

ABSTRACT

ROISE, LOGAN HUNTER. Long-Term Supply Contracts in Bioenergy (Under the direction of Dr. Robert Bardon and Dr. Frederick Cabbage).

A review was made of the current and past use of long-term supply contracts in the forestry, coal, and natural gas industries to assess the applicability of long-term supply contracts in bioenergy and why they are not prevalent. To assess past use, an extensive literature review was undertaken. In determining the current use of long-term supply contracts, professionals throughout woody biomass supply chain were interviewed using a structured questionnaire. Participants represented forest landowners (non-industrial and industrial), pellet and biofuel producers, forestry management consultants, procurement firms, and energy producers (Biomass facilities, investor-owned utilities, and electric cooperatives). Participants were asked about their experiences with long-term supply contracts, willingness to enter into future long-term supply contracts, and factors that impact the decision-making process for decided whether to sell on the spot market or enter a long-term contract.

Current use of long-term supply contracts was mixed, with only a few participants having willingly entered into a long-term supply contract. Several participants, who currently did not utilize long-term supply contracts, believed they had a system that worked and saw no need to change what “wasn’t broken.” At the same time, many of these participants were open to considering long-term supply contracts in the future.

Participants indicated several factors that were important to them when considering long-term supply contracts. Loss of control was particularly important for nonindustrial private timberland owners. Control was also important to other stakeholders in the bioenergy supply chain. These stakeholders believed long-term contracts could help them control the market by minimizing risk. Other important factors mentioned were the scale of operations to back a

contract, pricing, use of long-term offtake agreements, building mills in areas with less competition, and the higher costs of bioenergy.

Results from this study suggest the current lack of long-term supply contracts is attributable to a combination of relatively easy availability of wood, consumers not willing to pay a premium for a less efficient energy source as compared to coal, and stakeholders in the bioenergy supply chain being satisfied with their current system to procure/sell fiber. So is the current status quo likely to change? The answer is complicated. Due to the inefficiencies of woody biomass for energy and the efficiencies of using fossil fuels, bioenergy is not likely to gain significant market share without consumers being willing to pay more for energy. In places where it has expanded in use, contracts have usually been backed by subsidies.

In the end, possibly the most important factor is how stakeholders view long-term contracts as a strategy. Buyers in this study mentioned them being financially undesirable due to their higher costs associated with price premiums. Sellers, on the other hand, said they felt long-term contracts would limit their ability to receive maximum value for their timber. Is it possible for them to be both? Well if the contract includes a rolling average pricing mechanism, it's possible that at times it will be the highest priced/cost timber, and at other times the lowest priced/cost timber. It will however, never reach the market peaks or troughs that parties might experience in the spot market. Thus, if layered appropriately, it's possible to keep your revenue/expenses relatively flat compared to participating in the spot market. This strategy is utilized by many Utilities and allows them to focus on eliminating inefficiencies elsewhere in their business while guaranteeing a steady supply/price. Thus, if parties looked at long-term contracts as a way to minimize market risk, via lowering market swings, we could see an increased future use of long-term contracts in the bioenergy and forestry industries.

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Long-Term Supply Contracts in Bioenergy

by
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DEDICATION

To my parents and my brother, for always believing in my ability to achieve anything and encouraging me throughout my education. This work would not have been possible if it was not for the support you provided throughout this process. Thank you.

BIOGRAPHY

Logan Roise is a forestry student from North Carolina. He received his Bachelor degree in business administration at Appalachian State University. He also received a Master degree in Political Science from Appalachian State University. Logan continued his studies in the EU-US Transatlantic Masters Degree Program in Forestry, spending one year at North Carolina State University and one semester each at the University of Helsinki and the Swedish University of Agricultural Sciences. During his studies at North Carolina State University, he did an internship with Resource Management Services and currently works for Hancock Timber Resource Group as a Senior Portfolio Analyst.

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Chapter 1

Introduction

According to the United Nations, the world reached 7 billion people on October 31, 2011 (NYT 2011). As the world's population continues to grow, the demands that are placed on our current supply of energy will continue to increase. Further, as the world's current population continues to develop, even more pressure will be placed on our ability to provide electricity to everyone. In fact, in the past 15 years, there has been a 75% increase in the demand for electricity in Asia alone and this trend does not appear to be decreasing anytime soon (Wårell 2005). If these massive increases in demand for energy weren't enough, research indicates that we need to decrease fossil fuel use and increase renewable energy sources to mitigate global climate change.

The transition to renewables, and in particular, woody biomass, began in earnest in Europe due to favorable government policies (Washington Post 2015). In the United Kingdom, for instance, roughly 3-4% of its electricity is coming from wood pellets, largely imported from southeastern U.S. (BBC 2016; Pellet.org n.d.; Washington Post 2015). Wood pellet exports from the U.S. doubled between 2012 and 2014 due to European demand (Washington Post 2015).

The transition has been slower in the United States. From 2000 to 2010, coal's market-share in electricity-generation has decreased from 52% to 45%. However, instead of renewables taking its place, natural gas has benefited the most rising from 16% to 24% (ECON 2012). During this same time period, renewable energy sources inched higher from 9% to 10% (ECON 2012). Predictions on coal's future market-share range from 39% in 2035, by the Energy Information Administration, to 20% in 2030 by Deutsche Bank; depending on the regulatory framework (ECON 2012). Additionally, increased concerns with hydraulic fracturing will limit the ability of

natural gas to pick up the slack (CNN 2012). Thus, as coal's market-share continues to decline, other sources will need to take up the slack and one promising renewable energy sources would be woody biomass (Aguilar et al. 2011; DOE 2011; Faaij 2008; Flamos et al. 2011; Jiang et al. 2010; Junginger et al. 2014; Kirkland and Nicholls 2015; Rose et al. 2014; Routa et al. 2011).

Woody Biomass

The U.S. Forest Service defines woody biomass as “the trees and woody plants, including limbs, tops, needles, leaves, and other woody parts, grown in a forest, woodland, or rangeland environment, that are the by-products of forest management” (USFS 2008). The U.S. Environmental Protection Agency (“EPA”) and the U.S. Department of Energy use a broader definition that includes biomass derived directly from the forest as well as wood waste from manufacturing/processing facilities (ex: sawdust residuals from sawmills) and urban waste and prefer to refer to woody biomass as “forest or forest-derived biomass” (Perlack et al. 2005).

Whether or not woody biomass is considered a renewable energy source has been debated (Hudiburg et al. 2011). According to the EPA, woody biomass is a renewable energy source but it is not necessarily carbon neutral (EPA 2016). To assess the neutrality of woody biomass' carbon footprint, one must assess the “particular conditions under which a type of biomass (e.g., feedstock) is grown and consumed” (EPA 2016). There are several challenges in determining its neutrality, however. Bracmort (2016) and Sedjo (2013) argue that one must consider the type of biomass, how it is managed and procured, transportation methods, technology utilized and time frame studied.

According to Sedjo (2013), the general view is that emissions released from the use of woody biomass in energy production would be recaptured by future growth. The Manomet Study

(2010), however, argued that woody biomass is not carbon-neutral. In coming to this conclusion, the authors used a very narrow Life-Cycle Analysis (“LCA”) that does not take into account how the market might change as a result of increased demand for woody biomass (Sedjo 2013). The Manomet Study only looked at one tract of forest and assumed it would regrow over a period of 100 years in determining the carbon-neutrality of the use of woody biomass in energy production. Some consider this a flawed approach and that one must consider the external effects the use of woody biomass might have. Searchinger (2010), for instance, argued that for biofuels to be carbon neutral, it would need to generate “additional carbon.” Searchinger (2010) stated that if the use of biofuels did not cause any land use change, the feedstock used “would grow regardless of biofuels so they do not directly absorb additional carbon.” Thus, unlike the Manomet Study, Searchinger (2010) believed you needed to take into account indirect effects of the use of biofuels in order to determine their carbon neutrality. Others have even argued that you should exclude “sunk costs” from the LCA. According to Investopedia.com (n.d.), a sunk cost “is a cost that has already been incurred and thus cannot be recovered...[and]...are independent of any event that may occur in the future.” Thus, one should not consider a sunk cost when making a business decision. Applying this methodology to the use of woody biomass energy, one would need to exclude any emissions that would have occurred anyways. For instance, thinnings are a normal silvicultural operation in pine plantation management. Consequently, any emissions that come from thinnings should not be considered in determining carbon neutrality.

In the end, the majority of research suggests that if woody biomass is harvested in a sustainable manner, it is a net carbon sink and thus suitable to being a renewable energy resource (Aguilar et al. 2011; Faaij 2008; Flamos et al. 2011; Jiang et al. 2010; Routa et al. 2011).

However, it is not currently economically feasible (Aguilar et al. 2011; Faaij 2008; Flamos et al. 2011; Jiang et al. 2010). In the United Kingdom, the government has placed a tax on fossil fuel power generation, helping to support the budding wood pellet power industry (Washington Post 2015). In the United States incentives have also been put in place by both the federal government and state and local governments. These incentives included the federal Section 1603 grants, which paid 30% of the total capital cost upon completion, and state-level Renewable Portfolio Standards (RPS) which legislate that a certain ratio of power must come from renewable sources (Anderson 2012). However, as Anderson (2012) states, federal grants like Section 1603 are set to expire and nothing has been put in their place. How can we make woody biomass economically feasible with declining governmental support (Aguilar et al. 2011; Anderson 2012; Faaij 2008; Flamos et al. 2011; Jiang et al. 2010)?

Long-Term Supply Contracts

One potential way to develop the biomass market would be to utilize long-term supply contracts, which the industry is currently lacking (Burchfield 2011; Doster 2011; Jiang et al. 2010; von Hirschhausen and Neumann 2008; Yin and Izlar 2001). Research suggests that long-term contracts are important when making relationship-specific investments, particularly in an immature market. This begs the question, why these contracts are currently lacking as they seem well suited for the bioenergy industry.

Objectives

The objectives of this research are to:

- i. assess past use of long-term supply contracts in the forestry, coal, and natural gas industries

- ii. determine the opinions of industry professionals on the applicability of long-term supply contracts in bioenergy

The first objective was addressed through literature review and structured interviews. The second objective was addressed through structured interviews with industry professionals throughout the southeastern United States that represent forest landowners (non-industrial and industrial), pellet and biofuel producers, forestry management consultants and procurement firms, and energy producers (Biomass facilities, investor-owned utilities, and electric cooperatives).

Chapter 2 – Literature Review

Introduction

This review will examine the literature on long-term timber lease contracts, and on long-term supply contracts in the natural gas and coal energy sectors. The purpose of this review is to compare the types of long-term contracts that were common in the forestry industry with those from two energy markets that the emerging woody biomass energy market might be able to learn from and to suggest some potentially key components of a long-term supply contract or lease. The review will first examine the literature on long-term timber leases, followed by the coal and natural gas energy sectors.

Long-Term Timber Supply Contracts

The first major study on the use of long-term contracts in the forest products industry was by Siegel and Guttenberg in 1968. Siegel and Guttenberg (1968) found that there were roughly 6 million acres of non-industrial private forestland in the southeastern U.S. under contract in 1967. By 1970, Siegel (1973) found that in the southeastern U.S., the non-industrial private forestland (NIPF) under contract had increased to 6.7 million total acres, with an average size of 2,725 acres per contract, and consisted primarily of southern pine species. However, by 1984, Meyer and Klemperer (1984) found that the amount of NIPF land under long-term contracts had decreased to 4.7 million acres, a 30% decline.

Siegel's 1973 study also found that the pulp and paper industry had the most acreage under contract and those firms that specialized in veneer logs and plywood rarely used long-term contracts to procure their timber resources. According to Siegel (1973), firms in the Central Gulf (Alabama, Mississippi, and Tennessee) and East Gulf (Georgia and Florida) regions procured

significantly more timber resources through long-term contracts than did firms in the South Atlantic (North Carolina, South Carolina, and Virginia) and West Gulf region (Arkansas, Louisiana, Oklahoma, and Texas). Using the same regions for their analysis, Meyer and Klemperer (1984) found that all four regions used by Siegel (1973) experienced large declines in total land area under contract with a high of 38% in the South Atlantic region and a low of 13% in the Central Gulf region under contract.

Types of Contracts

In addition to the total and average acreage, location of contracted land, and types of firms that utilized them, Siegel also examined the types of contracts used. There were roughly nine types of contracts that were commonly used by forest product firms (Table 1). By the aggregate number of individual contracts, the most widely used type of contract were those that consisted of a lump-sum payment to the landowner, covering both the land and timber for the entire term of the contract (Siegel 1973). The lump-sum contract type made up 33.6% of the total number of contracts but only 2.3% of the total acreage under contract (Siegel 1973).

The second most widely used type of contract consisted of pre-determined cutting rights with a payment to the landowner on a volume basis as cut with the lessee assuming management responsibilities; this type of contract made up 24% of the total number of contracts and 21.5% of the contracted acreage (Siegel 1973).

Table 1 – Types of Long-Term Timber Contracts and Leases

Type of Agreement	Total Contracts ¹	Total Contracts (%) ¹	Total Contracted Acres ¹	Total Contracted Acres (%) ¹	Average Contract Acreage ¹	Future Use ²
Lump-Sum Payment (Land and Timber)	737	33.6	137,033	2.3	186	24%
Cutting Rights with Payment on Volume Basis. Lessee has management responsibilities.	526	24.0	1,281,495	21.5	2,436	35%
Same as above but no management responsibility.	31	1.5	1,120,126	18.8	36,133	22%
Lease of land. Lump-sum timber purchase.	230	10.5	861,823	14.4	3,747	82%
Lease of Bare Land	71	3.2	190,487	3.2	2,683	N/A
Lease of Land. Timber cutting rights with volume payment.	71	3.2	1,007,376	16.9	14,188	33%
Lease of Land and Timber. No payment on harvest. Stipulated timber volume when returned to owner.	274	12.6	520,058	8.7	1,825	45%
Same as Above. No stipulation of volume to return.	12	.5	19,025	.3	1,585	
Share-Crop Agreement. Timber sold on market value and revenue split with owner.	8	.4	21,433	.3	2,679	35%
Combinations or variations of proceeding types.	231	10.5	812,506	13.6	3,517	24% (Includes Increment Contract)
Total	2,191	100.0	5,971,362	100.0	2,725	N/A

¹ As determined by Siegel (1973)

² As determined by Meyer & Klemperer (1984)

Contracts that consisted of a land lease and lump-sum payment for the timber consisted of 10.5% of the contracts and 14.4% of the contracted acreage. The only other type of contract to gain more than 10% of the total, were those that consisted of lease payments for both the land and timber

and a pre-determined level of standing timber volume left when returned to the owner at contract end; this type of contract had 12.6% of the total and 8.7% of the total acreage (Siegel 1973).

While the aggregate number of contracts per type is one way to look at the most prevalent forms, things change significantly when you look at the contracted acres per type (*Table 1*). According to Siegel (1973), the most prevalent type of contract based on contracted acres was the payment per volume cut with the lessee assuming management responsibilities, which accounted for 21.5% of the total acreage. The second most common type by total acreage was the same type of cutting contract but with no management responsibility; this type of contract consisted of only 1.5% of the aggregate number of contracts but 18.8% of the contracted acreage. The third most common type were those that including a lease of land with cutting rights on the timber; this type made up 3.2% of the aggregate number of contracts and 16.9% of the total acreage. This was followed by contracts with a lease of land plus a lump-sum purchase of timber and consisted of 10.5% of the aggregate and 14.4% of the acreage. No other contract type was above 10% of the total acreage (Siegel 1973).

Promising Contracts and Future Use

In looking towards the future, Siegel (1973) found that of the 24 firms that offered landowner assistance programs (LAPs) in their survey, 54% of the firms were seeking to increase the participation of landowners. The other 46% felt that the returns were not worth the time involved. In regard to seeking more long-term contracts, 52% of firms said they would like more long-term contracts. Further, roughly 66% of these firms would like to have a 50% or more of their timber resources coming from leased land (Siegel 1973). Of the 54 firms surveyed, Siegel

(1973) found that 57% would prefer outright ownership, 22% favored contracts, 2% preferred LAPs, and the remaining 19% favored some combination of the above.

In contrast to the results in Siegel (1973), Meyer and Klemperer (1984) found that 88% of firms with landowner assistant programs wanted more of them and only 34% of firms with long-term contracts were eager to sign more. Additionally, Meyer and Klemperer (1984) found that slightly over half of the firms surveyed believed that NIPF landowners were now less willing to sign long-term contracts than they were a decade or two ago. Whether timber product firms preferred more long-term contracts, LAPs, or outright ownership is a mixed message. Meyer and Klemperer (1984) looked at this question concerning those who wanted more long-term contracts and what types were considered most promising for the future.

