



Ricardo
Energy & Environment

Use of North American woody biomass in UK electricity generation: Assessment of high carbon biomass fuel sourcing scenarios

Appendix 5: Summary of comments on the likelihood of the BEAC scenarios

Report for DECC

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1 Introduction

This appendix forms part of a report on the likelihood of certain biomass fuel sourcing scenarios in North America. The study included a questionnaire sent to stakeholders in the biomass fuel supply chain in North America and Europe. In addition to answering the questions in the questionnaire stakeholders provided comments on their responses. This appendix provides the comments that were made in association with the questionnaire responses. For background on the scenarios and why they are associated with high carbon impacts, please read the Technical report associated with this appendix.

This report provides the comments on answers that were given on the likelihood of each of the BEAC high GHG emissions intensity scenarios for wood supply in North America. Further comments, on questions regarding the context of biomass fuel supply are provided in Appendix 6.

2 Comments on Scenarios

2.1 Scenario 4a

Table 1.1 High level summary of BEAC scenarios 4-7: Extraction of residues from timberland

Definitions relevant to this scenario

Forest residues definition in BEAC:

Fine forest residues: Tree tops, limbs, non-merchantable harvested trees and tree components, and downed trees which are left over from traditional timber harvesting. Includes pre-commercial thinnings. Diameter < 0.1 m (Fritsche et al., 2012).

Coarse forest residues: Tree tops, limbs, non-merchantable trees and tree components, and downed trees which are left over from traditional timber harvesting. Includes pre-commercial thinnings. Diameter > 0.1 m (Fritsche et al., 2012).

This definition does not include the removal of stumps

Note: in all of these removal of coarse forest residues results in a larger GHG intensity than removing fine woody debris.

Counterfactual: Leave all residues in the forest

Scenario 4 Extraction of coarse forest residues, continuously over the time horizon

- a) from forests in South USA
- b) from forests in Pacific Canada

Scenario 5 Extraction of fine forest residues, continuously over the time horizon

- a) from forests in South USA
- b) from forests in Pacific Canada

Scenario 6 Extraction of coarse forest residues, for 15 years only

- a) from forests in South USA
- b) from forests in Pacific Canada

Scenario 7 Extraction of fine forest residues, for 15 years only

- a) from forests in South USA
- b) from forests in Pacific Canada

2.1.1 Definition of residues

Note: for Canadian respondents forest residues were either not a feedstock currently used for pellets or only an occasional feedstock.

2.1.1.1 How do you define residues?

The majority of respondents said that the BEAC definition of residues covers all of the forest residues they deal with. Where they disagreed they said it was because non-marketable trees are included in the definition.

A large proportion of them said that fine and coarse residues are not managed separately.

- Though all residues are included in the “coarse” and “fine” categories, BEAC does not give any objective method of determining whether feedstock is “coarse forest residue” or “pulpwood”. This is a significant defect in the model that has material consequences in calculations that depend on clear and accurate definitions.
- The BEAC definition differs from the Ofgem definition of forest residues in that Ofgem includes stumps and BEAC does not. In addition, BEAC includes non-merchantable trees (i.e. trees without an economically viable market), pre-commercial thinnings and downed trees – these are not included in the Ofgem definition. With the exception of stumps, which would not be used in wood pellet production anyway, the BEAC definition does include all forest residues.

Canadian responses

- Residuals from forest operations include logging residues (i.e., branches, tops, and stumps) and forest pre-commercial thinnings cut primarily to improve the growth of remaining trees. These residuals are generally left at the forest site. Those two types of residuals, sometimes referred to as lower value biomass (LVB), are considered together as “forest residuals”
- We don't differentiate between "coarse" and "fine"
- Currently "Non-marketable" trees are also part of the definition. These trees meet merchantability standards, however, there is currently no market for them (species, size). Alternative definition: tree tops, cull trees or portions of trees, individual and stands of trees not suitable for use in conventional forest products, and salvage trees from natural disturbance.
- All woody biomass left after logging operations except stumps
- Insect damaged, cracked, split, or rotten boles, branches, tops, including bark.

US Responses

- “Unmerchantable woody material that is generated when harvesting for commercial forestry products. Generally includes tree tops less than the merchantable diameter of the smallest commercial product, limbs, and rotten or deformed trees that cannot be sold into a market. Dead woody material that is on the site prior to harvesting is not considered a forest residue and is left in place per BMPs for biodiversity”
- “Material that would not otherwise be economically recovered from the forest without the presence of a pellet mill in the region, but that is also a by-product of harvesting higher value material” (Variations on this response from 7 respondents)
- “Leftovers from any forest operation (commercial harvests, thinnings, other activities such as wildlife habitat improvement, invasive species removal)”
- “Pre-commercial thinnings plus any woody material left in the forest after a timber harvest”
- “Forest residues consist of tree tops, limbs, brush and dead wood from existing logging operations that would otherwise be left to decay in the forest. Forest residues should NOT include mature sizable standing trees that have no immediate market other than bioenergy.” (Variations on this response from 4 respondents)
- “Forest residues consist of tree tops, limbs, brush and dead wood from existing logging operations that would otherwise be left to decay in the forest or be burnt (broadcast or road-side).”
- “Forest residues are logging residues that include limbs, tops, bark, and other residues produced during logging operations as well as whole-tree chips from pre-commercial thinning operations. (Variations on this response from 2 other respondents)
- “The BEAC definitions for forest residues and roundwood pulpwood overlap. Forest residues are defined as including “downed trees which are left over from traditional timber harvesting,” and pulpwood is defined as “roundwood which has a small end diameter typically less than a saw log, but greater than 2.5 inches.” This overlap is understandable, as the types of fibre qualifying as residue in the BEAC definition change based on the presence of markets.

However, this should be acknowledged in the BEAC definition to avoid confusion or misinterpretation. We define forest residues as tree tops, limbs, branches, leaves, and needles; diseased, rotten, or malformed trees unsuitable for sawmills; trees removed during pine plantation thinning; smaller diameter trees cleared during sawtimber harvests to avoid high-grading and to clear the land for replanting or natural regeneration. A market definition separating coarse and fine residues does not currently exist in the Southeast. We recognize the US EPA definition that describes forest residues as "the biomass material remaining in forests that have been harvested for timber, and are almost identical in composition to forest thinnings. Because only timber of a certain quality can be used in lumber mills and other processing facilities, biomass material—forest residue—is left in forests by harvesting operations. Forestry residues include logging residues, excess small pole trees, and rough or rotten dead wood." (EPA 2007). Based on this definition, we suggest that the vast majority, if not all of our forest-derived fibre would be considered a residual. However, we assume for the purpose of the BEAC model that this section assumes a "residual" is any type of fibre that has no possible market in the absence of a pellet market. Our answers reflect this assumption even though it is inconsistent with the market reality. In actuality, a residual is any product that has no other merchantable use at the time of harvest, regardless of the pellet or any other market. This represents a flaw within the BEAC framework, as it assumes that by creating new market demand for fibre sources for which pulp and paper market demand recently declined, the pellet industry is unable to define these fibre sources as residues. BEAC penalizes the use of the primary forest material most suited to be used as pellets when considering the overarching sawtimber market that drives forest management and harvesting in the Southeast. Using more residuals as we define them above incentivizes landowners to merchandize the various products from their forests and supports their efforts to replant/ naturally regenerate and manage more efficiently during the next rotation with denser tree stocking followed by increased thinning activity."

2.1.1.2 In your experience are coarse and fine residues managed differently at present?

Canadian responses: Majority of respondents said no, although a small number said yes (1).

US responses: Majority of respondents said no (21), but 6 said yes.

Comments

- In the way described above there would be no change in forest management, but there may be changes in harvesting management for instance in the harvesting of un-merchantable trees, tops and downed trees. When this type of material is harvested and transported it is likely that fine residues would be separated and left in the forest. These conditions already exist. Typically this material is left behind as a remnant from saw log harvesting, without a suitable market this material is un-merchantable. However, if there is a pellet plant or pulpwood market within a reasonable transport distance then this material can also be utilised. This is happening in some circumstances at present.
- Any change in harvesting management would depend on the type of forest residue being managed. If tops or un-merchantable trees are being collected then it is possible to remove branches and fine material, separating out the coarse residues. If pre-commercial thinnings, tops or un-merchantable trees are being "whole tree chipped" in the forest then all residues will be mixed. Given the definition of coarse residues (anything greater than 10 cm diameter), then it would be difficult to separate fine residues to ensure that nothing of this diameter was present. Therefore, some coarse residues could be utilised without the presence of fine residues, but if fine residues are to be used they are likely to be mixed with the coarse residues.
- "Fine residues might be left in the forest to mitigate nutrient loss concerns"
- "Note: we are making the assumption that "management" in this question refers to "forest management." Landowners do not "manage" timber stands for residue production; they manage them for stem wood production. Management regimes are modified to accommodate changes in these merchantable product markets. Residues will continue to only be generated and collected when stem wood is harvested and only when a market exists to establish a value for the residues. Because coarse residues are a low value by-product of higher value log harvests, landowners are highly unlikely to change their management practices to produce more coarse residues even if a market materializes for coarse residues."

