutional variables are among the most influential, yet they are the least defined, the most difficult to document, and the least researched. In the long run, however, institutional factors may have the greatest impact on adoption and use of conservation practices. More extensive identification of institutional influences on ESP participation should be conducted.

ESP-targeted populations should be viewed as being "segmented" rather than "mass" audiences, and targeted information and technical assistance should be provided to sub-groups based on their common needs, characteristics, stages in decision-making, etc. Knowledge of these characteristics including their needs, values, information sources, relationships with local organizations, environmental attitudes, perception toward government regulation, etc. can help to encourage ESP participation.

A noticeable difference between the agriculture and forestry respondents is the lack of information on cost-share programs. Many loggers indicated that they have limited access to financial assistance programs to implement conservation practices. Research on cost-share rates is limited, mostly in the form of site- and practice- specific case studies. Broad-based research

needs to be done in this area before any general statements can be made for the purpose of policy development.

Several characteristics of likely ESP adopters were identified in this research. For example, adopters are likely to be young, Caucasian, well-educated, full-time farmers/loggers with a high level of organizational participation. Results of open-ended questions indicate that loggers perceive their participation in the Master Logger Program as being mandatory (but not required by law), while farmers perceive their participation in the Master Farmer Program as voluntary for now, but many believe that it will eventually be required. This is a result of the fact that the Master Logger Program has industry support and endorsement, which requires loggers become certified in order to sell their products to mills in most cases, which is also likely to produce a high participation rate. Farmer respondent participation is in many cases preemptive.

The study suggests that there are unique factors that do and do not motivate Louisiana agricultural and forest sector ESPs adoption. For example, neither cost-share assistance nor a desire to adopt best management practices (BMPs) is primary motivators. This warrants additional focus on structural issues in agriculture and forestry ESP participation. Summarizing recommendations targeting Louisiana farmers and loggers:

1. The sectors should be viewed as a "segmented", rather than as "mass" audiences.
2. The sectors need "personalized" information and technical assistance that will help them increase awareness of local, state, regional, and national environmental quality concerns and requirements.
3. The sectors need information and technical assistance that will help them evaluate the economic impacts of ESPs on their operations.
4. The Louisiana Master Farmer and Master Logger Programs should clearly state objectives and disseminate information to targeted participants for all stages of adoption and implementation. This should include information on costs, benefits, as well as providing technical, educational, and financial assistance.

5. Industry support should be solicited at the early stages or program development and implementation and maintained throughout the process.

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APPENDIX I. MASTER FARMER SURVEY INSTRUMENT

Louisiana Farming Study

Section I. Your Farming Business

Completing this survey demonstrates your willingness to participate in this research study

My business is:

1. Farming (or ranching)
2. Not in the farming business

If you are NOT IN THE FARMING BUSINESS, this was mailed to you in error. Please stop here and return the survey in the postage-paid envelope so that we can remove you from our list.

2. Which best describes the legal structure of your farm. (Circle one)

1. Family or individual operation
2. Partnership (including family partners other than spouse or pre-adult children)
3. Incorporated under state law
4. Don't know

3. How many years have you been a farmer/farm manager? _____ Years

4. How long have you farmed in the state of Louisiana? _____ Years

5. What is your best estimate of your gross farm income in 2005? (Circle one)

1. Less Than $10,000	4. $30,000 to $39,999	7. $60,000 to $74,999
2. $10,000 to $19,999	5. $40,000 to $49,999	8. $75,000 to $99,999
3. $20,000 to $29,999	6. $50,000 to $59,999	9. Over $100,000

6. In which parish is your farm operation or the majority of your farm operations located?

_____ (name of parish)

7. Do you live on the farm? (Circle one)

1. Yes
2. No

8. Which product or commodity would you say produced the most gross sales on your operation in 2005? (Please circle all that apply)

1. Cotton	4. Wheat	7. Milo	10. Poultry	13. Other _____
2. Corn	5. Sugarcane	8. Swine	11. Dairy	
3. Rice	6. Soybeans	9. Beef Cattle	12. Crawfish	

9. About what percent of your total sales came from non-farm activities in 2005? _____ Percent

10. In 2005, how many days did you work at least four hours per day in a job away from your production operation? (Circle one)

    1. None
    2. Fewer than 100 days
    3. 100 to 199 days
    4. 200 days or more

11. How many total acres were in your operation in 2005, including all owned and rented land? Also include all locations and land uses (cropland, pasture and idle).