According to Meyer and Klemperer (1984), 82% of firms thought the most promising type of contract would be annual payments on leased land with a lump-sum payment at the beginning for the purchase of the timber. This type of contract made up 10.5% of total contracts and 14.4% of contracted acreage in Siegel's 1973 study. The second most promising type of contract, according to Meyer and Klemperer (1984), was a lease of both land and timber with an annual payment but no payment for timber at harvest time. Siegel (1973) has two separate categories this might fall into but if combined, this type of contract made up 13.1% of total contracts and 9% of total acreage in the study by Siegel and Guttenberg (1968).

No clear contract type comes in as the third most promising as three separate types all received between 33-35% (Meyer and Klemperer 1984). The second most prevalent type of contract and first most prevalent by acreage (Cutting Rights with Volume Payment) in the 1973 Siegel study, was tied for 3rd most promising contract type for the future in the Meyer and

Klemperer (1984) study. The contract type it tied for, a share-crop contract, made up 0.4% of total contracts in the 1973 Siegel study. One point of interest in the 1984 Meyer and Klemperer study was that the increment contract was considered most promising by 22% of firms but did not show up in the 1973 study by Siegel. This form of contract was studied by Greene (1979) and Zinn and Miller (1984).

Increment and Recurring Option Contracts

In his 1979 article, Greene argued that due to resource scarcity, forest product firms were turning to long-term contracts as a way to ensure adequate resources without encumbering large amounts of capital in land purchases. Further, Greene (1979) believed that the increment contract would be more beneficial to both the landowners (immediate payments that qualify as capital gains) and firms (more flexibility because capital is not tied up) than would other forms of long-term contracts. In an increment contract, the timber owner is compensated based on the average annual increment, or growth, that the contracted land is capable of producing

Zinn and Miller (1984) echoed this sentiment in their article. However, according to Zinn and Miller (1984), for the increment contract to gain more widespread use outside of southern pine forests and be more applicable to the Appalachians, the average contract length would need to be shortened, annual growth payments decreased (but compensated for at the end if timber grew more than expected), and payments should be based on market prices. Shaffer (1982), however, argued that most long-term contracts and landowner assistance programs included inequities and operational problems.

According to Shaffer (1982), the arbitrariness of setting contract payments and the balancing act between levels of management services offered and a right of first refusal can lead

to inequities. Additionally, Shaffer argues that conflicts of interest arise with industry foresters charged with preparing management plans for landowners while at the same time attempting to procure the timber. Lastly, Shaffer (1982) points out that a landowner can agree to have all of the management services provided by the industry firm with little to no intention of selling their timber to that firm.

To resolve these issues, Shaffer (1982) argues the recurring option contract would be best. This contract, however, is best suited when annual harvests are expected and becomes more complicated as harvests become more sporadic. Overall, Shaffer (1982) argues that the single biggest benefit for the landowner in using this type of contract is when they foresee problems with marketing their timber and right of first refusal contract clauses.

Other Contract Requirements

Other timber contract requirements that Siegel (1973) examined were minimum contracted acreage allowed, length, timber classes allowed, escalation clauses, and less formal assistance programs. According to Siegel (1973), 46% of the surveyed firms did not set a minimum for the amount of contracted acres, with the other 54% refusing to even consider a tract if it was under their minimum. The most commonly cited minimum acreage was between 501-1000 acres, with 24% of firms requiring more than that. Contract length averaged was over 21 years, with roughly 75% of all contracts being that long (Siegel 1973). Others have found similar results with a majority of contracts being between 30 and 60 years in length (Cubbage and Skinner 1985; Greene 1979; Zinn and Miller 1984). Roughly 25% of firms set a 10 year minimum and 20% had a 99 year maximum for their contract lengths (Siegel 1973). Siegel (1973) also noted that roughly

28% of firms were not willing to contract for NIPF lands if it only had premerchantable timber, with the other 72% willing to consider these lands if certain standards were met.

Price Indexes

As for price escalators, 19 out of the 23 (83%) firms that use them indicated they use the All-Commodities Wholesale Price Index (Siegel 1973) , later called the Producer Price Index (PPI). In their 1984 paper, Meyer and Klemperer found that roughly 81% of contracts that used a price escalator utilized the PPI. It would make sense that the All-Commodities Wholesale Price Index or Producer Price Index in long-term timber contracts would perform well but Hotvedt and Tedder (1977) found that it does not.

According to Hotvedt and Tedder (1977), the All-Commodities Wholesale Price Index or Producer Price Index, underestimates actual market prices and that as contract lengths are extended, the disparity grows. In a 1986 paper, Klemperer suggests that to overcome the shortcomings of the Producer Price Index, contracting parties should include a provision whereby if the real price of timber increases from the beginning to whenever the timber is harvested, the landowners should be compensated for the difference. It also appears that firms stick to what they are most familiar with, as only 8.7% (2 of 23) firms using a price escalator utilized more than one type in their contracts (Siegel 1973).

Landowner Assistance Programs

A less formal form of long-term contracts but widely used in the forest products industry are called Landowner Assistant Programs (LAP), Management Assistant Programs (MAP), or “tree farm family agreements” (Meyer and Klemperer 1984; Siegel 1973). These agreements

generally took the form of the timber products firm agreeing to provide management advice and/or manage the timberland for the landowner and would then have the opportunity to purchase said timber at the end of the agreement (Meyer and Klemperer 1984; Siegel 1973).

While these programs did serve as a sort of public relations program, they were also designed to help the timber management firm procure resources in a less formal manner. Consequently, a large portion of these agreements contained “right of first refusal” clauses (Meyer and Klemperer 1984; Siegel 1973). This clause allowed for the landowner to seek bids on the harvest to maximize their return. The firm in that contracted agreement, however, would have the ability to match or exceed the highest bid the landowner received (Cleaves and O’Laughlin 1983).

The use of “right of first refusal” clauses is somewhat sporadic, however. Cabbage and Skinner (1985) found that only 3 of 16 (19%) firms operating in Georgia in 1983 had such clauses in their agreements. Cleaves and O’Laughlin (1983), on the other hand, found that 8 out of 11 (73%) firms operating in Louisiana in 1980 used right of first refusal clauses in their agreements. This difference is apparently indicative of the more formal nature of LAPs in Louisiana than in Georgia (Cleaves and O’Laughlin 1983; Cabbage and Skinner 1985). Overall, according to Meyer and Klemperer (1984) 51% of firms in the South required a right of first refusal clause in all of their LAPs.

These programs are not without their own issues, however. According to Meyer and Klemperer (1984), firms have indicated that some landowners are ignoring their advice on management issues, others are withdrawing from the program before harvest, and an overall lack of cost-effectiveness because of the above issues and the small tract sizes. Average sizes for LAP

tracts ranged from 300 acres in Louisiana (Cleaves and O’Laughlin 1983) and 637 acres in Georgia (Cubbage and Skinner 1985). Not all landowner assistance programs are equal, however.

Hickman and Gehlhausen (1981) looked at what kind of assistance programs landowners in eastern Texas preferred. The most popular type of assistance program were “performance bonds.” This type of LAP required the management/harvesting company to post a bond that would insure landowners would be compensated for damages to their property from management and logging activities (Hickman and Gehlhausen 1981). Hickman and Gelhausen (1981) state this was because most of the landowners surveyed were not satisfied with the condition the management/logging company left their property in. This concern was echoed later by McGill et al. (2008). They found that the most important concern landowners in Wetzel County, West Virginia had about entering into long-term contracts was the issue of water quality and erosion; this concern was cited by 15.2% of the respondents (McGill et al. 2008).

Landowner Issues

Overall, NIPF landowners are reluctant to enter into any kind of long-term contract or assistance program; their reasons, of course, are diverse. According to the results by Hickman and Gehlhausen (1981), long-term leases and contracts are the least popular form of assistance programs. One of the most widely cited reasons for not entering into a long-term contract has to deal with losing control over their land (Hickman and Gehlhausen 1981; McGill et al. 2008; Meyer and Klemperer 1984; Somberg 1971). Additionally, both Somberg (1971) and McGill et al. (2008) found a general lack of knowledge about long-term contracts and leases. This lack of knowledge could be compounding the negative beliefs of landowners for both real and perceived reasons.

These issues, and others, led to numerous court cases and helped lead to the decrease in land under long-term leases, contracts, and landowner assistance programs.

Court Cases

There are many aspects of law relating to leases, in general, and timber leases and contracts specifically, that are important to consider. Below is a brief discussion on various legal issues that may be important to consider when writing a long-term supply contract.

What Makes a Timber Lease, a Timber Lease

As Siegal (1973) and Meyer & Klemperer (1984) found, timber leases can take many forms. However, there are certain characteristics needed for a lease to be considered legally valid. In *Newton et al. v. Allen (1965)*, the plaintiff was seeking relief from a document that stated she “[does] lease all of my workable timber for turpentine on all lands owned or controlled by me to Jack C. Newton, Jr...” by arguing it was not a valid lease. The Supreme Court of Georgia ruled in her favor, finding that it is not enough to simply state “I hereby lease all my timber on all my land to X,” you are required to describe the land as to make it identifiable what land the leasee controls.

In *Steward v. St. Regis Paper Co. (1979)*, Steward contended the Timber Purchase Agreement (“TPA”) was not a valid lease as it was not recorded within one year as required by Ala.Code § 35-4-6. St. Regis Paper Co (“St. Regis”), the defendant, argued that the TPA was not a lease but a license and thus was not required to be recorded. The District Court ruled in favor of St. Regis stating that St. Regis was not granted interest in reality, per *Holt v. City of Montgomery (1924)* and *Mason v. Carroll (1972)*, as the agreement did not expressly “give exclusive possession of the premises against all the world, including the owner, in which case a lease is intended, or whether

it merely confers a privilege to occupy under the owner, thereby indicating a license.” Further, the District Court argued that the rights that were granted to St. Regis were to give the defendant flexibility and not to expressly exclude the plaintiff.

As these two cases demonstrate, it is important to understate what constitutes a valid lease agreement and one that simply construes a licenses. *Newton et al. v. Allen (1965)* shows us that one cannot simply write that an agreement is a lease to make it a valid lease agreement. It is imperative that the agreement specify the land in question for it to be considered a valid lease. Additionally, if the agreement does not specifically grant the leaser exclusive rights to the land in question, the agreement takes the form of a license.

Force Majeure

Force Majeure is a legal doctrine that excuses performance of a contract by one or both parties due to an event, that is outside the control of the contracting parties and could not be reasonably avoided, which makes performance not possible (Sabino and Abatemarco 2013). *Force majeure* clauses are included in most contracts as insurance to the parties that in the event they are unable to perform their contractual duties, they will not be held in breach of contract. What constitutes a *force majeure* event is important to understand when writing and agreeing to a long-term supply contract.

Historically, a *force majeure* event can be described as an “act of God;” or an event that the contracting parties could not take due care to avoid and made performance impossible, not just difficult. For instance, a landowner contracts with a sawmill to provide timber over a given time period. If a tornado destroyed the mill, the mill could declare a *force majeure* and thus absolve itself of any contractual obligations to pay for the contracted timber. A *force majeure* clause, however, can

also stipulate any number of circumstances that would constitute a *force majeure* event (Sabino and Abatemarco 2013). Of particular interest to the current study is whether changes to environmental regulations or energy policy could constitute a *force majeure* event. This issue played out in a federal court in New York where the issue was whether a moratorium on fracking constituted such an event.

In *Aukema v. Chesapeake Appalachia, LLC*, Chesapeake Appalachia, the defendant, claimed New York's moratorium on fracking constituted a common law *force majeure* and thus absolved them of their requirement to drill, and remit resulting royalties, or remit the rental payments if they did not drill. Further, Chesapeake argued that the moratorium stopped the clock on their long-term lease agreements with landowners. The landowners sued Chesapeake, noting the increased value of their land, for a breach of contract in order to enter into a new more lucrative contract with other developers (Sabino and Abatemarco 2013). The court found that the moratorium did not constitute a *force majeure* event under common law as the defendants should have foreseen this possibility and thus should have included such an event in the *force majeure* clause.

Chesapeake also sought relief from the *frustration of purpose* doctrine. Under this doctrine, a party to a contract can seek to absolve itself from its obligations if an unforeseeable event occurs that would undermine the reasoning for entering into such contract in the first place. However, the *frustration of purpose* doctrine only applies to catastrophic events that are not foreseeable (Sabino and Abatemarco 2013) and the court ruled that a new method would likely require additional review. Sabino and Abatemarco (2013) argue, consequently, that parties must anticipate shifting regulatory environments and, consequently, draft their contracts appropriately.

Capital Gains vs Ordinary Income

Another aspect of law important to this discussion is tax law. According to Butler et al. (2012), tax policy can affect the forest management decisions of forest owners. Additionally, McGill et al. (2008) found that maximizing income from timber was the second most important factor in selling their timber. One way to maximize your income from timber is to ensure that it receives capital gains treatment, as opposed to ordinary income that is taxed at a higher rate. However, the United States Internal Revenue Code (IRC) has stipulations that must be met for timber income to receive preferential tax treatment. In general, the IRC has two ways for timber related income to qualify for capital gains treatment.

The first way for timber related income can be treated as capital gains is based on the fair market value of standing timber at the time the contract came into force (Revenue Ruling 62-81, 1962). To qualify for capital gains treatment this way, the sale must meet the requirements of a capital asset sale as outlined in Revenue Rulings 62-81 and 62-82 and the requirements in sections 1221 or 1231 of the 1954 IRC (Dyal v. United States, 1965). Section 1221 stipulates that for timber to be treated as a capital asset, it cannot be held “primarily for sale to customers in the ordinary course of trade or business” (Ah Pah Redwood v. Commissioner, 1959; Superior Pine Products Co. v. United States, 1973). Section 1231 of the 1954 IRC stipulates that the capital asset has to be held for a minimum of six months (now one year).

The second way for timber related income to be treated as capital gains is based on whether an economic interest was maintained at disposal of the timber under Section 631(b) of the 1954 IRC. As with Revenue Ruling 62-81, sections 1221 and 1231 apply to Section 631(b) but whether the timber was held “primarily for the sale to customers in the ordinary course of trade or

business” does not necessarily prevent timber related income from receiving favorable tax treatment under 631(b) (*Ah Pah Redwood v. Commissioner*, 1957). To qualify for capital gains tax treatment under 631(b), the income received from timber “must be conditioned upon severance of the timber” (*Lawton v. Commissioner*, 1959) and for a period of six months before disposal (now one year). Additionally, the purchaser must have the right and obligation to cut the agreed upon amount of timber. Thus, if the owner of the timber maintains the right to cancel the agreement at any time, the purchaser does not have the right and obligation to cut and thus the agreement is no longer a disposal under 631(b) but an option to sell and thus would not qualify for capital gains treatment (*Gaskin v. United States*, 1967).

There are numerous court cases involving the tax treatment of income derived from long-term fiber supply contracts and leases. In a majority of these legal disputes, the timber owner seeks capital gains treatment under both sections 631(b) and 1221 and 1231 of the 1954 IRC. One of the earliest cases to address the issue of tax treatment on timber income was *Ah Pah Redwood v. Commissioner* (1959).

At issue in this case, was whether the oral agreement between Ah Pah and Coast Redwood Company constituted an obligatory contract to dispose of timber within six months of ownership and thus whether this agreement was eligible for capital gains tax treatment under 631(b) or sections 1221 or 1231 of the 1954 IRC. It was ruled that the oral agreement did not require Coast Redwood to make cut any timber and thus, no disposal of timber occurred until that which time the timber was cut (*Ah Pah Redwood v. Commissioner*, 1959). However, in ruling in favor of Ah Pah, the Court determined that Ah Pah did not retain an economic interest in the timber at the time of disposal and thus did not qualify for capital gains treatment under 631(b) but did qualify

under sections 1221 and 1231 as the timber was not held “primarily for sale to customers in the ordinary course of its business.”

In *Lawton v. Commissioner (1959)*, the petitioner (Lawton) argued that the income received from their long-term supply lease with Union Bag was capital gains under sections 631(b), 1221, and 1231 of the 1954 IRC. However, it was ruled that the petitioner did not qualify under 631(b) because he received payment regardless of whether any timber was cut and thus did not retain an economic interest. It was also ruled that the petitioner did not qualify under sections 1221 or 1231 as they could not prove that a sale of timber took place during the tax years in question, except for the sales already receiving capital gains treatment (*Lawton v. Commissioner, 1959*).