2.1.1.3 Would an economic market for fibre from coarse residues for pellets encourage the separate management of these residues?

The following comments came from US respondents:

- “Need a cost-effective means to collect and transport coarse woody debris. Most of the fine residues are left in the forest and are too difficult to collect”
- “Largest determinant is price. Current prices generally are not enough to justify the collection and use of this material. Pellet mills are changing that, but at the margin.”
- “If the price received for, and the cost of collection and delivery of, coarse residues warranted the economically viable collection of them (separately).”
- “If buyers are willing to pay suppliers for the material they will manage those materials to supply them.”
- “The mills would have to pay a producer and landowner enough for the fibre to make it worthwhile to collect and haul the fibre to the mill.”
- “The coarse residue market is in effect what the US forest market has always referred to as “hog fuel” and as pellet markets are able to better utilize this material the markets will become more robust. As they become robust, landowners will be able to account for this value in their economic decisions and manage accordingly (i.e. more land will stay in forest)”
- “Operators would need to identify and segregate coarse residues from fine residues at the landing. Fine forest residues are not used for pellet production due to the requirement for clean chips and because it is not economical to gather fine residues.”
- “It’s already the case. Fine residues are not being used for bioenergy due to boiler requirements”
- “The separate management of forest residues is economically unfeasible and it is highly doubtful that this would ever change. The primary usage of forest residues in the US South is for boiler fuel. Landowners do not manage timber stands for residue production.”
- “Forests are not managed for residue production, as residues are extremely low in value. Management decisions are based upon more merchantable product markets, such as sawtimber. Residues are only generated as a by-product of higher-value market. Even if a separate market were to emerge for coarse residues, these residues would still be harvested as a low-value by-product of a higher-value industry and landowners would continue to manage their lands for the higher-value markets.”
- “It was assumed “management” refers to management of the forest as it grows. Landowners manage their stands for the highest value: sawtimber production. Markets for either type of forest residue would need to grow significantly to provide financial incentive for landowners to shift away from management regimes that maximize sawtimber volume. Sawtimber prices are currently about four times higher than forestry residue prices, and so the net present value of residues would need to be much closer to that of sawtimber to motivate managers to decrease rotation ages. Current subsidy schemes and forest bioenergy demand projections will not provide enough incentive for price increases of this magnitude. Residues will continue to only be generated when sawtimber is harvested. They will be collected only when a market exists to establish a value for them. Coarse residues are a low value by-product of higher value saw log harvests. So while a market incentive to clear some logging residue from a harvest site is favourable, landowners are highly unlikely to change their management practices to produce more coarse residues. A study published in Forest Science used a choice experiment to assess NIPF landowner response to the establishment of woody biomass markets. Authors found that landowners are interested in management and harvesting plans that provide the highest economic return, require limited site preparation, and incentivize optimal utilization of logging residues. (Joshi et al., 2013)”
- “Markets for low quality wood fibre are low value and generally, collection and handling costs are high. When good markets for pulpwood exist, top sizes will be smaller and include wood that might otherwise be defined as coarse residues.”

2.1.1.4 In the absence of demand for wood from pellet mills, this is how our forest residues are managed:

All respondents answered that stumps are left in the forest.

Respondents said that residues generated are either burnt at the roadside or left in the forest for natural degradation. On the whole coarse and fine residues are not managed separately, but it is more likely that fine residues would be left in the forest for natural degradation.

Respondents did not think that residues are landfilled or if so only very occasionally.

Canadian comments

- I have never experienced or heard of forest residuals being landfilled. I have seen mills residuals be landfilled but that is always considered to be unsustainable in the long run.
- It is common for residues generated during de-limbing to be burnt at the roadside in Canada and USA.

US Comments

- “Coarse and Fine residues are often left in the forest, not roadside, for natural degradation” (variation on this comment was received from 3 respondents).
- “Residues left in the forest would be left at point of separation and also at roadside. Residues are sometimes although more rarely presently burned in the forest. Residues would never be landfilled in the US South. Residues will continue to be used as hog fuel in areas close to pulp and paper mills. There are very few supplier of forest residues in SE Georgia.”
- “We don't landfill any forest residues. If there is no market for them, a pellet markets or some other market, they are left in the forest stand, not at roadside.”
- “Stumps are left in the woods and are not removed unless land is being cleared for agriculture use. Residues burned at roadside is not common practice and less than 5% occurrence. Residues are not normally landfilled - this would occur less than 0.1% of the time. Residues are normally spread over the tract or may be piled in windrows to decompose over time.” (Variation on this comment was received from 3 respondents).
- “Stumps are always left in the forest, whether or not there is a demand for pellets. Typically it is a combination of options. For example, for the natural degradation option, it should be noted that it is more common for logging crews to spread residues on the harvest site over the skid trails instead of leaving them piled on the log deck or roadside. Piles versus scattering will definitely affect the decay rate. Other: In areas where hardwood paper demand has declined and in the absence of bioenergy demand, a significant volume of forest residues in the form of small diameter roundwood that comes down during traditional timber harvesting would be harvested with no market destination (i.e. it is a residue). Pellet procurement effectively fills the void left by the shutdown of another market. This exposes a flaw in the BEAC framework because it assumes that if pellet producers were to cease to exist, forests would cease to be harvested and/or no residues would be used. The model is currently unable to incorporate the strong economic and market forces that drive industry and landowner decisions and therefore forest management in the Southeast. In reality, the existing supply chain and infrastructure left behind by the declining hardwood paper industry would attract another user of that product to the area, just like pellet producers chose areas where pulp and paper mills receded from. Other options: It is less likely that no other user of this product would enter the area. However in this case, this significant volume of forest residues would be left in the forest. As this volume might prevent regeneration of the site, it is likely that the rate of post-harvest burning for site preparation would increase from current levels (~5-10% of the time).”
- Drum chipping and burning residual small roundwood was common practice in the South during the 80s and 90s before the paper industry grew in the area.”
- “Fine residues are often dragged back onto the harvest site and scattered along the skid trail. This minimizes accumulation at the roadside, makes material available for nutrient cycling, and reduces risk of compaction in the skid trail. It also accelerates decomposition. Stumps are never removed. Residues are never landfilled.”
- “There is no universal answer for each geographic region. In the US South, on sites with a high proportion of unmerchantable trees and a higher proportion of tops and branches (e.g. some lower grade hardwood stands) then more of this material can be utilised for pellet production. However, this does not represent the most common practice in the forest industry across the US South. On the majority of harvesting sites residues are currently left in the forest. This is unlikely to change significantly as demand from the wood pellet sector is likely to be limited, both in terms of the total overall demand also in the proportion of forest residues that can be

utilised in pellet production. "Pellet producers can blend up to 20% harvesting residues and still be able to meet the key quality parameters for industrial pellets" Pöyry, 2015. When considered in the context of the total annual timber harvest the proportion of harvesting residues utilised for wood pellet production is extremely small. The average annual timber harvests in the US is around 292 million m³ p.a.¹, in 2014 the US produced 3.9 million tonnes of pellets for export² this equates to around 8 million m³ of wood fibre or 2.7% of the total harvest. Given that residuals would typically make up no more than 20% of the pellet furnish, this equates to just 0.5% of the annual harvest. For context the growing stock, or forest inventory, in the US is 34 billion m³³. All wood fibre used for export pellet production represents just 0.2% of this figure."

- "Stumps would not be used for wood pellet production, they are expensive to extract and contaminated with soil and stones and therefore unsuitable for pellet production. It is common in Canada and in some parts of the US South to burn residues at the roadside. Where a pellet market exists some of this material can be utilised for wood pellet production instead. It is more common in the US South that the residues are taken from roadside back into the forest, often used on the extraction route by the skidder. In some case a small proportion (<30% on any given site) may be utilised as hog fuel in a biomass boiler or potentially utilised for pellet production although this not currently widespread. Where residues are predominantly un-merchantable trees, then a higher proportion could potentially be utilised for pellet production. Forest residues are not landfilled as part of common practice anywhere."

2.1.1.5 In the presence of demand for pellet production, this is how our forest residues are managed:

Canadian response

Most respondents thought that a proportion of residues would go to pellet demand (either 30-79% or <29%). The respondents thought that less fine residues would be used for pellet production than coarse residues. Some respondents thought that residues would be managed the same as for no demand.