    _____ acres

12. Flexibility is the ability to be open to change and supportive of continuous improvements. How do you consider the level of flexibility of your farming operation? (Circle one)

    1. Very inflexible
    2. Somewhat inflexible
    3. Somewhat flexible
    4. Very flexible
    5. I don't know

13. Relative to farm related investment risks you are willing to assume, how would you characterize yourself? (Circle one)

    1. I tend to take on substantial levels or risk in my investment decisions.
    2. I neither seek nor avoid risk in my investment decisions.
    3. I tend to avoid risk when possible in my investment decisions.

14. With respect to your farming operation, on a scale of 1 to 5, please rate the importance of each of the following relationships to you as a farmer (Please circle one response for each)

My Relationships With ……..

	Not Important At All		**Neither Unimportant Nor Important**		**Very Important**
congressional delegations	1	2	3	4	5
local communities	1	2	3	4	5
farmland owners	1	2	3	4	5
lending institutions (i.e., banks)	1	2	3	4	5
the farming industry	1	2	3	4	5
neighbors who are non-farmers	1	2	3	4	5
other Louisiana farmers	1	2	3	4	5
regulatory agencies	1	2	3	4	5
Extension Service county agents	1	2	3	4	5
state legislators	1	2	3	4	5

Section II. Environmental Issues

1. Are you aware of efforts to control non-point sources of water pollution (runoff) through the congressionally approved Clean Water Act? (Circle one)

1. Yes 2. No

2. Have you modified the management of your operation as a result of this federal act? (Circle one)

1. Yes
2. No
3. Not Applicable

3. How would you rate the quality of surface water in your area? (Circle one)

1. Very poor
2. Somewhat poor
3. Average
4. Good
5. Very good

4. In your opinion, what is the water quality in the area you farm relative to what it was 20 years ago?

1. Much Worse
2. Somewhat Worse
3. No Difference
4. Somewhat better
5. Much Better

5. Farmers can do many things to protect water quality. How much information about protecting water quality have you received from the following:

	None at All	Some	A Lot
Newspapers	1	2	3
Farm magazines	1	2	3
Television	1	2	3
Radio	1	2	3
Internet	1	2	3
Master Farmer workshops	1	2	3
Other meetings or workshops	1	2	3
Other farmers	1	2	3
The Extension Service (county agents)	1	2	3
USDA – Natural Resources Conservation Service	1	2	3
Consultants	1	2	3
Pesticide or fertilizer dealers	1	2	3

6. The following are statements that deal with the relationship between humans and the environment. On a scale from 1 to 5 (1-strongly disagree, 5-strongly agree), please rate your level of agreement with the following statements. (Please circle your response)

	Strongly Disagree		Somewhat Agree		Strongly Agree
We are approaching the limit of the number of people the earth can support	1	2	3	4	5
Humans have the right to change the natural environment to suit their needs	1	2	3	4	5
When humans interfere with nature it often produces disastrous consequences	1	2	3	4	5
Humans are severely abusing the environment	1	2	3	4	5
The earth has plenty of natural resources if we just learn how to develop them	1	2	3	4	5
Plants and animals have as much right as humans to exist	1	2	3	4	5
The balance of nature is strong enough to cope with the impacts of modern industrial nations	1	2	3	4	5
Despite our special abilities, humans are still subject to the laws of nature	1	2	3	4	5
The so-called "ecological crisis" facing humankind has been greatly exaggerated	1	2	3	4	5

7. For the statements below, please indicate your level of agreement or disagreement on a scale of 1 to 5 (1-strongly disagree, 5- strongly agree) regarding your commitment to environmental improvement or stewardship. (Please circle your response)

I am committed to environmental improvement or stewardship because of:

	Strongly Disagree		Somewhat Agree		Strongly Agree
Increased regulation	1	2	3	4	5
Public pressures	1	2	3	4	5
Pressure from environmental groups	1	2	3	4	5
Customer demands for "green" products	1	2	3	4	5
Possible cost savings	1	2	3	4	5
To sustain a competitive advantage in the marketplace	1	2	3	4	5
To conserve topsoil and soil productivity	1	2	3	4	5

Other _____

Section III. Conservation/Best Management Practice Adoption

1. Have you ever heard about best management practices (BMPs) to address water quality? (Circle one)

   1. Yes 2. No

2. Have you implemented best management practices on your operations?

   1. Yes→ If yes, please continue with Question #3 below
   2. No→ If not, please go to Section IV on Page 7

3. In what year did you first start implementing best management practices on your operation? _____

4. What types of best management practices have you adopted on your operation? (Please Check ✓ all that apply).

   ___Nutrient Management
   ___Erosion Control
   ___Weed and Pest Control
   ___Conservation Buffers
   ___Conservation Tillage
   ___Irrigation Water Management
   ___Wellhead Protection/Groundwater Pollution Prevention
   ___Other, please list: _____

5. Taking everything into account, how important is conservation in producing your commodity in your operation? (Circle one)

   1. Very unimportant
   2. Somewhat unimportant
   3. Somewhat important
   4. Very important
   5. I don't know

6. The use of the best management practices offers a range of benefits. On a scale from 1 to 5 (1-strongly disagree, 5-strongly agree), please rate your level of agreement with the following benefits from **YOUR USE** of the best management practices. (Please circle your response)

The use of best management practices on my operation:

	Strongly Disagree		**Somewhat Agree**		**Strongly Agree**
have been easy to adopt because they were compatible with my operation	1	2	3	4	5
saves me money	1	2	3	4	5
were adopted as a result of regulatory pressure	1	2	3	4	5

7. Are you generally comfortable adopting new best management practices? (Circle one)

   1. Yes
   2. No

8. How important would each of the following factors be in your decision about whether to use a new conservation practice to help protect water quality? (Please circle your response)

	Not Important At All		**Neither Unimportant Nor Important**		**Very Important**
Cost of the practice	1	2	3	4	5
How easy the practice is to use	1	2	3	4	5
Labor or time required	1	2	3	4	5
Availability of government cost-sharing	1	2	3	4	5
Experience of other farmers	1	2	3	4	5
Potential to improve water quality	1	2	3	4	5
Effects of the practice on profits	1	2	3	4	5
Information from government agencies	1	2	3	4	5
Information from Master Farmer	1	2	3	4	5
Information from industry	1	2	3	4	5
Information from local organization	1	2	3	4	5
Definitive results from university research	1	2	3	4	5

9. Overall, how would you describe landowner support of implementing best management practices on the land you farm? (Circle one)

1. Very unsupportive
2. Somewhat unsupportive
3. Somewhat supportive
4. Very supportive
5. I don't know

10. Relative to other farmers in your area, when did you adopt best management practices? (Circle one)

1. We were one of the first to adopt best management practices
2. We adopted at about the same time as most farmers
3. We adopted best management practices later than most producers

11. How do you consider the level of government support/cost share funding for your best management practices? (Circle one)

1. Severely under-funded
2. Somewhat under-funded
3. Somewhat adequately funded
4. Very adequately funded

12. How often do you attend functions such as training/information sessions, etc. that help in the adoption of best management practices? (Circle one)

1. Never
2. Sometimes
3. As often as possible
4. All that are offered

Section IV. Master Farmer Program Participation

1. Are you a participant in the Master Farmer Program? (Circle one)

1. Yes→ If yes, please go to Question #2 below
2. No→ If not, please go to section V on Page 10

2. In your opinion, how important is it **for you** to participate in the Master Farmer Program? (Circle one)

1. Very unimportant
2. Somewhat unimportant
3. Somewhat important
4. Very important
5. I don't know

3. On a scale from 1 to 5 (1-strongly disagree, 5-strongly agree), please indicate your level of agreement concerning the **usefulness** of the Master Farmer Program to your operation.

