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Logging in the Southeastern US: Facing Challenges, Finding Opportunities

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LOGGING IN THE SOUTHEASTERN US: FACING CHALLENGES, FINDING OPPORTUNITIES

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ABSTRACT

The logging businesses, a crucial component of the wood supply chain, face shifting dynamics with various challenges and opportunities. Focusing on North and South Carolina, this study analyzes surveys and interviews to explore the logging business challenges and pathways to sustainable growth in the Southeastern United States.

In South Carolina, our findings indicate a shift towards more medium-sized businesses with a decrease in small and large logger, the entry of some younger loggers in the industry, and a notable rise in educational qualifications among loggers. Simultaneously, there is a decrease in the intergenerational transfer of logging businesses, coupled with escalated input and operational costs, compared to the 2017 South Carolina logging business survey. In North Carolina, 31% of loggers are aged 60 or above, 52% businesses are small-sized, and 51% of these loggers had completed high school. However, 27% anticipates exiting the industry by 2027, with reported challenges of high input and operational costs.

There are several logging businesses owned by Minority groups, Beginning loggers (e.g. middle-aged individuals starting logging businesses) and Young entrepreneurs in the Southeastern United States. However, there aren't many studies focused on understanding the state of these businesses in the logging industry. Interviews were carried out with nine MBY loggers to get an idea about these businesses 'boots-on-the—ground' level, and from four forestry/logging associations to get the broader/state-wide perspective on these businesses. The participating MBY loggers were more educated and had productive businesses with similar financial investment compared to the general logging population in these states. Forty-four percent started their business independently without a family

history in logging. The challenges these loggers reported were high startup cost, low profit, limited access to financing, strained relationships within the industry and rise in input and operational costs. In response to these challenges, the potential proposed solutions included government grants and low-interest programs, marketing and outreach to stimulate growth in the industry, training and workshops designed to empower logging businesses, and consideration of legislative measures to mitigate input and operational growth.

Keywords: timber harvesting, logging business owners, logger demographics, logging challenges, minority, logging opportunities

DEDICATION

I dedicate this thesis to my parents (Prem Khadka and Sakuntala Adhikari), my siblings (Supriya and Aarush), my partner (Bibek Aryal) and my whole family for their love, support and motivation throughout the journey.

This thesis is a big part of my personal and professional growth, and I want to dedicate it to everyone working on their growth.

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TABLE OF CONTENTS

Page

LIST OF TABLES

Table Page

LIST OF FIGURES

Figure Page

INTRODUCTION

0.1 Justification and Aim

The wood supply chain involves diverse stakeholders essential in producing wood and wood products. This network of actors often encompasses forest landowners responsible for land management and planning, logging businesses tasked with timber harvesting, hauling contractors responsible for transporting the wood from forests, and forest product mills that process the wood into various wood products like lumber, plywood, pulp and paper (Rodriguez et al., 2014). Effective coordination among these actors is essential to ensure a smooth flow of raw materials, minimizing waste, ensuring sustainability, and delivering wood products to end users while adhering to industry and environmental standards.

The logging businesses in the United States of America (USA) encompass the role of sustainable harvesting and delivery of timber to the forest product mills. They are responsible for sustainable harvesting practices to ensure forests' long-term health and productivity and implement best management practices. The characteristics of the logging industry across the Southeastern USA are similar, with abundant forest resources, high capital investment, intensively managed forests, diverse timber products, dominant pine plantations, and favorable terrain for logging operations (Conrad et al., 2018b; Fox et al., 2007). The logging industry in this region plays a significant role in the regional economy, providing jobs and contributing to the overall economic stability of many communities (GC & Potter-Witter, 2011; Greene et al., 2001).

0.2 Problem Statement

Given the importance of logging businesses to forest management and the forest products industry, it is essential to assess the state of the logging industry and document trends over time as logging businesses, like any other industry, are subject to fluctuations over time (Conrad et al., 2018b). Therefore, logging business surveys are prevalent for decades across several states in the USA to document the business characteristics and the challenges faced by the logging business owners. These surveys are crucial to assess the logging businesses’ sustainability and resource management.

Some of the results from previous logging business surveys carried out across the Southern USA suggest the logging business owners face many challenges, ranging from aging business owners, difficulty hiring skilled labor, and mill quota to profitability concerns (Bowman et al., 2023; Conrad et al., 2018b, 2018a). In addition, the reported potential shutdowns of logging businesses can pose a risk to the stability of the wood product sector. Hence, it is possible that some of these circumstances might have evolved since the past surveys.

Given most logging business owners are typically white males and concentrated towards the fifties and sixties age group, chances are these business owners will retire in the coming one or two decades (Conrad et al., 2018b; Ellis, 2023). The logging business are traditionally family businesses with the intergenerational transfer of businesses (Allred, 2009). However, several surveys across the USA suggest that loggers are not planning to hand over their logging businesses or that the coming generation is reluctant to become a logger (Allred, 2009; Blinn et al., 2015; Conrad et al., 2018a, 2018b; Egan, 2009). Therefore, there is a potential for a group of new logging business owners to play a pivotal role in the logging industry. However, there aren't many studies focused on understanding where these business owners stand in the industry today and what challenges, they perceive.

0.3 Thesis scope, Goal and Structure

This thesis incorporates surveys and interviews carried out to understand the challenges and opportunities of logging businesses in the Southeastern USA, focusing on South and North Carolina. Chapter 1 of this thesis comprises the results of mailed surveys of independent logging businesses across South and North Carolina carried out in 2022. This South Carolina logging business survey is the continuation of the 2012 South Carolina logging business survey started in 2012 in conjunction with the Georgia logging business survey, taking place every five years since then. The North Carolina logging businesses were included in this series of surveys for the first time. The goal of this study was to get a snapshot of independent logging businesses in South and North Carolina and gather regional logging business information.

With the decreasing trend in intergenerational logging business handover and the predominance of older demographics in the logging industry today, the future of the logging industry depends on the success of Minority, Beginning and Young (MBY) logging business owners. Chapter 2 summarizes the results of interviews carried out with Minority (non-male or non-White), Beginning (owners that started their business within past 10 years from 2022) and Young (under the age of 35 years) logging business owners, and another set of interviews carried out with the representatives of forestry/logging associations, focused on North and South Carolina and surrounding states. The individual MBY loggers were interviewed to gather responses about their businesses at the 'boots-on-the-ground' level. The representatives of forestry/logging associations out to obtain broader, state-level perspectives of MBY logging businesses on the overall trend and challenges, moving beyond the experiences of individual loggers.

0.4 Thesis objectives

The overall goal of the thesis is to document challenges faced by logging businesses in the Southeastern US and identify the opportunities for change. The specific objectives are to

i) Collect data from North and South Carolina logging businesses about general timber harvesting characteristics, business information, owner's demographics, equipment age, capital investment, and challenges faced, and summarize the responses by physiographic regions within North and South Carolina.

ii) Identify the challenges faced by MBY logging business owners in the Southeastern US and document their suggestions for support to help establish new logging businesses

CHAPTER ONE

THE STATE OF LOGGING BUSINESSES IN NORTH AND SOUTH CAROLINA

Abstract

The challenges and changes that logging businesses face impact the whole wood supply chain, making it relevant to gather timely information about them. Logging business surveys have been taking place for several decades in various states across the United States of America and have played a vital role in documenting the status of logging industry and the challenges facing business owners. Two waves of mail surveys following the methodology of previous South Carolina logging business surveys were sent to individual logging businesses across North and South Carolina between March and May of 2022. These surveys collected information related to general timber harvesting (products harvested, silvicultural operations), business information (number of workers, types of equipment, capital investment), owner demographics, and the challenges faced by the logging businesses. Data were analyzed for each state and within the different physiographic regions (Mountains, Piedmont, and Coastal Plain). Results from South Carolina indicate more medium-sized logging businesses today, some younger loggers entering the logging industry, an increase in the educational level of loggers, a decrease in intergenerational transfers of logging businesses within families, and a rise in the input and operational costs compared to 2017 South Carolina logging business survey. This study also provides insights into the current state of North Carolina logging businesses and will serve as a good baseline for future studies. Results from North Carolina indicate 31% of loggers are aged 60 or above, 52% represent small-sized businesses, 51% have completed high school, 27% anticipate exiting the industry by 2027, and high input and operational cost reported as significant challenges.

1.1 Introduction

The logging sector is a critical component of the forest products industry. It connects forest resources and management with wood-using mills, which manufacture various forest products (GC et al., 2020). This industry mainly influences rural communities socially and economically (GC & Potter-Witter, 2011; Greene et al., 2001). These communities primarily depend on small and medium-sized family-owned forestland, logging businesses, and forest products mills (Uusitalo & Pearson, 2010). The logging businesses in the United States of America (USA) play a crucial role in the wood supply chain, which encompasses the sustainable harvesting and delivery of timber to the mills. Logging businesses work closely with downstream industries, such as sawmills, pulp mills, and wood product manufacturers, to ensure a seamless flow of raw materials. They are responsible for sustainable harvesting practices to ensure the long-term health and productivity of forests and implement best practices and certifications such as Sustainability Forestry Initiative (SFI) and Forest Stewardship Council (FSC) (Moore et al., 2012).

Given the importance of logging businesses to forest management and the forest products industry, it is essential to assess the state of the logging industry and document trends over time (Conrad et al., 2018b). For this purpose, logging business surveys have occurred for several decades in various states across the USA (Conrad et al., 2018a; Greene et al., 2001; Hiesl, 2020). Logging business surveys from Georgia, Virginia, Minnesota, and Wisconsin have reported changes and productivity patterns in the logging sector over time (Baker & Greene, 2008; Blinn et al., 2015; Greene et al., 2001).

The Georgia logging business survey started in 1987, taking place every five years since then (Conrad et al., 2018b, 2018a; Greene, 1988; Greene et al., 2001). Aging logging business owners, a trend towards fewer but larger logging businesses, increasing average weekly production, and increasing financial investment are a few prominent characteristics of Georgia logging businesses over the past three decades (Baker & Greene, 2008; Conrad et al., 2018b; Greene et al., 2001). The Virginia logging business survey started in the 2000s (Conrad et al., 2018a,Bolding et al., 2010). The 2009 logging business survey in Virginia provided regional data within the state. It highlighted some significant challenges

the logging business owners faced, such as difficulty finding markets for their products, mill closures, and increasing fuel and operation costs (Bolding et al., 2010). The logging business survey in Minnesota has been taking place periodically since the 1970s, giving a general idea about the logging sector's status, health, and vitality (Blinn et al., 2014, 2015; GC et al., 2020,Smidt & Blinn, 1994). The shift towards fewer but larger logging businesses and the need for better succession plans are some of the results of a recent Minnesota logging business survey (Blinn et al., 2015; GC et al., 2020). The Wisconsin logging business survey started in the 2000s. (Rickenbach et al., 2005) included Wisconsin loggers and Michigan loggers' in the survey. Wisconsin logging business surveys provide information about the characteristics of logging businesses, such as capital investment, harvesting practices, and production capacity. Recent survey results include the ongoing consolidation of the logging sector and logging business owners nearing retirement age (Rickenbach et al., 2015).

There have been few efforts to summarize the logging businesses across the USA, highlighting some commonalities and differences in the logging industry among the various regions (Conrad et al., 2018b). (Leon & Benjamin, 2012) surveyed four states: New York, Vermont, New Hampshire, and Maine in the Northeast, (Abbas et al., 2014) conducted a multi-state survey including Michigan and Northern Wisconsin, and (Conrad et al 2018b) conducted a Georgia and South Carolina logging business survey.

The logging industry in the southern USA has some of the most productive businesses in the country, with higher median annual production per crew than elsewhere (Conrad et al., 2018a). The intensively managed forest with high financial returns, gentle terrain, and pine plantations are the factors favoring this industry here (Conrad & Greene, 2017; Fox et al., 2007). Like the logging industries in other states, logging businesses in the southern USA face a wide range of challenges, ranging from aging business owners to profitability concerns (Conrad et al., 2018a, 2018b; Greene et al., 2001). Also, inflating fuel prices in the recent past have affected logging businesses and are starting to strain the industry (Forest Resource Association, 2022; Martin, 2022).

The South Carolina logging business survey started in 2012 in conjunction with the Georgia logging business survey, taking place every five years since then (Conrad et al., 2018a, 2018b; Hiesl, 2020). Like most states, the aging of logging business owners is one

of the biggest challenges for the industry (Conrad et al., 2018b; Hiesl, 2020). The median age of the logging business owners in South Carolina in 2017 was reported to be 57 years (Conrad et al., 2018b). South Carolina logging businesses have changed substantially since the last survey in 2017. Speaking with members of the Forestry Association of South Carolina, new logging business owners are often more business focused and may not run equipment themselves. Similar information has been conveyed by members of the North Carolina Forestry Association and forest products industry, however, limited scientific information exists that documents this change. As such, logging business surveys are an important tool to document periodic changes in the industry.

Our study aims to get a snapshot of South Carolina and North Carolina logging businesses, including North Carolina logging businesses for the first time in this series of surveys, to gather regional logging business information. The objectives of our study are to (1) collect data from North and South Carolina logging businesses about general timber harvesting characteristics, business information, owner's demographics, equipment age, capital investment, and challenges faced, and (2) summarize the responses by physiographic regions within North and South Carolina.

1.2 Methods

1.2.1 State Information

South Carolina has approximately 5.2 million ha of forest land, comprising 52% hardwood and 48% softwood forests (USDA Forest Service, 2021b). Forestry contributes $23.2 billion US Dollar (USD) while providing more than 100,000 jobs and $5.5 billion USD in annual labor income (Von Nessen, 2022). There are around 9 billion live trees on the forestland with a volume of 775.55 million cubic meter (USDA Forest Service, 2021b). Approximately eighty-seven percent of forest land ownership belongs to private individuals/families, 8% to the federal government, and the remaining 5% to state and local government. Around 190,810 ha of forest land are harvested (thinning, clear-cut, etc.) annually (USDA Forest Service, 2021b). Pulpwood is the state's leading forest product by volume.

North Carolina has approximately 7.6 million ha of forest land, comprising 68% hardwood and 32% softwood forests (USDA Forest Service, 2021a). Forestry contributes

$35 billion USD while providing more than 139,700 jobs and $8.9 billion USD in annual labor income (Parajuli & Bardon, 2021). There are around 14 billion live trees on the forestland with a volume of 1.29 billion cubic meters (USDA Forest Service, 2021a). Approximately eighty-three percent of forest land ownership belongs to private individuals/families, 11% to the federal government, and the remaining 6% to state and local government. Around 158,273 ha of forest land are harvested (thinning clear-cut, etc.) annually. Softwood lumber is the state's leading forest product by volume.

1.2.2 Data Collection

Mail surveys of logging businesses were conducted in North and South Carolina between March and May of 2022. Following the methodology of the Georgia logging business surveys and the previous South Carolina logging business surveys (Conrad et al., 2018a, 2018b; Greene, 1988; Greene et al., 2001), we sent a questionnaire printed on the front and back of one legal-sized page to 347 logging businesses in South Carolina and 528 logging businesses in North Carolina. Mailing lists were provided by the Forestry Association of South Carolina and the North Carolina Forestry Association and were screened to eliminate duplicates and non-loggers. Consensus among the forestry associations and logger associations in the two states was that the address lists from the Forestry Association of South Carolina and the North Carolina Forestry Association are the most complete and comprehensive lists available. Utilizing a modified version of the Tailored Design Method, we sent two waves of surveys to maximize response rates (Dillman et al., 2014). The first wave of South Carolina surveys was mailed on March 16th, followed by a second mailing on May 4th. The first North Carolina survey was mailed on April 1st, followed by a second mailing on May 13th. This study was approved by the Clemson University Institutional Review Board (IRB2021-0672).