- If harvesting coarse residues, harvesting operations need to be modified in order for the material to be extracted with traditional saw logs and pulp logs. This not treating residues like a waste but treating like an additional product. In practice this requires modified processing and not hay stacking residues for burning. To some extent these conditions already exist in Pacific Canada.
- I don't see any condition where the coarse residues could be used for anything but bioenergy. The materials typically don't meet the requirements of pulp producers due to occasional burnt wood, and bark.
- Although harvest residuals are used to some extent, the vast majority are left or in the case of BC, burned. Fines are used if attached to coarse, otherwise not used. Harvest residuals will be the main source of growth for the industry.
- Stumps would not be used for wood pellet production, they are expensive to extract and contaminated with soil and stones and therefore unsuitable for pellet production.
- In Canada, where residues are commonly burned, more of this material is being utilised by wood pellet producers.

US responses

- In the US South, on sites with a high proportion of un-merchantable trees and a higher proportion of tops and branches (e.g. some lower grade hardwood stands) then more of this material can be utilised for pellet production. However, this does not represent the most common practice in the forest industry across the US South. On the majority of harvesting sites residues are currently left in the forest. This is unlikely to change significantly as demand from the wood pellet sector is likely to be limited, both in terms of the total overall demand. The proportion of harvesting residues utilised for wood pellet production is extremely small.
- "You need to differentiate by forest type. For softwood plantations basically nothing remains in the forest except sometimes fine residues."
- "Only a small percentage of forest residuals will ever be economically harvested/utilized"

¹ source: FAO

² Source: EU Stat, Forisk, Pöyry

³ USDA 2012

- “Fine residues are not usually being collated for pellets at all”
- “Regulation for water/soil quality, BMPs, etc. and more importantly cost, will likely mean fine residues (though 4 inches might be too a high bound) remain in the forest.”
- “The use of forest residues for pellet production is very minimal in our fibre procurement area. Any increase caused by increase pellet demand would be very small and used mostly for boiler fuel.”
- “According to Forest2Market’s Delivered Price Database and data describing forest inventory from the Forest Inventory and Analysis (USFS) inventory data, roughly 1 percent of the forest inventory that is removed annually is forest residue for which there is a market (primarily purchased as boiler fuel for pulp and paper industry). Increased demand for pellet production is unlikely to produce a significant change from current practices and increase this amount significantly, although particular forest owners may find a market for a higher proportion of their residues (80% would seem unlikely). Two points: 1) roadside is where all materials are picked up for transport; 2) residues are market driven without concern for coarse and fine.” (Variations on this response received from 4 respondents)
- “According to Forest2Market’s Delivered Price Database and data describing forest inventory from the Forest Inventory and Analysis (USFS) inventory data, roughly 1 percent of the forest inventory that is removed annually is forest residue for which there is a market (primarily purchased as boiler fuel for pulp and paper industry). Increased demand for pellet production is unlikely to produce a significant change from current practices and increase this amount significantly. Producers have entered the sub-region in which they operate because of the local decline of the hardwood paper industry that used trees that came along during harvests for high value sawtimber. They used this fibre as boiler fuel, but also a feedstock for their process. Pellet procurement effectively filled the void left by the shutdown of another market. With no other existing demand in the area, higher value sawtimber demand still drives regional harvest rates, and the small diameter hardwood roundwood that is a by-product of this traditional timber harvesting is defined as a residue. This exposes a flaw in the BEAC framework because it assumes that if pellet producers were to cease to exist, that then forests would cease to be harvested and/or no residues would be used. The model is currently unable to incorporate the strong economic and market forces that drive industry and landowner decisions and therefore forest management in the Southeast. In reality the existing supply chain and infrastructure left behind by the declining hardwood paper industry would attract another user of that product to the area, just like pellet producers chose areas where pulp and paper mills receded from.”
- “Depends heavily on the proximity to a pellet mill and the harvesting approach as it impacts the quality of the residues”
- “100% of our sales to pellet mills is considered pulpwood, though it may be merchandized to a somewhat smaller top than the 2.5 inch small end BEAC definition for pulpwood.”

2.1.2 Comments on the Counterfactual

Comments on Counterfactual (“leave all residues in the forest”)

Table 2-1 High level summary of comments on counterfactual for Scenario 4a Summary in Tool

Counterfactual for 4a, 5a, 6a and 7a – summary of US responses

Respondents commented that the counterfactual was not fixed but varied from location to location, between thinnings and at harvest and depending on market conditions. In general the comments indicated that the main options are to burn residues or leave them in the forest, but that thinnings residues are usually left on the forest floor. If the market conditions are right residues may also be used as a fuel for power generation at a mill or used as pulp. The treatment of the residues also depends on how regeneration is managed after harvest.

In addition in some circumstances the alternatives include urbanisation.

One respondent said “The counterfactuals are (as they must be for this type of analysis) fixed and very, very narrow. They do not represent the economic choices made by landowners and loggers.”

Counterfactual for 4b, 5b, 6b and 7b – summary of Canadian responses

Most residues are burnt, remain in situ at the landing or are scattered. Each jurisdiction will have an approach to residue management.

US respondent comments were:

- “This varies by region, forest type and the owners’ objectives. It is common either to burn residues or to leave them in the forest”
- “The absence of a market for forest residues in many locations increases the cost of reforestation. We incur the additional cost of moving it aside (and in some cases, knocking it down) in order to get trees planted. A residuals market makes forest management and forest retention more attractive.”
- Sometimes (*residues are*) burnt for soil quality (particularly in long-leaf pine areas where fire is increasingly being re-introduced), but mechanical mastication or scattering is probably most common.”
- “Depending on the market and the forest type, some of these residues may be used for fuelling forest products facilities or in some case might be used for pulp or other products.”
- “There may be other markets for forest residues from traditional markets that would capture some of the residuals, such as to industrial boilers. The size class of residual tops changes regularly as the market for low quality wood fibre changes. If traditional wood fibre markets are strong, the specified top size is smaller. If there is less demand and lower prices, top sizes become larger and more residuals are left on site.”
- “Residues are generated at harvest. When roundwood tree stems are harvested and skidded to the loading deck, some residue is broken off and left on the forest floor. At the loading deck, if no market exists for residues, then residue piles will be generated. At this point, two circumstances may occur:
 - The skidder may grapple the pile and spread some of the residue back across the forest, mostly on the skid trail.
 - The skidder or a dozer will blade the residue to the edge of the deck, which clears the deck and creates a pile.

At the loading deck, if a market exists (10-20 percent of the time), small residuals that cannot be loaded onto truck beds are generally chipped directly into trucks and used as boiler fuel for power generation at a mill or as a feedstock for pellets. In the absence of pulp or paper markets, tree tops, diseased and deformed trees, and small diameter roundwood with no other market demand that come down when a site is harvested for saw timber are loaded onto truck beds and delivered to pellet mills. Residues for pre-commercial thinnings are not usually collected and are left on the forest floor. In areas where hardwood paper demand has declined and in the absence of bioenergy demand, a significant volume of forest residues in the form of small diameter roundwood that comes down during traditional timber harvesting would be harvested with no market destination (i.e. it is a residue). Pellet procurement effectively fills the void left by the shutdown of another market. This exposes a flaw in the BEAC framework because it assumes that if pellet producers were to cease to exist, forests would cease to be harvested and/or no residues would be used. The model is currently unable to incorporate the strong economic and market forces that drive industry and landowner decisions and therefore forest management in the Southeast. In reality, the existing supply chain and infrastructure left behind by the declining hardwood paper industry would attract another user of that product to the area, just like pellet producers chose areas where pulp and paper mills receded from. It is less likely that no other user of this product would enter the area. However in this case, this significant volume of forest residues would be left in the forest. As this volume might prevent regeneration of the site, it is likely that the rate of post-harvest burning for site preparation would increase from current levels (~5-10% of the time). Drum chipping and burning residual small roundwood was common practice in the South during the 80s and 90s before the paper industry grew in the area.”

Canadian respondents gave a range of responses saying that this is what always happens through to it definitely does not happen. Comments were:

- “Residues are burnt to reduce wildfire” (3 respondents gave a variation of this)
- “In Pacific Canada the current post-MPB situation has resulted in significant usage of residues for a certain window of time -- primarily to reduce wildfire potential and address other wildlife and biodiversity issues. Each jurisdiction, however, has regulatory constraints beyond these temporary measures.”
- For East Canada “Market for residues not developed yet. Most residues remain in-situ or at the landing”

2.1.3 Scenario 4a

2.1.3.1 Is this scenario happening now?

Table 2-2 High level summary of comments on question for Scenario 4a Summary in Tool

Scenario 4a: summary of comments for question: Are the practices described in the scenario already occurring?