	Strongly Disagree		**Somewhat Agree**		**Strongly Agree**
My operation is further along in the Master Farmer Program than other producers in my area	1	2	3	4	5
The Master Farmer Program conforms with the beliefs and practices of doing business in my operation	1	2	3	4	5
Technical support provided by the Master Farmer Program makes the adoption of best management practices valuable for me in agricultural production	1	2	3	4	5
My productivity is increased by using the Master Farmer Program	1	2	3	4	5
Environmental quality is increased by participating in the Master Farmer Program	1	2	3	4	5

4. How important has the Master Farmer Program been in promoting the adoption of best management practices on your operation? (Circle one)

1. Very unimportant
2. Somewhat unimportant
3. Somewhat important
4. Very important
5. I don't know

5. Do you consider the adoption of the Master Farmer Program to be sufficient in meeting your business needs? (Circle one)

1. Yes
2. No
3. I don't know

6. Do you have adequate knowledge about the reason(s) why you participate in the Master Farmer Program? (Circle one)

1. Yes
2. No
3. I don't know

7. Do you believe the Master Farmer Program is a requirement for doing business in Louisiana? (Circle one)

1. Yes
2. No
3. I don't know

8. How satisfied were you with the information you received from the Master Farmer Program? (Circle one)

1. Very unsatisfied
2. Somewhat unsatisfied
3. Somewhat satisfied
4. Very satisfied

9. If the Master Farmer program had not been available, how likely are you to have used the best management practices you are using now? (Circle one)

1. Very unlikely
2. Somewhat unlikely
3. Somewhat likely
4. Very likely
5. I don't know

10. On a scale from 1 to 5 (1-does not influence at all, 5-influence greatly), please indicate the level of influence of the following factors has on your Master Farmer participation. (Please circle your response)

	Does not Influence At All		**Somewhat Influences**		**Significantly Influences**
Louisiana Farm Bureau's sponsorship of the program	1	2	3	4	5
Potential to reduce the threat of regulation	1	2	3	4	5
Better public perception of agriculture	1	2	3	4	5
Lower cost of BMP implementation through cost-share programs (i.e. EQIP) through the 2002 Farm Bill	1	2	3	4	5
Possibility of tax break	1	2	3	4	5
Increased marketability	1	2	3	4	5
Water quality regulations in the Clean Water Act	1	2	3	4	5
To learn about the alternative uses for marginal land	1	2	3	4	5
Pass farming benefits on to my children	1	2	3	4	5
Provide a safe food supply to the American public	1	2	3	4	5
It is voluntary	1	2	3	4	5
It is free	1	2	3	4	5
Recreational benefits of environmental stewardship	1	2	3	4	5
To produce my commodity with less impact on the environment	1	2	3	4	5

11. Are there any other factors that influenced your decision to enroll in the Master Farmer program that we haven't covered? If so, please let us know.

_____

_____

_____

12. Please use the following space below for any additional comments you have about the Master Farmer Program and adoption of best management practices.

_____

_____

_____

Section V. Please Tell Us More About Yourself

Remember, your responses are <u>completely anonymous.</u>

1. Gender: (Circle one)

   1. Female 2. Male

2. Your age: (Circle one)

   1. < 25 years 2. 26 -35 years 3. 36-45 years 4. 46-55 years 5. 56-65 years 6. > 65 years

3. Your ethnic group: (Circle one)

   1. Caucasian 2. Asian or Pacific Islander 3. African-American 4. Hispanic 5. Native American 6. Other

4. Your marital status: (Circle one)

   1. never married 2. divorced or separated 3. widowed 4. married or living with partner

5. Education (Highest Level Attained): (Circle one)

   1. Some High School or less
   2. High School Graduate or equivalent
   3. Some College
   4. College Graduate (BA/BS)
   5. Graduate degree (MS/PhD)

6. Please indicate the type of area you currently reside. (Circle one)

   1. Very Large City (1,000,000 or more)
   2. Large City (250,000 to 999,999 population)
   3. Medium-sized City (50,000 to 250,000 population)
   4. Small city (10,000 to 50,000 population)
   5. Very Small City, Town, or village (2,500 to 9,999 population)
   6. In a Rural area (population less than 2,500)
   7. Not Sure.