The questionnaires included questions related to general timber harvesting (products harvested, silvicultural operations), business information (number of workers, types of equipment, capital investment), owner demographics, and miscellaneous questions addressing current topics of interest to researchers, loggers, and other stakeholders (Conrad et al., 2018a, 2018b; see Appendix A). To enable comparisons over time, the questions in the first three sections were identical to those from earlier Georgia and South Carolina logging business surveys (Conrad et al., 2018b). The respondents were also asked to enter

three counties where they primarily work in. This county information was used to associate responses with each state's physiographic region (Coastal Plain, Piedmont, Mountains) (Figure 1.1). The 'Mountain region' in North and South Carolina is commonly referred as 'Appalachian region'. However, for the sake of consistency with earlier studies, we have used the term 'Mountain region' throughout this paper. In total, the questionnaire consisted of 36 questions.

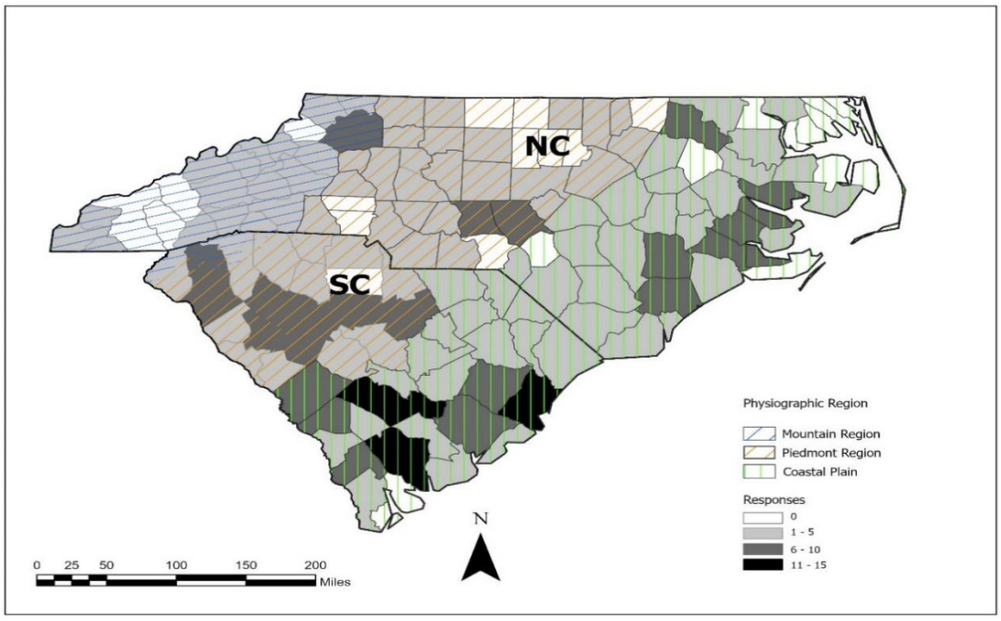

Figure 1.1. Reported frequency of the counties listed by North Carolina (NC) and South Carolina (SC) logging business owners that they work in the most, separated into the three physiographic regions of Mountains, Piedmont, and Coastal Plain based on categorization by (Bristol, 2019; NC Department of Natural and Cultural Resources, 2012).

We recorded individual responses in a MS Excel spreadsheet. We collected the data in USA customary units and converted into Metric units. We tested for non-response bias using wave analysis (Armstrong & Overton, 1977), comparing the first and last twenty responses to the questions related to production, investment, and owner demographics. (Conrad et al., 2018b). The mountain region in South Carolina only covers a portion of the north-western counties, therefore, we divided South Carolina into two physiographic regions: Coastal Plain and Piedmont. We tested for normality of data using the histograms, Shapiro-Wilk test and QQ plots. If the distribution of data were normal, we applied parametric tests such as t-test and ANOVA. Otherwise, we applied non-parametric tests such Mann-Whitney U test and Kruskal Wallis test. Levene's test was applied for testing for equal variance. Statistical tests were carried out using R 4.2.1. We applied a t-test/

Mann-Whitney U test to compare the average owner age, average weekly production, and average age of various pieces of equipment within the Coastal Plain and Piedmont regions of South Carolina and an ANOVA test/ Kruskal Wallis test to compare within Coastal Plain, Piedmont, and Mountain regions of North Carolina. For the remaining comparisons, a chi-square test of independence was applied to compare two physiographic regions in South Carolina and three physiographic regions within North Carolina. All the tests were carried out using an alpha value of 0.05. Weekly production level responses were converted to loads per week, assuming 22,680 kg per truckload, 2,449 kg per cord, 27 kg per cubic foot, and 7,257 kg per thousand Board Feet (MBF) (Baker & Greene, 2008; Conrad et al., 2018b; Greene et al., 2001). In our study, we defined the logging businesses as small (less than 40 loads per week), medium (40 to 70 loads per week), and large (more than 70 loads per week). We defined loggers under the age of 35 years as a young logger.

1.3 Results

Out of 347 questionnaires sent to the logging businesses in South Carolina, 10 were not deliverable, reducing the sample frame to 337. South Carolina logging businesses returned a total of 100 questionnaires for an adjusted response rate of 29.7%. Five hundred twenty-eight questionnaires were sent to North Carolina logging businesses, of which three were not deliverable, and one was sent to a construction business, reducing the sample frame to 524. North Carolina logging businesses returned 103 questionnaires for an adjusted response rate of 19.7%. Five questionnaires in South Carolina and nine in North Carolina were returned empty and are not considered further in the data analysis.

In South Carolina, we received 61% of the responses (n=58) from the Coastal Plain region and 33% (n=31) from the Piedmont region, and 6% of respondents (n=6) did not indicate the county/region where they primarily work in. In North Carolina, we received 47% of the responses (n=44) from the Coastal Plain region, 28% (n=26) from the Piedmont region, 21% (n=20) from the Mountain region, and 4% (n=4) of respondents did not indicate the county/region they operated in. Some questionnaires were returned only partially completed and as such the number of responses considered for each question varies.

We found no significant difference in South Carolina between the early and late respondents in weekly production ($t=2.02$, $p=0.95$), total capital investment ($t=0.21$,

p=0.82), and the owner's age (t=1.12, p=0.26). Similarly, there was no significant difference in North Carolina between the early and late respondents in weekly production (t=1.28, p=0.20), total capital investment (t=2.10, p=0.06), and the owner's age (t=1.50, p=0.14). Therefore, we concluded that non-response bias is not present in our survey data.

The total respondents in South Carolina represent an annual harvest volume of 6,324,234 tonnes (25.7% of South Carolina's annual harvest volume; (USDA Forest Service, 2021b), and the total respondents in North Carolina represent annual harvest of 4,726,600 tonnes (17.8% of North Carolina's annual harvest volume;(USDA Forest Service, 2021a).

1.3.1 General business characteristics

The products harvested by the logging businesses were classified as tree length, log length, short wood (2.3 m or less), clean chips, and dirty/fuel chips, among which tree length and log length were reported as the primarily harvested products in both South and North Carolina (Figure 1.2). Ninety-three percent of logging business owners in South Carolina and 78% of logging business owners in North Carolina reported harvesting tree-length raw material. Approximately 86% of South Carolina logging business owners and approximately 90% of North Carolina logging business owners reported harvesting log-length raw material. No significant difference between the products harvested and the physiographic regions in South Carolina was observed (χ^2=3.83, p=0.42). In North Carolina, statistically significant differences between all three regions were observed (χ^2=17.58, p=0.001).

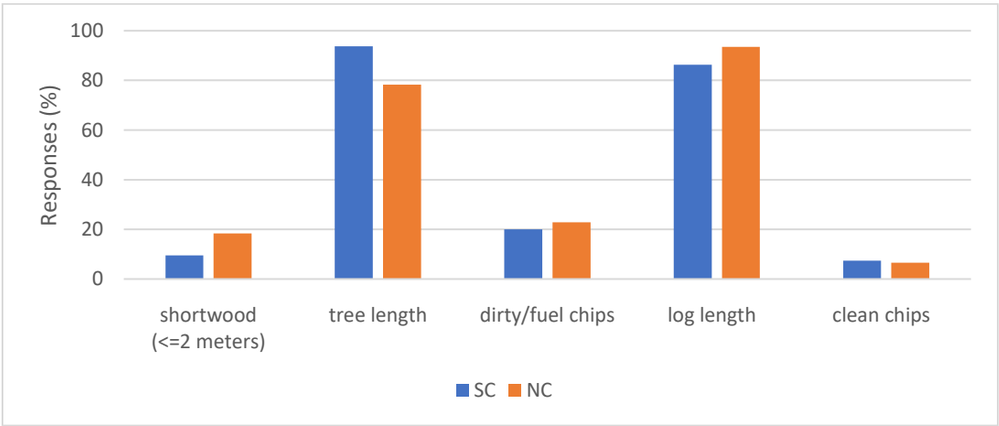

Figure 1.2. Products harvested by logging businesses in South Carolina (SC) and North Carolina (NC) in 2022. Multiple responses were possible, and sum of the bars exceed 100%.

Logging businesses in South and North Carolina reported harvesting planted pine and mixed pine/hardwood forest types in higher quantity than natural pine, and hardwood forest types. In South Carolina, 47% of logging business owners reported pre-dominantly harvesting planted pine, and 46% reported pre-dominantly harvesting mixed pine/hardwood. In North Carolina, 33% of logging business owners reported pre-dominantly harvesting planted pine, and 57% reported pre-dominantly harvesting mixed pine/ hardwood. No significant difference between the harvested forest type and the physiographic regions in South Carolina was observed (χ^2=2.60, p=0.45). In North Carolina, statistically significant differences between the Coastal Plain and Mountain regions were observed, with 48% percent of Coastal Plain loggers, 31% of Piedmont loggers, and 5% of Mountain loggers harvesting planted pine (χ^2=17.60, p<0.001; Figure 1.3).

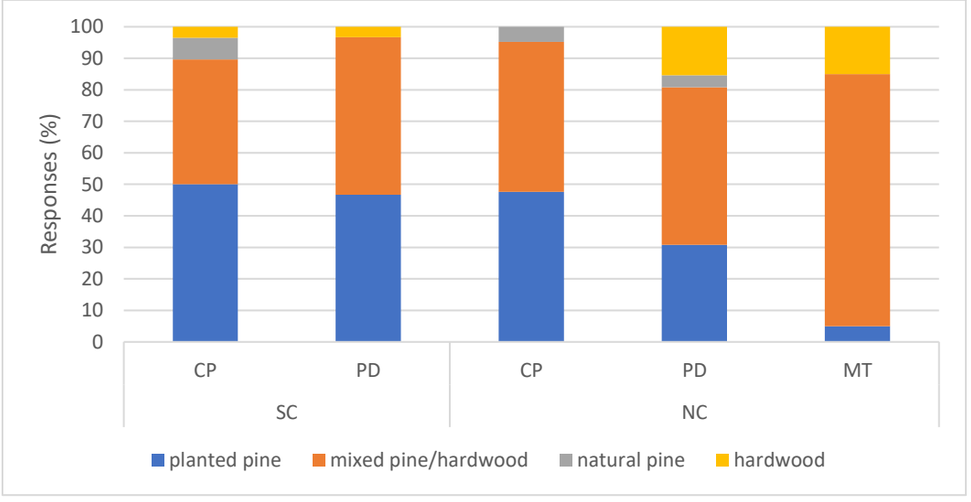

Figure 1.3**.** Pre-dominantly harvested stand types as reported by South Carolina (SC) and North Carolina (NC) logging businesses for Coastal Plain (CP), Piedmont (PD), and Mountain (MT) physiographic regions.

Clear-cutting was reported as the primary harvest practice for 40% of loggers in South Carolina and 51% in North Carolina. Equal use of clearcutting and thinning was reported by 39% of South Carolina logging businesses and 31 % of North Carolina logging businesses. Thinning was pre-dominantly carried out by 21% of South Carolina and 18% of North Carolina logging businesses. There was no significant difference between the harvesting practices and the regions within South Carolina (χ^2=0.24, p=0.88) and North Carolina (χ^2=21.70, p=0.18).

During this survey, logging business owners were asked for information about the tract they were currently harvesting with their largest crew. In South Carolina, 13% of respondents reported the tract ownership belonged to the forest industry/ Real Estate Investment Trust (REIT), 79% to Private individuals/family, 7% to Pension fund/ Timber Investment Management Organization (TIMO), and 1% to the Federal/State Government. In North Carolina, 10% of respondents reported the tract ownership belonged to the Forest industry/REIT, 81 % to Private individuals/family, 2% to Pension fund/TIMO, and approximately 7% to the Federal/State Government. There was no significant difference between the regions and the ownership of the tract across both South Carolina (χ^2=0.58, p=0.74) and North Carolina (χ^2=12.30, p=0.11). The size of the tract, the distance from the previous tract, and the average one-way distance to mills were reported for both South and North Carolina, and their maximum, minimum, average, and standard deviation values were recorded (Table 1.1). The average harvest site for South Carolina logging businesses with their largest crew was49 ha with an average distance of 45 km from the previous tract. The average harvest site for North Carolina logging businesses with their largest crew was 35 ha, with an average distance of 39 km from the previous tract (Table1.1).

Table 1.1. Reported details on the currently harvested tract with the largest crew in South Carolina and North Carolina in 2022

	Mean*	Median	Standard deviation	Minimum	Maximum
South Carolina (n=95)					
Tract size (ha)	49±13.01	28	63	0.40	404.68
Distance from the previous tract (km)	45±6.36	40	31	1.60	120.70
One-way distance to mills (km)	66±5.34	72	26	9.65	131.96
North Carolina (n=94)					
Tract size (ha)	35±6.30	24	31	2.02	161.87
Distance from the previous tract (km)	39±5.52	32	27	1.60	112.65
One-way distance to mills (km)	69±6.57	64	32	4.82	185.07

*Mean ± margin of error for 95% confidence interval

1.3.2 Business characteristics

The average number of employees per logging business in South and North Carolina was reported as 11 and 7, respectively (Table 1.2). The median number of crews in both South and North Carolina was 1. The median time South Carolina logging business owners owned and operated their business was 20 years. In North Carolina, this number was 22

years. Fifty-eight percent of South Carolina, and 70% of North Carolina logging businesses were employing their relatives.

Table 1.2. Reported logging business characteristics for South Carolina and North Carolina in 2022

	Mean* (median) employees per firm	Mean* (median) number of crews	Logging businesses employing relatives (%)	Median owner age (yr.)	Median years owning or operating a logging business
South Carolina (n=95)	10.76±1.79 (8.0)	1.35±0.01 (1.0)	58.1	53	20
CP (n=58)	10.93±1.31 (8.0)	1.29±0.03(1.0)	50.8	50	18
PD (n=31)	9.9±1.87 (7.0)	1.42±0.04(1.0)	57.8	50	23
North Carolina (n=94)	6.36±0.6 (4.0)	1.11±0.01 (1.0)	69.8	49	22
CP (n=44)	8.39±0.81 (7.0)	1.11±0.07 (1.0)	72.72	49	20
PD (n=26)	4.93±1.1 (5.0)	1.15±0.03 (1.0)	69.23	53	26
MT (n=20)	2.95±1.83 (3.0)	1±0.02 (1.0)	50	47	23

*Mean ± margin of error for 95 percent confidence interval

The logging business owners were asked if they operated through a wood dealer/supplier, a TIMO/REIT, or directly with the mill. Around 71% of South Carolina logging business owners reported working through wood dealers/suppliers, 4% through TIMO/REIT, and 25% directly with the mill. In North Carolina, approximately 46% of logging business owners reported working through wood dealers/suppliers, 5% through TIMO/REIT, and 49% directly with the mill.