Residues, particularly coarse residues, are removed now, but the extent of removal is highly dependent on location, forest type, forest owner's objectives (including the need to reduce the costs of reforestation) and local markets for pulp, paper or woodfuel for power generation or for heating which is seasonal. Another factor that influences removal is the equipment available, e.g. having a chipper available and appropriate transport vehicles is important. This means that in the vicinity of a pellet mill or pulp mill that uses residues for power generation the residues may be removed but in most other locations they are not. In addition in a strong pulp wood market most of the 'coarse' grade residues would be used for this market. A number of respondents commented that the scale of removal of residues is small compared to the amount of residues generated (e.g. 10-20% or that the “large number of small producers simply don't bother with such 2nd order activities.”)

Comments from US respondents were:

- “This is occurring for SE softwood harvests (basically no coarse residues left on site; all goes to the pulp market), and to an increasing extend for hardwoods now as well, especially in proximity to pellet plants”
- “Coarse residues are removed if there is a nearby mill. Having a chipper on site is important too. But without a pellet mill or chipper they are left.”
- “Where energy facilities, or other uses for this material are available they are certainly used, but that is the exception rather than the rule. The large number of small producers simply don't bother with such 2nd order activities.”
- “Residues are generated during a harvest. If a market exists, the residue is usually chipped and delivered to the buyer of the residue. Otherwise, the residues remain in the forest. Currently, a market for residues only”
- “Occurs 10-20% of the time, so a majority of residues are left in the forest even with current pellet demand.”
- “When traditional markets for pulpwood are strong, more of a tree is utilized, harvesting virtually all of the coarse residue definition.”
- “The removal of residues is based on very local markets (close to end user) and is also affected by season due to use as fuel. The total removals are very low as compared to other products.”
- “In areas where pellet mills are currently operational, fine residues that cannot be loaded onto truck beds are generally chipped directly into trucks and used as boiler fuel for power generation at a mill or as a feedstock for pellets. In the absence of pulp and paper markets, tree tops, diseased and deformed trees, and small diameter roundwood with no other market demand that come down when the site is harvested for saw timber are loaded onto truck beds and delivered to pellet mills. This occurs in small areas of the overall region, and so the overall magnitude of the effect is small.”
- “This is not happening “continuously over the time horizon” as demand for industrial wood pellets is uncertain after 2027, therefore any utilisation may only be in the short term.”
- There was also an important comment on all scenarios: “It's important to note the discrepancy between likelihood and significance in these BEAC scenarios. While, many of these scenarios

might happen, the scale at which they occur is likely to be very small. Pellet mills use a small percentage of overall fibre demanded in the Southeastern US, and they buy the lowest value products. Growing pellet demand occurs on the margins and usually in locations where the pulp and paper industry that also used to compliment the sawtimber industry has retreated. The pellet fibre price increases suggested in this survey are unlikely to be caused by pellet markets, and are often not drastic enough to sway landowners away from managing for the highest value product that actually affects prices and forest management decisions: sawtimber.”

2.1.4 Scenario 4b

Table 2-3 High level summary of comments for 4b

Scenario 4b: summary of comments for question: Are the practices described in the scenario already occurring?

It is likely that coarse and fine residues will be mixed. Their extraction is only happening in isolated areas.

- “Only in isolated areas”
- “Mixed with fine residues”
- “This is not happening “continuously over the time horizon” as demand for industrial wood pellets is uncertain after 2027, therefore any utilisation may only be in the short term.”

2.1.4.1 If you are familiar with a region and aware of changes in this region, please provide the name of the region with an indication of the percentage forest affected by it, with evidence to support this

- East Canada: Markets are opening up for pellet production and export to the UK. Starting to take forest derived biomass (and sawmill residues) for pellet production.

2.1.5 Scenario 5a

Scenario 5a: summary of comments for question: Are the practices described in the scenario already occurring?

Fine residues are more problematic and difficult to collect than coarse residues, so they are only likely to be collected in combination with coarse residues. Residues will only be extracted where there is a market. This only exists 10-20% of the time, so the majority of residues are left in the forest, even where there is pellet demand.

There are small markets for fine residues as fuel at forest products sites, depending on the price of natural gas.

- “It occurs where pine straw is collected”
- “In combination with the coarse residues.”
- “Much of the time the removal of fine residues is problematic as it is more costly to collect and has more dirt and unwanted debris.”
- “The removal of residues is based on very local markets (close to end user) and is also affected by season due to use as fuel. The total removals are very low as compared to other products.”
- “Residues are generated during a harvest. If a market exists, the residue is usually chipped and delivered to the buyer of the residue. Otherwise, the residues remain in the forest. Currently, a market for residues only exists 10-20% of the time, so a majority of residues are left in the forest even with current pellet demand.”
- “Occasionally, domestic markets for boiler fuel exist at forest products or other manufacturing sites, especially when natural gas prices are high. When this happens, there are small markets for ground up material that includes fine residues, needles and bark. Dryers at pellet plants utilize this kind of material but generally generate it by the debarking and processing of the roundwood brought in for pellets.”

- “It should also be noted that fine residues have fewer uses regardless of which specific markets are present at the time of harvest, and so they are more suited to pellet markets.”
- “This is not happening “continuously over the time horizon” as demand for industrial wood pellets is uncertain after 2027, therefore any utilisation may only be in the short term.”

2.1.6 Scenario 5b

2.1.6.1 Is this scenario happening now?

Table 2-4 High level summary of comments for Scenario 5b

Scenario 5b: summary of comments for question: Are the practices described in the scenario already occurring?

Fine residues are only likely to be used in association with coarse residues, as they can cause flashing in rotary dryers and are dangerous.

- “Mixed with coarse residues”
- “Only if not delimited and still attached to the coarse residues. Fines can cause flashing in rotary dryers and are dangerous”.
- “This is not happening “continuously over the time horizon” as demand for industrial wood pellets uncertain after 2027, therefore any utilisation may only be in the short term”

2.2 Scenarios 6 & 7

Removal of residues from the forest for a short timescale (up to 15 years), after which no further residues are removed. Is this already occurring?

Canadian comments

Table 2-5 Summary of Canadian responses for Scenarios 6b and 7b: is this practice already occurring?

Scenarios 6b and 7b: summary of comments for question: Are the practices described in the scenario already occurring?

Canadian respondents thought these scenarios were unlikely and made few comments. One comment was: “You don't understand harvesting. You can't remove over time. They must be used immediately or they will be disposed of. There is no new opportunity until the next rotation.”

- “Timber supply reductions are forthcoming for the BC Interior and it is assumed that the removal of forest residues will become an increasingly important feedstock over time for pellet producers.”
- “You don't understand harvesting. You can't remove over time. They must be used immediately or they will be disposed of. There is no new opportunity until the next rotation.”

US comments

Table 2-6 Summary of US responses to Scenario 6a and 7a: is this practice already occurring?

Scenarios 6a and 7a: summary of comments for question: Are the practices described in the scenario already occurring?

Some US respondents found these scenarios difficult. These respondents said that there is no way to know that residues would only be removed for 15 years when they first started extraction in year 1 (e.g. “Because there is no difference between scenarios 4 and 5 and scenarios 6 and 7 in year one, we cannot determine whether or not these scenarios are occurring currently”). Others commented that, even if pellet markets soften when subsidies expire, demand for these materials from other forest products manufacturers and non-pellet energy producers will continue.