In *Lawton v. Commissioner (1959)*, the issue of tax treatment for timber income was from a landowner perspective. However, in *Union Bag-Camp Paper Corp v. United States (1963)*, the issue of tax treatment for timber related income and expenses was from the perspective of a paper company that was procuring its timber. At issue in *Union Bag-Camp Paper Corp v. United States (1963)*, was whether various expenses associated with the leases could be deducted as “ordinary and necessary business expenses” and whether Union Bag qualified for capital gains treatment under section 631(b) for the timber it sold to outside parties. To the first issue, the government contended that the agreement between Union Bag and the landowner were not, in fact, leases but a contract for the right to cut timber and thus not deductible as “ordinary and necessary business expenses.” The Court of Claims ruled that the agreements between the parties were leases as the details of the long-term supply contract demonstrated all the characteristics of what the court traditional considers a lease. Consequently, the expenses were eligible to be deducted as “ordinary and necessary business expenses.” Additionally, the Court of Claims ruled that if landowner did

not retain an economic interest in the timber, it follows that the other contracting party, Union Bag, must be the owner and thus maintains an economic interest to qualify for capital gains treatment under section 631(b).

As in Lawton, *Dyal v. United States (1965)* examined the tax treatment by landowners of income derived from the long-term fiber supply contracts with Union Bag that were at issue in *Union Bag-Camp Paper Corp v. United States (1963)*. In *Dyal*, the petitioner treated the annual leases payments as capital gains under sections 631(b), 1221, and 1231. The Commissioner argued that 631(b) did not apply as *Dyal* failed to retain an economic interest in the timber upon severance and was affirmed by the Court of Appeals for the 5th Circuit. However, the 5th Circuit also ruled that the District Court ruled in error by stating that Revenue Rulings 62-81 and 62-82 do not apply. According to the 5th Circuit, the difference between the present case and those rulings was the stipulation that Union Bag must wait 7 years before it can cut any timber and that fact alone does not disqualify *Dyal* from treating the income as capital gains under 62-81 and 62-82 (*Dyal v. United States, 1965*).

In *Crosby v. United States (1969)*, the petitioners were denied capital gains treatment under both sections 631(b) and 1221 because payment from St. Regis was not conditioned on the severance of timber and it was found that the petitions purchased the land for the sole purpose of selling timber to St. Regis. Petitioners attempted to argue that section 1.631-2(d)(1) allowed for advance payment but this line of argument was rejected as there was no guarantee timber would ever be cut (*Crosby v. United States, 1969*).

In *Godbold v. Commissioner (1984)*, the long-term fiber supply contract was similar to those in *Crosby v. United States (1969)* and *Plant v. United States (1982)*. However, unlike in those cases the

petitioners in *Goldbold* included a “liquidated damages clause” in an attempt to demonstrate they retained an economic interest in the timber in spite of payment not being conditioned on severance. In its ruling, the Tax Court ruled that the contract before them was virtually identical to those of *Crosby* and *Plant*. The Tax Court also ruled that the “liquidated damages clause” was “words of art” and did not change the fact they could receive payment for timber that might never actually be cut (*Goldbold v. Commissioner*, 1984).

Long-Term Supply Contracts in the Coal Industry

One of the earliest scholarly articles to examine the use of long-term supply contracts in the coal industry was by Paul Joskow. In his 1985 article, Joskow utilized a transactions cost framework to determine why “mine-mouth” coal plants choose to integrate vertically or utilize long-term supply contracts. “Mine-mouth” coal plants are those located directly next to a coal mine and are thus more dependent on one supplier than might another coal plant is. According to Joskow, “mine-mouth” coal plants use long-term supply agreements for two reasons (1985). First, government regulations limit the amount of vertical integration allowed. Second, due to the large importance of relationship-specific investments, both parties are highly dependent on each other. Thus, a long-term supply agreement provides the necessary protection against opportunistic behavior (Joskow 1985). In 1987, Joskow expanded his research and determined that the same results applied.

One year later, Joskow examined the structures of “price-adjustment provisions” within long-term supply contracts (1988). These “price-adjustment provisions” are considered highly important in the long-term supply contract literature because they allow for greater flexibility in the long term (Crocker and Masten 1988, 1991; Goldberg 1985; Joskow 1985, 1987, 1988, 1990;

Kozhevnikova and Lange 2009; Masten and Crocker 1985; Williamson 1983). In this article, Joskow (1988) argued that for a seller to agree to a contract, he must believe that the present value of all future income will be greater than or equal to the present value of all future costs. According to Joskow, the most common form of price-adjustment came in the form of a “base price plus escalation adjustment formula. This form of price-adjustment would set a base price at the start of the contract and then let it float based on a basket of indexes (Joskow 1988). Further, Joskow found that almost all of these contracts included provisions for renegotiations if “gross inequity” were to occur (1988).

In 1990, Joskow examined the performance of these price-adjustment provisions over time. According to Joskow (1990), these provisions handled changes in the market relatively well with very few contracts ending prematurely. However, Joskow (1990) also found that these provisions were not well suited for demand-side shocks, which resulted in downward price rigidity.

These contract provisions are relatively similar to what was found in timber price contracts. However, unlike in long-term coal supply contracts, Hotvedt and Tedder (1977) argued that the price adjusters used were inadequate and disparities grew over time. Klemperer (1986) suggested compensation similar to what Joskow (1988) found in his study of coal contracts.

In 2009, Kozhevnikova and Lange used transaction cost theory to study the length of the supply contracts in the coal industry (2009). A transition to an industry with more alternatives (because of market-based regulations and improved spot markets) led to a decrease in the average length of a supply contract. On the other hand, as contracted quantities increased and as relationship-specific investments became more important, the length of the supply contracts increased (2009).

Long-Term Supply Contracts in the Natural Gas Industry

Masten and Crocker (1985) examined the use of “take-or-pay” provisions in long-term supply contracts in the natural gas industry. The “take-or-pay” provisions in the contracts should increase efficiency because it provides purchasers with incentives to act efficiently. However, because of wellhead regulations, nonprice competition increased and led to these provisions surpassing their optimal level, thus distorting the market (Masten and Crocker 1985).

Mulherin (1986) looked at the various theories for why long-term supply contracts in the natural gas industry were complex. Mulherin argued that authors like Masten and Crocker (1985) were wrong in arguing that regulations distorted the market because the same events could be witnessed in markets without the regulation. Mulherin concludes that the best framework for studying these contracts was the transaction cost framework used by Joskow (1985), among others. Mulherin found similar results to those of Joskow (1985, 1987, 1988, 1990) and Kozhevnikova and Lange (2009) in that the contracts were designed to deal with the unique relationship-specific investments present between each group of parties (1986).

Crocker and Masten (1988) examined the use of price-adjustment provisions and how they affected contract length. They found that the length of a contract is determined by balancing the tradeoffs between the pitfalls of being locked into an inflexible contract and the costs of negotiating the terms (1988). In spite of the results from Mulherin (1986), Crocker and Masten find that even small distortions in the terms of the contract will make the parties less willing to enter into long-term agreements and thus shorten the average length.

Shifting slightly from their work on the effects of wellhead regulation, Crocker and Masten examine the various processes that parties use to adjust prices in their contracts (1991). Similar to

the results of Joskow (1988), Crocker and Masten (1991) find that as uncertainty in the future increases, more flexibility is required in the contract. However, if future conditions have a certain level of certainty, they argue that parties are willing to accept more rigid terms to a contract.

Von Hirschhausen and Neumann (2008) examined the international natural gas industry. Von Hirschhausen and Neumann find that as international markets become more mature and thus competitive, contract length tends to decrease. However, like Joskow (1985, 1987, 1988, 1990), Kozhevnikova and Lange (2009), and Mulherin (2009), von Hirschhausen and Neumann found that as relationship-specific investment became more important, contracts, on average, were extended by three years (2008).

Components of a Long-Term Supply Contract

A review of the literature seems to suggest there are a few key components of a long-term supply contract. While opinions have likely changed, it would make sense to start with the most promising types of contracts listed by companies in Meyer and Klemperer's study. Thus, a contract with an annual lease payment for land with a lump-sum payment for timber at the beginning or a contract with an annual lease payment for land and timber might be the basis for any future contracts (1984).

Using these two types of contracts as a starting point, there are several pieces that might be included to make them more desirable. Given that non-industrial private forestland owners are hesitant to sign long-term contracts and leases, due to loss of control and property degradation, these contracts could include provisions that would minimize or eliminate these concerns. Thus, an important provision to include might be one that provides for renegotiations if "gross inequity" occurred, as Joskow (1988) suggested. The contracting parties would want to predetermine what

would constitute “gross inequity,” but including this type of provision would help give landowners peace of mind that they would seek a remedy if things went wrong. Additionally, it is important that neither party has the ability to terminate the contract without the consent of the other party to avoid complications with tax treatment of timber related income and expenses (*Gaskin v. United States*, 1966).

Another aspect to include in these contracts would be to limit, whenever possible, contract lengths. Contract lengths of between 5 to 10 years would seem the most reasonable and should be determined on a case by case basis. By limiting the contract length, landowners might be more likely to agree to terms as they would not lose control of their land for the rest of their life and potentially, into the life of their heirs (*Hickman and Gehlhausen* 1981; *McGill et al.* 2008). Additionally, as the research in coal and natural gas contracts found, shorter contracts are preferred as uncertainty increases (*Crocker and Masten* 1991). Another added benefit to shorter contracts lengths than previously used in the timber industry is that qualifying for capital gains treatment would be less complicated.

As the legal discussion stated, it is possible to qualify for capital gains tax treatment as either a capital asset sale, based on the fair market value of the timber at the time the contract came into force (*Ah Pah Redwood v. Commissioner*, 1959; *Camp v. United States*, 1974); or, by using Section 631(b) and having payment be conditioned upon severance of the timber (*Lawton v. Commissioner*, 1959; *Dyal v. United States* (1965)). Landowners will want to ensure they comply with these sections if they wish to receive capital gains treatment on their time sales.

Given that landowners are concerned about the harvest quality and the conditions their land is left in after a harvest (*Hickman and Gehlhausen* 1981; *McGill et al.* 2008), contracts that

require a “performance bond” would insure compensation for poor harvest quality and land degradation. This type of contract provision was found to be popular among landowners in east Texas (Hickman and Gehlhausen 1981).

If price-escalators are to be used, contracting parties should shy away from the Producer Price Index as it has found to underestimate actual market prices by Hotvedt and Tedder (1977). Additionally, it’s possible these traditional timber pricing mechanisms do not handle demand-side shocks well, as Joskow (1990) found to be the case with contracts in the coal industry. Of course, most price-escalators have not been used in some time for timber products and it is quite possible that they would perform better. Thus, contracting parties should determine whether to use one and include a provision to compensate the party that “loses out” at the end of the contract as suggested by Klemperer (1986).

Lastly, as the *Aukema v. Chesapeake Appalachia, LLC*, *Newton et al. v. Allen*, and *Steward v. St. Regis Paper Co.*, cases demonstrate, it is important to thoroughly think through how your contract/lease is written. If the language is vague, you are in danger of it not being considered a valid lease agreement. One should also include a robust *force majeure* clause. Currently, a majority of timber harvested for bioenergy purposes is shipped to Europe and a policy change there would likely render U.S. pellet operations obsolete. Consequently, any party entering into a long-term supply contract should take this factor into consideration.

Conclusion

As the literature in timber, coal, and natural gas industries demonstrate, long-term contracts are important tools for parties to use to procure the resources they need to operate (Joskow 1985, 1987, 1988, 1990; Kozhevnikova and Lange 2009; Meyer and Klemplerer 1984;

Mulherin 2009; Siegel 1973; von Hirschhausen and Neumann 2008). These results mirror the sentiment of Marvin Burchfield in his speech at the Woody Biomass Supply Chains Conference in October 2011. From the industry side, it is likely that the lack of long-term supply contracts in the woody bioenergy industry has to do with the level of uncertainty surrounding its economic sustainability. In the past, non-industrial private forestland owners were needed to help fill the resource gaps faced by forest product companies in the southeast U.S (Meyer and Klemperer 1984; Siegel 1973). It is likely, then, that they will play a part in the development of the woody bioenergy supply chain. Additionally, the large relationship-specific investments energy companies need to make (Burchfield 2011; Joskow 1985) will require the kind of certainty a long-term contract provides.

However, as McGill et al. (2008) demonstrated, there is a general lack of knowledge of contracts with NIPF landowners and these landowners are generally adverse to these contracts anyways (Hickman and Gehlhausen 1981; Meyer and Klemperer 1984; Somberg 1971). As parts of the court case overview suggest, this lack of knowledge could lead to landowners entering into agreements that do not have the same force of law as they believed because they were not a valid legal lease (Newton et al. v. Allen, 1965). In the past, landowner assistance programs have proved useful in helping to fill the gaps left in timber product companies procurement strategies (Cleaves and O’Laughlin 1983; Cabbage and Skinner 1985; Hickman and Gehlhausen 1981; Meyer and Klemperer 1984; Somberg 1971), but may be less useful in developing the biomass energy market as woody biomass energy industries will likely utilize contracts similar to those in coal and natural gas industries.

Another possible issue for the bioenergy industry to overcome is that it exists at the intersection of an immature market (Faaij 2008) and a mature market in the forest products industry. As the research in the coal and natural gas industries found, contract lengths tend to decrease as a market matures (Mulherin 1986; Von Hirschhausen and Neumann 2008; Kozhevnikova and Lange 2009). At the same time, however, the bioenergy is young and immature and thus relationship-specific investments are very important to its development. Kozhevnikova and Lange (2009) found this tends to increase the length of contracts in the coal industry and Von Hirschhausen and Neumann (2008) found this can increase the length of a contract by 3 years.

Thus, the bioenergy industry must overcome these challenges as a very young and immature as a market. Further, as previously noted, the industry has a potential to play a large role in the 21st century energy portfolio (Aguilar et al. 2011; DOE 2011; Faaij 2008; Flamos et al. 2011; Jiang et al. 2010; Junginger et al. 2014; Kirkland and Nicholls 2015; Rose et al. 2014). While the literature in the natural gas and coal industries are helpful in creating a more mature and self-sustaining market, research will be needed in the bioenergy field to determine the exact reasons why long-term supply contracts have yet to be realized. After that is determined, the vast amount of research conducting in the natural gas and coal energy sectors can be better utilized to create a framework for constructing long-term supply contracts in the bioenergy sector.

Chapter 3 – Methodology

This paper used a qualitative research approach to examine how long-term supply contracts could be used in the bioenergy markets. This included the preceding review of the literature and components of supply contracts; interviews with prospective participants in the bioenergy supply chain; and synthesis of the literature and responses from the interviews. A survey instrument was developed for the various stakeholders in the supply chain; pre-tested with colleagues and industry experts; and reviewed and approved by the NC State University IRB process.

Introduction

Structured interviews were conducted with stakeholders throughout the woody biomass supply chain in the southeastern United States. The interviews were conducted by phone, except for one in person interview, with the use of a structured questionnaire that consisted of open-ended and closed-ended questions. Participants were asked about their current and previous experiences with long-term supply contracts, willingness to enter into future long-term supply contracts, and factors that impact the decision-making process for deciding whether to enter into, maintain, or terminate a long-term contract. In total, 20 interviews were conducted. Due to the nature of the study, a structured interview based on a questionnaire was determined to be the most appropriate research design as they are well suited to studying participant opinions on a subject matter (Babbie 2007).

There are many advantages to the use of an interviewer in administering a questionnaire. Babbie states that questionnaires administered in this manner tend to have higher response rates as well as a higher proportion of questions answered in the questionnaire (2007). Additionally, the

interviewer can clarify any question the interviewee has as well as ask additional questions if respondent answers open additional doors of thought (Babbie 2007). By conducting the questionnaires over the phone, as opposed to in person, several negative biases are eliminated. Additionally, the careful selection of participants and communication prior to the interview, eliminated many of the negative biases individuals have in regard to phone questionnaires (Babbie 2007).

Questionnaire Construction

Given the wide range of stakeholders within the woody biomass supply chain, five separate questionnaires (Appendix A-F) were developed to focus on specific stakeholder groups. The five targeted stakeholder groups are: NIPF landowners, industrial timberland owners, intermediate users (pellet and biofuel producers), biomass power facilities, and electric utilities (investor-owned and cooperative) (Table 2). The questionnaires were designed to be as similar as possible while allowing for differences in stakeholder groups.