When asked how these respondents obtain most of the timber that they cut, more than 50% of logging businesses in South Carolina and more than 33% of logging businesses in North Carolina reported wood dealers as the primary timber purchaser. The remaining respondents reported that either they purchase the timber, the forest product mill purchases the timber, or they cut on company land (Figure 1.4). There was a significant difference between the type of timber purchaser and the two regions in South Carolina (χ^2=8.84, p=0.03) and between all three regions in North Carolina (χ^2=24.15, p=0.006; Figure 1.4). In South Carolina, 53% of Coastal Plain loggers and 48% of Piedmont loggers reported wood dealer as their primary timber purchaser. In North Carolina, 53% of Coastal Plain loggers, 35% of Piedmont loggers, and 11% of Mountain loggers reported wood dealer as their primary timber purchaser.

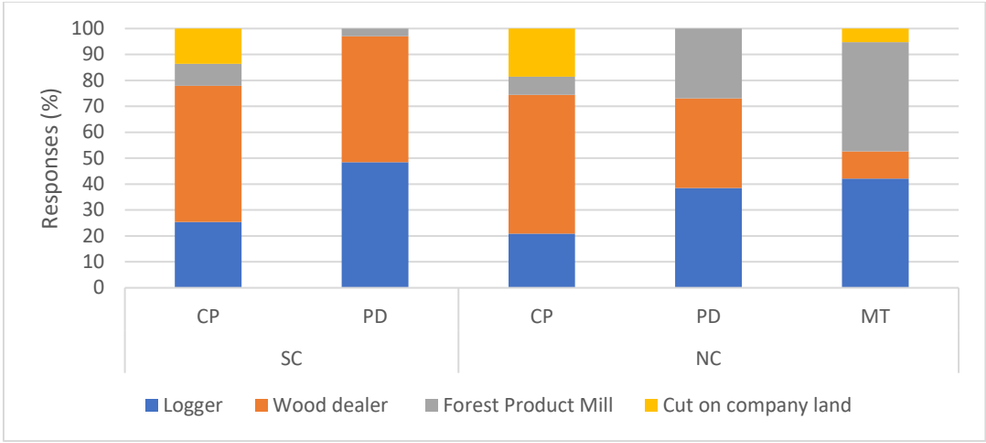

Figure 1.4. Self-reported primary wood purchaser for logging businesses in South Carolina and North Carolina in 2022 for Coastal Plain (CP), Piedmont (PD), and Mountain (MT) physiographic regions.

Approximately 57% of South Carolina logging businesses and 60% of North Carolina logging businesses reported using written contracts 100 % of the time (Table 1.3). There was no significant difference between the regions and the use of a written contract in South Carolina (χ^2=2.01, p=0.56) and North Carolina (χ^2=5.75, p=0.32).

The respondents were asked if their businesses use email, internet, GPS, and computer mapping technologies. Many North and South Carolina logging businesses reported using more than one technology. The use of email was reported as the most common technology by around 88% of logging businesses in both South and North Carolina. Computer mapping was reported by the least number of businesses in both states, with around 52% in South Carolina and 41% in North Carolina (Figure 1.5). There was no significant difference between the technologies used and the regions in South Carolina (χ^2=0.25, p=0.96) and North Carolina (χ^2=1.56, p=0.78).

Table 1.3. Reported frequency of using a written contract on the tracts South Carolina and North Carolina logging businesses harvest

	less than 33% of the time	33-65% of the time	66-99% of the time	100% of the time
South Carolina (n=93)	21%	5%	17%	57%
North Carolina (n=93)	25%	7%	8%	60%

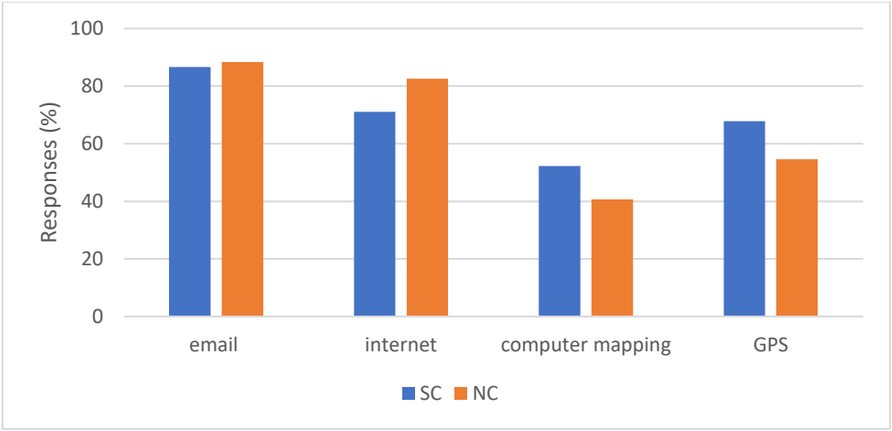

Figure 1.5. Self-reported technology used by South Carolina (SC) and North Carolina (NC) logging businesses in 2022. Multiple responses were possible, and sum of the bars exceed 100%.

Some logging businesses in South Carolina (33% of Coastal Plain (n=19) and 13% of Piedmont (n=4) loggers) and North Carolina (30% of Coastal Plain (n=13), 4% of Piedmont (n=1) and 5% of Mountain (n=1) loggers) reported using commercially available onboard computers/telematics on at least one of their machines to track location, productivity, or utilization. Among those who use onboard computers/telematics, eighty-three percent of South Carolina respondents and 75% of North Carolina respondents reported using systems from equipment manufacturers, and the remaining respondents reported using after-market systems.

Approximately 57% of South Carolina and 54% of North Carolina logging businesses reported using contract trucking. Seventeen percent of South Carolina and 20% of North Carolina logging businesses responded having more than 75% of their loads hauled by contractors (Table 1.4). There was no significant difference between the regions and the percentage of loads transported by contract trucking in South Carolina (χ^2=4.71, p=0.19) and North Carolina (χ^2=6.23, p=0.21).

Table 1.4. Percentage of loads hauled by contract trucking reported by South Carolina and North Carolina logging businesses in 2022

	less than 25%	26-50%	51-75%	more than 75%	do not use contract trucking
South Carolina (n =94)	16%	15%	9%	17%	43%
North Carolina (n=92)	18%	13%	3%	20%	46%

Around 25% of logging businesses in South Carolina and 34% of those in North Carolina operated other businesses besides logging. Among them, in South Carolina, 4% buy/sell land, approximately 10% buy/sell timber, and the remaining 11% operate other businesses such as farming, sawmill, and grading. In North Carolina, 7% buy/sell land, approximately 11% buy/sell timber, and the remaining 16% operate other businesses such as farming, sawmill, and grading. There was no significant difference between the regions and the businesses operated in South Carolina (χ^2=1.05, p=0.30) and North Carolina logging businesses (χ^2=0.07, p=0.83).

The logging businesses in South and North Carolina reported a wide range of average weekly production ranging from less than 20 loads per week to higher than 120 loads per week. The median weekly production in South and North Carolina were reported as 55 and 35 loads per week, respectively. There was no significant difference between the regions and the average weekly production in South Carolina (t=2.03, p=0.95) and North Carolina (F=3.10, p=0.09; Figure1.6).

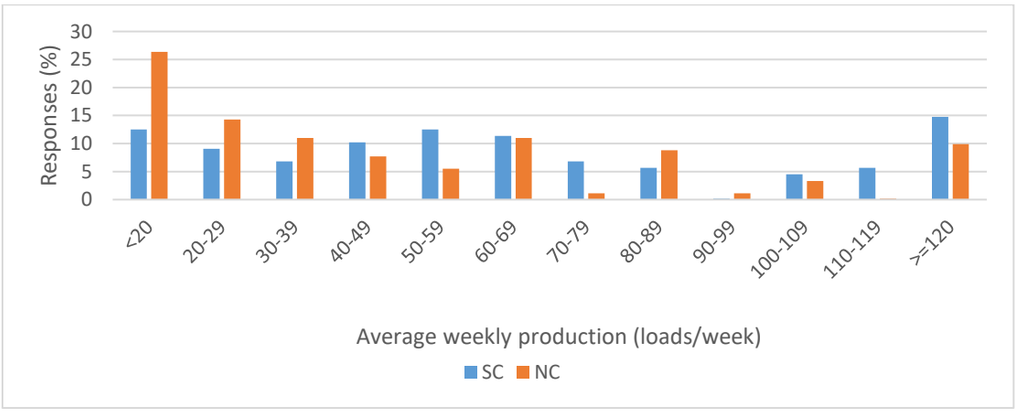

Figure 1.6. Self-reported average weekly production of South Carolina and North Carolina logging businesses in 2022.

The logging business owners were asked to estimate the current total investment in their business. The average investment in South Carolina (n=84) and North Carolina (n=88) was 1.3 million USD and 945,989 USD, respectively. There was no significant difference between the current total investment and physiographic regions in South Carolina (W=593.5, p=0.69) and North Carolina (F=1.38, p=0.25).

Approximately 93% of Coastal Plain loggers and 97% of Piedmont loggers in South Carolina, and 95% of Coastal Plain, 99% of Piedmont, and 95% of Mountain in North Carolina logging businesses reported implementing Best Management Practices (BMPs)

regularly. One South Carolina logging business in the Piedmont region reported not having heard of BMPs. All logging businesses in North Carolina reported knowledge of BMPs.

1.3.3 Owner/Manager background

There was no significant difference between the basic demographics of the logging business owners (age group and highest level of education) among the regions in both South and North Carolina ($p>0.05$), and the overall data were summarized at the state level.

The age of logging business owners across South and North Carolina ranged from less than 30 years to more than 60 years (Figure 1.7). The average age of the logging business owners in South Carolina was 50 years (95% CI: 47.58-52.42) and North Carolina was 50 years (95% CI: 47.1-52.9). Median owner ages were 53 and 49 years in South Carolina and North Carolina, respectively.

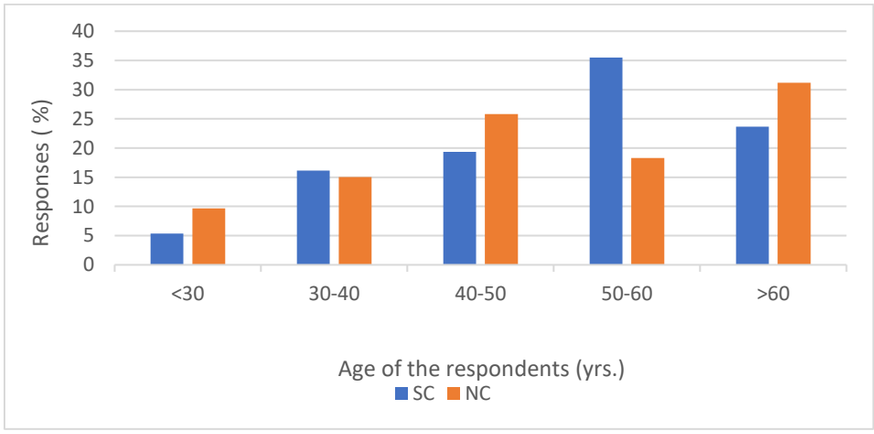

Figure 1.7. Self-reported age distribution of South Carolina (n=93) and North Carolina (n=94) logging businesses in 2022.

Thirty-four percent of the logging business owners in South Carolina had a college degree, and 50% had a high school degree as their highest level of education (Figure 1.8). In North Carolina, 23% of the respondents had a college degree, and approximately 51% had a high school degree.

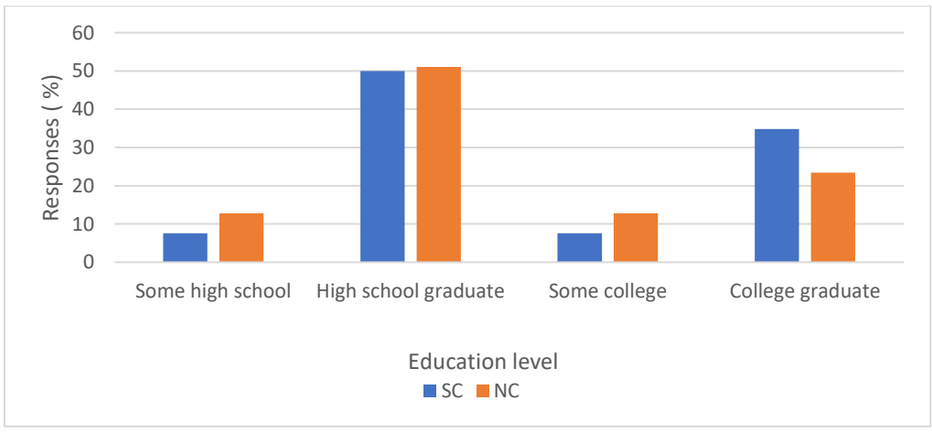

Figure 1.8. Self-reported highest education level attained by South Carolina (n=92) and North Carolina (n=95) logging business owners.

Logging business owners were asked to provide the quantity and age of common harvesting equipment they operate on a daily basis. The reported average age of equipment ranged from 2.8 years (chainsaw) in South Carolina to 19.8 years (cable skidder; Table 1.5) in North Carolina. The average empty weight of the lightest truck and trailer combination in South Carolina was 14.2 tonnes and 12.5 tonnes in North Carolina. Most businesses in South Carolina (84%) and North Carolina (73%) reported not using either onboard or in-wood scales to measure their truck weights. In South Carolina, 11% of Coastal Plain loggers and 7% of Piedmont loggers reported using onboard scales to measure truck weights (Table 1.6). In North Carolina, approximately 36% of Coastal Plain loggers, 19% of Piedmont loggers and none of the Mountain loggers reported using onboard scales to monitor truck weights.