- “This would occur with pre-commercial thinnings if a pellet mill is nearby. Otherwise they are left in the forest”
- “I’m struggling to understand the scenario description... why would folks stop removing residues after 15 years?”
- “I am afraid that I do not understand the question. It says that residues are a product of harvesting or pre-commercial thinnings. I can understand if there is only one pre commercial thin prior to 15 years and then no harvest of residue until the final harvest but I am not sure if that is what the scenario is referring to. If it is then it sometimes happens and would increase with pellet demand.”
- “Even if pellet demand goes away in 15 years, there will continue to be markets in some areas for fuel. Therefore the removal of residues will continue”
- “Whether forest residues are removed from the forest depends on having a market (pellets, energy generation at paper mills, domestic energy generation or some other use) that offers a high enough price to justify harvesting and transporting them to the market. We assume this question is driven by a concern over the soil productivity effect of the removal of residuals over a long period of time. It has been our experience that, in our planted pine stands, each rotation is more productive than the one that preceded it, whether residues were removed or not.”
- “Because there is no difference between scenarios 4 and 5 and scenarios 6 and 7 in year one, we cannot determine whether or not these scenarios are occurring currently. Furthermore, any real incentive for these scenarios to occur are non-existent, as even if pellet markets soften when subsidies expire, demand for these materials from other forest products manufacturers and non-pellet energy producers will continue.” (This response from 3 respondents)
- “The main market for residues in the Southeastern US is as a source of fuel for power boilers for forest products manufacturers other than pellets. These manufacturers will continue to purchase and use residues for this purpose with or without pellet demand. There is no short term plan for residues, as forests are not managed for residues. Residues will be produced so long as the forest is actively managed for high-value industries like sawtimber. It would be extremely rare that a forest owner would plan to manage his forest for 15 years and then stop”
- “There is no way to distinguish between scenarios 4&5 and 6&7, as the scenarios are identical for the first 15 years of the analysis timeline. Moreover, we cannot fathom what would incentivize these scenarios, apart from the thinking that forest bioenergy markets are ephemeral because of subsidies that are due to expire. The investment that pellet producers have made in the local supply chains will not simply cease if pellet producers were to go away. This is a flaw in the BEAC framework because it assumes that if pellet producers were to cease to exist, that then forests would cease to be harvested and/or no residues would be used. In reality the existing supply chain and infrastructure left behind in the off-chance pellet producers go away would simply just attract another user of that product to the area, just like pellet producers chose areas where pulp and paper mills receded from.”
- “There is no reason to believe that markets for fine residues, when they occur, will go away after 15 years.”
- “There are some instances where this is happening in the US South. Sometimes the counterfactual would be burning at roadside and in other cases it would be residues left in the forest.”

2.2.1 General comments on scenarios 4-7

2.2.1.1 In the future (to 2030), if demand for fibre for pellets stays at the current level, how likely do you think it is that these scenarios will occur (or continue to occur, if they already happen)?

Table 2-7 High level summary of comments on question for Scenarios 4-7 Summary in Tool

Scenarios 4a, 5a, 6a and 7a: Summary of comments on question: In the future (to 2030), if demand for fibre for pellets stays at the current level, how likely do you think it is that these scenarios will occur (or continue to occur, if they already happen)?

Any increase in the use of forest residues for pellets will be dependent on location and price. Analysis of the market indicates that forest residues are not likely to be the only source of fibre for pellets. Additionally, the use of forest residues for pellet production is not likely to drive the market, which will be driven by saw timber demand or, in some circumstances, by pulpwood demand. The use of forest residues for pellet fibre is therefore part of and dependent on these markets.

In the US South there is currently “heavy reliance on boles from new harvesting used for pellets.”

Other respondents said that the use of forest residues will only be on a small scale.

Some respondents are concerned that the UK market has a cut off at 2027, which will impact investment in extraction of residues.

Scenarios 4b, 5b, 6b and 7b: Summary of comments on question: In the future (to 2030), if demand for fibre for pellets stays at the current level, how likely do you think it is that these scenarios will occur (or continue to occur, if they already happen)?

Canadian response: residues can only be removed once per rotation, immediately upon completion of harvesting or the opportunity is lost due to burning. There is very little thinning in Canada.

- “I assume prices for pulpwood will increase modestly and allow use of forest residue to become more profitable.”
- “The current level of utilisation is likely to continue up to 2027 and then decline”
- “While I think it is likely that the collection of residues will continue to occur, this can't be looked at by itself. It means that there would be a more robust use of the forest resource, more money going to the forest resource, and more land staying in forest. In addition a market for the small diameter residues would be god send in the times where there was pest infestation or fire risk and demonizing it would have serious unintended consequences.”
- “I'm still guessing the US will still ultimately invest in increased bioenergy use (though cheap natural gas has substantially delayed this investment). It will likely be self-moderated by price competition with other renewable technologies, which is why I am not concerned about exports or domestic markets creating an “unsustainable” demand for this product.”
- “Although harvesting unutilized coarse residues (Scenario 4a) might provide a portion of woody biomass-based energy consumption, recent analysis⁴ indicates that merchantable timber is also likely to be required.”
- “Field observation already confirms heavy reliance on boles from new harvesting used for pellets”
- “An increase in demand for fibre for wood pellets may promote a slight increase in the use of harvesting residues”
- “Scenario 4a and 5a are likely, however 6a and 7a are highly unlikely. Expected forest productivity increases, while the primary product will still be sawtimber, may result in surplus fibre⁵.” (This was commented by three respondents)
- “Forest management for large landowners is the product of anticipated high-value markets. At the present time, the highest value market is for saw timber and this is not expected to change. Additional markets for thinnings and residuals add value and should over time allow increased investment in productivity. However, these markets are not likely to drive overall management. Thus, scenarios 4 and 5a are likely but scenarios 6a and 7 are unlikely.”
- “It is very unlikely that scenarios 6 and 7 will occur. It is likely that scenarios 4 and 5 will occur. However, the scale would be very small. The annual volume of residues generated and delivered divided by total tons of inventory in the US South is less than 1%. The US Forest Service predicts that the US South will provide 65% of the nation's timber harvests by 2050 (up from 61% in 1997,) and that the high and rising productivity of Southern pine plantations will make this possible (Prestemon and Abt, 2002). If demand remains where it is, but forest

⁴ Galik and others 2009, Rossi and others 2010

⁵ Fox, T.R., E.J. Jokela and H.L. Allen. 2007. The development of pine plantation silviculture in the southern United States. J. Forestry 105:337-347

productivity increases at current rates, there will be a surplus of residual fibre that can go to pellet markets.”

- Canadian response: “I don't know what you are thinking. Fines can only be removed once per rotation, immediately upon completion of harvesting or the opportunity is lost due to burning. There is very little thinning in Canada.”

2.2.1.2 Assuming pellet demand increases what is the likelihood of it happening (a) at current fibre prices (b) If prices rise by up to 15% (c) If prices increase by 30%.

Table 2-8 High level summary of comments on question for Scenarios 4-7 Summary in Tool

Scenario 4a, 5a, 6 and 7 Summary of comments to the questions on: Assuming pellet demand increases in the future, what is the likelihood of the scenario at current fibre prices? And at 15% or 30% higher fibre prices?

The likelihood of the use of forest residues for pellets given increased demand and prices was caveated in a number of ways: in particular because the market would react to increased prices by providing an increase in supply and reducing price. It was also pointed out that residues are part of other markets and prices and availability will be dependent on these markets (i.e. as part of harvesting operations or saw timber production). These respondents pointed out that pellet prices do not drive forestry operations.

Other respondents said that “Boles and large tops and limbs are primary source for UK pellets. The boles are not residue, but may not be in demand by saw mills.”

Scenarios 4b, 5b, 6 and 7

There is already an excess of forest residues beyond ecological needs left behind now

For scenario 5b: It is very rare for the extraction of fine residues only to occur in Canada.

6 and 7: It is unlikely that timescale will influence this scenario.

Comments from US respondents

- “Boles and large tops and limbs are primary source for UK pellets. The boles are not residue, but may not be in demand by saw mills” (from NGOs)
- “Coarse residues are not always but are often taken in the course of harvesting for small diameter roundwood.”
- “My answer is based on the presumption that residues, whether coarse or fine, are generated by harvesting operations. My answers do NOT presume that 100% of residues at a particular site are removed. Also, my answers do NOT presume that pellet demand will drive price increases. Pellet demand is unlikely to cause prices increases of these magnitudes. A variety of factors will come into play that ultimately affect price, including demand for various forest products and increasing fibre supply.
- “Such price rises are unlikely to be caused by pellet mills. While increase in pellet demand may cause small increases in price, it will not be at these percentage rates. The market would see an increase in supply and then a reducing of prices as a response to any small price increase. Simple economics.”
- “It is not accurate to say that pellet mill demand alone can be responsible for increases and at the percentage rates suggested. This market has the ability to increase supply and result in lower rather than higher prices. More important, the questions seem to ignore the impacts of changes in the lumber market and corresponding residual output from sawmills”
- “Long term demand for wood pellets is uncertain and likely to be limited therefore it is unlikely that this scenario would happen continuously over the time horizon. Even if long term demand did exist it is likely to be in smaller quantities, reducing fibre demand.”

- “These questions suggest pellet demand will increase prices 15-30%, but this is unlikely. While increased demand in the presence of static supply will cause a price increase, it's inaccurate to attribute all increased demand to bioenergy, especially at these percentage rates. This assumption ignores the market's ability to adjust, increasing supply and reducing price. It also ignores the effect of changes in the lumber market which is the real driver of forest products markets. Sawtimber market strength more directly affects price, residual availability, and planting activity.”