Table 2 – Questionnaires Developed and Components

Type	Sub-Grouping	Background & Introduction	Contract Requirements	Types of Long Term Contracts	Contract Decisions
Timberland Owners	Non Industrial Private	x	-	x	x
	Industrial	x	x	x	x
Intermediate Users	Biofuel/Biodiesel	x	x	x	x
	Pellet	x	x	x	x
End Users	Biomass Power	x	x	-	x
	Utilities	x	x	-	x
Misc. Participants	Forest Mgmt Company	x	x	x	x
	Procurement Firm	x	x	x	x

Timberland Owners Questionnaire

The timberland owners' questionnaire was based on three questionnaires developed by McGill et al. (2008), Myer & Klemperer (1984), and Silva (2013). The goal of the questionnaire was to understand how participant landowners' have sold timber in the past, what role long-term supply contracts, or leases, have played and what factors have impacted their decision on whether to use, or not use, a long-term supply contract/lease. The questionnaire was divided into four sections. They are:

1. Introduction and Background – This section of the questionnaire was focused on obtaining basic information regarding the timberland the participants' owned. Both questionnaires asked for information regarding the species composition and harvesting practices on the land they owned, or managed. In addition to this information, the NIPF landowners' questionnaire sought to determine the landowners who was involved in the sale(s), how they were contacted, what method they used to sell their timber, satisfaction level with the work done, and how long they planned to own the land. The additional detail in the NIPF questionnaire was included as previous studies indicated landowners were not satisfied with the work done on their properties (Hickman and Gehlhausen 1981; McGill et al. 2008).
2. Long-Term Contract and Lease Requirements – The purpose of this section was to understand the various requirements participants have for entering into a long-term contract or lease. Participants were also asked about what type(s) of price adjuster(s) they used and what an ideal long-term contract or lease would look like. The NIPF questionnaire did not explicitly include this section but participants were asked if they had

an ideal long-term contract or lease. The reason it was not included was the general lack of knowledge most NIPF landowners have in regard to long-term contracts/leases (Somberg 1971; McGill et al. 2008).

3. Types of Long-Term Contracts and Leases – This section of the questionnaire was included to determine if the participants used any forms of long-term contracts and leases that were previously studied by Siegel (1973) and Klemperer & Myer (1984) and to see which of these contract types participants considered to be the most promising in the future.
4. Reasons for Using/Not Using Long-Term Contracts and Leases - The goal of this section was to determine the participants reasoning for using, or not using, long-term supply contracts and/or leases. Participants were asked to rank various factors on a likert scale, from 1 (Not Important) to 5 (Very Important). While both the NIPF and Industrial questionnaires included this section, the factors given differed. The NIPF questionnaire more closely followed the one as developed by McGill et al. (2008). Whereas the Industrial questionnaire more closely followed Silva (2013). Overall, the factors can be grouped into similar overarching groups but the differences were included due to (a) previous studies use of them and (b) factors considered important in previous studies (i.e. loss of control of property, etc) would only be applicable to one of the groups of participants. Lastly, participants were asked to rank the top 3 reasons for entering into a long-term contract/lease and deciding whether to maintain or terminate one.

Intermediate Users Questionnaire

The intermediate users' questionnaire aimed to understand the procurement strategies of pellet and biofuel/biodiesel producers and the role, if any, long-term supply contracts, or leases, had in their strategy. The questionnaire also asked, whether the participants used long-term contracts to sell their finished product. The questionnaire was divided into four sections. The questionnaires did not differ between pellet mills and biofuel/biodiesel plants. They are:

1. Introduction and Background – This section of the questionnaire was focused on getting basic background information, such as: feedstock mix, their reason(s) for their feedstock mix, and how they would like their feedstock mix to change in the future, if at all. Additionally, participants were asked what feedstocks they thought were most promising in the future and why.
2. Long-Term Contract and Lease Requirements – This section is identical to the section in the Industrial questionnaire. Participants were asked about the requirements they have for entering into a long-term contract or lease. Participants were also asked about what type(s) of price adjusters they used and what an ideal long-term contract or lease would look like.
3. Types of Long-Term Contracts and Leases – This section is identical to the section included in the Industrial questionnaire. Participants were asked they used any forms of long-term contracts and leases that were previously studied by Siegel (1973) and Klemperer & Myer (1984) and to see which of these contract types' participants considered to be the most promising in the future.
4. Reasons for Using/Not Using Long-Term Contracts and Leases – This section was identical to the section included in the Industrial questionnaire. The goal of this section

was to determine the participants reasoning for using, or not using, long-term supply contracts and/or leases. Additionally, this section looked to understand which reasons were considered to be the most important when entering into a long-term contract, or lease, and when deciding whether to maintain or terminate a long-term contract, or lease.

End Users Questionnaire

The purpose of the End Users questionnaires was to understand the procurement strategies of End Users in the biomass supply chain and, specifically, what role, if any long-term supply contracts have played. Two similar but different questionnaires were developed as it was believed that Biomass Power Facilities would have similarities to both intermediate users and electric utilities. Neither questionnaires included the Types of Long-Term Contracts and Leases section, as it was determined that they procured fuel from more concentrated sources and were thus less likely to enter into any contract that required forest management responsibilities. The questionnaire was divided into three sections. They are:

1. Introduction and Background – The purpose of this section was to ascertain background information on the participant's feedstock(s) and energy sources, as well as the reason(s) for their mix. The categories differed between Biomass Power Facilities and Utilities. Utilities categories was broader (nuclear, coal, etc) whereas the Biomass Power Facility categories focused on types of biomass (harvest residues, standing timber, etc). Participants were asked to consider what feedstock(s)/sources of energy they thought were most promising in the future and how they would like their current mix to change. The differences were driven by the fact that Biomass Power Facilities would be focused

strictly on biomass fuel types; whereas a Utility would have a much broader mix of fuel sources.

2. Long-Term Contract and Lease Requirements – This section is mostly identical to those in the Intermediate Users and Industrial timberland owners’ questionnaires. The main difference is that it asks the Participant to describe the types of long-term contracts/leases they use instead of including a separate section. They were also asked about whether the participant was, or planned to, use a wood dealer, or other procurement company, to supply their feedstock.
3. Reasons for Using/Not Using Long-Term Contracts or Leases – This section was identical to the section in the Intermediate Users and Industrial timberland owners’ questionnaires.

Miscellaneous Participants Questionnaire

The miscellaneous participants did not fit into any of the above categories; consequently, they need special consideration in the questions asked in the interview. It was determined that the Forest Management Company resembled the characteristics of an Industrial Timberland Owner and would be able to use their questionnaire without modifications. The Procurement Firm, however, only resembled various functions of different participant groups. Thus, a unique survey was developed using the Industrial Timberland Owners and Biomass Power Facilities questionnaires. The questionnaire was divided into three sections. They are:

1. Introduction and Background – As the participant’s main business was not timberland management but procurement, this section asked background information on the tons the firm procured throughout the region as well as whether they had been contacted by bioenergy producers to procure their feedstock.

2. Long-Term Supply Contracts and Lease Requirements – This section closely resembled the same section of the Industrial Timberland Owners questionnaire. The participant was asked whether they utilized long-term contracts or leases and any requirements they had. Additionally, the questionnaire asked what an ideal contract might look like.
3. Reasons for Using/Not Using Long-Term Contracts and Leases – This section matched that of the Biomass Power Facility questionnaire. The questionnaire did not include the section on Types of Long-Term Contracts and Leases, as it was determined that they were unlikely to utilize any of the types. Consequently, this section did not ask why, or why not, the participant utilized, or did not utilize, long-term contracts or leases. Otherwise, it was believed that the factors remained the same.

Participant Selection

A comprehensive list of possible participants was made. Resources used in constructing the possible participant list included: personal knowledge, committee members' knowledge, public databases compiled by BBI International, facility database as maintained by the N.C. State Extension Forestry Department, N.C. Tree Farm Program, and a few participants were added as recommended by other participants.

All participants were from the Southeastern United States with a concentration around the mid-Atlantic region. Possible participants were initially contacted by email and/or phone with interviews scheduled for a later time. A total of 33 participants were contacted and interviews were conducted with 20 participants (Table 3).

Table 3 - Interviews Conducted by Participants Type

Participant Type	Contacted	Number Interviewed
Utilities	8	4
Biomass Power Facilities	4	2
Pellet	3	3
Biofuel/Biodiesel	2	2
TIMO/REITs	7	3
NIPF Landowners ¹	7	4
Procurement Firm	1	1
Forestry Mgmt Company	1	1
Total	33	20

¹All NIPF landowners contacted and interviewed were participants in the American Tree Farm Program

Interviews

Before the scheduled interview, participants were provided a detailed list of topics to allow them to gather information they might not have readily available (i.e. acres in planted vs natural pine) as well as the informed consent letter for their review.

Interviews began with reviewing the informed consent letter. After reading over the informed consent letter, participants were asked if they agreed to participate in the study. If the participant declined to participate in the study, the interview was ended immediately. If the participant agreed to participate, they were then asked for permission to record the interview. If the participant asked for the interview to not be recorded, answers were noted on the questionnaire. If the participant agreed to be recorded, the recording began with the start of the interview.

Interviews progressed through the questionnaire as they were designed. Questions were only skipped when a previous answer rendered them inapplicable. At the end of the questionnaire, participants were given a chance to provide any further comments and to ask questions about the study.

Analysis

Due to the limited sample size and nature of the study, basic descriptive statistics and qualitative analysis were used. As previously noted, interviews were recorded, with permission from participants, and notes were made from the recordings. After reviewing the recordings several times and adding detail to the interview notes, they were sent to the participant to ensure the notes accurately reflected their facts and opinions. If the participant stated in the affirmative that the notes were accurate, the recording was deleted and the notes were stored on a secure external hard drive for later analysis.

After a majority of the interviews were conducted, the notes from individual interviews were examined and examined within their survey group (Table 4). Table 4 presents the results at the aggregate level and states whether the group currently used long-term contracts and whether they would consider them in the future.

Table 4 - Participants Possible Interest in Long-Term Contracts

Type	Sub-Grouping	Current Use	Future Use
Timberland Owners	Non Industrial Private	No	Unlikely
	Industrial	Yes	Yes
Intermediate Users	Biofuel/Biodiesel	No	Maybe
	Pellet	Yes	Yes
End Users	Biomass Power	No	Maybe
	Utilities	Yes	Yes
Misc. Participants	Forest Mgmt Company	Yes	Yes
	Procurement Firm	No	Maybe

Chapter 4 – Results

Introduction

Participants' use of long-term supply contracts was mixed. While none of the non-industrial private landowners had entered into a long-term supply contract, two of three industrial timberland owners were currently in long-term supply contracts. As for intermediate users, two out of the three pellet mills used long-term supply contracts to purchase their feedstock while neither biofuel producer did. Due to their position in the supply chain, the biofuel producer and two pellet mills used long-term supply agreements to sell their product to end users. Of the six end users interviewed, neither biomass power facility utilized long-term supply contracts but all four utilities used them. However, these long-term supply contracts are used to procure fuel sources other than woody biomass.

Reasons for using, or not using, long-term supply contracts varied by participant type. Control was a common theme among participants. While NIPF landowners were mostly concerned with losing control over their property, Industrial timberland owners and utilities looked at long-term supply contracts as a way to control the market. Pricing was another major concern for all parties. While timberland owners wanted to receive the highest value possible, sometimes including a premium over market, purchasers regularly cited that premium as an impediment to entering into a long-term contract. Few participants cited sustainable certifications as important to their decision making. Overall, participants were most concerned with their ability to supply/purchase the feedstock, competitive pricing for the feedstock, and ease of doing business.

NIPF Landowners

A total of seven non-industrial private landowners were contacted in which four of them participating in the study. Respondents varied in land size holdings from 47 acres to over 2,000 acres. All participants had timber harvested from their property but only one had been contacted about selling timber for bioenergy purposes. Three of the four participants sold their timber under sealed bids with lump sum payments and the fourth used a pay as cut contract. The participant that used a pay as cut contract indicated they were not fully satisfied with the harvesting job done on the property, due to both the merchandizing as well as the rutting from the harvesting. All participants indicated they planned to own their property for 20+ years (Table 5).

Table 5 - NIPF Interest in Long-Term Contracts

	Current Use	Future Use	Top Reason For	Top Reason Against
Landowner 1	No	Maybe	-	Loss of Control
Landowner 2	No	Maybe	Stable Prices	Remedies for Poor Performance
Landowner 3	No	No	-	Loss of Control
Landowner 4	No	Maybe	-	Loss of Control/Trust

None of the participants were currently in a long-term supply contract and only Landowner 3 expressed strong apprehension about entering into one. However, this landowner indicated that if the business environment required one, they would be open at that point. When entering into long-term supply contracts, participants generally were most concerned with receiving maximum value for their timber, harvest quality, and provisions for terminating a contract if gross inequities occurred, including if harvest quality was extremely poor. Tied into all these concerns was the overarching concern by the participants that they did not want to feel like

they had lost control over their property. These comments seem to mirror those from Hickman and Gehlhausen (1981).

Industrial Timberland Owners

A total of seven industrial timberland owners were contacted in which three participated in the study. Respondents varied in land size holdings from, roughly, 100,000 acres to over 300,000 acres in the mid-Atlantic region (North Carolina, South Carolina and Virginia). Two of the three participants currently had long-term supply contracts. However, only one of three participants had voluntarily entered into one as most long-term supply contracts in the industry were part of large acquisitions from old vertically integrated forest product companies. The one participant that was not currently under a long-term supply contract indicated that they were open to them but had (a) not purchased timberland from old integrated forest product companies and (b) did not have the scale of operations in the region to commit to a level of volume that would make a meaningful difference. This participant did have multiple long-term leases with NIPF landowners (Table 6).

Table 6 - Industrial Timberland Owner Interest in Long-Term Contracts

	Current Use	Future Use	Top Reason For	Top Reason Against
TIMO 1	Yes	Yes	Investment Return/Risk	Investment Return/Risk
TIMO 2	No	Maybe	Investment Return/Risk	Investment Return/Risk
TIMO 3	Yes	Maybe	Investment Return/Risk	Investment Return/Risk

The long-term supply contracts generally varied in length from 10 to 15 years. Participants indicated, however, that some long-term supply contracts in other regions extend for upwards of 40 years depending on the acquisition.

The long-term supply contracts all contained price adjusters that could be split into two main groups. The first group used a four quarter rolling average, using a market index (TimberMart South or Forest2Market). The second group used a simple average of wood purchased outside the supply agreement. Both types of price adjusters can include provisions for freight adjustments but were only included in one pulpwood long-term supply agreement. These price adjuster mechanisms are different from those studied in earlier literature, where the All-Commodities Wholesale Price Index or Produce Price Index was used to adjust the agreed upon timber price for inflation. These new price adjusters avoid any previous issues when the real timber price increased faster than inflation while automatically keeping timber prices paid in current dollars. The long-term leases, on the other hand, provided for a lump-sum payment for the timber at the beginning of the lease and annual rent payments that were adjusted for inflation using the Consumer Price Index.

All the long-term leases/supply contracts contained *force majeure*¹ clauses and the long-term supply contracts contained *Take or Pay* clauses. *Take or Pay* clauses require Party A to supply the contracted quantity of a product to Party B who is required to pay for the contracted quantity regardless of whether Party B takes the supplied volume.

The three participants all had similar reasoning for entering into a long-term supply contract or lease. The most important factor for all three participants was investment return, as they have a fiduciary duty to their clients. The second most important factor can be described as technical capacity of their ability to supply a given quantity as well as the ability of the purchaser to take the contracted volume. Two participants indicated a premium over market is desired while

¹ *Force majeure* is a legal doctrine that alleviates a party from performing a contractual duty due to an unforeseeable and uncontrollable event.

the third participant placed high importance on price stability due to their long-term supply contracts with thinnings, a silvicultural practice that would occur regardless.

As for maintaining or terminating a long-term supply contract, all participants stressed the importance of their fiduciary duty to their clients. The second most important factor was technical capacity. Participants indicated that it is important to determine what changes, if any, occurred in the market and whether they have the capacity to supply the contracted quantity. Lastly, participants indicated that their experience with the contracting party(ies) is very important.

Overall, all participants indicated they desired contracts of lengths of roughly 5 to 10 years. All of the participants interviewed indicated they desired a price adjuster based off of a local market index (TimberMart South or Forest2Market) and, when appropriate, freight adjustments to compensate for longer hauling distances. Participants also believed a premium should be paid over the market price as the price for securing volume for a given amount of years. *Take or Pay* and *Force Majeure* provisions were also considered to be necessary. Participants did not have a minimum, or maximum volume amount to be supplied via a long-term supply contract but believed it is beneficial to have at least a small portion of annual volume sold under a long-term supply contracts to guarantee market share.

Two of the three participants indicated that they utilized long-term leases. These leases ranged in length from 25 years to 100 years. Both participants indicated that the leases contained an upfront payment for timber and an annual rent payment to the landowner. This type of long-term lease was the 5th most prevalent in number of contracts found by Siegel (1973) and was considered the most promising for future long-term lease types by Meyer & Klemperer (1984).

Both participants were neutral on whether they desired more long-term leases in the future. They indicated the main benefit a long-term lease provides is that they require lower upfront capital than a fee-based acquisition. However, these benefits are mitigated by the value fluctuation possible in a long-term lease as their value is highly correlated to the price of timber.