7. What is your primary occupation? _____

8. Are you a member of any environmental organization whose primary mission is to protect the environment? (Circle one)

   1. Yes *(please specify)* _____
   2. No

Please return this survey by placing it in the *postage paid* envelope and dropping it in the nearest mailbox. Your response has insured that this study will be a success. Thank you for your cooperation and time in completing this survey.

Thank you for your time!!

APPENDIX II. MASTER LOGGER SURVEY INSTRUMENT

Louisiana Logging Study

Section I. Your Logging Business

Completing this survey demonstrates your willingness to participate in this research study

My business is:

1 Logging
2 Not in the logging business

If you are NOT IN THE LOGGING BUSINESS, this was mailed to you in error. Please stop here and <u>return the survey</u> in the postage-paid envelope so that we can remove you from our list.

1. Please indicate the number of crews that you currently operate: _____

Please answer the following questions for your <u>most productive</u> logging crew.

2. Does this crew deliver your wood primarily through a wood dealer/supplier? (Circle one response)

   1. Yes 2. No

3. How does this crew obtain timber to cut? (Circle all that apply)

   1. I buy it
   2. The mill buys it (from private individuals, other companies, US Forest Service, etc.)
   3. The mill owns it (Company fee-simple land)
   4. A wood dealer/supplier buys it (from individuals, other companies, USFS, etc.)

4. Product(s) produced by this crew (Circle all that apply)

   1. Roundwood (saw logs, poles, pulpwood, Chip-N-Saw, etc.)
   2. Chips
   3. Other (Please specify: _____)

5. Type of harvesting conducted by crew? (Circle all that apply)

   1. Clearcut
   2. Plantation thinning
   3. Thinning
   4. Other (please specify: _____)

6. Species of wood hauled by this crew on average. (Circle one response)

   1. Pine
   2. Hardwoods
   3. Both Pine and Hardwoods

7. Please estimate how many days per year this crew normally works? (Circle one response)

1. 149 or less
2. 150 – 174
3. 175 – 200
4. 201 – 225
5. 226 – 250
6. Over 250

8. How many loads per week does this crew produce in a typical week *without significant quota limitations?* (Check ✓ one response)

_____ 5 or less	_____ 41-50	_____ 91-100
_____ 6-10	_____ 51-60	_____ 101-110
_____ 10- 20	_____ 61-70	_____ 111 or more
_____ 21-30	_____ 71-80	
_____ 31-40	_____ 81-90	

9. How many product sorts (separation of wood for various markets) does this crew typically make? (Check ✓one response)

_____ 3 or less
_____ 4-5
_____ 6-7
_____ 8-10
_____ More than 10

10. Flexibility is the ability to be open to change and supportive of continuous improvements. How do you consider the level of flexibility of your logging operation? (Circle one)

1. Very inflexible
2. Somewhat inflexible
3. Somewhat flexible
4. Very flexible
5. I don't know

11. Relative to logging related investment risks you are willing to assume, how would you characterize yourself? (Circle one)

1. I tend to take on substantial levels or risk in my investment decisions.
2. I neither seek nor avoid risk in my investment decisions.
3. I tend to avoid risk when possible in my investment decisions.

12. With respect to your logging operation, on a scale of 1 to 5, please rate the importance of each of the following relationships to you as a logger (Please circle one response for each)

My Relationships With ……..

	Not Important At All		Neither Unimportant Nor Important		Very Important
congressional delegations	1	2	3	4	5
local communities	1	2	3	4	5
forest landowners	1	2	3	4	5
lending institutions (i.e., banks)	1	2	3	4	5
the forest products industry	1	2	3	4	5
neighbors who are non-loggers	1	2	3	4	5
other Louisiana loggers	1	2	3	4	5
regulatory agencies	1	2	3	4	5
Extension Service county agents	1	2	3	4	5
State legislators	1	2	3	4	5
State/private foresters	1	2	3	4	5
Consultants	1	2	3	4	5

Section II. Environmental Issues

1. Are you aware of efforts to control non-point sources of water pollution (runoff) through the congressionally approved Clean Water Act? (Circle one)