Comments from Canadian respondents

- 4b: “There is already an excess of forest residues beyond ecological needs left behind now”
- 5b: “Very rare for this to occur in Canada”
- 6 and 7: “Unlikely that the timescale will play into this scenario”

2.2.1.3 If the practices described in scenarios 4 to 7 are already occurring what percentage of your forest land do you think has been affected by this? Please enter the percentage against the scenario that applies

Table 2-9 High level summary of comments for question

Scenarios 4a, 5a, 6, 7 Summary of comments to the question on whether or not these scenarios are already happening.

The use of residues for pellets was generally considered to be a minor part of the US forest inventory and forest products market.

- “The total forest inventory in the US South in 2012 was 10.8 billion m³ (USDA) with 3.9 million tonnes of pellets produced for export (EU Stat) and a max of 1.6 million m³ of harvesting residues used, this represents just 0.015% of the inventory in the US South.”

2.2.1.4 If you are familiar with a region and aware of changes in this region, please provide the name of the region with an indication of the percentage forest affected by it, with evidence to support this.

Table 2-10 High level summary of comments on question for Scenario 4a Summary in Tool

Scenarios 4a, 5a, 6, 7 Summary of comments on extent of region affected.

A small amount of residues is being used for pellet production because of the cost of transport, harvesting and utilisation technologies and the levels of conventional harvesting. The amount of pellet use is very small compared to the total forest inventory in the region.

US responses

- “I cannot give away large woody residues. People said they would accept it for firewood only if I delivered it to them”
- “Currently, Residue utilization is limited by transportation distance, harvesting and utilization technologies, and levels of conventional harvesting. See “The Southern Forest Futures Project: Technical Report” by David N. Wear and John G. Greis. August, 2013. http://www.srs.fs.fed.us/pubs/gtr/gtr_srs178.pdf”
- “(Scenarios) 4a and 5a are likely 6 and 7 are very unlikely. If demand stays at the current level, and forest productivity increases at current rates, there is likely to be a surplus of fibre. Also, forests are managed for sawtimber production.”
- “Less than 1% Forest2Market calculation from proprietary Delivered Price Service and Forest Inventory Analysis (USFS) data” (This comment was received from 5 respondents)
- “The total forest inventory in the US South in 2012 was 10.8 billion m³ (USDA) with 3.9 million tonnes of pellets produced for export (EU Statistics) and a max of 1.6 million m³ of harvesting residues used, this represents just 0.015% of the inventory in the US South.”

Canadian responses

- There is “some removal of coarse and fine debris (~2% of available residues) in Ontario.”
- “The actual harvest is currently only 45% of planned harvest (in East Canada).”

2.2.1.5 Which of the following changes would encourage the practices described in scenarios 4 to 7 to occur? Please select up to the three most important factors. (1 is most important)

Table 2-11 High level summary of comments on question for Scenario 4a Summary in Tool

Scenario 4a, 5a, 6 and 7: Summary of comments on practices that would encourage these scenarios

Respondents said that pellets are part of a larger market and the factors that encourage the use of forest residues for pellets will depend on these markets, on landowner objectives, location, proximity to mill and the costs of extraction (including investment in equipment). Small private land owners who collectively own a large proportion of land in the Southeastern USA manage their land for different purposes, not for pellet production (in addition to financial return their objectives include recreation and legacy). There is a backdrop of other economic and policy drivers that will have large impacts on land owner decisions.

Scenario 4b, 5b, 6b and 7b: Summary of comments on practices that would encourage these scenarios

The changes are context specific and depend on distance to a pellet mill and availability of a chipper

Summary of factors that would encourage these scenarios:

Factors that would encourage this scenario are: increased demand for pellets and decreased cost of extraction; changes in policy or legislation that encourage the scenario; and if the scenario reduced vulnerability to disease or pests.

US Comments were:

- “The changes are context specific and depend on distance to a pellet mill and availability of a chipper.”
- “Pellet demand is occurring against a backdrop involving many other economic and policy drivers that will have large impacts on land owner decisions. Among these are EPA's CPP and PSD rules, state renewable portfolio standards, fossil fuel costs, housing demand.”
- “New harvest technologies (would make a difference)”
- “Pellet demand is such a small portion of the market that changes would have little to no effect on forest management practices for residues. The possibility of decreasing cost of extraction is zero. Is the cost of anything decreasing? The cost of extracting forest residues is very high and will continue to rise.”
- “Pellet producers typically don't like residues.”
- “The answer to these questions would depend upon the landowner. Small, private land owners own the majority of lands in the Southeastern US and manage their lands for different purposes. The above selections would be very unlikely in general as no forest is managed for residue production, forests are managed for high-value saw timber or maybe recreation or legacy.”
- “While these scenarios are likely to occur in the presence of bioenergy markets, the magnitude of their occurrence will be small.”
- “Private landowner objectives are diverse. The answers to these questions will vary depending on landowner objectives. Small landowners own the majority of forests in the South US, and private property rights are extremely important to them. While financial return is a primary reason for land ownership, but it is not the only one. Other objectives include recreation and legacy, and for those who manage their lands with these objectives in mind, the above bulleted changes are subordinate.”

Canadian comments were:

- “The changes are context specific and depend on distance to a pellet mill and availability of a chipper.”
- “You don't understand harvesting. You can't remove over time. They must be used immediately or they will be disposed of. There is no new opportunity until the next rotation.”

2.2.1.6 Which of the following changes would prevent the practices described in scenario 4 to 7 from occurring in the future? Please select up to the three most important factors

Table 2-12 High level summary of comments on question for Scenario 4a Summary in Tool

Scenarios 4a, 5a, 6a, 7a: Summary of comments on factors that would prevent these scenarios.

Pellet demand is small and unlikely to have an effect on forest management practices, except in specific locations. The margin on forest residues is small, so any change in cost along the supply chain could prevent a landowner from selling residues into a low value market. Costs such as transport and extraction costs will disincentivise landowners from removing residues when costs are high or availability of transport or equipment is low.

Summary of factors that would prevent these scenarios

Insufficient financial return; cost of extraction of residues is too high; sustainability concerns; lack of availability of logging or trucking capacity; other uses make the land value more attractive; and low roundwood demand results in greater haulage distances.

US Comments

- “Pellet demand is such a small portion of the market that changes would have little to no effect on forest management practices for residues. The cost of extracting forest residues is very high and will continue to rise.”
- “Because forests are not managed for residues and residues are very low-value, landowners may be disincentivised from removing residues from the forest and selling them when costs are too high to do so or availability of transportation or equipment is limited. The margin on selling residues is very thin, so any small change in cost along the supply chain could prevent a landowner from selling residues into any low-value market.”
- “Very likely in some areas and only moderately likely in others depending on market factors.”
- “We could find that there are major sustainability impacts... but it is more likely hyperbolized concern rather than real impact, at least at the landscape/regional scale.”

2.2.2 Other comments on scenarios 4-7

Table 2-13 High level summary of comments on question for Scenarios 4a, 5a, 6 and 7 Summary in Tool

Scenarios 4a, 5a, 6a and 7a Summary of additional comments

Counterfactuals are not straightforward and may include urbanisation. They will also be location dependent. One respondent pointed out that “The counterfactuals are (as they must be for this type of analysis) fixed and very, very narrow. They do not represent the economic choices made by landowners and loggers.”

A number of respondents point out that the demand for forest residues is low and the cost of extraction and transport is relatively high, which means that this biomass is a relatively low value material. In addition pellet demand is a small part of a much larger market and is not likely to drive management practices. In general respondents did not think that pellet demand will drive changes in forest management. If demand for roundwood and residues is strong and prices are high, pellet manufacturers are unlikely to be able to compete for the fibre.

Separation of coarse and fine residues is not easy and is unlikely to be done for pellet demand. It is likely that scenarios 4a and 5a could occur, but scenarios 6 and 7 are highly unlikely.

One source provided an estimate of the forest residue resource of 13.9 million dry t from growing stock and 36.2 million dry t from both growing stock and other sources (Gan and Smith 2006).

Research and inventory analysis was quoted to demonstrate that pellet demand was a relatively small part of the forest products market and likely to have a small impacts (e.g. "(Galik & Abt 2015) estimated pellet demand was found to have a small relative impact on regional forest product prices, removals, and inventories.")