Intermediate Users

Biofuel/ Diesel Plants

One biodiesel and one biofuel plant were contacted and interviewed for the study. The facilities are capable of producing 1 million to 12 million gallons per year. The biofuel plant only use clean de-barked chips that met specific standards; whereas the biodiesel plant mostly uses poultry and swine fat and occasionally used cooking oil and low quality soybean oil. While the biofuel plant cited eliminating as many variables to focus on the production process, the biodiesel facility indicated that their feedstock choice was strictly driven by price. Both facilities desired their feedstock to change in the future. The biofuel plant wished to switch to whole-tree chips produced in the woods and the biodiesel plant wanted to use locally grown oil seed crops. The biodiesel plant cited the high cost of locally grown oil seed crops compared to the prices end users were willing to pay for their product as the major obstacle to their use (Table 7).

Table 7 - Biofuel/ Biodiesel Plant Interest in Long-Term Contracts

	Current Use	Future Use	Top Reason For	Top Reason Against
Biodiesel	No	Maybe	N/A	Maturity of Market
Biofuel	No	Maybe	N/A	Equitable

Neither facility currently used long-term supply contracts but both were open to them in the future. The biodiesel plant indicated that they did not currently utilize long-term supply

contracts for several reasons. First, the facility cited the immaturity of the market and lack of stable demand. Second, the facility cited the price competition from regular diesel as end users are, generally, not willing to pay a premium for a greener product. Finally, the facility cited the uncertainty of federal tax incentives that are renewed every year. Without these incentives, the facility indicated they could not operate and would be forced to shut down.

The biofuel facility, on the other hand, stated that their main reason for not utilizing long-term supply contracts was due to (a) the company's chip standards leading to a supply chain forming around them and (b) the utilization of long-term off-take agreements for their products. The facility also indicated that while their relationship with their suppliers would likely be long-term, a long-term contract is not likely to provide any additional benefits over a yearly contract that is renewed. Additionally, the facility indicated that they enter into long-term off-take contracts before their mills are built. The facility declined to provide additional detail but it is possible the use of a long-term off-take contract allows for more flexibility in their procurement decisions. This is similar to the strategy employed by Pellet Mill 1.

The reasons for entering into, maintaining, and/or terminating a long-term supply contract differed between facilities. The biodiesel facility indicated that the most important factors were the immaturity of the market and the presence of incentives/subsidies. Conversely, the biofuel producer was more concerned with the content of the contract when entering into it. Specifically, the facility indicated the pricing mechanism and structuring the contract so that both parties had a vested interest in the other's success. The facility specifically mentioned the important of a *take-or-pay* provision, a meaningful *force majeure clause*, and provisions for non-compliance that penalized

the party enough to sting while not crippling them and allowing for a make-up period for short-term issues of nonperformance.

As to whether to maintain or terminate a long-term supply contract, the biofuel facility was mostly concerned with whether the counterparty was reliable and easy to do business with. Additionally, the facility would evaluate the performance of the pricing mechanism to ensure that it was equitable for all parties.

Neither facility considered any of the contract types studied by Siegel (1973) and Meyer & Klemperer (1984) as promising in the future. For the biodiesel producer, they did not have a contract length in mind but desired to have a minimum of 50% of their annual feedstock needs supplied via a long-term contract, while attempting to take advantage of spot market prices to lower their overall feedstock cost. The biofuel producer desired contract lengths between 5-10 years with, roughly, 250,000 tons, per contract, of clean de-barked chips supplied annually at a minimum. As mentioned previously, the contract must be structured to ensure both parties have a vested interest in each other's success. To this affect, the facility's ideal contract would have a *take-or-pay* provision with consequences for non-performance that stung but did not cripple the other party. Additionally, the facility indicated it was important that the contract include a *make-up* provision that allowed for the party not in compliance, due to reasons other than lack of effort/incompetence, to make the other party whole before any consequences levied. Lastly, the facility indicated that stumpage and hauling costs be independent of one another.

Pellet Mills

Three pellet facilities in the southeast were contacted for this study. Respondents varied in production capacity from, approximately, 50,000 tons annually to over 700,000 tons annually

of wood pellets produced. Two of the three participants had long-term contracts, with one not willing to disclose details. Two of the mills utilized a mix of 80/20 hardwood to pine while one of the larger two facilities utilized 100% pine; though, they noted in the future they would like to add between 5-10% hardwood to their mix for pellets (Table 8).

Table 8 - Pellet Mills Interest in Long-Term Contracts

	Current Use	Future Use	Top Reason For	Top Reason Against
Mill 1	Yes	Yes	Risk Mitigation	Few Credit Worthy Counterparties
Mill 2	No	Maybe	Price Stability	Current Strategy Working
Mill 3	Yes	Yes	Risk Mitigation	Concern of Future Market Conditions

Mill 2 is the smallest of the three producers and indicated that they did not utilize long-term supply contracts or leases as their current system of one-year contracts had not been a major issue. This producer did, however, contract with a wood dealer to supply their mill. The mill indicated that they did not have a particular reason for utilizing one-year contracts with a wood dealer. Mill 1, the largest producer interviewed, indicated that the reason they didn't have more long-term fiber supply contracts was that there are few counterparties that can support them and the one's that can, generally attach a significant price premium to them. Thus, making them financially undesirable. Additionally, Mill 1 indicated that they seek to build mills in shallower markets with less competition for resources.

Mill 3 indicated they had a total of three long-term supply contracts that supplied the mill with, roughly, 14% of their annual fiber needs. Two of the contracts were for five years and the third contract was for 10 years. None of the contracts provided for the mill to have management

responsibilities. Their contracts utilized a local market index price adjuster with a four quarter rolling average.

Both Mill 1 and Mill 3 indicated they utilized long-term off-take contracts to sell their finished products for end-use demand. Mill 3 indicated they varied in length between five to seven years while Mill 1 declined to provide any detail. Both mills indicated that these contracts were essential to their procurement decisions and that they would be less likely to enter into a long-term fiber procurement contract if these were not in place.

The reasons for entering into, maintain, and/or terminate a long-term supply contract varied by mill. However, fuel source availability was important to all three mills. Pricing was also important to all three mills but their reasoning differed. While Mill 2 was mostly concerned with price stability, Mills 1 and 3 indicated that it was equally important to them that the pricing was competitive and not unreasonably expensive. Mill 2 indicated community relations was important to them while Mill 3 indicated the ease of doing business was their third most important factor going into their procurement and selling contract decisions. Mills 1 and 3 indicated the presence and timing of their supply contracts with their long-term supply agreements to sell pellets was highly important. Mill 3 was the only mill interviewed that indicated sustainable third party certifications were important due to European Union subsidies. Future market conditions was mentioned by all three mills as one of their biggest apprehension to entering into a long-term contract.

The larger mills indicated they desired contract lengths that corresponded with their offtake agreements but with one mill signaling five years as a reasonable length. As with TIMO/REIT timberland managers, a local market index as a price adjuster was desired. None of

the mills explicitly stated they desired either a *Take or Pay* and/or *Force Majeure* provision(s) but all of them considered flexibility and risk mitigation as important qualities in a long-term contract to purchase fiber or sell pellets. Thus, it can be reasonably assumed that these would be important provisions to include in any long-term supply contract. One mill indicated they would prefer a long-term supply contract to supply, roughly, 100,000 tons per year, while the other two mills did not indicate a preference.

All three mills were open to entering into future long-term supply contracts. However, Mill 2 desired to stay with their current procurement system, of one-year contracts, while Mill 1 indicated that the lack of credit worthy counterparties and price premiums attached to them minimized their appetite for them. This mill also indicated that supply chains have tended to develop around them due to their reliable demand, making long-term supply contracts unnecessary with the current level of local competition. Mill 1 stated that if competition were to increase in their fiber baskets, long-term supply contracts might become more prevalent in their procurement decisions. Mill 3 was the most open to entering into more long-term supply contracts. The mill stated they wished to increase their use of long-term supply contracts from, roughly, 14% of their annual volume needs to 20% as they found their long-term contracts to reduce market volatility as periods of higher price wood was mitigated by periods of lower cost wood.

End Users

Biomass Power Plants

Two biomass power plants were contacted and interviewed for this study. The plants were capable of producing 15 and 20 megawatts per hour, with Plant 1 being the larger power producer of the two plants. One of the plants also produced 240,000lbs/hr of steam. Neither plant currently

used long-term supply contracts or leases for their procurement needs with Plant 1 willing to consider shorter contracts of 18-24 months and Plant 2 being open to long-term supply contracts or leases (Table 9).

Table 9 - Biomass Power Plants Interest in Long-Term Contracts

	Current Use	Future Use	Top Reason For	Top Reason Against
Plant 1	No	No	Price Stability	Price Premiums by TIMO/REITs
Plant 2	No	Maybe	Price Stability	High Price of Power Generation

Both plants were specifically designed to handle their prospective feedstocks. Plant 1 utilizes 70% wood fiber (90% in-woods chips, 10% mill residues), 28% tire chips and 2% pallets. Plant 2, utilizes 80-90% logging residues and 10-20% mill residues in the form of chips and sawdust. Both plants were designed/permitted for their feedstocks and did not wish for their feedstock mix to change. Plant 1 cited the economics of their feedstock choices and also indicated that due to the EPA loosening some rules recently, tire derived and industrial waste were considered promising feedstocks in the future due to their higher BTU values as compared to green wood. Plant 2 noted that the design specifications for their facility were chosen due to the mill’s location in a highly productive logging region that provided abundant residues for use.

Plant 1 indicated their average length of contract was one year and included an additional year extension with mutual consent. The contracts stipulate a minimum volume and include an option to buy additional volume at the same price. Some of Plant 1 contracts had fuel surcharge adjustments but did not include any price adjusters. Plant 2 currently uses “loosely worded [contracts]” as they are less sophisticated and the counter parties, generally, do not have the ability to back them up if they failed to perform.

While both plants currently had somewhat similar current contracts, they differed in their ideal use. Plant 1, as previously mentioned, desired contracts under two years in length. Plant 2, on the other hand, believed a 10-year contract to be most ideal. Both plants desired contracts without fuel adjustments and some flexibility in supplied volume.

Both plants were similar in the reasons for not currently using long-term supply contracts. They mentioned that it was not common in the forestry industry to enter into long-term contracts and that most parties, outside of TIMOs/REITs and their charged premiums, do not control the necessary supply or can back up the contract financially if they failed to perform. Most importantly, both plants indicated a concern for losing money due to the price of electricity and the price of fiber.

Overall, reasons for entering into a long-term supply contract were relatively similar by plant. Both plants considered the profitability of the contracts as paramount. Plant 1, however, was more concerned about price stability whereas Plant 2 was focused on the interplay between the price of electricity and fiber supply. Both plants also considered the ability of counterparties to fulfil their contractual requirements as very important. Plant 1 indicated that TIMOs/REITs, which generally require a premium over market are the majority of parties that can back up a long-term supply contract. As for the third most important reason, Plant 1 indicated their knowledge of the market was important to them. Whereas, Plant 2 indicated the ease of doing business was most important.

Reasons for maintaining or terminating a long-term contract were similar as well. Plant 1, however, specifically indicated changes in environmental law and loss of subsidies as important in their decision making process. Plant 2, on the other hand, stated they believed one should never

enter into a long-term contract due to subsidies as they cannot be guaranteed into the future. Lastly, neither plant considered sustainable certifications as important in long-term contract decisions.

Overall, Plant 1 indicated they are only likely to use shorter term contracts for their fuel procurement needs. Plant 2 was open to long-term contracts but indicated that either the price of electricity would have to rise or the price of fiber would need to decrease for it to become financially viable as a procurement method.

Electric Utilities

Four utilities were interviewed for this study. Of that total, Utility 1 is a university power plant, Utility 2 is an electric cooperative, and Utilities 3 & 4 are investor-owned. Two of the four participants have either tested biomass power and plan to utilize it in the future (Utility 1) or currently operate biomass power facilities (Utility 4). Utility 3 and Utility 2 both indicated that they had no plans to utilize biomass for the foreseeable future due to prohibitive costs. Utilities 1, 3, and 4 utilized contracts within the three to five years range. Utility 2 has several purchase agreements that extend up to 20+ years. None of the utilities indicated they desired changes in their procurement strategies but all of them did indicate that as natural gas becomes cheaper, less coal is likely to be utilized in power generation.

Currently, the investor-owned utilities (Utilities 3 and 4) are going through a drastic change in how they generate their power. 10 years ago, coal represented over 50% of their power generation. The percentage of coal utilized now is in the mid to high-30s as the use of natural gas, nuclear, and renewable energies have increased in power generation. Due to cheap shale gas, natural gas has benefited the most as it has gone from single digits to the low and mid-30s in their

generation mix. Nuclear power generation has remained slightly below 20%, since the 1970s. However, due to increasing concerns over greenhouse gases, one investor utility indicated they would like to double the percentage of power generated from nuclear plants. Renewables were all below 10% and of that amount, biomass represented less than 1%.

Utilities 1 and 2 both had unique generation mixes. Utility 1, due to its size, did not use any nuclear power. Its energy mix was split between coal (~70%) and natural gas (30%). In the future, the plant believed coal would drop to around 50% of their generation needs with biomass picking up a majority of the slack and natural gas remaining around its current levels. Utility 2 indicated that roughly 56% of their energy portfolio was generated from nuclear power (through purchase agreements), with coal and natural gas representing ~13% and 19% of their portfolio. The balance represented a mix of renewables and diesel plants as required for peak generation needs.

While Utilities 2 and 3 indicated that the BTU value of biomass was too low for its use to be economical, Utility 4 operated several biomass plants and Utility 1 indicated that they had tested its use and desired to make it a part of their energy mix. Utility 1 stated the reason they began to test biomass in their boilers was due to the university instituting a climate action plan. However, Utility 1 indicated the reason they were not currently using wood pellets on a regular basis had to do with storage issues. Utility 1 indicated that they would like to procure terrified wood, which can be stored similar to coal, to utilize in their energy mix. Utility 4, indicated that the reason they were operating several biomass power plants primarily had to do with aging coal plants nearing retirement and retrofitting them to meet new environmental laws was not as economical as converting them to biomass power. Additionally, the utility indicated that there were some tax

benefits for the conversions and that the plants are located in biomass rich markets. The utility stated that they did not plan to increase their use of biomass power and would continue to use wood waste products (harvesting, mill residues, etc) instead of pellets due to their lower costs

The procurement strategies utilized by all the interviewed participants in this section were similar (Table 10). Three out of the four participants indicated they utilized contracts that varied in length of three to five years. The electric cooperative entered into purchase agreements that varied in length from five years to 20+ years. Utility 1 indicated that they would be interested in possibly entering into a 10 year contract with coal or torrefied wood. All four participants' procurement strategies focused on risk mitigation. To that end, the utilities stated that they stagger their contracts over time in order to minimize market swings. Additionally, all participants indicated that they vary pricing mechanisms and contract with multiple parties to minimize market swings as well as supply disruptions. Details on contract requirements were only provided by Utility 1. Specifically, the plant indicated that they had a set price for the procured fuel and an adjuster only kicked in if (a) the market price was +/- 10% of the contract price and/or (b) the BTU was +/- 2% of the contract amount. Overall, quantities were estimated with the participant able to call additional volume. Lastly, *take-or-pay* provisions were not included in all contracts.

Table 10 - Electric Utilities Interest in Long-Term Contracts

	Current Use	Future Use	Top Reason For	Top Reason Against
Utility 1	Yes	Yes	Reliable Supply	Price & Fuel Availability
Utility 2	Yes	Yes	Risk Mitigation	Lack of Flexibility
Utility 3	Yes	Yes	Risk Mitigation	Lack of Flexibility
Utility 4	Yes	Yes	N/A	N/A

Overall, the participants had similar reasons deciding whether to enter into a long-term supply contract in their procurement strategy. Price stability was the most important listed. All participants wanted to manage market risks and provide their customers with the lowest and most stable price possible. The second most important factor was the availability from diverse sources. As other participants in the study stated, if the fuel isn't available, you can't contract for it. Additionally, all the participants indicated it was important that they be able to source their fuel from several sources to minimize possible supply disruptions. The third most important factor was having infrastructure in place in order to be able to obtain and move the fuel supply to the plant that is needed at. All the participants indicated similar reason for deciding whether to maintain or terminate a long-term supply contract. One additional factor mentioned was their experience with the provider. As with other participants in the study, utilities stated it was important that the counterparty be easy to work with and able to perform their contractual duties.

The participants did not provide specifics for their ideal contract but flexibility and stability were mentioned throughout the interviews. The utilities interviewed utilized contracts to smooth out market swings as well as protect them from supply disruptions. The participants' considered contracts a means to managing uncertainty in the market place and thus giving them the ability to focus on delivery energy to end-users. The participants were split on their belief and utilization of biomass power. The two participants that were either using or planned to use biomass power, were guided to this decision due to environmental regulations that either required its use or made aging coal plants uneconomical. The other two participants stated that biomass power was too expensive to be included in their current energy mix.

Miscellaneous Participants

Forestry Management Company

One forestry management company firm was contacted for this study to ascertain their views on long-term supply contracts and leases (Table 11). The firm does not enter into any long-term contracts or leases but does manage land subject to them. In general, the firm believes long-term supply contracts are better suited for shallower markets with less competition and would like to get out of the contracts in deeper markets to take advantage of the competition for resources.