    1. Yes
    2. No

2. Have you modified the management of your operation as a result of this federal act? (Circle one)

    1. Yes
    2. No
    3. Not Applicable

3. How would you rate the quality of surface water in your area? (Circle one)

    1. Very poor
    2. Somewhat poor
    3. Average
    4. Good
    5. Very good

4. In your opinion, what is the water quality in the area you farm relative to what it was 20 years ago?

    1. Much Worse
    2. Somewhat Worse
    3. No Difference
    4. Somewhat better
    5. Much Better

7. Loggers can do many things to protect water quality. How much information about protecting water quality have you received from the following:

	None at All	Some	A Lot
Newspapers	1	2	3
Logging magazines	1	2	3
Television	1	2	3
Radio	1	2	3
Internet	1	2	3
Master Logger workshops	1	2	3
Other meetings or workshops	1	2	3
Other loggers	1	2	3
The Extension Service (county agents)	1	2	3
USDA – Natural Resources Conservation Service	1	2	3
Consultants	1	2	3
The timber company or mill's forester	1	2	3

8. The following are statements that deal with the relationship between humans and the environment. On a scale from 1 to 5 (1-strongly disagree, 5-strongly agree), please rate your level of agreement with the following statements. (Please circle your response)

	Strongly Disagree		Somewhat Agree		Strongly Agree
We are approaching the limit of the number of people the earth can support	1	2	3	4	5
Humans have the right to change the natural environment to suit their needs	1	2	3	4	5
When humans interfere with nature it often produces disastrous consequences	1	2	3	4	5
Humans are severely abusing the environment	1	2	3	4	5
The earth has plenty of natural resources if we just learn how to develop them	1	2	3	4	5
Plants and animals have as much right as humans to exist	1	2	3	4	5

The balance of nature is strong enough to cope with the impacts of modern industrial nations	1	2	3	4	5
Despite our special abilities, humans are still subject to the laws of nature	1	2	3	4	5
The so-called "ecological crisis" facing humankind has been greatly exaggerated	1	2	3	4	5

9. For the statements below, please indicate your level of agreement or disagreement on a scale of 1 to 5 (1- strongly disagree, 5- strongly agree) regarding your commitment to environmental improvement or stewardship. (Please circle your response)

I am committed to environmental improvement or stewardship because of:

	Strongly Disagree		**Somewhat Agree**		**Strongly Agree**
Increased regulation	1	2	3	4	5
Public pressures	1	2	3	4	5
Pressure from environmental groups	1	2	3	4	5
Customer demands for "green" products	1	2	3	4	5
Possible cost savings	1	2	3	4	5
To sustain a competitive advantage in the marketplace	1	2	3	4	5
To conserve topsoil and soil productivity	1	2	3	4	5

Other _____

Section III. Conservation/Best Management Practice Adoption

1. Have you ever heard about best management practices (BMPs) to address water quality? (Circle one)

   1. Yes 2. No

2. Have you implemented best management practices on your operations?

   1. Yes→ If yes, please continue with Question #3 below
   2. No→ If not, please go to Section IV on Page 7

3. In what year did you first start implementing best management practices on your operation? _____

4. What types of best management practices have you adopted on your operation? (Please Check ✓ all that apply).

___Water bars/dips
___Roadside ditches
___Wing ditches
___Seeding roads
___Seeding landings
___Seeding skids trails
___Landowner conferences BEFORE harvest
___Spreading slash back into the forest
___Streamside Management Zones (SMZs)
___Remove temporary stream crossings
___Portable bridges
___Portable mats
___Use culverts instead of tree tops for stream crossings
___Pick up litter
___Written harvest plan
___Keep equipment out of stream bottoms
___Use geotextile in crossings
___Build road a year beforehand
___Plant trees in old sets or decks (truck loading areas)
___Leave trees on steep hillsides or gullies
___When skidding on hillsides, run trails at an angle instead of straight up or down the hills
___Minimize number of skid trails
___Remove logging debris from streams
___Other, please list: _____

5. Taking everything into account, how important is conservation in producing your commodity in your operation? (Circle one)