Table 1.5. Common equipment types and age reported by South Carolina and North Carolina logging businesses in 2022 by physiographic region. Summary statistics are shown only for equipment with at least 4 responses and the number of responses within physiographic regions may not equal total state response

	State/Region	Responses (n)	Mean Age (yrs.)	Median Age (yrs.)	SD (yrs.)	Min. (yrs.)	Max. (yrs.)
Chainsaw							
	South Carolina	50	2.8	2	2.2	1	10
	Coastal Plain	26	3.2	2	2.8	1	10
	Piedmont	19	2.4	2	1.3	1	10
	No region specified	5	3.9	2	1.9	1	6
	North Carolina	33	4.6	3	4.6	1	30
	Coastal Plain	7	2.3	2	4.7	1	20
	Piedmont	12	5.0	3	4.3	1	30
	Mountain	13	3.3	3	2.5	1	15
	No region specified	1	5.0	5	-	5	5
Knuckle-boom loader							
	South Carolina	77	7.5	5	7.8	1	50
	Coastal Plain	52	5.5	5	5.7	1	21
	Piedmont	25	10.1	8	7.4	1	50
	North Carolina	82	11	8	8.9	1	30
	Coastal Plain	40	6.7	7	6.8	1	27
	Piedmont	24	13.4	13.5	8.3	2	36
	Mountain	18	15.8	16	9.8	1	30
Rubber-tired feller-buncher							
	South Carolina	72	7.0	4	10.2	0.5	26

	Coastal Plain	47	5.9	4	5.4	1	26
	Piedmont	25	6.3	4	5.2	0.5	24
	North Carolina	66	8.4	5.5	7.1	1	27
	Coastal Plain	40	5.9	5	6.2	1	27
	Piedmont	21	10.5	8.5	7.5	1.5	27
	Mountain	5	11	9	6.4	1	16
Tracked feller-buncher							
	South Carolina	13	9.4	7	7.8	1	21
	Coastal Plain	12	8.9	6	7.7	1	21
	North Carolina	21	4.7	3	4.1	1	21
	Coastal Plain	13	5.1	3	4.8	1	21
	Piedmont	5	3.7	3.5	0.9	3	5
Grapple skidder							
	South Carolina	77	7.1	5	6.2	0.5	30
	Coastal Plain	50	6.6	5	5.5	0.5	24
	Piedmont	27	7.7	5	7.1	1	30
	North Carolina	78	10.4	8	8.9	1	44
	Coastal Plain	42	8.2	7.5	8.6	1	44
	Piedmont	24	12.8	10	8.7	1	36
	Mountain	12	12.4	11	8.2	1	28
Cable skidder							
	South Carolina	7	7.5	4.9	9.8	1	20
	Coastal Plain	5	5.3	5	3.1	1	10
	North Carolina	10	19.8	25	10.2	2	33
	Mountain	8	21.2	25	10.7	3	33
Chain-flail delimber							
	South Carolina	6	9.5	8	5	3	19
Whole-tree chipper							
	South Carolina	14	7	6	4.2	2	18
	Coastal Plain	10	7.9	7	4.4	2	18
	Piedmont	4	6.3	6	3.2	2	10
	North Carolina	15	11.3	7	11.6	2	37
	Coastal Plain	10	6	5	4.2	1	13
	Piedmont	5	13	12	13.3	2	37
Forwarder							
	South Carolina	5	3.6	3	2.4	1	10
	North Carolina	4	10.5	9	7.2	3	24
Bulldozer							
	South Carolina	39	9.7	8.5	7.5	1	20
	Coastal Plain	24	8.7	9	8.5	1	20
	Piedmont	15	8.4	8.5	5.2	1	16
	North Carolina	36	17.4	15	10.5	3	48
	Coastal Plain	11	13.2	10	8.7	4	30
	Piedmont	10	19.9	20	7.6	6	30
	Mountain	15	18.8	14.5	13	3	48

Truck						
South Carolina	59	11.2	8	13	1	39
Coastal Plain	33	9.9	7.5	7	1	30
Piedmont	26	10.8	8	10	1	39
North Carolina	51	15.2	15	10	2	40
Coastal Plain	19	17.5	18	11	2	40
Piedmont	21	15.8	15	11	2	39
Mountain	11	16.2	16	5	6	26

Table 1.6. Reported use of onboard or in-woods scales to measure truck weight by South Carolina and North Carolina logging businesses in 2022

	not using scales (%)	onboard scale (some trucks) (%)	onboard scale (all trucks) (%)	platform scales (%)	Loader-mounted scales (%)
South Carolina (n=92)	**84**	**6**	**8**	**2**	**1**
Coastal Plain (n =56)	82	7	4	5	1
Piedmont (n=30)	87	7	0	6	0
No region specified (n=6)	100	0	0	0	0
North Carolina (n=92)	**73**	**17**	**4**	**5**	**1**
Coastal Plain (n =42)	60	29	7	5	0
Piedmont (n= 27)	78	19	0	0	4
Mountain (n=20)	95	0	0	5	0
No region specified (n=3)	100	0	0	0	0

The logging business owners were asked if they were members of the professional organizations active in their state. Some logging business owners reported being members of two or more organizations. In South Carolina, 51% of respondents reported being a member of the Forestry Association of South Carolina, and approximately 57% were a member of the South Carolina Timber Producer Association. Approximately 89% of respondents in North Carolina were members of the North Carolina Forestry Association, and approximately 45% were members of the Carolina Loggers Association.

Eighty-nine percent of logging businesses in South Carolina and approximately 95% in North Carolina recorded no lost time accidents among their workers in the previous year. One lost time accident was reported by 11% of South Carolina logging businesses and by 5% in North Carolina.

Seventy-two percent of Coastal Plain (n=42) and 58% of Piedmont (n=18) loggers in South Carolina, and 84% of Coastal Plain (n=37), 73% of Piedmont (n=19) and 30% of Mountain (n=6) loggers in North Carolina reported having a market for fuelwood/biomass.

Approximately 20% of South Carolina and 27% of North Carolina logging business owners expected to be out of the business in the next five years. Of them, more than two-thirds expect their businesses to cease to exist in both states. In South Carolina, none expected their family member to take over the businesses, whereas one North Carolina logging business owner expected their family member to take over their businesses.

1.3.4 Logging Business challenges

The logging business owners were asked to report the biggest problems they were facing in their businesses. The South and North Carolina logging businesses reported various challenges. Among them, the most common challenges recorded were high fuel costs, hiring qualified labor including finding truck drivers and other operators, high equipment and operation cost, and increasing insurance costs. The recent rise in fuel prices in 2022 concerned many logging businesses across both states. The high fuel cost was reported as a challenge by 53% of respondents in South Carolina and 56% of respondents in North Carolina (Figure 1.9). Some logging business owners also stated a lack of markets for their products and low cut and haul rate as their challenges. Several logging businesses also reported an increase in the overall cost/inflation.

Several South and North Carolina logging businesses reported an increase in the insurance costs for the equipment, trucking, and worker's compensation in the last five years, ranging from an average increase of 16% to 51%, while some stated a decrease in the insurance costs, ranging from an average decrease of 2% to 36% (Table 1.7).

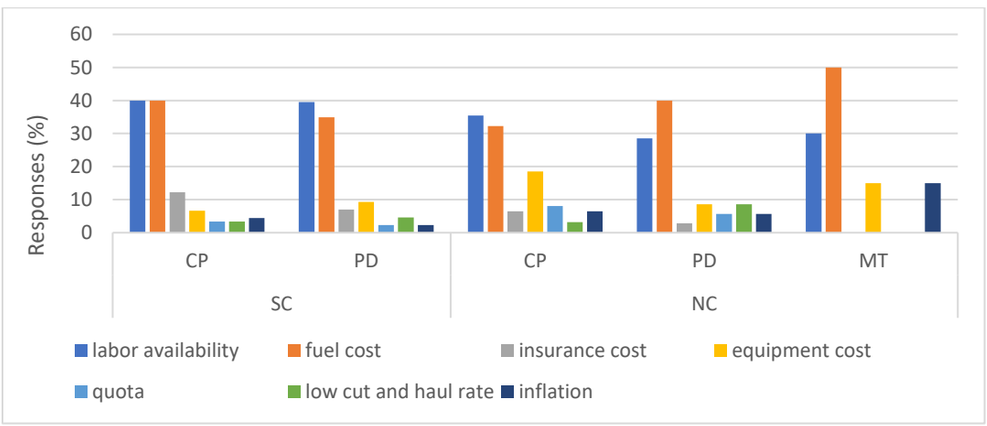

Figure 1.9. Self-reported challenges faced by South Carolina (SC) and North Carolina (NC) logging businesses in 2022 for Coastal Plain (CP), Piedmont (PD), and Mountain (MT) physiographic regions. Multiple responses were possible, and sum of the bars exceed 100%.

Table 1.7. Self-reported average increase and decrease in insurance costs by South Carolina and North Carolina logging businesses in 2022

Insurance cost	Average increase	Average decrease
South Carolina		
Worker's compensation	22% (n=43)	11% (n=22)
Equipment Insurance	27% (n=64)	4% (n=6)
Truck Insurance	51% (n=68)	13 (n=4)
North Carolina		
Worker's compensation	16% (n=33)	9% (n=23)
Equipment Insurance	20% (n=55)	36% (n=8)
Truck Insurance	30% (n=64)	2% (n=2)

1.4 Discussion

1.4.1 Business characteristics

Logging typically entails working in remote locations, often in poor weather and hazardous terrain (Bailey et al., 2019). The reported challenges of finding labor may be attributed to the given condition in which the workers must work and the amount of pay and benefits they receive (Egan & Taggart, 2009; He et al., 2021). Trucking tops the chart in this case, where loggers have difficulty finding and hiring log truck drivers (American Trucking Association, 2017). However, the problem is broader than finding labor; many loggers mentioned hiring skilled labor as a challenge. Skilled labor availability focuses more on the workers skilled with the technical knowledge of operating mechanized equipment used across the logging businesses in the southern US. However, the availability of skilled and technical workers in the US logging industry is limited, and a similar situation is identified across Europe and New Zealand (Bayne & Parker, 2012; Szewczyk et al., 2020).

The production level of a business is associated with the financial size of the business, often termed as small, medium, or large businesses. Small businesses must benefit from the limited capital investment and the marginal profit, whereas large businesses seem to gain more benefits given their higher capacity to produce (Spinelli et al., 2017). Also, the parcelization of forest lands, especially those owned by non-industrial private forest landowners, may pose challenges for highly productive harvesting systems as small tracts do not sustain their harvesting operation for a long time and require frequent and costly

moving of harvesting equipment (Moldenhauer & Bolding, 2009).In the middle of these businesses, there exist medium-sized businesses, which account for most of South Carolina's logging businesses in 2022. We identified a decrease in small-sized businesses between 2012 and 2022 and that the logging industry is mostly concentrated toward the medium-scale production level with an average weekly production of 40 to 70 loads. Incorporating highly mechanized harvesting technologies incompatible with harvesting smaller tract sizes by logging businesses may be the reason for the rise in medium-sized businesses as the cost per acre of harvested tract increases as the forest tract size decreases for the capital-intensive mechanized harvesting methods (Allred et al., 2011). Due to this restriction, many small businesses have increased their production levels, or have merged to form medium-sized businesses to lower costs and make a profit. However, it is essential to recognize that worker's performance has a significant impact on a business's productivity and profitability. The shortage of qualified workers is concerning, as adding low-skilled employees can lead to long-term declines in productivity and profitability (He et al., 2021; Spinelli et al., 2017).

Quotas have long been addressed as one of the factors causing unused logging production capacity in the Southern US, and the wood supply system must bear the cost of this logging inefficiency (Egan et al., 2006; Greene et al., 2004). It was reported as the most significant challenge by more than half of the surveyed logging businesses in 2017. However, in 2022, the quota is identified as a challenge by fewer logging businesses. The reason may be that there have been many logging businesses closures in the last five years that have balanced the excess logging capacity produced previously, or the logging businesses have altered some of their mechanisms to deal with the quota issue. Regarding the logging business closures, 14% of South Carolina loggers in 2017 expected to be out of their businesses by 2022 (Conrad et al., 2018b). This number shows no sign of abating, with more loggers expecting not to be in their businesses in the next five years. Regarding a change in the logging business mechanism, an increase in number of loggers buying their timber instead of operating through wood dealers or mills is one example. When loggers buy their timber, they have more negotiating power over prices and can cut costs associated with the transaction, both of which will increase their profitability and favor flexible scheduling (GC et al., 2020). However, because this calls for more expertise and higher

investment, purchasing timber can expose the company to additional risk (Conrad et al., 2018b; GC et al., 2020). The increase in the higher educational level of loggers can help incorporate this mechanism by conveying essential skills in their businesses. However, in 2023, there has been a notable trend of mill closures within the paper and pulp industry in North and South Carolina (Abbati, 2023). As mills shut down, the demand for wood decreases, consequently affecting employment opportunities for mill workers and those involved in the supply chain, including foresters, loggers, wood dealers and truckers (Kingsley, 2023a; Lang, 2023). Further research is warranted to explore the potential correlation between mill closures and their impact on North and South Carolina logging businesses.

The most significant/dominant harvested products in North and South Carolina are tree and log length. Most logging businesses in both states in 2022 practiced clearcutting on most harvest sites. In South Carolina, clearcutting has increased compared to past surveys. The loggers' harvesting operations depend upon the operation’s financial feasibility and the skills required. Thinning is mostly carried out to improve forest health and reduce hazardous fuels, and smaller equipment works better for thinning (Chang et al., 2023). However, the equipment used in the southern US logging industry is mostly larger mechanized equipment which is expensive to use (Concu, 2019; Conrad et al., 2018a). Therefore, one of the main challenges in thinning operations today is the low financial feasibility (Chang et al., 2023). The region also has many acres of mature stands that were not harvested during the 2010s because of low sawtimber prices, meaning these stands are past due for a regeneration harvest (Adams et al., 2019). Another reason behind clearcutting the stands might be the projected recovery in the housing demand and divestment of timberland focusing on fulfilling timber demand (Prestemon et al., 2022).

The wood energy market across North and South Carolina is significant, with many loggers reporting a fuelwood/biomass market in their respective areas. More than 25% of the logging businesses in South Carolina reported harvesting dirty/fuel chips and clean chips. The biomass market is a way to earn additional revenue from the by-product of primary operations that may otherwise be left behind on-site (Dirkswager et al., 2011; Zamora-Cristales et al., 2015). However, there is a need for a more stable and green market

to capitalize on the wood energy/biomass market, given the challenges that come along with expanding the biomass market (GC & Potter-Witter, 2011; Ince et al., 2011).

1.4.2 Owner's/Manager's background

The aging of logging business owners has been a common trend across several states of the USA, with many loggers over the age of 55 years, and this demographic remains problematic in 2022 as well (Conrad et al., 2018b; GC et al., 2020; Hiesl, 2020; Rickenbach et al., 2005). The age demographics suggest that the existing logging business owners are nearing retirement age, and there is a need for new and young loggers to sustain the logging industry. We found that some young loggers are entering the South Carolina logging industry. However, to attract new loggers, logging must be profitable (Conrad & Greene, 2017). A logging business is generally associated with a high capital investment, with one piece of equipment costing hundreds of thousands of dollars along with its high operational cost (Cook et al., 2022). However, the reported profit margin of logging businesses ranges from 3 to 5.5% (Lowrance, 2018). In addition, there is a decrease in the trend of logging business owners passing their businesses to their family members after retirement. It is challenging to attract the young generation to the logging job as there are other jobs in the marketplace with good pay and job security (Conrad et al., 2018b; Melemez & Tunay, 2010).

Many loggers are leaving their businesses after reaching their retirement age, and some loggers have mentioned expecting to leave their businesses in the next five years, given the challenges in the logging industry. Fuel cost has been reported as the one of the prominent challenges in 2022 by more than half of the responding logging businesses in South Carolina and North Carolina, followed by increased equipment and operational costs. According to a recent survey carried out by American Loggers Council, the logging contractors reported a 25% cost increase in equipment and its parts and in commodities such as fuel compared to 2021 (Martin, 2022). Other challenges, such as lack of markets for timber, low wood prices, and low-profit margin, are reported by several loggers, which has raised the concern of whether logging businesses with multi-million dollars of capital investment can make a profit and sustain themselves in the industry in the long run. One of the main issues for the loggers today is that there is no realistic path for growth, whether

it is due to the structure of the input costs or their inability to pass on cost increases to mills (Martin, 2022).