Table 11 - Miscellaneous Participants Interest in Long-Term Contracts

	Current Use	Future Use	Top Reason For	Top Reason Against
Forest Management Company	Yes	Maybe	Price Stability	Less Able to Benefit From Competition
Procurement Firm	No	Maybe	Stability of Market	Misc.

The firm does not manage any land subject to bioenergy contracts but does manage land in the mid-Atlantic region that is subject to traditional fiber-supply contracts. These contracts range in length from 10 years to 20 years. The firm has engaged with pellet mills and they have generally sought contracts that average around seven years. These contracts generally use a trailing market index with some utilizing freight adjustments.

The firm believed that the maturity of the market, technical capacity and price stability were the most important factors in determining whether to enter into a long-term supply contract. As for determining whether to maintain or terminate a long-term contract, the firm indicated that price stability, investment returns and environmental laws were the most important. The firm also indicated it was important to maintain community relations in their local business dealings as clients generally want to avoid potential public relation issues. Previous experience was also considered important as it is important to be able to trust the party you are contract with. Lastly,

the firm indicated that while currently sustainable certifications are not considered important, they would be if there was a financial incentive to maintain them.

In general, the firm worried about the immaturity of the bioenergy market in deciding whether to enter into a long-term supply contract. The firm cited uncertainty with environmental laws and how that could adversely affect their clients. The firm did believe, however, that long-term supply contracts can provide some benefits like price stability and insurance of market share in shallow markets. The firm believed these benefits would only allow for some limited use but not widespread adoption.

Procurement Firm

One wood procurement firm was interviewed in the study (Table 11). The procurement firm currently does not operate under a long-term supply agreement but has agreed, in principal, to a possible long-term supply contract with a renewable energy firm, pending a mill sale. However, the procurement firm has utilized a renewable one year contract with a pulp and paper company for over four decades and does procure fiber for several pellet mills in the southeast.

The firm gave a few reasons for not currently using any long-term supply contracts. First, renewable one year contracts have worked well for them so they see no need to change from what has worked for them in the past. Second, renewable energy firms have “unrealistic expectations with price stability” over the life of the contract; whereas they would like for the price to fluctuate depending on local demand. Lastly, the firm sighted a lack of interest for long-term contracts from traditional wood product firms as a reason for not currently utilizing them.

In determining whether to enter into, maintain, or terminate a long-term supply contract, the firm indicated fuel source availability was one of the major factors impacting their decision

making. As other forestry companies have noted, if they cannot source the needed timber, they will default on their legal obligations under the contract. Community relations was the second most important aspect for the procurement firm as the firm mostly procures timber from NIPF landowners and if you have poor relations with them, it calls into question the reliability of the available fuel source. Lastly, the firm considered their experience with the other contracting party(ies) in whether to enter into, maintain, and/or terminate a long-term supply contract. The firm also stated that they will not enter into any contract whereby they supply 100% of the mill's needs. The firm believes this sets you up for failure when unforeseen circumstances limit harvesting activities and the mill does not have the necessary supply to operate. Whereas, if multiple companies supply the mill, "you are not blamed" for supply issues.

Chapter 5 – Discussion

Study participants' were mixed on their reasons for using or not using long-term supply contracts but none of these participants procured any biomass via a long-term supply contract for energy generation. For many of the participants in this study, it simply got down to the fact they had a system they felt worked and saw no need to change what “wasn't broken.” This was particularly true for the NIPF landowners in this study as well as some of the interviewed intermediate users and Biomass Power Plants. Generally speaking, however, this fact did not preclude these participants from stating they would potentially be open to the future use of a long-term contract.

Loss of control was another important issue, particularly for NIPF landowners. For NIPF landowners, this issue took the form of both concern over harvesting when timber prices are low as well as possibly poor harvesting conditions and the opinions of relatives. Loss of control was one of the most widely cited issues for NIPF landowners in previous studies (Hickman and Gehlhausen 1981; McGill et al. 2008; Meyer and Klemperer 1984; Somberg 1971). Industrial Timberland Owners, Intermediate Users, and Utilities, on the other hand, believed long-term contracts could help them control the market by minimizing risk. This belief mirrors what von Hirschhausen and Neumann stated, long-term contracts can help parties in [immature] industries reduce the risk associated with relationship-specific investments (2008).

Scale of operations was also an important factor for many of the participants. Several of the intermediate and end users indicated that they would only work with parties that controlled enough fiber to back a contract. While none of the participants explicitly indicated an acreage minimum, or maximum, it seems likely that previous acreage requirements of roughly 500-1000

acres as found by Siegel (1973), would underestimate minimum requirements. Echoing these sentiments, one of the TIMOs mentioned this as an issue that has prohibited them from entering into a long-term contract. In addition, these intermediate and end users indicated the only parties that did control the necessary fiber required a premium over market; making these contracts financially undesirable, as Pellet Mill 1 stated during their interview.

Price was also an important factor. For the NIPF landowners, they stated they desired to receive maximum income for their timber. These landowners expressed concern that if they did not have control over their timber, the counter-party to the contract might harvest their timber when prices are low. Industrial Timberland Owners were also concerned about the price received under a long-term contract due to their fiduciary duties. This led some of these owners to require a premium over the prevailing market price when timber is harvested. These price premium requirements made long-term supply contracts financially undesirable to many intermediate and end users.

Long-term offtake agreements also played a large role for several intermediate users in determining whether to use, or not use, long-term supply contracts. These intermediate users, generally, stated they would not build a new mill until these agreements were in place. While these mills were open to using long-term supply contracts for the fiber procurement needs, they have not been needed as they have guaranteed demand for their product and built mills in areas with less competition. Additionally, the price premium most landowners that control significant amounts of timberland place on any fiber sold through a long-term supply contract has made these less financially desirable.

Considering these factors, do the components of a long-term supply contract discussed in the literature review change? Generally speaking, no. In many ways, results from this study mirror those studies previously discussed. However, this study revealed that none of the previous types of long-term contracts were considered highly desirable. That being said, results from this study suggest that while the contract type might not resemble those studied in the past, there are several components that are important to include in future contracts.

This study further supports what was found in previous studies (Hickman and Gehlhausen 1981; McGill et al. 2008) that NIPF landowners were very concerned with losing control over their land. Consequently, it would be prudent for any long-term contract, or lease, to include provisions to minimize or eliminate this concern. This could come in the form of a clause that would allow for renegotiations in the event of “gross inequities,” as suggested by Joskow (1988). NIPF landowners could also be given what would amount to a “right of first refusal” for certain silvicultural and harvesting activities. Limiting the length of the contract would also be prudent. This study supports what was found by Hickman and Gehlhausen (1981), as well as McGill et al. (2008), that NIPF landowners generally expect to hold their land for an extended period of time (all respondents stated they plan to hold their land for 20+ years) and possibly even pass it on to their heirs. According to the 2013 National Woodland Owner Survey, over half of the respondents received their land from a family member (Butler et al. 2016). Thus, contract lengths of five to 10 years would seem most reasonable and would likely help assuage landowner concerns over losing control of their property for the whole time of ownership. Industrial Timberland owners that participated in this study also desired contracts of this length as they did not exceed the length of

fixed term commingled funds. An additional benefit to shorter contract lengths is that it should be less complicated to qualify for capital gains treatment.

Another concern among NIPF landowners in this study, as well as those studied by Hickman and Gehlhausen (1981) and McGill et al. (2008), was the concern over harvest quality and the condition of the property after a harvest. “Performance bonds” were found to be popular among landowners in east Texas by Hickman and Gehlhausen (1981). Thus, it would be prudent to require some form of performance bond as insurance against poor harvest quality and land degradation.

Given the importance of pricing to all participants, it would be prudent to use some form of a local market index to determine pricing and not use the Producer Price Index as it was found to underestimate market prices by Hotvedt and Tedder (1977). The question then becomes whether to use a rolling-average and/or charge a premium over market. Depending on how risk adverse a given party is, they should be more inclined to pay a premium over market in exchange for less risk. Several participants down the supply chain indicated that price premiums were not acceptable to them. However, these participants located their mills in areas with low levels of competition; allowing them to be pickier in their procurement choices than a mill located in deeper markets.

Another important part of any long-term contract, or lease, is to include a robust *force majeure* clause. Given bioenergy’s dependence on European subsidies, a policy change in Europe could render U.S. pellet operations obsolete. Consequently, it is imperative that any party entering into a long-term contract should account for this possibilities, or at least be sure to link their contract to the potential renewal or cessation of the bioenergy policies in the European Union.

There are many tax considerations that also need to be accounted for when deciding on using a long-term contract. As previously stated, there are two ways to qualify for capital gains treatment. A landowner can either (a) qualify for capital gains tax treatment through an outright sale of a capital asset (i.e. their timber) or (b) by making payment for the timber conditioned on when, and how much, is harvested (*Ah Pah Redwood v. Commissioner*, 1959; *Lawton v. Commissioner*, 1959; *Dyal v. United States*, 1965; *Camp v. United States*, 1974). Lastly, the ability to terminate the contract without the consent of the other party could create tax treatment complications related to income and expenses (*Gaskin v. United States*, 1966).

Chapter 6 – Conclusion

Due to the growing global population, corresponding demand for electricity, and concerns around climate change, it is important for the world to find ways to meet these increased demands through renewable sources of energy (Aguilar et al. 2011; ECON 2012; NYT 2011). One possible way to increase the amount of energy generated from renewable sources is to increase the use of woody biomass (Jiang et al. 2010). However, expanding the use of woody biomass as a renewable energy source has not been easy.

For starters, many utilities, such as those in this study and other studies, do not find woody biomass to be economically feasible in most situations (Aguilar et al. 2011; Faaji 2008; Flamos et al. 2011; Jing et al. 2010). While some incentives have been put in place (Anderson 2012), depending on them as a business strategy is incredibly risky, as mentioned by both Biomass Power Plants in this study. Several scholars, as well as industry members, have indicated that one possible way to increase the utilization of woody biomass in power generation would be to increase the use of long-term supply contracts (Burchfield 2011; Doster 2011; Jiang et al. 2010; von Hirschhausen and Neumann 2008; Yin and Izlar 2001).

So why haven't we seen more widespread use of these agreements for the woody biomass supply chain and is this likely to change? The answer is complicated. Due to the inefficiencies of using woody biomass, a geographically distributed resource, and the efficiencies of using fossil fuels, a geographically concentrated resource, bioenergy is not likely to gain significant market share without individuals and businesses being willing to pay more for their energy. Where biomass energy has expanded in use, it has usually been backed by subsidies.

In the end, possibly the most important factor is how stakeholders view long-term contracts as a strategy. Buyers in this study mentioned them being financially undesirable due to their higher costs associated with price premiums. Sellers, on the other hand, said they felt long-term contracts would limit their ability to receive maximum value for their timber. Is it possible for them to be both? Well if the contract includes a rolling average pricing mechanism, it's possible that at times it will be the highest priced/cost timber, and at other times the lowest priced/cost timber. It will however, never reach the market peaks or troughs that parties might experience in the spot market. Thus, if layered appropriately, it's possible to keep your revenue/expenses relatively flat compared to participating in the spot market. This strategy is utilized by many utilities and allows them to focus on eliminating inefficiencies elsewhere in their business while guaranteeing a steady supply/price. Thus, if parties looked at long-term contracts as a way to minimize market risk, via lowering market swings, we could see an increased future use of long-term contracts in the bioenergy and forestry industries.

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APPENDICES

**Bioenergy Long-Term Contracts Questionnaire
Individual Forest Landowners**

**North Carolina State University
Department of Forestry & Environmental Resources**

This interview is designed to learn more about your experience and interest with long term contracts for wood supply in the bioenergy sector. This research will provide general information about bioenergy contracts, which could be useful for producers and consumers in the bioenergy market. We have questions about your practices, potential strategies and specific factors that influence them. You do not need to answer any questions that you feel would present a problem with proprietary business information.

Questions about your forest property:

1. Have you ever been contacted about selling your timber?
 No (Proceed to Question 4) Yes (Proceed to Question 2)

2. How were you contacted about selling your timber?
 In Person
 Mail
 E-Mail
 Phone
 Other (Specify): _____

3. Were you contacted about selling your timber for bioenergy uses?
 No
 Yes
 Don't Know

4. Have you ever had timber harvested from your property?
 No (Proceed to Question 16) Yes (Proceed to Question 5)

5. How many acres were harvested? _____ *acres*

6. What was approximate value of the harvested timber? (*check one*)

- | | |
|---|--|
| <input type="checkbox"/> Less than \$20,000 | <input type="checkbox"/> \$80,001-\$100,000 |
| <input type="checkbox"/> \$20,001-\$40,000 | <input type="checkbox"/> \$100,001-\$150,000 |
| <input type="checkbox"/> \$40,001-\$60,000 | <input type="checkbox"/> \$150,001-\$200,000 |
| <input type="checkbox"/> \$60,001-\$80,000 | <input type="checkbox"/> More than \$200,000 |

7. Did you use a forester to help you make the sale? No Yes

If yes, what type of forester?

- Private consultant
- Industry forester
- Other: _____

8. Who else was involved in the sale?

- Only me and the buyer
- Lawyer
- Family member—relation (e.g., father, sister, etc.): _____
- Other: _____

9. How satisfied were you with the revenue generated from the sale?

- Very satisfied
- Somewhat satisfied
- Somewhat dissatisfied
- Very dissatisfied

10. Please describe why you were satisfied or dissatisfied with revenues generated from sale.

11. How satisfied were you with the condition of your forest following the timber harvest?

- Very satisfied
- Somewhat satisfied
- Somewhat dissatisfied
- Very dissatisfied

12. Please describe why you were satisfied or dissatisfied with the condition of your forest.

13. What type of method did you use to sell your timber?

- Sealed bid
- Negotiated
- Sold According to Long-Term Timber Contract/Lease
- Don't know

14. What type of transaction method did you use?

- Lump sum sale (received full amount in a single payment prior to harvest)
- Pay as cut (timber buyer paid for each load taken to sawmill using set prices per unit for each species)
- Percentage (timber buyer paid a percentage they received at the mill)
- Other: _____ (type of transaction)

15. Following the harvest, was the area reforested?

- Yes
- No
- Don't Know

16. How long have you owned your land? _____ years

17. How long do you think you or your family will continue to hold onto the land?

- 1-9 years
- 10-19 years
- 20+ years

Questions about long-term timber leases

Generally, long-term timber leases feature two main parts:

- 1) an agreed-upon annual or single up -front fee paid by a purchasing party to retain the right to harvest an agreed-upon amount of timber in a specified time period (generally 5 to 20 years), and
- 2) an agreed upon price for timber harvested during the lease period.

The timing and harvesting guidelines for long-term leases can vary considerably and are set in place by the contract between the landowner and timber leasing party.

18. Are you under a long-term timber lease currently?

- No (Proceed to Question 21) Yes (Proceed to Question 19)

19. Is the long-term timber lease for bioenergy uses?

- No Yes Don't know

20. Which of the following, if any, contract/lease types does your contract most accurately reflect? (check one)

	Long-Term Supply Contract/Lease Type
	1. One initial lump-sum payment that covers both land lease and timber purchase for term of contract
	2. Specific timber cutting rights with payment on a volume basis as cut; No lease of land or timber; Company has management responsibilities
	3. Same as 2 but company has no management responsibilities
	4. Increment contract: landowner receives regular (e.g, annual or quarterly) payment which is determined by the average annual growth the land can produce under management; Any harvested timber that exceeds the accumulated value of the regular payments is paid for on a volume basis
	5. Lease of land with annual or periodic payments, plus initial lump-sum purchase of timber
	6. Lease of land with annual or periodic payments, plus timber cutting rights with timber paid for on a volume basis as cut
	7. Lease of both land and timber with annual or periodic payments: no additional payment when timber is cut
	8. Share-crop contract: company manages the land and harvest timber: harvest value at current market stumpage prices is shared with landowner as agreed in contract
	9. Other type(s)—please specify:
Comments:	

21. Would you be willing to enter into a long-term contract with a company that would pay you an annual lease fee for a set period of time (say 10 years) plus the average fair market value for timber when it is harvested?