   1. Very unimportant
   2. Somewhat unimportant
   3. Somewhat important
   4. Very important
   5. I don't know

6. The use of the best management practices offers a range of benefits. On a scale from 1 to 5 (1-strongly disagree, 5-strongly agree), please rate your level of agreement with the following benefits from **YOUR USE** of the best management practices. (Please circle your response)

The use of best management practices on my operation:

	Strongly Disagree			**Somewhat Agree**	**Strongly Agree**
have been easy to adopt because they were compatible with my operation	1	2	3	4	5
saves me money	1	2	3	4	5
were adopted as a result of regulatory pressure	1	2	3	4	5

7. Are you generally comfortable adopting new best management practices? (Circle one)

1. Yes
2. No

8. How important would each of the following factors be in your decision about whether to use a new conservation practice to help protect water quality? (Please circle your response)

	Not Important At All		**Neither Unimportant Nor Important**		**Very Important**
Cost of the practice	1	2	3	4	5
How easy the practice is to use	1	2	3	4	5
Labor or time required	1	2	3	4	5
Availability of government cost-sharing	1	2	3	4	5
Experience of other loggers	1	2	3	4	5
Potential to improve water quality	1	2	3	4	5
Effects of the practice on profits	1	2	3	4	5
Information from government agencies	1	2	3	4	5
Information from Master Logger	1	2	3	4	5
Information from industry	1	2	3	4	5
Information from local organization	1	2	3	4	5
Definitive results from university research	1	2	3	4	5

9. Overall, how would you describe landowner support of implementing best management practices on the land you log? (Circle one)

1. Very unsupportive
2. Somewhat unsupportive
3. Somewhat supportive
4. Very supportive
5. I don't know

10. Relative to other loggers in your area, when did you adopt best management practices? (Circle one)

1. We were one of the first to adopt best management practices
2. We adopted at about the same time as most loggers
3. We adopted best management practices later than most producers

11. How do you consider the level of government support/cost share funding for your best management practices? (Circle one)

1. Severely under-funded
2. Somewhat under-funded
3. Somewhat adequately funded
4. Very adequately funded

12. How often do you attend functions such as training/information sessions, etc. that help in the adoption of best management practices? (Circle one)

1. Never
2. Sometimes
3. As often as possible
4. All that are offered

Section IV. Master Logger Program Participation

1. Are you a participant in the Master Logger Program? (Circle one)

1. Yes→ If yes, please go to Question #2 below
2. No→ If not, please go to section V on Page 9

2. In your opinion, how important is it **for you** to participate in the Master Logger Program? (Circle one)

1. Very unimportant
2. Somewhat unimportant
3. Somewhat important
4. Very important
5. I don't know

3. On a scale from 1 to 5 (1-strongly disagree, 5-strongly agree), please indicate your level of agreement concerning the **usefulness** of the Master Logger Program to your operation.

	Strongly Disagree		**Somewhat Agree**		**Strongly Agree**
My operation is further along in the Master Logger Program than other producers in my area	1	2	3	4	5
The Master Logger Program conforms with the beliefs and practices of doing business in my operation	1	2	3	4	5
Technical support provided by the Master Logger Program makes the adoption of best management practices valuable for me in timber production	1	2	3	4	5
My productivity is increased by using the Master Logger Program	1	2	3	4	5

Environmental quality is increased by participating in the Master Logger Program	1	2	3	4	5

4. How important has the Master Logger Program been in promoting the adoption of best management practices on your operation? (Circle one)

1. Very unimportant
2. Somewhat unimportant
3. Somewhat important
4. Very important
5. I don't know

5. Do you consider the adoption of the Master Logger Program to be sufficient in meeting your business needs? (Circle one)

1. Yes
2. No
3. I don't know

6. Do you have adequate knowledge about the reason(s) why you participate in the Master Logger Program? (Circle one)

1. Yes
2. No
3. I don't know

7. Do you believe the Master Logger Program is a requirement for doing business in Louisiana? (Circle one)

1. Yes
2. No
3. I don't know

8. How satisfied were you with the information you received from the Master Logger Program? (Circle one)

1. Very unsatisfied
2. Somewhat unsatisfied
3. Somewhat satisfied
4. Very satisfied

9. If the Master Logger program had not been available, how likely are you to have used the best management practices you are using now? (Circle one)