- "We have major issues with forest health, land conversion to urban use, etc. Increasing the value for forest lands and ability to do forest health thinnings, etc. through creation of new markets for wood energy are one of the few tools we actually have to counter these problems."
- "When the mills are built and they pay enough for landowners and loggers to cut, skid, load and haul fibre (no matter what kind it is), then it will be done."
- "The interchange between traditional markets, operational practices, and new markets is very fluid and results in different outcomes in different areas."
- "Utilizing forest residues is highly unlikely because it will be too costly and we know that UK electric power plants need pellets made from "clean" chips for processing. The wood pellets being burned by UK power stations are being produced largely if not wholly from high value virgin wood fibre coming from whole trees, not from low value forest residue. Forest residues normally include bark, tree branches and tops, but these materials alone would not be sufficient in quantity to make pellets or burn for energy in pellet form and certainly not at the scale presently being foreseen for subsidized burning in the EU. Further, bark creates an ash disposal problem after the burn which precludes any significant percentage of bark. Data from FORISK in August 2014 shows 37 pellet mills already operating in the Southeast U.S. It also shows 36 new pellet mills either under construction or in the financing or feasibility stages, all of which would be in operation by 2020. FORISK also tracks what these facilities have stated they will use as feedstock. Total wood use for these pellet plants (built, operating or presently under construction) is forecasted to be more than 43.8 million green tons of wood. Of that amount, 80% or 34.87 million green tons will be pine and hardwood pulpwood (whole trees) material and 19.75% or 8.56 million tons will be sawmill chips and dust. Another Forisk analysis indicates the emerging pellet industry in the U.S. South relies on pulpwood sized roundwood (54 percent of total wood consumption) and manufacturing residuals (45 percent) as its basic raw materials."
- "We would like to see a stronger market for forest residues. The increased revenue resulting from such a market and the reduction in reforestation costs resulting from the removal of a portion of the residues increase the financial return for a landowner, providing an incentive to keep the land in a forest use and engage in active forest management. However, we are not sure that increased demand of feedstock for pellets will impact recovery for forest residuals. In our experience most pellet producers just don't want them."
- "Utilizing forest residues is highly unlikely because it will be too costly and we know that UK electric power plants need pellets made from "clean" white fibre for processing."
- "Within the BEAC model itself, the scenario 4 counterfactuals for small roundwood are insufficient. There is no option for small roundwood going to new or recovering pulp and paper mills, which is the most likely counterfactual fate after in woods decay/ burning. Scenarios 4-7 need an industry counterfactual that (accounts for what) exists for pine. Specifically, hardwood residues should also have a counterfactual where they would be used for pulp and paper at some level.... This is a flaw in the BEAC framework because it assumed that if pellet producers were to cease to exist, that forests would cease to be harvested and/or no residues would be used. In reality, the existing supply chain and infrastructure left behind in the off-chance pellet producers go away would simply just attract another user of that product to the area, just like pellet producers chose areas where pulp and paper mills receded from."
- "The interchange between traditional markets, operational practices, and new markets is very fluid and results in different outcomes in different areas."
- "The following resources show that forests are not managed for residues and that residues are considered a very low-value product - Forest2Market stumpage price index US Forest Service Forest Inventory and Analysis data Abt, K., Abt, R., Galik, C. and Skog, K. 2014. Effect of Policies on Pellet Production and Forests in the U.S. South: A Technical Document Supporting the Forest Service Update of the 2010 RPA Assessment. Gen. Tech. Rep. SRS-202, Asheville, NC: U.S. Department of Agriculture Forest Service, Southern Research Station."

(http://www.srs.fs.usda.gov/pubs/gtr/gtr_srs202.pdf) USDA. June 24, 2015. National Woodland Owner Survey. <http://www.fia.fs.fed.us/nwos/results>"

- "Numerous field inspections in the pellet mill sourcing area in VA and NC in 2013, 2014, and 2015 show that boles (with large tops and limbs) are the primary material entering the pellet plants and stored on site. Enviva reports that 80% or more of their supply is hardwood from coastal plain forests for the three mills there."
- "If the market for roundwood and residuals is strong and prices are high, pellet producers will not be able to compete with non-bioenergy producers such as pulp mills and/or sawmills. The economics aren't there for forest landowners to manage their timber for pellet production. Landowners managing for timber grow for saw timber for most value. Pellet mills can't pay those kind of prices to make a pellet."
- "No change to forest management would take place, but in some circumstances there may be changes in harvesting management. Any change in harvesting management would depend on the type of forest residue being managed. If tops or un-merchantable trees are being collected then it is possible to remove branches and fine material, separating out the coarse residues. If pre-commercial thinnings, tops or un-merchantable trees are being "whole tree chipped" in the forest then all residues will be mixed. Given the definition of coarse residues (anything greater than 10 cm diameter), then it would be difficult to separate fine residues to ensure that nothing of this diameter was present. Therefore, some coarse residues could be utilised without the presence of fine residues, but if fine residues are to be used they are likely to be mixed with the coarse residues."

The story of US forestry in the South over the past 60 years is that forest inventories have increased as demand has increased. RPA statistics (table 20) shows that in 1953 total forest inventory in the south was 148,470 million cubic feet. By 2012, this had more than doubled to 306,622 million cubic feet. Forest owners have responded to new demand by investing in forestry and growing more timber. It is highly probable that given strong markets forest inventories, and available residual material, will continue to grow. Markets for wood for energy helps this process."

- "(Galik & Abt 2015) estimated pellet demand was found to have a small relative impact on regional forest product prices, removals, and inventories"
- Gan, J. and Smith, C. 2006 "Forest Inventory and analysis (FIA) data and a 70% residue recovery rate, annually recoverable logging residues in the USA were estimated at 13.9 million dry t from growing stock and 36.2 million dry t from both growing stock and other sources".
- "Current sourcing in VA and NC is not relying on traditional "forest residue" to any substantial degree, except for larger tops and limbs⁶."
- "Due to low demand and relatively high costs of harvesting and transporting, woody biomass is currently a relatively low valued material⁷."

Canadian comments

- "You obviously have no idea how a forest is managed."

⁶ Southern Environmental Law Center Memo to UK and EU Policy Makers, June 2, 2015

⁷ Extension.org. 2014

2.2.3 Overall summary

Table 2-14 Summary of comments for Scenario 4a – to go into summary page of Tool.

Overall summary of comments for Scenario 4a, 5a, 6a and 7a

One source provided an estimate of 13.9 million dry t from growing stock and 36.2 million dry t from both growing stock and other sources.

Although the use of coarse forest residues for fibre for pellets is likely and probably happening now, the scale is small compared to the overall forest inventory in the US South East. Extraction of forest residues are likely to be dependent on location, the costs of extraction and the availability of transport and equipment. It is unlikely that coarse and fine residues will be extracted separately and it is more likely that fine forest residues will remain in the forest as they are more difficult to collect.

The forestry market is not driven by pellet demand because of the relatively low value of this product. It is more likely that production of fibre for pellets will be part of/or associated with sawtimber and/or pulpwood markets. Small scale land owners who own a significant part of the Southeastern US forest are not motivated by the pellet market; often their management objectives will include factors such as recreation and legacy as well as financial return from saw timber. This means that they are less likely to invest in collection of forest residues for what they consider to be a low value market.

NGOs are concerned about the use of “boles and large tops and limbs are primary source for UK pellets. The boles are not residue, but may not be in demand by saw mills.”

The counterfactuals to extraction of forest residues for pellets will be variable, depending on local circumstances and practice. It will not always be easy to have a clear understanding of the counterfactual. For example the alternative use could include urbanisation or use in pulp and paper mills, but most respondents considered the alternative to extraction to be to leave the residues in the forest or to burn them. One respondent commented that if pellet demand ceases to exist the counterfactual will not be that forests would cease to be harvested and/or no residues would be used. In reality, the existing supply chain and infrastructure (could) attract another user of that product to the area.

Many respondents commented that the use of forest residues for pellets is (and will be) a small part of the forest inventory and forest products market in Southeastern USA.

Overall summary of comments for Scenarios 4b, 5b, 6b and 7b

Forest residues in Canada currently form a very small part of the residue for pellets. Their extraction will depend on location, equipment available, demand and (most of all) economics. It is unlikely that fine and coarse residues would be extracted separately in Canada. One respondents said “fines can cause flashing in rotary dryers and are dangerous.” The current harvest limits are not achieved in Canada, which implies that some respondents think that harvest would be increased before forest residues are extracted. Other respondents think that the only likely market for residues would be pellet demand. One respondent said that “Timber supply reductions are forthcoming for the BC Interior and it is assumed that the removal of forest residues will become an increasingly important feedstock over time for pellet producers.”

Any changes would be context specific and depend on distance to a pellet mill and availability of a chipper.

2.3 Scenarios 10 - 12

Definitions relevant to this scenario

Roundwood definition in BEAC:

Roundwood comprises:

- Saw logs (usually defined as a log with a small end diameter greater than 5 - 8 inches (0.13 - 0.20 m));
- Chip-n-saw (small saw logs and large pulpwood, with minimum diameters of 4 - 6 inches (0.10 - 0.15 m) and maximum diameters of 9 - 16 inches (0.23 - 0.41 m)); and
- Pulpwood (roundwood which has a small end diameter typically less than a saw log (5 - 8 inches), but greater than 2.5 inches (0.064 m) (also known as small roundwood in the UK), and low quality roundwood with dimensions of saw logs and chip-n-saw, that can't be used for sawn-timber).