The noticeable increase in the number of South Carolina loggers completing a college degree in 2022 compared to past surveys might lead to further changes in the logging industry. Along with the increasing size and complexity and given profitability concerns within the logging businesses, high-level financial management skills that can be obtained from a college education can help logging business owners be successful (Conrad et al., 2018b; Henderson et al., 2017). The loggers' educational attainment can also be correlated with the adoption of technologies like email, internet, GPS, computer mapping, as higher educational level tends to promote greater adoption of technology (Bolding et al., 2010). Similar future surveys could provide further insights into this aspect.

The economic life of a machine and its rate of deterioration depend highly on the type of equipment, and the environment and conditions (terrain, weather) on which it is operated (Cook et al., 2022; Dodson et al., 2015; McConnell, 2021). The average age of several equipment types in 2022 is reported to be lower compared to the average equipment age in 2017 (Conrad et al., 2018b). The average equipment age in North and South Carolina indicates that the North Carolina logging businesses use their equipment longer than South Carolina. However, the regional values within North Carolina indicate that the loggers in the Mountain region use some of their equipment longer than Coastal Plain loggers. The Coastal Plain and Piedmont regions, with their abundant timberland, suitable terrain and higher productivity appears to have more daily operations which might accelerate equipment wear and replacement (Aust et al., 2004). Also, loggers in these regions may be profitable enough to replace their equipment more often, as high equipment cost was cited as a common challenge for many loggers.

1.4.3 Limitations of the study

There are limitations to our study that need to be mentioned. The mailing lists for our surveys were provided by the Forestry Association of South Carolina and the North Carolina Forestry Association. Even though these lists are considered most complete lists, there is a chance that some logging businesses are not included in these lists and therefore had no opportunity to respond to this survey or be sampled from. While the lists include loggers that participate in the state's logger training programs that are required by most

larger mills, there may be selection bias, and our results only apply to loggers that participate in the state's logger training programs and are active within their respective forestry associations.

There were some questions in our survey that respondents could only answer accurately after going through the detailed records of their yearly operations. However, some of the respondents likely didn't go to such lengths to answer those questions, which might have caused a recall bias in our study, and our results might be limited in accuracy due to that. We also made some comparisons with the past surveys without statistical significance tests, we acknowledge that some of the differences in response could be merely sampling related.

1.5 Conclusions

Logging businesses are a crucial component of the wood supply chain. Therefore, surveys like this can provide valuable insights into the current state and trends of logging businesses and the challenges that come with them. Some of the key findings of our study show a market of increasing medium-sized logging businesses, a shift from reporting quota to high fuel cost as one of the significant challenges, an increase in the educational level of the loggers, few young loggers entering the logging industry, decrease in the trend of passing down the logging businesses and a growing wood energy market in South Carolina. The loggers' difficulty hiring skilled workers, increased equipment and operational costs, and low wood prices are some challenges impacting logging businesses success. Our findings document the current state of the logging businesses in North Carolina, while creating a baseline for future studies. The logging businesses in South Carolina and North Carolina may require support, coordination, and incentives from the forest product industry, given that the challenges are increasing and making it difficult for the loggers to make a profit and sustain their businesses.

CHAPTER TWO

CHALLENGES PERCEIVED BY NEW, BEGINNING, AND MINORITY LOGGING BUSINESS OWNERS IN THE CAROLINAS AND SURROUNDING STATES, USA

Abstract

The aging of logging business owners is a common trend in the USA, and the intergenerational transfer of these businesses has slowed down. Given the rural Southeastern US demographics, young entrepreneurs, beginning loggers (e.g., middle-aged individuals starting logging businesses), and socially disadvantaged groups could develop new businesses. We interviewed Minority, Beginning and Young logging business owners and the representatives of forestry/logging associations between May 2022 and August 2023 to gather information on the business characteristics and perceived challenges of MBY loggers. Results from nine responding MBY logging businesses indicated a group of educated business owners (having graduate/college level degrees) with a productive set of businesses and an average financial investment of 100,000 to 499,999 USD. Nearly half of these business owners started their businesses independently, without a family background. Some challenges these businesses reported include high startup costs, limited access to financing and funds, low profit margin, unhealthy relationships within the industry, and increased input and operational costs. The four-participating forestry/logging associations indicated a shared understanding of the characteristics and challenges of MBY-owned logging businesses. The proposed solutions included government grants, low-interest loan programs, marketing and outreach efforts to promote the logging industry, training and workshops to empower these businesses, and legislation on input and operational cost reduction.

2.1 Introduction

The familial ties within the logging businesses have played a significant role in the long run of a logging business. It has been evident across decades that loggers hand over their logging businesses to the coming generation after retirement (Allred, 2009; Baker & Greene, 2008; Conrad et al., 2018b). This way, the same logging business would continue from Grandfather to father to son. The loggers' children are familiar with the logging environment, the machinery used, and the feeling of working in the woods/outdoors from childhood. This familiarity turns them into loggers in their family businesses (Egan & Taggart, 2004). However, this trend of passing down a logging business to the next generation has slowed down recently (Allred, 2009; Blinn et al., 2015; Ellis, 2023).

Several surveys across the United States of America (USA) suggest that loggers are not planning to hand over their logging businesses or that the coming generation is reluctant to become a logger (Allred, 2009; Blinn et al., 2015; Conrad et al., 2018a, 2018b; Egan, 2009). Logging is considered dangerous, with a fatal work injury rate of 82 per 100,000 full-time equivalent workers in 2021 and categorized as the most dangerous job by the U.S. Bureau of Labor Statistics (U.S. Bureau of Labour Statistics, 2021). Logging falls into a less attractive job category with low pay, limited benefits, and a lower sense of stability (Bailey et al., 2019; Egan, 2009; Rissman et al., 2022; Spinelli et al., 2017). The reported profit margin for logging businesses ranges from 3 to 5.5% (Lowrance, 2018). The lack of market and skilled labor availability is only a part of the logging industry's problem (GC et al., 2020). In some areas, logging is not considered a skilled job and lacks occupational prestige (Egan, 2009; Egan & Taggart, 2009).

For the last two decades, the aging of logging business owners has been a common trend across several states of the USA (Blinn et al., 2015; Conrad et al., 2018b; Egan, 2009; Egan & Taggart, 2004; GC et al., 2020). The logging business owners are typically white males and concentrated towards the fifties and sixties age group, with fewer younger loggers in the business. The average age of South and North Carolina logging business owners in 2022 was 50 years, with 24% and 31% of South Carolina and North Carolina logging business owners, respectively, over the age of 60 years (Khadka et al., 2023). This number suggests that many loggers will retire from their businesses within the next two

decades. Therefore, there is a need for incoming new and young loggers to sustain the logging industry.

Given the rural Southeastern United States demographics, young entrepreneurs, beginning loggers (e.g., middle-aged individuals starting logging businesses), and socially disadvantaged groups could develop new businesses (Conrad et al., 2018b). Young logging business owners are typically the relatives of existing logging business owners. They have been a primary source of new logging business owners for decades (Allred, 2009; Egan & Taggart, 2004, 2009). Beginning logging business owners are loggers who start their businesses from scratch or purchase from existing logging business owners, and are typically considered as owners that have less than 10 years of ownership experience (Snyder et al., 2019). The new and young business owners lack the advantage of a history of good credit and years of networking and social connections compared to older business owners (Van Praag, 2003). Additionally, young and beginning logging business owners might need help finding employees with good attitudes and skills, given that finding labor is already challenging in the logging industry (Bolding et al., 2010; Bowman et al., 2023; Egan, 2009; He et al., 2021; Khadka et al., 2023).

Members of disadvantaged groups are underrepresented as logging business owners, despite their roles in the logging industry (Ellis, 2023; Greene et al., 1998). They have been actively working in the logging industry for an extended time, but only little is known about them. This group likely faces unique challenges in starting and continuing a logging business (Ellis, 2023). Several studies have been carried out about the characteristics and challenges of minority landowners but few focused on minority loggers (Butler et al., 2020; Christian et al., 2022). Research has shown that minority business owners such as Black Americans and Hispanic owners often have significantly reduced access to bank financing compared to Caucasian-owned businesses with similar characteristics and risk profiles (Rakshit & Peterson, 2022; Tabiri, 2022). Minority-owned businesses have been noted to encounter greater difficulties in obtaining the right human resources, securing financing, and capitalizing on market opportunities compared to their White counterparts (Bates, 2011). Women-owned business studies suggest women seem to take more time to launch the business and seek business assistance and advice in the early stages compared to their

male counterparts (Walker & Webster, 2006). Therefore, there must be proper documentation of socially disadvantaged logging business owners to understand where this group stands in the logging industry.

With the aging demographics of logging business owners and the potential for Minority, Beginning, and Young (MBY) people to become new logging business owners, the objectives of our study are to (1) identify the challenges faced by MBY logging business owners in the Southeastern US and (2) document their suggestions for support to help establish new logging businesses.

2.2 Methods

In-person and telephone interviews of logging business owners and forestry/logger associations were conducted in South Carolina and North Carolina. However, responses were also collected from Florida, Georgia, Kentucky, and Virginia. We interviewed individual MBY loggers to gather responses about their businesses at the 'boots-on-the-ground' level. We also interviewed representatives of forestry/logging associations to obtain broader, state-level perspectives of MBY logging businesses on the overall trend and challenges, moving beyond the experiences of individual loggers. For our study, we defined Minority logging business owners as non-male or non-white owners, Beginning logging business owners as owners that started their business within the past ten years (2012 or after), and Young logging business owners as individuals under the age of 35 years (Ellis, 2023).

The initial sample frame of South Carolina and North Carolina loggers was based on responses to the 2022 South Carolina and North Logging business surveys (Khadka et al., 2023). A total of twenty respondents had the characteristics of an MBY logging business owner. The logging business owners were contacted through email to participate in an interview. Once logging business owners agreed to participate in the interview, the interviews were carried out by phone or going to their logging site for an in-person interview. Each interview took approximately 45 to 60 minutes, and the audio was recorded with the permission of logging business owners, when possible. We expanded our respondent pool by relying on referrals from loggers, forestry associations and foresters working in South and North Carolina. We talked with representatives of the South Carolina

Timber Producer Association (SCTPA), Forestry Association of South Carolina (FASC), Carolina Logger Association (CLA), and North Carolina Forestry Association (NCFA), requesting them to distribute information about our surveys to their members and share it on social media platforms. We also participated in the SCTPA and CLA Annual logger meeting in 2023. We completed a few additional interviews at the meetings, however, some individuals preferred to fill out a paper version of the interview questionnaire on their own and hand-in a written response to us. One logger from Virginia requested a printed copy of the interview questions to provide a written response.

For the loggers/forestry association interviews, we emailed the representatives of 23 logger/forestry associations across 11 Southeastern US states asking them to participate in the interview. The interviews took approximately 60 minutes to complete and were carried out through a phone or Zoom call.

The MBY interview questionnaire included questions related to general business characteristics, owner background information, perception of challenges and future outcomes, access to capital, future plans and open-ended questions (see Appendix B). The MBY questionnaire consisted of 66 questions, with 41 closed-ended questions, 14 open-ended questions, and 11 Likert scale questions.

We designed a separate questionnaire to interview the logging associations/forestry associations across the Southeastern US. The questionnaire comprised questions related to MBY loggers, perceptions of challenges and future outcomes, access to capital, succession plans, and open-ended questions (see Appendix C). There were 29 questions, four closed-ended questions, 14 open-ended questions, and 11 Likert scale questions. Our study is part of a more extensive study across the southern US, and we utilized a modified version of the questionnaire used by Ellis (2023) in Georgia and Florida. This study was approved by the Clemson University Institutional Review Board (IRB2021-0954 and IRB2021-0784).

All data were collected between May 2022 and August 2023. All responses were recorded in MS Excel, and summary statistics were calculated.

2.3 Results

2.3.1 Owner background, General business characteristics and Profitability

Twenty MBY business owners working in North and South Carolina were contacted initially with six completing an interview for an initial response rate of 35%. From the referrals of forestry/logging associations, foresters, and loggers, we were able to conduct another three interviews. All but one respondent worked in South Carolina or North Carolina, while one worked in Virginia. Eight respondents were White logging business owners, with one Hispanic owner. All but one of the respondents were male business owners. The age of the respondents ranged from 23 years to 54 years, with a median age of 28 years. All the business owners had at least completed their high school degree. Thirty-three percent of respondents (n=3) had an undergraduate/graduate degree in Forestry, 33% (n=3) had a college degree, in business and organization or in certified programming, and the remaining 34% (n=3) had a high school degree. Seventy-eight percent of the respondents (n=7) were the sole owners of their businesses and the remaining 22% (n=2) reported sharing the business ownership with their fathers. All had worked in the logging industry before becoming the owner of their businesses as truck drivers, logging crews, skidder operators, or timber buyers. For all the respondents, their logging business was their primary source of income. The majority (n=8) of the responding businesses were a Limited Liability Company, and (n=1) was a Cooperative.

Table 2.1. Profile of Minority, Beginning and Young logging business owners: demographics and general business characteristics

	Logging business owner category	States operated	Age	Race	Gender	Highest level of formal education (name of the degree)	Years of involvement in logging industry	Years of operating business	No. of logging crews	No. of full-time employees	Average weekly production (all crews) (loads)	Current capital investment (USD)
1	Y & B	SC, NC	28	White	Male	Undergraduate	6	6	2	13	40	1,500,000-1,999,999
2	Y	SC, NC	27	White	Male	College	12	1	1	4	25	100,000-499,999
3	M	SC	54	White	Female	Graduate	13	7	1	4	50	100,000-499,999
4	Y & M	NC	30	Hispanic	Male	High school	5	5	1	3	26	less than 100,000
5	Y & B	SC	23	White	Male	Undergraduate	<1	<1	1	2	25	100,000-499,999
6	Y & B	SC	26	White	Male	High school	10	2	1	4	45	2,000,000-2,499,000
7	Y	SC	33	White	Male	College	17	12	1	8	55	1,000,000-1,499,999
8	Y	NC	35	White	Male	College	17	8	3	33	130	3,000,000 or more
9	Y	VA	25	White	Male	High school	7	4	1	1	50	1,000,000 to 1,499,999

Note: M=Minority, B=Beginning, Y=Young

The years that these respondents have been involved in the logging profession ranged from 10 months to 17 years, with a median of 10 years. The years of operating their businesses ranged from 10 months to 12 years, with a median of 5 years. When asked if they had a family history in logging, 44% of respondents (n=4) reported having no family history, meaning these owners came into the logging industry independently. All other respondents had some familial ties to the logging industry. All the loggers with a family history in logging mentioned that logging was a part of their childhood and their father working in this industry was the pushing factor for them to join this profession. The remaining respondents either had worked in the logging industry before or were familiar with the logging industry.

The number of crews for each respondent ranged from 1 to 3, with a median of 1 crew. The number of full-time employees ranged from 1 to 33, with a median of 4 employees (Table 2.1). When asked about the recruiting method, most respondents reported ‘word of mouth’ as their typical method. Two of the respondents mentioned using social media to find employees. One logger mentioned not having to recruit any employees as the employees in their business had been working there for a long time. The average weekly production (all crews) ranged from 25 loads to 130 loads/week with a median of 45 loads/week (Table 2.1). The number of mills these logging businesses do regular business with ranges from 3 to 13 mills annually, with an average of 6 mills.