1. Very unlikely
2. Somewhat unlikely
3. Somewhat likely
4. Very likely
5. I don't know

10. On a scale from 1 to 5 (1-does not influence at all, 5-influence greatly), please indicate the level of influence of the following factors has on your Master Logger participation. (Please circle your response)

	Does not Influence At All				Significantly Influences
Louisiana Forestry Association's sponsorship of the program	1	2	3	4	5
Potential to reduce the threat of regulation	1	2	3	4	5
Better public perception of forestry	1	2	3	4	5
Lower cost of BMP implementation through cost-share programs (i.e. EQIP) through the 2002 Farm Bill	1	2	3	4	5
Possibility of tax break	1	2	3	4	5
Increased marketability	1	2	3	4	5
Water quality regulations in the Clean Water Act	1	2	3	4	5
To learn about the alternative uses for marginal land	1	2	3	4	5
Pass forestry benefits on to my children	1	2	3	4	5
Provide a safe timber supply to the American public	1	2	3	4	5
It is voluntary	1	2	3	4	5
It is free	1	2	3	4	5
Recreational benefits of environmental stewardship	1	2	3	4	5
To produce my commodity with less impact on the environment	1	2	3	4	5

11. Are there any other factors that influenced your decision to enroll in the Master Logger program that we haven't covered? If so, please let us know.

_____

_____

_____

Please use the following space below for any additional comments you have about the Master Logger Program and adoption of best management practices.

_____

_____

_____

Section V. Please Tell Us More About Yourself

Remember, your responses are <u>completely anonymous.</u>

1. Gender: (Circle one) 1. Female 2. Male

2. Your age: (Circle one)
   1. < 25 years 2. 26 -35 years 3. 36-45 years 4. 46-55 years 5. 56-65 years 6. > 65 years

3. Your ethnic group: (Circle one)
   1. Caucasian 2. Asian or Pacific Islander 3. African-American 4. Hispanic 5. Native American 6. Other

4. Your marital status: (Circle one)
   1. never married 2. divorced or separated 3. widowed 4. married or living with partner

5. Education (Highest Level Attained): (Circle one)
   1. Some High School or less
   2. High School Graduate or equivalent
   3. Some College
   4. College Graduate (BA/BS)
   5. Graduate degree (MS/PhD)

6. Please indicate the type of area you currently reside. (Circle one)
   1. Very Large City (1,000,000 or more)
   2. Large City (250,000 to 999,999 population)
   3. Medium-sized City (50,000 to 250,000 population)
   4. Small city (10,000 to 50,000 population)
   5. Very Small City, Town, or village (2,500 to 9,999 population)
   6. In a Rural area (population less than 2,500)
   7. Not Sure.

7. What is your primary occupation? _____

8. Are you a member of any environmental organization whose primary mission is to protect the environment? (Circle one)
   1. Yes *(please specify)* _____
   2. No

Please return this survey by placing it in the *postage paid* envelope and dropping it in the nearest mailbox. Your response has insured that this study will be a success. Thank you for your cooperation and time in completing this survey.

Thank you for your time!!

If you have any questions about this survey, please contact Carrie Castille Mendoza, Doctoral Candidate, Post Office Box 25100, Baton Rouge, LA 70894-5100; Phone: (225) 578-2906 Fax: (225) 578-4225; email: cmendoza@agctr.lsu.edu.

VITA

Carrie Lynn Castille was born on December 31, 1974, in Breaux Bridge, Louisiana, where she spent her childhood and still resides. She graduated from Breaux Bridge High School in Breaux Bridge. She received her bachelor of science degree in industrial engineering from the University of Louisiana at Lafayette in 1998. During her degree she worked as an instructor for the University of Louisiana Marine Survival Training Center.

In 1999, Carrie took a position as an extension associate at the Louisiana State University AgCenter. During this time, she began work on her master of science degree in environmental studies at Louisiana State University. In 2001 she completed her degree and was also named as program director of the Louisiana Master Farmer Program. In 2001, she began pursuit of her doctorate degree part time. As a doctoral student, Laura served as extension associate for Dr. Paul Coreil with the LSU AgCenter.