- No Yes

- 22.** Please read each factor carefully and rate their importance to you when considering whether or not to enter, maintain, or end a long-term timber contract or lease. (Circle the level of importance that applies: 1=not important; 2=slightly important; 3=Neutral; 4=important; 5=very important)

Contract/Leasing Factor	Not Important	Slightly Important	Somewhat Important	Important	Very Important
					
Knowing I have good information on timber values	1	2	3	4	5
Condition of roads during and after harvest	1	2	3	4	5
Scenic beauty after harvest is finished	1	2	3	4	5
Provision for improving or maintaining wildlife habitat	1	2	3	4	5
Prevention of soil erosion and protection of water quality	1	2	3	4	5
Control over when harvesting will occur (e.g. holidays, hunting season, etc.)	1	2	3	4	5
Control over what trees are harvested (species, sizes)	1	2	3	4	5
Receiving at least some annual income	1	2	3	4	5
Receiving income up-front, rather than when timber is harvested	1	2	3	4	5
Receiving maximum income from your timber	1	2	3	4	5
Reducing the risk of timber price fluctuations in the future	1	2	3	4	5
Improving the growth and quality of your timber	1	2	3	4	5
Concern over multiple harvests on your land over the term of the lease	1	2	3	4	5
Provision for early termination of the lease	1	2	3	4	5
Ability to obtain “green” certification for your timber	1	2	3	4	5
Other (specify below)	1	2	3	4	5

23. (a) Of the preceding factors, which **3** do you consider to be the most important in determining whether to enter into a long-term supply contract (1 – Most Important, 2 – 2nd Most Important, 3rd Most Important)?

1) _____
2) _____
3) _____

- (b) Please briefly explain why you consider these three factors to be the most important.

1) _____
2) _____
3) _____

24. (a) Of the preceding factors, which **3** do you consider to be the most important in determining whether to maintain or terminate a long-term supply contract (1 – Most Important, 2 – 2nd Most Important, 3rd Most Important)?

1) _____
2) _____
3) _____

- (b) Please briefly explain why you consider these three factors to be the most important.

1) _____
2) _____
3) _____

25. Would you be interested in finding out more about long-term timber leases?

No Yes

26. How much would you be willing to pay and how far would you be willing to travel to attend a 2-hour workshop on long-term timber leases?

\$_____ and _____miles

27. Would you be interested in finding out more about bioenergy?

No Yes

28. How much would you be willing to pay and how far would you be willing to travel to attend a 2-hour workshop on bioenergy?

\$_____ and _____miles

Please answer the following questions about yourself:

29. What is your gender? Female Male
30. What year were you born? 19_____
31. What is your occupation? _____
32. I live in: _____ county/_____ state
33. I own a total of _____ acres of land. With _____ in forest and _____ in agricultural land.
34. Please indicate the type of timber on your property:
 Hardwood
 Softwood
 Mixed (Mostly Hardwood, Some Softwood)
 Mixed (Mostly Softwood, Some Hardwood)
 Mixed (Even Amount of Hardwood and Softwood)
35. Please indicate the age of the timber on your property:
 0-15 Years Old
 16-30 Years Old
 31+ Years Old
36. What is your best source of information on timber markets?
Short answer: _____
37. Are you satisfied with this source? No Yes

Why?
38. What is the highest level of education you have completed? (*Check only one*)
 Some High School Associates degree
 High School Graduate/GED Bachelors degree
 Trade or Technical School Masters degree
 Some college Ph.D.

39. What is your average yearly income? (*Check only one*)

- Less than 50,000
- \$50,001 - \$100,000
- \$100,001 +

40. Please use the space provided for additional questions/comments regarding long-term timber leases or this survey.

**Bioenergy Long-Term Contracts Questionnaire
Industrial Landowners**

**North Carolina State University
Department of Forestry & Environmental Resources**

This interview is designed to learn more about your experience and interest with long-term contracts for wood supply in the bioenergy sector. This research will provide general information about bioenergy contracts, which could be useful for producers and consumers in the bioenergy market. We have questions about your practices, potential strategies and specific factors that influence them. You do not need to answer any questions that you feel would present a problem with proprietary business information.

I. Introduction and Background

1. Date: _____
2. Name of Company: _____
3. Location (City/State): _____
4. How many acres of timberland does your company manage?

Type	North Carolina	South Carolina	Virginia
Planted Pine			
Natural Pine			
Hardwoods			
Total			

5. How many tons per year does your company harvest?

Type	North Carolina	South Carolina	Virginia
Planted Pine			
Natural Pine			
Hardwoods			
Total			

II. Long-Term Contract and Lease Requirements

Note: We are interested in learning more about your long-term contracts and leases. The following set of questions apply to both, but if they differ, please indicate how.

6. Does your company currently have any long-term (5 or more years) supply contracts?
No: ___ (Proceed to Section III) Yes: ___ (Proceed to Question 7)
7. Does your company currently have any long-term (5 or more years) supply contracts with bioenergy producers-e.g. biofuels, biomass, wood pellets, etc?
No: ___ Yes: ___
8. Over the last 5 years, approximately how many tons of each timber type has your company supplied through long-term supply contracts and/or leases?

Timber Type (specify)	Tons Supplied		
	Minimum	Maximum	Average

9. What length of period is used for long-term contracts and/or leases?

Timber Type (specify)	Contract/Lease Length (Years)		
	Minimum	Maximum	Average

10. For each type of timber, what is the minimum, maximum, and average number of acres, if any, for which your company requires for entering into a long-term supply contract?

Timber Type (specify)	Contract/Lease Acreage		
	Minimum	Maximum	Average

11. Does your company use a price adjuster when entering into a long-term supply contracts and/or leases?
No: ___ (Proceed to Question 13) Yes: ___ (Proceed to Question 12)

12. Please describe the type(s) of price adjuster(s) your company uses:
13. What other, if any, requirements does your company have for entering into long-term supply contracts and/or leases?
14. Does your company have different requirements for long-term supply contracts for customers that do produce bioenergy?
 No: ___ Yes: ___ (Please Explain):
15. What would your ideal contract look like-e.g., length, annual volume, price adjuster, etc.?
16. Does your ideal contract change based on fuel source? (If Yes, Please Explain):
17. Could we obtain a copy of your typical long-term supply contract?

III. Types of Long-Term Supply Contracts and Leases

18. Below is a list of commonly used types of long-term supply contracts and leases. Please indicate with a check mark in the space provided for the various types your company uses. (Proceed to Question 19 if your company currently does not utilize any long-term supply contracts or leases.)

Bioenergy		Traditional		Long-Term Supply Contract/Lease Type
# of Contracts	# of Acres	# of Contracts	# of Acres	
				A. One initial lump-sum payment that covers both land lease and timber purchase for term of contract.
				B. Specific timber cutting rights with payment on a volume basis as cut. No lease of land or timber. Company has management responsibilities.
				C. Same as 2 but company has no management responsibilities.
				D. Increment contract: landowner receives regular (e.g, annual or quarterly) payment which is determined by the average annual growth the land can produce under management. Any harvested timber that exceeds the accumulated value of the regular payments is paid for on a volume basis.
				E. Lease of land with annual or periodic payments, plus initial lump-sum purchase of timber.
				F. Lease of land with annual or periodic payments, plus timber cutting rights with timber paid for on a volume basis as cut.

				G. Lease of both land and timber with annual or periodic payments: no additional payment when timber is cut.
				H. Share-crop contract: company manages the land and harvest timber: harvest value at current market stumpage prices is shared with landowner as agreed in contract.
				I. Other type(s)—please specify:
Comments:				

19. (a) Based on the same list of commonly used types of long-term supply contracts and leases presented above, which **3** types of long-term supply contracts/leases do you believe are the most promising in forestry in the future (*1 – Most Promising, 2 – 2nd Most Promising, 3rd Most Promising*)?

- 1) _____
- 2) _____
- 3) _____

(b) Please briefly describe why you believe these three types to be the most promising.

- 1) _____.
- 2) _____.
- 3) _____.

20. (a) Based on the same list of commonly used types of long-term supply contracts and leases presented above, which **3** types of long-term supply contracts/leases do you believe are the most promising in bioenergy in the future (*1 – Most Promising, 2 – 2nd Most Promising, 3rd Most Promising*)?

- 1) _____
- 2) _____
- 3) _____

b) Please briefly describe why you believe these three types to be the most promising.

- 1) _____.
- 2) _____.
- 3) _____.

IV. Reasons for Using/Not Using Long-Term Supply Contracts and Leases

21. Please explain why your company currently does/does not use traditional long-term fiber supply contracts and/or leases:

22. Please explain why your company currently does/does not use long-term supply contracts and/or leases with bioenergy producers:

23. Please read each factor carefully and rate their importance to you when considering whether or not to enter, maintain, or end a long-term supply contract? (*Circle the level of importance that applies: 1=not important; 2=slightly important; 3=somewhat important; 4=important; 5=extremely important*)

Factor	Not Important	Slightly Important	Somewhat Important	Important	Extremely Important
	←—————→				
Maturity of Market	1	2	3	4	5
Knowledge of Market	1	2	3	4	5
Fuel Source Availability	1	2	3	4	5
Price Stability	1	2	3	4	5
Investment Returns/Risks	1	2	3	4	5
Technical Capacity	1	2	3	4	5
Environmental Laws	1	2	3	4	5
Community Relations	1	2	3	4	5
Incentives or Subsidies	1	2	3	4	5
Infrastructure	1	2	3	4	5
Ease of Doing Business	1	2	3	4	5
Access to Credit	1	2	3	4	5
Public Policy	1	2	3	4	5
Sustainable Certifications	1	2	3	4	5
Tax Rates	1	2	3	4	5
Complexity of Contracts	1	2	3	4	5
Previous Experience	1	2	3	4	5
Other (specify below)	1	2	3	4	5

24. (a) Of the preceding factors, which **3** do you consider to be the most important in determining whether to enter into a long-term supply contract or lease (1 – Most Important, 2 – 2nd Most Important, 3rd Most Important)?

- 1) _____
- 2) _____
- 3) _____

(b) Please briefly describe why the three factors you choose are the most important to you:

- 1) _____.
- 2) _____.
- 3) _____.

25. (a) Of the preceding factors, which **3** do you consider to be the most important in determining whether to maintain or terminate a long-term supply contract before the contract end date (1 – Most Important, 2 – 2nd Most Important, 3rd Most Important)?

- 1) _____
- 2) _____
- 3) _____

(b) Please briefly explain why you consider these three factors to be the most important.

- 1) _____.
- 2) _____.
- 3) _____.

26. Do any of the rankings change in the previous two questions based on timber type (*please explain*)?

Bioenergy Long-Term Contracts Questionnaire Pellet & Biofuel Producers

**North Carolina State University
Department of Forestry & Environmental Resources**

This interview is designed to learn more about your experience and interest with long term contracts for wood supply in the bioenergy sector. This research will provide general information about bioenergy contracts, which could be useful for producers and consumers in the bioenergy market. We have questions about your practices, potential strategies and specific factors that influence them. You do not need to answer any questions that you feel would present a problem with proprietary business information.

I. Introduction and Background

1. Date: _____
2. Name of Facility/Company: _____
3. Location (City/State): _____
4. How many tons/gallons of pellets/biofuel does your company produce per year?
Quantity: _____ Units: _____
5. Which of the following feedstocks does your company use and what are their shares?-e.g., corn, timber (residual or standing), switchgrass, etc.?

Feedstock Type	Share (%)
Agricultural Residues	
Corn	
Timber Harvest Residues	
Standing Timber	
Switchgrass	
Urban Trees and Yard Waste	
Other (specify)	

6. Why has your company chosen the feedstock(s) that it has-e.g., profitability, proven technology, efficiency, public relations/perceptions etc.?
7. Looking 10 years into the future, how would your company like its feedstock supply to change, if at all? Why?

8. (a) What three feedstock sources do you consider to be the most promising (1 – 1st most promising, 2 – 2nd most promising, 3 – 3rd most promising)?

- 1) _____
- 2) _____
- 3) _____

(b) Please briefly explain why you consider these feedstocks to be the most promising:

- 1) _____.
- 2) _____.
- 3) _____.

II. Long-Term Contract and Lease Requirements

Note: We are interested in learning more about your long-term contracts and leases. The following set of questions applies to both, but if they differ, please indicate how.

9. Does your company currently procure any feedstock through the use of long-term (5 or more years) supply contracts and/or leases?

No: ___ (Proceed to Section III) Yes: ___ (Proceed to Question 10)

10. For each feedstock your company procures through long-term contracts, indicate the minimum, maximum, and average length used for long-term contracts and the percent procured of each fuel source in the last five years.

Feedstock (specify)	Contract/Lease Length (Years)			Percent (%) procured through long-term supply contracts.
	Minimum	Maximum	Average	
Agricultural Residues				
Corn				
Timber Harvest Residues				
Standing Timber				
Switchgrass				
Urban Trees and Yard Waste				
Other (specify)				

11. What quantity of each feedstock is procured through long-term contracts and/or leases?

Feedstock (specify)	Measurement Units (Specify)	Quantity (Volume)		
		Minimum	Maximum	Average

12. For each type of feedstock, what is the minimum, maximum, and average number of acres, if any, for which your company requires for entering into a long-term supply contract and/or lease?

Feedstock (specify)	Contract/Lease Acreage		
	Minimum	Maximum	Average

13. Does your company use a price adjuster when entering into a long-term supply contract and/or leases?

No: ___ (Proceed to Question 15) Yes: ___ (Proceed to Question 14)

14. Please describe the type(s) of price adjuster(s) your company uses:

15. What other, if any, requirements does your company have for entering into long-term supply contracts and/or leases?

16. What would your ideal contract look like-e.g., length, percent procured of total, annual volume, price adjuster, etc.?

17. Does your ideal contract change based on feedstock? (If Yes, Please Explain)

III. Types of Long-Term Supply Contracts and Leases

18. Below is a list of commonly used types of long-term fiber supply contracts and leases. Please indicate the total number of contracts and the total number of acres under contract for each type used by the company. *(Proceed to Question 19 of this section if your company currently does not utilize any long-term supply contracts or leases.)* {n.b., repeat this questions with extra sheets for each type of fuel source}.

# of contracts	# of Acres under contract	Long-Term Fiber Supply Contract/Lease Type
		A. One initial lump-sum payment that covers both land lease and fiber purchase for term of contract.
		B. Specific fiber harvest rights with payment on a volume basis as cut. No lease of land or fiber. Company has management responsibilities.
		C. Same as B but company has no management responsibilities.
		D. Increment contract: landowner receives regular (e.g, annual or quarterly) payment which is determined by the average annual growth the land can produce under management. Any harvested fiber that exceeds the accumulated value of the regular payments is paid for on a volume basis.
		E. Lease of land with annual or periodic payments, plus initial lump-sum purchase of fiber.
		F. Lease of land with annual or periodic payments, plus fiber harvest rights with fiber paid for on a volume basis as cut.
		G. Lease of both land and fiber with annual or periodic payments: no additional payment when fiber is harvested.
		H. Share-crop contract: company manages the land and harvest fiber: harvest value at current market stumpage prices is shared with landowner as agreed in contract.
		I. Other type(s)—please specify:
Comments:		

19. (a) Based on the same list of commonly used types of long-term supply contracts and leases presented above, which **3** types of long-term supply contracts/leases listed below do you believe are the most promising in the future (1 – Most Promising, 2 – 2nd Most Promising, 3rd Most Promising)?

- 1) _____
- 2) _____
- 3) _____

(b) Please briefly explain why you consider the three types of contracts/leases to be the Most promising?

- 1) _____.
- 2) _____.
- 3) _____.

20. Are you currently contracting with a wood dealer or other procurement company to obtain your feedstock?

IV. Reasons for Using/Not Using Long-Term Supply Contracts and Leases

21. Please explain why your company currently does/does not use long-term supply contracts/leases:

22. Please read each factor carefully and rate their importance to you when considering whether or not to enter, maintain, or end a long-term supply contract/lease? (Circle the level of importance that applies: 1=not important; 2=slightly important; 3=somewhat important; 4=important; 5=extremely important)

Factor	Not Important	Slightly Important	Somewhat Important	Important	Extremely Important
	←—————→				
Maturity of Market	1	2	3	4	5
Knowledge of Market	1	2	3	4	5
Fuel Source Availability	1	2	3	4	5
Price Stability	1	2	3	4	5
Investment Returns/Risks	1	2	3	4	5
Technical Capacity	1	2	3	4	5
Environmental Laws	1	2	3	4	5
Community Relations	1	2	3	4	5
Incentives or Subsidies	1	2	3	4	5
Infrastructure	1	2	3	4	5
Ease of Doing Business	1	2	3	4	5
Access to Credit	1	2	3	4	5
Public Policy	1	2	3	4	5
Sustainable Certifications	1	2	3	4	5
Tax Rates	1	2	3	4	5

Complexity of Contracts	1	2	3	4	5
Previous Experience	1	2	3	4	5
Other (specify below)	1	2	3	4	5

23. (a) Of the preceding factors, which **3** do you consider to be the most important in determining whether to enter into a long-term supply contract or lease (1 – Most Important, 2 – 2nd Most Important, 3rd Most Important)?

- 1) _____
- 2) _____
- 3) _____

(b) Please briefly describe why the three factors you choose are the most important to you:

- 1) _____.
- 2) _____.
- 3) _____.