The capital investment for these logging businesses ranged from less than $100,000 to $3,000,000. The respondents were asked to self-report their business profitability in the past five years. Thirty-three percent (n=3) reported overall profitability as ‘average (break-even)’, 33% (n=3) as ‘good’, 22% (n=2) as ‘poor’, and one respondent (12%) reported ‘very poor’.

Sixty-seven percent of respondents (n=6) reported that 100% of the tracts they harvest annually belong to Private individuals/families, with the remaining respondents indicating a mix of ownership between Private individuals/families, Forest industry/Real Estate Investment Trust, and Pension fund/Timber Investment Management Organization. None of the businesses reported harvesting on Federal/State Government owned tracts. Fifty-six percent of the respondents (n=5) reported conducting clear-cut for more than half of their

annual harvest, 22% (n=2) reported conducting equal clear-cut and thinning, and 22% (n=2) reported conducting thinning for more than half of their annual harvest. Seventy-eight percent of the respondents (n=7) reported primarily harvesting pine, and 22% (n=2) reported primarily harvesting hardwood.

Forty-four percent (n=4) reported ‘always’ using written logging contracts, 22% (n=2) reported using written logging contracts ‘very often’ and 33% (n=3) reported ‘never’ using written logging contracts. Eleven percent (n=1) reported ‘always’ using a written harvest plan, 22% (n=2) reported using a written harvest plan ‘sometimes’, 11% (n=1) reported ‘rarely’ using a written harvest plan and 55% (n=5) reported ‘never’ using a written harvest plan, and only one reported ‘always’ using a written harvest plan. All the respondents reported not working with landowners that do not have a legal title.

All the respondents reported owning at least one Feller-buncher, Skidder, and Loader. Seventy-eight percent of the loggers (n=7) reported owning a log truck, with 44% (n=4) reported owning more than one log truck. Thirty-three percent of respondents (n=3) reported owning a Chipper. For 55% of the respondents (n=5), the reported age of typically replacing the types of equipment ranged from 1 to 8 years for harvesting equipment and 5 to 25 years for log trucks. The remaining 45% (n=4) reported not having any replacement plan. When further asked why, two respondents mentioned they could not afford to replace equipment because of the high cost. For the other two respondents, one mentioned replacing equipment only after the equipment wears out, and another reported replacing equipment based on the maintenance cost and wanting the equipment last if it can.

Sixty-seven percent of the respondents (n=6) mentioned buying their own timber. Loggers who buy their own timber are individuals/companies who purchase timber resources directly from the landowners, timber companies or other sources rather than solely relying on contracts or employment to obtain timber for logging operations. The primary timber purchasers for the remaining businesses were wood dealers (n=2) and cutting on company land (n=1). Most self-timber-buying respondents purchased their sales through negotiation with landowners and foresters, and through a pay-as-cut agreement. Out of the six businesses purchasing their timber, three reported the largest lump sum in the past five years, ranging from 38,000 USD to 362,000USD, with a median of 290,000 USD.

Sixty-seven percent of respondents (n=6) were a member of professional organizations, and all the respondents held logging certifications such as Timber Operation Professional (TOP) Logger, Sustainable Harvesting And Resource Professional (SHARP) Logger, and ProLogger.

2.3.2 Perception of challenges, Future outcome and Proposed solutions

Fifty-five percent of the respondents (n=5) reported 'never', 11% (n=1) reported 'rarely', 22% (n=2) reported 'very often', and one respondent reported 'always' having difficulty receiving financing from the bank. When asked to elaborate on the situation, three of them reported that they were not sure why they did not get financed by a bank, and one of them mentioned it had not been as long since he is a business owner and his credit history might have limited him from getting financed, and that this situation is getting better.

Thirty-three percent of respondents (n=3) 'strongly agree', 44% (n=4) 'agree' and 23% (n=2) were 'neutral' that their relationship with local mills and foresters was good. Some respondents reported that the relationship with local mills is improving. However, some mentioned they must accept mill prices with little negotiation from the mill's side, there is a quota issue, and the relationship could improve if the mills would help.

The common challenges faced by these logging businesses include finding skilled labor, high fuel cost, economic inflation and unhealthy relationships within the wood product industry (Figure 2.1). One respondent reported having a handful of loggers in their area that are engaging in deceptive practices, intentionally disrupting the operations of other businesses. Two respondents reported timber buyers and mills charge higher prices with less room for negotiation. One respondent reported facing discrimination which impacted their ability to be successful. He reported that some forest landowners were not confident to work with him because of his newcomer status which made him miss some opportunities.

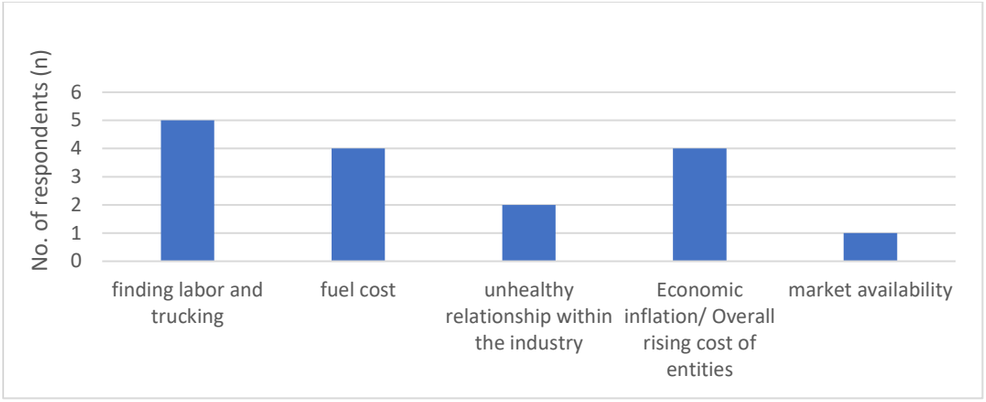

Figure 2.1. Challenges faced by Minority, Beginning and Young logging business owners today. Multiple answers possible.

Understanding cost and production of the business, receiving financing from bank and managing funds, developing good relationship with the right people in the logging industry, earning respect from the established people in the industry, and finding skilled and trustworthy workers who often prefer established businesses were reported by these respondents as some challenges faced during the first five years of operating their businesses. In their opinion, the challenges preventing the establishment of MBY-owned logging businesses were reported as high startup costs, limited profit margin, difficulty in acquiring equipment to start, and the unstable timber market.

All respondents except one expect to be in their logging businesses in the next five years. However, that respondent didn't elaborate on the situation. When asked if they will sell their business after retirement, 33% (n=3) reported 'possibly', 55% (n=5) reported 'probably not' and one respondent reported 'definitely not'.

We asked what these respondents believe needs to happen for there to be more MBY-owned businesses; some respondents reported fair compensation and profit margin from the forest industry by developing and enforcing fair pricing guidelines to ensure that loggers receive fair pay to their work. Few reported banks and financial institutions could offer tailored loan programs with reasonable interest rates to assist them in securing capital for equipment and business operations. Some reported the need for promoting logging industry through educational initiatives and outreach programs to raise awareness and attract more individuals to consider a career in logging and addressing labor shortages. They expect the industry to identify and implement cost-saving measures, to make logging businesses more financially sustainable. Some expect mentoring and support programs for

new loggers, providing guidance, resources and trainings to help them in business operations and success.

Regarding governmental assistance, the respondents expect help in similar areas such as providing increased access to funds and financing through startup grants, reducing fuel prices, encouraging more mills to enter the industry, and providing apprenticeship and educational programs oriented towards new and emerging businesses. Thirty-three percent of the respondents (n=3) were unsure what help to expect from local, state, and federal governments. They reported not having an idea about how and where the government could help them.

2.3.3 Perceptions of forestry/logging associations

We contacted 23 forestry/logging associations across 11 Southeastern US states for the survey and received responses from five organizations for a response rate of 21.7%. We received responses from South Carolina, North Carolina, Kentucky, Georgia and Florida. However, one organization refused to further participate in the survey because of concerns about questions related to discrimination and equal opportunity in the logging industry. They stated that their industry does not practice discrimination based on race, age, or gender and that equal opportunities are open to everyone. We did not further consider this response and lowered the response rate to 4.

The primary purchasers of timber that loggers harvest across these states were wood dealers, loggers and cutting on company land. Seventy-five percent of respondents (n=3) 'agreed' that logging businesses in their states have a good relationship with most local mills and foresters. One respondent was neutral about the statement. All respondents disagreed with logging businesses recruiting new woodworkers and truck drivers without difficulty. Half of the respondents (n=2) did not agree or disagree regarding the statement that logging businesses have high employee turnover. One respondent agreed with the statement, while another disagreed.

When asked if they knew of logging businesses facing discrimination that impacted their ability to be successful, one respondent said yes, one was not sure, one said no, and one respondent did not answer the question. When further asked, one respondent reported hearing of some lawsuits filed by minority loggers against wood dealers and mills and

reported finding that minority loggers were not given a good property to work. Other respondents reported not being exposed to that part of the industry and were unaware.

Most respondents (n=3) reported logging businesses face difficulty receiving financing from banks ‘sometimes', and (n=1) reported logging businesses face difficulty receiving financing from banks ‘very often'. According to the respondents, obtaining bank financing is a challenge for most loggers, largely due to the high number of applicants and banks' greater willingness to lend to conventional industries like agriculture, as opposed to the logging sector. Consequently, logging businesses tend to rely primarily on financing their operations through logging equipment dealers rather than seeking loans from banks. They also reported that receiving bank finance depends upon a business's financial record, past income and revenue history. All respondents reported that 'sometimes' logging businesses had an application for financing denied by a bank in the past. One respondent reported that many logging businesses apply for financing, which limits the chances of getting financed by banks.

The biggest challenges facing the logging industry today, as perceived by these associations, were finding skilled labor including truck drivers, fluctuating wood markets, high business ownership costs, inflation, low cut and haul rate, the aging demographics of logging business owners, and underutilized productivity.

High startup costs and low return on investment, difficulty obtaining bank financing, inability to handle inconsistencies due to having less room for error, not having family history in logging, lack of experience and the trend of consolidation, were perceived as the most significant obstacles and barriers to the establishment of new businesses.

The responding organizations reported several key needs for there to be more MBY owned logging businesses. They reported the need for senior loggers to retire, and the closure of inefficient and part-time businesses to maintain industry health as it will help in reducing competition and create space and market shares for viable MBY owned business. They reported the need for promotion and exposure of logging as a viable career choice through media campaigns and educational programs to encourage a diverse pool of newcomers. They reported the need for vocational trainings and business education to help loggers with necessary skills and knowledge to succeed. Supporting existing loggers by

helping them in maintaining high level production and creating a favorable environment for newcomers was also reported essential.

The respondents reported offering mentorship to loggers, having financial reserves for economic downturns, maintaining quotas, providing aid in capital and market access, securing bank loans, helping businesses in accounting and bookkeeping and developing specialized tools to overcome the financial challenges of this industry as some areas that the Forest Product Industry can help the MBY owned logging businesses.

The respondents reported designing small startup business development centers, supporting loggers during disruptions like hurricane storms by improving skid trails, establishing apprenticeship initiatives, making loans accessible to more loggers, providing tax advantage for startup businesses and offering workshop training opportunities as some areas that local/state/federal governments can help the MBY owned logging businesses.

2.3.3.1 Roles of logging/forestry associations

The logging/forestry association reported playing a multifaceted role in supporting logging businesses. They offer training programs tailored to meet the evolving demands of the industry. They advocate for policies and regulations that promote active forest management and the overall health of forests. Additionally, they work towards fostering a robust and thriving market for wood products. These associations actively manage the wood supply chain, recognizing loggers as a vital link. They also address trucking regulations and advocate for road and infrastructure funding to facilitate efficient operations. They help with business licensing, providing guidance on insurance and cost management, and creating job programs to attract new loggers to the industry. They also offer emergency funding initiatives during the time of need like Paycheck Protection Program (PPP) and Pandemic Assistance for Timber Harvesters and Haulers (PATHH) offered during the COVID 19 pandemic.

Face-to-face education and training workshops are a cornerstone of their efforts, supplemented by the development of practical tools like logging safety plans and trucking cost estimators. These tools address critical issues faced by logging businesses, enhancing their competitiveness. Additionally, these associations emphasize compliance with state laws, ensuring that loggers are audited and verified. Recognizing the importance of

technology, they encourage loggers to attend several events, leveraging the internet for knowledge acquisition. Specialized workshops focused on logging cost management cater to loggers' needs. They promote educational materials through multiple channels, including in-person sessions, websites, and social media platforms like Facebook.

2.4 Discussion

2.4.1 Owner background, General business characteristics and Profitability

The characteristics of the logging industry across the Southeastern US states are similar, with abundant forest resources, high capital investment, intensively managed forests, diverse timber products, dominant pine plantations, and favorable terrain for logging operations (Conrad et al., 2018b; Fox et al., 2007). The logging industry plays a significant role in the regional economy, providing jobs and contributing to the overall economic stability of many communities (GC & Potter-Witter, 2011; Greene et al., 2001). However, the foundation of the logging industry in this region has been constantly questioned, given the uncertainty and doubt surrounding the viability and sustainability of the industry. Examining the demographics and challenges, our study respondents share similarities with their counterparts in other states across the southeastern USA. Some industries' concerns are skilled labor shortages, fluctuating wood market, aging demographics, inflation, and high business costs (Bowman et al., 2023; Conrad et al., 2018b; Ellis, 2023; Khadka et al., 2023).

However, despite not having a family background in logging, nearly half of the respondents entered this industry by choice. This indicates a positive sign of young individuals voluntarily joining the logging profession. Two of these businesses described their overall profitability as 'average', indicating that they broke even. However, one reported 'poor' profitability, and another reported 'very poor' profitability. These two businesses mentioned facing challenges in obtaining bank financing, with one business stating that they were denied financing "very often" and the other "always." Notably, the businesses reporting 'poor' and 'very poor' profitability had only been in operation for a year. Studies show that family-owned businesses often have a long-term perspective, which can be advantageous for business sustainability and financial success (Chua et al., 1999; McConaughy et al., 2001). However, it depends upon several other factors, such as size

and the industry in which the business operates. Hence, future research in the logging sector can elucidate the relationship between business profitability/success and the presence or absence of family history in the business.

Among our study respondents, one Minority logger reported the lowest capital investment, totaling less than $100,000. He mentioned encountering challenges where individuals from the local community people exhibited a bossy attitude, affecting his confidence in the business operation. While our study had a limited number of minority loggers, constraining the evidence of racial discrimination within the industry, one participating logging association highlighted instances of racial discrimination. Studies on minority landowners showed that they are more likely to be regionally located, have smaller forest holdings and feel disadvantaged due to their race (Butler et al., 2020; Christian et al., 2022). Ellis(2023) also reported that the sole black logging business owner in her study cited direct examples of racial discrimination. These findings suggest the need for dedicated studies on minority business owners to uncover and address such underlying issues within the industry.

The majority, around 67% of the responding businesses, had completed college or graduate studies, higher than the overall demographics of logging business population in North and South Carolina (Khadka et al., 2023). While practical experience and training play pivotal roles in developing business handling skills, it is essential to acknowledge that higher education levels provide a knowledge foundation and critical thinking skills that can be advantageous in business management (Blackburn et al., 2013; Bowman et al., 2023). Notably, 67% of the participants preferred directly buying their timber rather than going through wood dealers. This approach helps them save money by skipping intermediaries, offering competitive prices and having more control over the timber they harvest (GC et al., 2020). Nevertheless, this approach necessitates higher capital investments, effective networking for selling wood, and demands significant administrative skills, making it a time-consuming and complex process (Conrad et al., 2018b). Higher education can empower businesses to take calculated risks and implement strategies for the growth of the business (Chiliya & Roberts-Lombard, 2012). In addition to education, the responding logging/forestry associations reported recognizing the value of technologies to share educational materials through various digital channels and websites, especially for young

demographics. These circumstances suggest a correlation that younger and educated individuals are more inclined to embrace innovative approaches and technologies in various areas.

Logging businesses collaborate closely with landowners, wood dealers and forest product mills. However, the reported existence of unhealthy relationships among these entities raises a concern, particularly those that overlook the presence of young and new loggers in the industry. This situation not only adds to the difficulties these new businesses face but also discourages them from continuing the job and recommending it to others. It can further exacerbate the existing older logging demographic challenges in the industry. Therefore, cooperation and coordination within the wood product industry are crucial to support and encourage new and young business owners.

2.4.2 Role of forestry/logging associations, Perception of challenges, Future outcome and Proposed solutions

The challenges reported by our study participants show that the logging industry will continue to be challenging to work in, given that the challenges start with higher financial investment, higher input and operational costs, and skilled labor shortages until lower financial returns. In addition, being an MBY logger adds more complexities in operating the business. All but one respondent reported their financial investment of more than 100,000 USD. These businesses had an average investment of 100,000 to 499,999 USD, lower than the average investment of general logging business population in South Carolina (1.3 million USD) and North Carolina (945,989 USD) (Khadka et al., 2023).

The logging/forestry associations support and advocate for logging businesses. They work to shape policies, regulations, and legislations favorable to the industry and advocate at local, state and federal levels (Cubbage et al., 2007; Straka, 2011). The logging businesses look to these associations for assistance in several facets of their businesses. Our study findings reveal a shared understanding between logging/forestry associations and logging businesses regarding the industry's characteristics and challenges, although certain areas remain outside the associations' scope. However, a gap exists between the expectations of these logging businesses and the extent of support these associations provide, as logging businesses are struggling with several aspects of the business and its

sustainability. Nevertheless, it is essential to recognize that addressing all the issues reported by logging business may be challenging. Effective policy instruments must meet several criteria: efficiency, equitable decision-making, practicality, and affordability (Straka, 2011). Therefore, bridging this gap while adhering to these criteria is essential for these organizations to serve the logging industry better.

The forestry/logging organizations and the University extension offices can collaborate to invest in marketing and outreach efforts to promote logging as a viable career option, mainly targeting younger individuals and minority groups. They can offer financial consulting services or tools through training and workshops to help logging businesses analyze their profit margins and identify opportunities for cost reduction without compromising on business safety or sustainability. The Producer Price Index (PPI) by the U.S. Bureau of Labor Statistics can be a crucial tool to assess whether loggers receive adequate compensation to sustain their involvement in the industry and maintain a robust supply chain (Kingsley, 2023b). In addition, they can develop and document standardized logger training programs, startup assistance programs and certification programs to ensure safety, environmental responsibility and best practices in the industry. In 2022, the North Carolina Agromedicine Institute collaborated with the Forest Resource Association (FRA) to research logger training and safety to identify barriers and improve training programs (Altizer, 2022).

Forest product industry can advocate for government grants, low-interest loan programs, and tax advantages to encourage business growth and investment. Some such efforts were the USDA Forest Service accepting grant applications for Wood Innovations Projects and Community Wood Energy Facilities to spark innovations and create new markets for wood products and renewable wood energy in 2023, and The American Loggers Council (ALC) and state logging associations urging Congress to support the “COVID-19 Economic Damage Relief Package for Logging and Trucking Companies” in 2020 (American Loggers Council, 2020; U.S. Department of Agriculture, 2023). The forest product industry can collaborate with equipment manufacturers and other microfinancing institutions to create equipment leasing programs and work on fuel subsidies or tax incentives to help reduce operational costs. Companies like John Deere and Global Financial & Leasing Services (GFLS) have been providing forestry and equipment

financing and assisted small- to medium-sized logging business owners in obtaining equipment leasing options to meet customer demands during periods of high wood demand. With the recent increase in mill closures, incentives by the forest industry to encourage the establishment of more mills, increasing the demand for wood products and additional markets for logging businesses can prove essential. Further such collaborative efforts are crucial for the continued growth and stability of the logging sector.

2.4.3 Limitations of the study

We carried out mixed-mode surveys for our data collection to gather responses from a diverse group of participants. While this approach offers flexibility, it has challenges. The participants may have varying responses for survey modes, and some individuals may favor online surveys/mailed surveys as the phone and in-person interviews were time-consuming. Therefore, these participants may differ from those who responded to other mailed logging business surveys. While these phone/in-person interviews provided more detailed information than a standard mailed survey, this could have influenced the responses and created bias. Additionally, some respondents might not have answered a few questions accurately, particularly those related to finances, which could have caused a recall bias in our study. Lastly, the relatively small number of responding logging business owners and forestry/logging associations in this study makes it difficult to draw strong conclusions about the logging industry.

2.5 Conclusion

With the decreasing trend in intergenerational logging business handover and the predominance of older demographics in the logging industry today, the future of the logging industry depends on the success of MBY logging business owners. Therefore, understanding the challenges MBY logging business owners face and identifying their solutions is crucial for ensuring a healthy wood supply chain. Results from nine responding MBY logging businesses indicate a productive set of businesses with a good amount of financial investment and highly educated business owners. Nearly half of these business owners started their logging businesses independently with no family history in logging. The challenges faced by this group were identical to the challenges faced by the general logging population in the Southeastern USA, with some additional unique challenges.

Some of the reported challenges include high startup costs, difficulty accessing financing and funds, low profit margins, unhealthy relationships within the industry, and higher input and operational costs, and other underlying challenges. The four-participating forestry/logging associations indicate similar results about the characteristics and challenges of MBY-owned logging businesses in these states. These organizations make efforts to empower logging businesses and their operations. However, further collaborative efforts by the entire Forest Product Industry and Government to support and guide these businesses is ideal, especially since most business owners desire to remain in their businesses despite the challenges. Similar research and broader surveys could provide robust insights about these businesses' needs and sustainability.

CHAPTER THREE

CONCLUSION

3.1 Chapter One conclusion

The goal of Chapter 1 was to collect data from North and South Carolina logging businesses about general timber harvesting characteristics, business information, owner's demographics, equipment age, capital investment and challenges faced by the logging business owners and summarize these responses by physiographic regions within North and South Carolina. I reached this goal by conducting a mailed survey of North and South Carolina logging businesses between March and May of 2022, following the methodology of previous Georgia and South Carolina logging business surveys. The respondents were asked to enter three counties they primarily worked in, which was used to correlate the responses with the relevant physiographic regions in each state (Coastal Plain, Piedmont and Mountains). Statistical tests were carried out to test the significance between the responses and the physiographic regions within a state. South Carolina logging businesses returned a total of 100 questionnaires for an adjusted response rate of 29.7%. North Carolina logging businesses returned 103 questionnaires for an adjusted response rate of 19.7%.

Results from South and North Carolina logging businesses indicate similar business characteristics and challenges faced. Tree length and log length were the most significant/dominant harvested products in North and South Carolina. The majority of logging businesses in both states practiced clearcutting on most harvest sites. The wood energy market across both states was significant, with many loggers reporting a fuelwood/biomass market in their respective areas. The average age of logging business owners in both states was 50 years. The loggers' difficulty hiring skilled workers, increased equipment and operational costs, and low wood prices were some challenges impacting the logging business success. However, logging business owners in South Carolina appeared to be more educated than North Carolina logging business owners. The average equipment age in North and South Carolina indicated that the North Carolina logging businesses use their equipment longer than South Carolina. However, the regional values within North

Carolina indicated that the loggers in the Mountain region use some of their equipment longer than Coastal Plain loggers.

Compared to the 2017 South Carolina logging business survey, the logging businesses in 2022 show a market of increasing medium-sized logging businesses, a shift from reporting quota to high fuel cost as one of the significant challenges, an increase in the educational level of the loggers, few young loggers entering the logging industry, decrease in the trend of passing down the logging businesses and a growing wood energy market in South Carolina.

This chapter documented the current state of the logging businesses in North Carolina for the first time in the series of logging business surveys, while creating a baseline for future studies. The logging businesses in South Carolina and North Carolina may require support, coordination, and incentives from the forest product industry, given that the challenges are increasing and making it difficult for the loggers to make a profit and sustain their businesses. Future research efforts can be crucial to document the trends in logging businesses over time.

3.2 Chapter Two conclusion

The goal of Chapter 2 was to identify the challenges MBY logging business owners faced in the Southeastern US and document suggestions to help establish new logging businesses. I reached this goal by carrying out in-person interviews with 9 MBY logging business owners and 4 forestry/logging associations, between May 2022 and August 2023. Our study was part of a more extensive study across the southern US, and we utilized a modified version of the questionnaire used by Ellis (2023) in Georgia and Florida for the MBY interview. We documented the business characteristics of MBY owned logging businesses and their perceived challenges. We designed a separate forestry/logging association questionnaire comprising questions related to MBY loggers, perceptions of challenges and future outcomes, access to capital, succession plans, and open-ended questions.

Examining the demographics and challenges, our study respondents share similarities with their counterparts in other states across the southeastern USA. They were more educated and business focused than the general logging business population in South and North Carolina in 2022. These businesses had an average investment of 100,000 to 499,999

USD, lower than the average investment of the general logging demographics in South Carolina (1.3 million USD) and North Carolina (945,989 USD). Nearly half of the respondents entering the logging industry independently, without prior family history in logging industry, can be a positive sign towards new.

The challenges faced by this group were identical to the challenges faced by the general logging population in the Southeastern USA, with some additional unique challenges. Some of the reported challenges include high startup costs, difficulty accessing financing and funds, low profit margins, unhealthy relationships within the industry, and higher input and operational costs, and other underlying challenges. Some of the proposed suggestions from MBY logging business owners for there to be more MBY owned logging businesses include fair compensation and profit margin, more access to fund and financing, promotion of logging industry, and need for apprenticeship and educational programs.

Our study findings reveal a shared understanding between logging/forestry associations and logging businesses regarding the industry's characteristics and challenges, although certain areas remain outside the associations' scope. However, a gap exists between the expectations of these logging businesses and the extent of support these associations provide, as logging businesses are struggling with several aspects of the business and its sustainability. Nevertheless, it is essential to recognize that addressing all the issues reported by logging business may be challenging.

The logging/forestry associations support and advocate for logging businesses. They work to shape policies, regulations, and legislations favorable to the industry and advocate at local, state and federal levels. Some of the realistic areas of support from the forest product industry and government would be advocating for government grants, low-interest loan programs, and tax advantages to encourage business growth and investment, collaborating with equipment manufacturers and other microfinancing institutions to create equipment leasing programs and work on fuel subsidies or tax incentives to help reduce operational costs, develop and document standardized logger training programs, startup assistance programs and certification programs to ensure safety, environmental responsibility and best practices in the industry and investing in marketing and outreach efforts to promote logging as a viable career option.

APPENDICES

Appendix A

2022 North and South Carolina Logger Survey – All Responses Confidential

DO YOU OWN OR MANAGE AN INDEPENDENT LOGGING BUSINESS?

☐ YES *Please complete the survey*

☐ NO *Please stop now and return this form*

Part 1 – General Timber Harvesting

1. In which three counties do you most often harvest timber? Include state if not NC.

_____ _____ _____

2. What products do you haul to mills? Check ALL that apply.

□ shortwood (7.5' or less) □ log length
□ tree length □ clean chips
☐ dirty/fuel chips

3. What type of harvesting do you perform most often? Check ONE

☐ clearcut
☐ thinning/partial cuts
☐ equal time clearcutting and thinning/partial cuts

4. Of the stands you harvest, what is the most common type? Check ONE

□ planted pine □ natural pine
□ mixed pine/hardwood □ hardwood

5. What percentage of your harvest is pine? Check ONE

□ less than 25% □ 26-50%
□ 51-75% □ more than 75%

6. Provide the following information about the tract you are <u>currently</u> harvesting with your <u>largest crew</u>.

Ownership:
□ Forest industry/REIT □ Private individual/family
□ Pension fund/TIMO □ Federal/State Govt.
Size: _____acres
Distance from previous tract: _____miles
Average one-way distance to mills: _____miles

Part 2 – Company Questions

7. Indicate the number of people your company employs by their PRIMARY job category.

_____*Total number of employees*

_____woods workers _____truck drivers

_____foreman/supervisors _____office & clerical

_____timber cruisers _____owners/managers

_____mechanics

_____other (specify)_____

8. How many of your relatives do you employ in this business?

_____relatives

9. How many logging crews does your company operate?

_____

10. *How many of your crews are preferred supplier to a mill or for a REIT/TIMO?*

---

11. Do you operate through a wood dealer/supplier, a TIMO/REIT, or directly with the mill? *Check ONE*

☐ Through wood dealer/supplier
☐ TIMO or REIT
☐ Directly with mill

12. How do you obtain MOST of the timber that you cut? *Check ONE*

□ I buy it □ Wood dealer buys it
□ Mill company buys it □ Cut on company land

13. How often does your company use a written contract on the tracts that you harvest? *Check ONE*

□ less than 33% of the time □ 33-65% of the time
□ 67-99% of the time □ 100% of the time

14. Does your company use or follow written harvest plans? *Check ONE*

□ Yes □ No

15. How often does your company follow Best Management Practices (BMPs) to protect water quality on harvested sites? Check ONE

□ Never heard of BMPs □ Seldom
□ Usually □ Always

16. What is your company's average weekly production (all crews)? *Please circle the correct units*

_____ tons loads cords MBF

17. Does your company use contract trucking?

□ Yes □ No

If Yes, what percentage of your loads are hauled by contractors?