24. (a) Of the preceding factors, which **3** do you consider to be the most important in determining whether to maintain or terminate a long-term supply contract/lease before the contract end date (1 – Most Important, 2 – 2nd Most Important, 3rd Most Important)?

- 1) _____
- 2) _____
- 3) _____

(b) Please briefly explain why you consider these three factors to be the most important.

- 1) _____.
- 2) _____.
- 3) _____.

25. Do any of these rankings change in the previous two questions based on feedstock type (please explain)?

**Bioenergy Long-Term Contracts Questionnaire
Biomass CHP Facilities**

**North Carolina State University
Department of Forestry & Environmental Resources**

This interview is designed to learn more about your experience and interest with long-term contracts for wood supply in the bioenergy sector. This research will provide general information about bioenergy contracts, which could be useful for producers and consumers in the bioenergy market. We have questions about your practices, potential strategies and specific factors that influence them. You do not need to answer any questions that you feel would present a problem with proprietary business information.

I. Introduction and Background

1. Date: _____
2. Name of Facility/Company: _____
3. Location (City/State): _____
4. How much power does your company produce per year in North Carolina / Virginia / South Carolina (circle state)?
Quantity: _____ Units: _____ kilowatts or megawatts?
5. Which of the following biomass feedstocks does your company use and what are their shares?

Fuel Source	Share (%)
Agricultural Residues	
Municipal Solid Waste	
Timber Harvest Residues	
Standing Timber	
Switchgrass	
Urban Trees and Yard Waste	
Other (specify)	
Total	100%

6. Why has your company chosen the feedstock(s) that it has-e.g., profitability, proven technology, efficiency, public relations/perceptions, RPS standard etc.?

7. Looking 10 years into the future, how would your company like its feedstock supply to change, if at all? Why?
8. (a) What three biomass feedstock sources do you consider to be the most promising (1 – 1st most promising, 2 – 2nd most promising, 3 – 3rd most promising)?
- 1) _____
- 2) _____
- 3) _____
- (b) Please briefly explain why you consider these feedstocks to be the most promising:
- 1) _____.
- 2) _____.
- 3) _____.

II. Long-Term Contracts

Note: We are interested in learning more about your long-term contracts and leases. The following set of questions applies to both, but if they differ, please indicate how.

9. Does your company currently procure any feedstock through the use of long-term (5 or more years) biomass supply contracts and/or leases?
 No: ___ (Proceed to Section III) Yes: ___ (Proceed to Question 10)
10. Please describe the type(s) of long-term supply contracts/leases used:
11. For each biomass feedstock your company procures through long-term contracts, indicate the minimum, maximum, and average length used for long-term contracts/leases and the percent procured of each fuel source in the last five years.

Feedstock (specify)	Contract/Lease Length (Years)			Percent (%) procured through long-term supply contracts.
	Minimum	Maximum	Average	
Agricultural Residues				
Municipal Solid Waste				
Timber Harvest Residues				
Standing Timber				
Switchgrass				
Urban Trees and Yard Waste				

Other (specify)				
-----------------	--	--	--	--

12. For each type of biomass feedstock, what is the minimum, maximum, and average quantity, if any, for which your company requires for entering into a long-term supply contract and/or lease?

Fuel Source (specify)	Measurement Units (Specify)	Quantity (Volume)		
		Minimum	Maximum	Average

13. For each type of biomass feedstock, what is the minimum, maximum, and average number of acres, if any, for which your company requires for entering into a long-term supply contract and/or lease?

Feedstock (specify)	Contract/Lease Acreage		
	Minimum	Maximum	Average

14. Does your company use a price adjuster when entering into a long-term supply contract?
 No: ___ (Proceed to Question 16) Yes: ___ (Proceed to Question 15)

15. Please describe the type(s) of price adjuster your company uses:

16. What other, if any, requirements does your company have for entering into long-term supply contracts and/or leases?

17. What would your ideal contract look like-e.g., length, percent procured of total, annual volume, price adjuster, etc.?

18. Does your ideal contract change based on fuel source? (If Yes, Please Explain)

19. Are you currently contracting with a wood dealer or other procurement company to obtain your feedstock? Why?

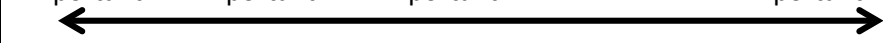
20. Could we obtain a copy of your typical long-term supply contract?

III Reasons for Using/Not Using Long-Term Supply Contracts and Leases

21. Please explain why your company currently does/does not use long-term supply contracts/leases:

22. Based on your past experiences and future expectations, what type(s) of long-term supply contract(s) do you consider to be the most promising?

23. Please read each factor carefully and rate their importance to you when considering whether or not to enter, maintain, or end a long-term supply contract/lease? (Circle the level of importance that applies: 1=not important; 2=slightly important; 3=somewhat important; 4=important; 5=extremely important)

Factor	Not Important	Slightly Important	Somewhat Important	Important	Extremely Important
					
Maturity of Market	1	2	3	4	5
Knowledge of Market	1	2	3	4	5
Fuel Source Availability	1	2	3	4	5
Price Stability	1	2	3	4	5
Investment Returns/Risks	1	2	3	4	5
Technical Capacity	1	2	3	4	5
Environmental Laws	1	2	3	4	5
Community Relations	1	2	3	4	5
Incentives or Subsidies	1	2	3	4	5
Infrastructure	1	2	3	4	5
Ease of Doing Business	1	2	3	4	5
Access to Credit	1	2	3	4	5
Public Policy	1	2	3	4	5
Sustainable Certifications	1	2	3	4	5
Tax Rates	1	2	3	4	5
Complexity of Contracts	1	2	3	4	5
Previous Experience	1	2	3	4	5

Other (specify below)	1	2	3	4	5
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24. (a) Of the preceding factors, which **3** do you consider to be the most important in determining whether to enter into a long-term supply contract/lease (1 – Most Important, 2 – 2nd Most Important, 3rd Most Important)?

- 1) _____
- 2) _____
- 3) _____

(b) Please briefly explain why you consider these three factors to be the most important.

- 1) _____.
- 2) _____.
- 3) _____.

25. (a) Of the preceding factors, which **3** do you consider to be the most important in determining whether to maintain or terminate a long-term supply contract/lease before the contract end date (1 – Most Important, 2 – 2nd Most Important, 3rd Most Important)?

- 1) _____
- 2) _____
- 3) _____

26. Please briefly explain why you consider these three factors to be the most important.

- 1) _____.
- 2) _____.
- 3) _____.

27. Do any of the rankings change in the previous two questions based on feedstock type (*please explain*)?

Bioenergy Long-Term Contracts Questionnaire Electric Utility Companies

North Carolina State University
Department of Forestry & Environmental Resources

This interview is designed to learn more about your experience and interest with long-term contracts for wood supply in the bioenergy sector. This research will provide general information about bioenergy contracts, which could be useful for producers and consumers in the bioenergy market. We have questions about your practices, potential strategies and specific factors that influence them. You do not need to answer any questions that you feel would present a problem with proprietary business information.

I. Introduction and Background

1. Date: _____
2. Name of Facility/Company: _____
3. Location (City/State): _____
4. How much power does your company produce per year in North Carolina?
Quantity: _____ Units: _____ kilowatts or megawatts?
5. What power sources make up your energy portfolio and what are their shares?

Fuel Source	Share (%)
Biomass	
Coal	
Natural Gas	
Nuclear	
Solar	
Wind	
Wood pellets	
Other (specify)	

6. What reason(s) has your company chosen the energy portfolio that it has-e.g., profitability, public relations/perceptions, proven technology, efficiency, etc.?

7. (a) What three sources of energy (renewable and non-renewable) do you consider to be most promising (1 – Most promising, 2 – Second most promising, 3 – Third Most promising)?

- 1) _____
- 2) _____
- 3) _____

(b) Please briefly explain why you consider these three sources to be the most promising.

- 1) _____
- 2) _____
- 3) _____

8. Looking 10 years into the future, what percentage of your energy portfolio would you like renewable energy sources to make? Why?

9. (a) What three sources of renewable energy do you consider to be the most promising (1 – First, 2 – Second, 3 – Third)?

- 1) _____
- 2) _____
- 3) _____

(b) Please briefly explain why you believe these three sources to be the most promising.

- 1) _____
- 2) _____
- 3) _____

II. Long-Term Contracts

10. Does your company currently procure any fuel sources through the use of long-term (5 or more years) supply contracts?

No: ___ (Proceed to Section III) Yes: ___ (Proceed to Question 11)

11. Please describe the type(s) of long-term supply contracts used:

12. For each fuel source your company procures through long-term contracts, indicate the minimum, maximum, and average length used for long-term contracts and the percent procured of each fuel source in the last five years.

Fuel Source (specify)	Contract Length (Years)			Current Length	Percent (%) procured through long-term contracts in past 5 years.
	Minimum	Maximum	Average		

13. What quantity of woody biomass is procured through long-term contracts?

Fuel Source (specify)	Measurement Units (Specify)	Quantity (Volume)		
		Minimum	Maximum	Average

14. What quantities of other fuel sources are procured through long-term contracts?

Fuel Source (specify)	Measurement Units (Specify)	Quantity (Volume: Specify)		
		Minimum	Maximum	Average
Coal				
Natural Gas				
Nuclear				
Other:				

15. Does your company use a price adjuster when entering into a long-term supply contract for wood fiber, or for other fuel sources?

No: ___ (Proceed to Question 17) Yes: ___ (Proceed to Question 16)

16. Please describe the type(s) of price adjuster your company uses per fuel source below:

17. What other, if any, requirements does your company have for long-term supply contracts it enters into?

18. What would your ideal contract look like-e.g., length, percent procured of total, annual volume, price adjuster, etc.?

19. Does your ideal contract change based on fuel source? (If Yes, Please Explain)

20. Could we obtain a copy of your typical long-term supply contract?

III Reasons for Using/Not Using Contracts

21. Why does/doesn't your company currently use long-term wood fiber or other fuel supply contracts:

22. Based on your past experiences and future expectations, what type(s) of long-term supply contract(s) do you consider to be the most promising?

23. Please read each factor carefully and rate their importance to you when considering whether or not to enter, maintain, or end a long-term supply contract? (Circle the level of importance that applies: 1=not important; 2=slightly important; 3=somewhat important; 4= important; 5=extremely important)

Factor	Not Important	Slightly Important	Somewhat Important	Important	Extremely Important
	←—————→				
Maturity of Market	1	2	3	4	5
Knowledge of Market	1	2	3	4	5
Fuel Source Availability	1	2	3	4	5
Price Stability	1	2	3	4	5
Investment Returns/Risks	1	2	3	4	5
Technical Capacity	1	2	4	4	5
Environmental Laws	1	2	3	4	5
Community Relations	1	2	3	4	5
Incentives or Subsidies	1	2	3	4	5
Infrastructure	1	2	3	4	5
Ease of Doing Business	1	2	3	4	5
Access to Credit	1	2	3	4	5
Public Policy	1	2	3	4	5
Sustainable Certifications	1	2	3	4	5
Tax Rates	1	2	3	4	5
Complexity of Contracts	1	2	3	4	5
Previous Experience	1	2	3	4	5
Other (specify below)	1	2	3	4	5

24. (a) Of the preceding factors, which **3** do you consider to be the most important in determining whether to enter into a long-term supply contract (1 – Most Important, 2 – 2nd Most Important, 3rd Most Important)?

- 1) _____
- 2) _____
- 3) _____

(b) Please briefly explain why you consider these three factors to be the most important.

- 1) _____.
- 2) _____.
- 3) _____.

25. (a) Of the preceding factors, which **3** do you consider to be the most important in determining whether to maintain or terminate a long-term supply contract before the contract end date (1 – Most Important, 2 – 2nd Most Important, 3rd Most Important)?

- 1) _____
- 2) _____
- 3) _____

(b) Please briefly explain why you consider these three factors to be the most important.

- 1) _____.
- 2) _____.
- 3) _____.

26. Do any of the rankings change in the previous two questions based on fuel source (*please explain*)?

Bioenergy Long-Term Contracts Questionnaire Procurement Firms

North Carolina State University Department of Forestry & Environmental Resources

This interview is designed to learn more about your experience and interest with long term contracts for wood supply in the bioenergy sector. This research will provide general information about bioenergy contracts, which could be useful for producers and consumers in the bioenergy market. We have questions about your practices, potential strategies and specific factors that influence them. You do not need to answer any questions that you feel would present a problem with proprietary business information.

I. Introduction and Background

1. Date: _____
2. Name of Facility/Company: _____
3. Location (City/State): _____
4. Can you briefly explain what _____ does?
5. How many tons does your company procure/supply per year in North Carolina / Virginia / South Carolina / companywide (circle state)?
6. Has your company been contracted by bioenergy producers (pellet mills, biofuels, CHP facilities, etc.) to procure their feedstock(s) for them?
No: __ (Proceed to Section II) Yes: __ (Proceed to Question 7)
7. What type(s) of bioenergy producers have contacted you?
8. Are you currently procuring any feedstock(s) for them? (If Yes, What Types. If No, Why Not)

II. Long-Term Contract

Note: We are interested in learning more about your long-term contracts and leases. The following set of questions applies to both, but if they differ, please indicate how.

9. Does your company currently procure any feedstock through the use of long-term contracts (5 or more years)?
No: __ (Proceed to Question 11) Yes: __ (Proceed to Question 10)

10. Please describe the type(s) of long-term contracts used:
11. Does your company currently supply any feedstock through the use of long-term (5 or more years) supply contracts?
 No: ___ (Proceed to Section III) Yes: ___ (Proceed to Question 12)

12. Please describe the type(s) of long-term contracts used:
13. Are any of these long-term contracts with bioenergy producers (pellet mills, biofuels, CHP facilities, etc.)?
 No: ___ (Proceed to Question 15) Yes: ___ (Proceed to Question 14)

14. Please describe the type(s) of long-term contracts used:
15. What are the required minimum and maximum lengths as well as the average length used for long-term contracts?

Fuel Source (specify)	Length		
	Minimum	Maximum	Average

16. What is the minimum, maximum, and average quantity, if any, for which your company requires for entering into a long-term contract?

Feedstock (specify)	Measurement Units (Specify)	Quantity (Volume)		
		Minimum	Maximum	Average

17. Does your company use a price adjuster when entering into a long-term supply contract?
 No: ___ (Proceed to Question 19) Yes: ___ (Proceed to Question 18)

18. Please describe the type(s) of price adjuster(s) your company uses:
19. What other, if any, requirements does your company have for entering into long-term supply contracts?
20. What would your ideal contract look like-e.g., length, annual volume, price adjuster, etc.?

21. Does your ideal contract change based on feedstock type or by supplied party type? *(If Yes, Please Explain)*

22. Could we obtain a copy of your typical long-term supply contract?

III. Reasons for Using/Not Using Long-Term Supply Contracts and Leases

23. Please explain why your company currently does/does not use long-term supply contracts/leases:

24. Please read each factor carefully and rate their importance to you when considering whether or not to enter, maintain, or end a long-term supply contract? *(Circle the level of importance that applies: 1=not important; 2=slightly important; 3=somewhat important; 4= important; 5=extremely important)*

Factor	Not Important	Slightly Important	Somewhat Important	Important	Extremely Important
	←—————→				
Maturity of Market	1	2	3	4	5
Knowledge of Market	1	2	3	4	5
Fuel Source Availability	1	2	3	4	5
Price Stability	1	2	3	4	5
Investment Returns/Risks	1	2	3	4	5
Technical Capacity	1	2	3	4	5
Environmental Laws	1	2	3	4	5
Community Relations	1	2	3	4	5
Incentives or Subsidies	1	2	3	4	5
Infrastructure	1	2	3	4	5
Ease of Doing Business	1	2	3	4	5
Access to Credit	1	2	3	4	5
Public Policy	1	2	3	4	5
Sustainable Certifications	1	2	3	4	5

Tax Rates	1	2	3	4	5
Complexity of Contracts	1	2	3	4	5
Previous Experience	1	2	3	4	5
Other (specify below)	1	2	3	4	5

25. (a) Of the preceding factors, which **3** do you consider to be the most important in determining whether to enter into a long-term supply contract or lease (1 – Most Important, 2 – 2nd Most Important, 3rd Most Important)?

- 1) _____
- 2) _____
- 3) _____

(b) Please briefly describe why the three factors you choose are the most important to you:

- 1) _____.
- 2) _____.
- 3) _____.

26. (a) Of the preceding factors, which **3** do you consider to be the most important in determining whether to maintain or terminate a long-term supply contract/lease before the contract end date (1 – Most Important, 2 – 2nd Most Important, 3rd Most Important)?

- 1) _____
- 2) _____
- 3) _____

(b) Please briefly explain why you consider these three factors to be the most important.

- 1) _____.
- 2) _____.
- 3) _____.

27. Do any of these rankings change in the previous two questions based on feedstock type (*please explain*)?