□ less than 25% □ 26-50%
□ 51-75% □ more than 75%

18. Does your firm operate any business in addition to logging? □ Yes □ No

If YES, what type of business? *Check ALL that apply.*

□ Buy/sell land □ Buy/sell timber
☐ Other (specify) _____

19. Estimate the current total investment that you have in your logging business.

$_____

20. Does your company use any of the following technologies? *Check ALL that apply.*

□ Email □ Computer mapping
□ Internet □ Global positioning system (GPS)

Part 3 – Owner/Manager Questions

21. What is your age?

_____years

22. How long have you operated your own logging business?

_____years

23. Describe your formal level of education. Check ONE.

_____

□ Some high school □ High school graduate
□ Some college □ College graduate

24. List the number and ages (years) of each type of equipment you use. Do NOT count spare equipment not kept in the woods. If you own multiple pieces of particular equipment, separate their ages by commas.
Ex. Grapple skidders Number = 3 Ages = 1, 2, 4

Felling	Number	Ages
Chainsaws		
Rubber-tired fellers/Shear		
Rubber-tired fellers/Saw		
Tracked fellers/Shear		
Tracked fellers/Saw		
Cut-to-Length Harvesters		

Delimbing and Bucking	Number	Ages
Chainsaws		
Delimbing gates		
Pull-through delimbers		
Cut-to-length processor		
Stroke delimber		
Chain-flail delimber		
Whole-tree chipper		
Horizontal or Tub grinder		

Skidding	Number	Ages
Cable skidders		
Grapple skidders		
Forwarders		
Clambunk skidders		
Bulldozers		

Loading & Hauling	Number	Ages
Knuckleboom loader		
Front-end loader		
Mobile knuckleboom		
Tractor-trailer rigs		
Self-loading trucks		
Extra log trailers		
Chip trailers		
Lowboy trailers		
Other (specify)		

25. Are you a member of any of the following associations? *Check ALL that apply.*

☐ Southern Loggers Cooperative

☐ North Carolina Forestry Association

☐ Forest Resources Association

☐ Carolina Loggers Association

26. What is the biggest problem you face in your business? Please describe.

_____

_____

_____

Part 4 – Miscellaneous

27. How has your workers' compensation insurance cost changed over the past five years?

_____% Increase / Decrease (circle one)

28. How has your equipment insurance cost changed over the past five years?

_____% Increase / Decrease (circle one)

29. How has your truck insurance cost changed over the past five years?

_____% Increase / Decrease (circle one)

30. What is the tare (empty) weight of your lightest truck and trailer combination?

_____lbs.

31. Are the trucks that haul your timber to mills centrally dispatched?
□ Yes □ No

32. Do you use onboard or in-woods scales to measure truck weights?

□ No scales □ Onboard scales (some trucks)

☐ Platform scales □ Onboard scales (all trucks) □Loader-mounted scales

32. Is there a market for fuelwood/biomass in your area?

□ Yes □ No

33. Do you use onboard computers/telematics on at least one machine to track location, productivity, and/or utilization? Examples include JDLink, Cat Product Link, etc.

☐ Do not use

☐ Use system from manufacturer

☐ Use after-market system

If you use onboard computer(s), which of the following best describes your experience?

☐ Rarely or never use data from onboard computer to improve operation

☐ Sometimes use data from onboard computer to improve operation

☐ Often use data from onboard computer to improve operation

34. How many lost time accidents have your employees had in the past year?
□ 0 □ 1 □ 2 □ 3 □ More than 3

35. Do you expect to be in the logging business in 5 years?

□ Yes □ No

If no, which of the following is <u>most likely</u> to happen after you leave the business?

☐ Family member will take over business

☐ An employee/partner will take over

☐ Business will be sold to an outsider

☐ Business will cease to exist

☐ Other (please specify)_____

36. Would you like a copy of the results of this survey as soon as they are available?
□ Yes □ No If yes, please provide your name & address OR email address:

_____

Appendix B

Minority, Beginning and Young logging business owner questionnaire

Privacy/Confidentiality

All your responses will remain confidential. We will report summary data from our interviews, but no one will be able to identify your individual responses. Researchers will not release identifiable results of the study to anyone other than individuals working on the project without your written consent unless required by law.

Your participation in the study is voluntary, and you may choose not to participate or stop the interview at any time without penalty. If you decide to withdraw from the study, the information collected from you will be kept as part of the study unless you make a written request to remove, return, or destroy the information.

General business characteristics

1. In what county is your business based? _____
2. Does your firm operate any business in addition to logging? If yes, please describe these businesses.
3. In which states do you operate? _____
4. How many logging crews does your company have? _____
5. Which of the following best describes the legal structure of your business?
    a. LLC
    b. Partnership
    c. Sole proprietorship
    d. Other (please specify)_
6. How many of your relatives work for this business?

    _____

7. What previous history does your family have in the logging industry, if any?

    _____

8. How do you typically recruit employees for your business?

    _____

9. Indicate the number of full-time employees your company employs by their PRIMARY job category

a. ___ Total number of employees
b. ___ Woods workers
c. ___ Truck drivers

10. During a typical year, approximately what percent of the tracts that you harvest are owned by the following entities (totaling 100%):

____ Private individual/family

____ Federal/State Government

____ Forest industry/ REIT, Pension fund/TIMO

11. During a typical year…
    a. What percentage of your harvests are Clearcuts _____% and what percentage are Thinnings _____%?
    b. What percentage of your harvests are Pine _____% and what percentage are Hardwood _____%?
    c. What is the average harvest size (loads or tons)? _____

12. How do you obtain the timber that you cut? Select all that apply.
    i. Cut on company land
    ii. I buy it
    iii. Mill company buys it
    iv. Wood dealer buys it
    v. Other (please specify)_____

13. If you typically buy your own timber, what percentage of the sales are purchased through negotiation with landowners or foresters and what percentage are purchased through competitive bidding?

___% Negotiated

___% Competitive bidding

14. If you typically buy your own timber, please describe how landowner compensation is determined. What percentage of sales are purchased for a lump sum and what percentage of sales are purchased with a pay-as-cut agreement?

___% Pay-as-cut

___% Lump sum

15. How often does your business use written logging contracts?

Never Rarely Sometimes Very often Always

16. How often does your business use written harvest plans?
Never Rarely Sometimes Very often Always

17. What is your timber buying strategy when working with landowners who do not have a legal title?

_____

18. What is your company's average weekly production (all crews)? (tons) (loads) (cords) (MBF) _____

19. How many mills do you regularly do business with during a year ? _____

20. What percentage of the timber that you harvest is transported by the following?
____% transported by trucks that my company owns
____% transported by contract truckers
____% Other (please specify)_____

21. How many of the following pieces of equipment does your company operate on a daily basis? Please provide the number of each of the following types of equipment that you operate:
a. ___ Feller-bunchers
b. ___ Loaders
c. ___ Skidders
d. ___ Processors
e. ___ Log Trucks
f. ___ Other (please specify) _____

22. At approximately what age (in years) do you typically replace harvesting equipment?

_____

23. At approximately what age (in years) do you typically replace log trucks?

_____

Owner background

1. What is your age? _____
2. What is your race/ethnicity?
    a. American Indian or Alaskan Native
    b. Asian
    c. Black or African American
    d. Native Hawaiian or Other Pacific Islander
    e. White
    f. Other (specify) _____
3. How did you first become interested in owning a logging business?

    _____
4. Are you the sole owner of this logging business? Yes/No
5. What type of work or positions did you hold in the logging industry before becoming the owner of this business?

    _____
6. How many years have you been involved in the logging profession? _____
7. How long have you operated your logging business?
8. What is your highest level of formal education? (e.g., Some high school, high school graduate/GED, some college, college degree). If you have received a college degree, what was your major?

    _____
9. Is this business your primary source of income? Yes/No
    a. If not, what is your primary source of income?

    _____

Perceptions of Challenges and Future Outcomes

1. What are the biggest challenges facing your business today?

    _____
2. What were the biggest challenges to the establishment of your business?

3. How would you describe the overall profitability of your logging business in the last 5 years?

    Very poor Poor Average (broke even) Good Excellent
4. How would you describe your level of confidence in evaluating the financial aspects of your logging business? Very poor Poor Average Good Excellent

5. Do you have contacts outside of your business that you can go to for advice relating to your business? If so, please describe their background and expertise. (ex. Mentors, family members, fellow business owners, etc).

_____

6. Is your business a member of any professional organizations? If so, what are they? (ex. Forestry Association of South Carolina, South Carolina Timber Producers **Association, Carolina Loggers Association, Southeastern Wood Producers Association, Forest Resources Association).**

_____

7. Do you hold any logging certifications? (ex. TOP Logger, Pro Logger)

_____

Please state your agreement or disagreement with the following statements based on your perceptions as a logging business owner using a 5-point scale where 1 = strongly disagree, 2 = disagree, 3 = neutral, 4 = agree, and 5 = strongly agree.

8. My business has a good relationship with most local mills

Strongly disagree Disagree Neutral Agree Strongly agree

9. My business has a good relationship with most local foresters

Strongly disagree Disagree Neutral Agree Strongly agree

10. My business recruits new woods workers as needed without difficulty

Strongly disagree Disagree Neutral Agree Strongly agree

11. My business recruits new truck drivers as needed without difficulty

Strongly disagree Disagree Neutral Agree Strongly agree

12. My business has high employee turnover

Strongly disagree Disagree Neutral Agree Strongly agree

13. My business offers competitive wages compared to other logging businesses

Strongly disagree Disagree Neutral Agree Strongly agree

14. My business has experienced discrimination which impacted its ability to be successful. For the purposes of this statement, discrimination is defined as treating someone unfavorably because he/she is of a certain race, nationality, age, and/or sex.

Strongly disagree Disagree Neutral Agree Strongly agree

15. If you believe that your business has faced discrimination that has impacted its ability to be successful, please elaborate or provide an example.

_____

16. If your business does not have a good relationship with local mills, please elaborate on the nature of the relationship.

_____

17. Please describe your ability to negotiate successfully with local mills.

_____

18. If your business does not have a good relationship with local foresters, please elaborate on the nature of the relationship.

_____

Access to Capital

Please describe the frequency of the following events or circumstances based on your perceptions as a logging business owner using a 5-point scale where 1 = always, 2 = very often, 3 = sometimes, 4 = rarely, and 5 = never.

1. My business has had difficulty receiving financing from banks

Always Very often Sometimes Rarely Never

2. My business has had to finance through a logging equipment company instead of a bank to pay for equipment

Always Very often Sometimes Rarely Never

3. My business has relied on funding from family/friends

Always Very often Sometimes Rarely Never

4. My business has had an application for financing denied by a bank in the past

Always Very often Sometimes Rarely Never

5. If your business has had difficulty receiving financing from banks, please elaborate on the circumstances.

_____

6. Please estimate how much capital you currently have invested in your logging business. Check only one response.
    a. Less than $100,000
    b. $100,000 to $499,999
    c. $500,000 to $999,999
    d. $1,000,000 to $1,499,999
    e. $1,500,000 to $1,999,999
    f. $2,000,000 to $2,499,000
    g. $2,500,000 to $2,999,999
    h. $3,000,000 or more

Open-ended questions

1. What unique challenges do you perceive are faced by young/minority/beginning logging businesses?

_____

2. What barriers, if any, do you believe prevent the establishment of young/minority/beginning logging businesses?

_____

3. What do you believe needs to happen for there to be more young/minority/beginning owned logging businesses?

_____

4. What, if anything, do you believe the forest products industry could do to encourage the formation of young/minority/beginning logging businesses?

5. What, if anything, do you believe local, state, and federal governments could do to encourage the formation of young/minority/beginning logging businesses?

Future Plans

1. Do you expect to be in the logging business in the next five years? Yes/No
   If not, which of the following is most likely to happen after you leave the business?

   a. An employee/partner will take over
   b. Business will be sold to an outsider
   c. Business will cease to exist
   d. Family member will take over the business
   e. Other (please specify)_____

Please estimate the likelihood of the following outcomes when you retire from your logging business on a 5-point scale where 1 = definitely not, 2 = probably not, 3 = possibly, 4 = very probable, and 5 = definitely.

2. My business will be sold after I retire

Definitely Not Probably not Possibly Very Probable Definitely

3. My business will cease operations after I retire

Definitely Not Probably not Possibly Very Probable Definitely

4. Is there anything that this survey has not addressed that you would like to share with me?

End of questionnaire

Do you know of other logging business owners in South Carolina or North Carolina that are young (i.e., ~35 years-old or younger), have started their logging business in the past 10 years, or are women, veterans, or minorities? If so, would you be willing to share their contact information?

Appendix C

Forestry/logging association questionnaire

MBY Questions

What State are you in: _____

1. How do most loggers obtain the timber they cut?
    i. Cut on company land
    ii. I buy it
    iii. Mill company buys it
    iv. Wood dealer buys it
    v. Other (please specify) _____
2. What is the typical landowner compensation model in your state? What percentage of sales are purchased for a lump sum, and what percentage of sales are purchased with a pay-as-cut agreement?
   ___% Pay-as-cut
   ___% Lump sum

Perceptions of Challenges and Future Outcomes

1. What are the biggest challenges facing the logging industry today?

   _____

2. What were the biggest challenges to the establishment of new businesses that you know of?

   _____

Please state your agreement or disagreement with the following statements based on your knowledge of logging businesses in the state using a 5-point scale where 1 = strongly disagree, 2 = disagree, 3 = neutral, 4 = agree, and 5 = strongly agree.

3. Logging businesses have a good relationship with most local mills

   Strongly disagree Disagree Neutral Agree Strongly agree

4. Logging businesses have a good relationship with most local foresters

   Strongly disagree Disagree Neutral Agree Strongly agree

5. Logging businesses recruit new woods workers as needed without difficulty

   Strongly disagree Disagree Neutral Agree Strongly agree

6. Logging businesses recruit new truck drivers as needed without difficulty

   Strongly disagree Disagree Neutral Agree Strongly agree

7. Logging businesses have high employee turnover

   Strongly disagree Disagree Neutral Agree Strongly agree

8. Logging businesses have experienced discrimination which impacted their ability to be successful. For the purposes of this statement, discrimination is defined as treating someone unfavorably because he/she is of a certain race, nationality, age, and/or sex.

   Strongly disagree Disagree Neutral Agree Strongly agree

9. If you believe that logging businesses have faced discrimination that has impacted their ability to be successful, please elaborate or provide an example.

   _____

Access to Capital

Please describe the frequency of the following events or circumstances based on your knowledge of logging businesses in the state using a 5-point scale where 1 = always, 2 = very often, 3 = sometimes, 4 = rarely, and 5 = never.

1. Logging businesses have difficulty receiving financing from banks

   Always Very often Sometimes Rarely Never

2. Logging businesses have to finance through a logging equipment company instead of a bank to pay for equipment

   Always Very often Sometimes Rarely Never

3. Logging businesses have relied on funding from family/friends

   Always Very often Sometimes Rarely Never

4. Logging businesses have had an application for financing denied by a bank in the past

   Always Very often Sometimes Rarely Never

5. If logging businesses have had difficulty receiving financing from banks, please elaborate on the circumstances.

   _____

Open-ended questions

1. What unique challenges do you perceive are faced by young/minority/beginning logging businesses?

   _____

2. What barriers, if any, do you believe prevent the establishment of young/minority/beginning logging businesses?

   _____

3. What do you believe needs to happen for there to be more young/minority/beginning owned logging businesses?

   _____

4. What, if anything, do you believe the forest products industry could do to encourage the formation of young/minority/beginning logging businesses?

   _____

5. What, if anything, do you believe local, state, and federal governments could do to encourage the formation of young/minority/beginning logging businesses?

   _____

Succession Plan Questions

1. Do many logging business owners have a written succession plan? A succession plan is defined as a plan that specifies when, how, and under what circumstances the management of a business will pass from the current operator to another individual. Please elaborate.

   _____

2. Do you know about some exit strategies for logging business owners nearing retirement? What will most commonly happen?
   a. Leave all at once

b. Gradually decrease workload until retirement
c. Other (please describe)

3. Do you know the factors that trigger loggers to exit from the logging industry?
    a. Children's readiness to take over the business
    b. Value of retirement savings
    c. Financial health of logging business
4. Do you know what will happen to most logging businesses when the owner retires?

    _____

5. Do you know of any loggers that have a plan in place to continue logging business operations if they were unable to manage day-to-day operations for an extended period because of illness, injury, etc.? Please elaborate.

    _____

6. What are the major challenges facing logging businesses today?

    _____

7. Do you think that the major challenges faced by new logging businesses today are different than the major challenges that existed when established logging businesses started?

    _____

Additional Questions

What are your responsibilities and methods as Logging Association/Forestry Association to help/educate logging businesses and help overcome their challenges?

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