Scenario 10 Additional wood (in comparison to the counterfactual) generated by increasing the rate of harvest of a naturally-regenerated hardwood forest in East Canada

(a) from every 100 years to every 50 years

(b) From every 100 years to every 80 years

Counterfactual: continue harvesting the forest every 100 years.

Scenario 11 Additional wood (in comparison to the counterfactual) generated by increasing the rate of harvest of a naturally-regenerated conifer forest in Pacific Canada from every 70 years to every 50 years.

Counterfactual: Continue harvesting the forest every 70 years.

Scenario 12: Additional wood (in comparison to the counterfactual) generated by increasing the rate of harvest of a naturally-regenerated conifer forest in boreal Interior-West Canada

(a) from every 100 years to every 50 years

(b) from every 100 years to every 80 years.

Counterfactual: Continue harvesting the forest every 100 years.

Scenario 13a: Additional wood (in comparison to the counterfactual) generated by increasing the rate of harvest of a naturally-regenerated hardwood forest in South USA from every 70 years to every 60 years.

Counterfactual: Continue harvesting the forest every 70 years.

Scenario 13b: Additional wood (in comparison to the counterfactual) generated by continuing harvesting a naturally-regenerated hardwood forest in South USA every 70 years.

Counterfactual: Reduce the rate of harvest to every 80 years.

2.3.1.1 Counterfactual

Table 2-15 High level summary of comments associated with counterfactual

Scenario 10-12: Summary of responses to counterfactual

The counterfactual is more complex than assuming that all the rotation period will decrease. In Canada what happens in the absence of pellet demand is determined by local regulations and the management plan agreed in the licence or tenure management plan. The rotation length of natural stands is driven by markets other than the pellet market. Currently the annual allowable cut is not exceeded in any Canadian province, so it is unlikely that rotation periods will be decreased as a result of pellet demand.

A number of respondents also suggested that the counterfactual could be different to that defined in BEAC, such as increased conversion to urban use or decreased harvest.

As a result it is difficult to define the counterfactual. It will depend on region, growth rate of forest and other market demands. It is not clear that the extraction of fibre for pellets impacts the rotation or harvesting period, as pellet fibre is only taken as part of an integrated forest products market. It will be difficult to determine if the extraction of additional fibre for pellets has changed the harvest period.

One respondent said that harvesting will not increase due to pellet demand as the value of biomass is a tiny fraction of the forest value and (it) will never influence whether a forest is cut or not. This decision rests on sawlog or veneer demand in Canada.

Scenario 13: Summary of responses to counterfactual

In the USA forest are harvested at all ages based on land owners' objectives and usually financial return is an important consideration. This means that the more valuable saw log markets are likely to dictate harvest rotation and fibre production for pellets will be a 'follower' of this market, so it will not dictate harvest periods. Rotation period vary widely and respondents said that they were not convinced that anybody could clearly distinguish between a 60, 70 or 80 year old hardwood stand. Others said it would be difficult to prove a change in rotation or to be certain of the counterfactual rotation period. A typical comment was "pellet markets are unlikely to affect the rotation age of naturally regenerated forests. The pellet market, like the paper market, makes use of the least valuable component of the forest stand and typically has little impact on harvesting decisions." Changing harvest period by 10 years or more is unlikely to be financially viable and the changes would probably be more subtle, i.e. 1-2 years.

One respondent said the counterfactual to extraction of fibre for pellets could be a variety of cases, including conversion to urban use, decreased harvest levels due to reduced market demand for saw and pulp timber, and increased impacts from forest health threats such as invasive species, wildfire, etc.

Canadian responses

- "When the mills are built and they pay enough for landowners and loggers to cut, skid, load and haul fibre (no matter what kind it is), then it will be done."
- "The fibre supply for our 5 management units is way excess of our contract. 800,000 m³ compared to 1,375 annually. The roundwood use in our pellet production process are mainly poplar and birch."
- "In Canada the rate of harvest is independent of demand for fibre for pellets, as **AAC is set by provincial governments related to production of primary products such as pulp and wood products.**"
- "The rotation of hardwood from natural stands is driven by markets other than the pellet market."
- "We use mainly sawmilling residuals and do not influence extraction policies."
- "Sustainable forest management practices. No reduction in rotation ages are contemplated. There is excess supply as it is."
- "Harvesting will not increase due to biomass demand increase. The value of biomass is only a tiny fraction of the forest value and will never influence whether a forest is cut or not. The decision rests entirely on sawlog or veneer log demand."

US responses

- "The counterfactual in too many cases will be increased conversion to urban use, decreased harvest levels (due to reduced market demand for saw and pulp timber), and increased impacts from forest health threats such as invasive species, wildfire, etc."
- "I'm not sure that anyone, with any accuracy could, clearly distinguish between a 60 year old hardwood forest versus a 70 or 80 year old hardwood forest."
- "The scenario rotation age is not accurate for the US South. Average rotation age in the US South is between 30 and 50 years. Rotation age changes do not occur in 10 year increments. They are typically in the 1-2 year range. Hardwood forests make up around 50% of forests in the US South. A reduction of rotation age by 10 years would put a tremendous amount of fibre on the market and is totally unrealistic."
- "Pellet markets are unlikely to affect the rotation age of naturally regenerated forests. The pellet market, like the paper market, makes use of the least valuable component of the forest stand and typically has little impact on harvesting decisions."
- "Current US Forest Service Forest Inventory and Analysis data suggests that the average age of hardwood removals in the US South is 54 years, which is lower than both the scenarios and

the counterfactuals. Demand for pellets will have no effect on harvest decisions for naturally regenerated hardwood forests. The scenarios and counterfactuals also presume that rotation adjustments happen in 10 year increments. This is counter to what actually occurs in the market, where adjustments generally occur in 1-2 year increments. To move rotation age lower by 10 years would lead to a major glut of hardwood on the market, for which there would be little to no demand". (A variation of this comment was received from 2 respondents)

- "A report from the Pinchot Institute for Conservation on the sustainable sourcing of biomass for bioenergy states that "the greatest loss [in forestland] is expected to occur in areas where forest product markets are weak and development pressures are strong. The economic values associated with the South's forests may be a critical factor in keeping private lands as forest, and maintaining the conservation values provided by a mosaic of native and plantation forests, in a variety of ages and successional stages." Further, the investment that we and other pellet producers have made in the local supply chains will not simply cease if pellet producers were to go away. This is a flaw in the BEAC framework because it assumes that if pellet producers were to cease to exist, that then forests would cease to be harvested and/or no residues would be used. In reality the existing supply chain and infrastructure left behind in the off-chance pellet producers go away would simply just attract another user of that product to the area, just like pellet producers chose areas where pulp and paper mills receded from."
- "Current US Forest Service Forest Inventory and Analysis data suggests that the average age of hardwood removals in the US South is 54 years, which is lower than both the scenarios and the counterfactuals."
- "The counterfactual is to continue harvesting at the current average rotation, but that rotation for us is somewhat shorter than 70 years to begin with."
- "The rotation length and frequency of harvesting is determined by the optimum financial return for the forest owner, and other ownership objectives. Therefore, in commercially productive forests, the time of harvesting is determined by the market requirement for the highest value product. The local saw timber markets will have a preferred size class for their logs, therefore the forest owner must ensure that the rotation length is long enough for enough of the trees to reach this size class. With every year, trees will get bigger, up to the point where growth rates decline and stagnate. Therefore with every year there will be a higher total volume of standing timber per acre and a higher proportion of larger trees that can access the higher value markets. On the counter side, with every passing year the cost of capital invested in the forest becomes more significant, reducing the value of any incremental increase in revenue. Therefore an optimum rotation age can be determined based on the rate of growth of that species in that region, the market demand and requirements for the highest value products and the financial costs of waiting another year before generating revenue. Typically these rotation lengths will not change unless significant improvements in growth rate can be achieved or if the market demand changes (e.g. requiring bigger or smaller logs and providing an ability to pay for this different product). Another factor affecting the time of harvest, particularly for private, non-corporate, forest owners is the total revenue generated at the time of harvest. This type of owner may have made a minimal investment in establishing the forest and may not consider the Net Present Value when making the decision to harvest. Therefore, whilst a higher NPV can sometimes be achieved from a shorter rotation (due to the costs of capital) some owners prefer the much greater total revenue generated from older stands with larger trees. Given that the forest industry in these supply regions is long established and well developed, optimum management and rotation lengths have been determined according to the factors detailed above, this is not likely to change unless there is the opportunity to generate much more revenue through this change. This may happen with increasing sawlog price but will never be influenced by the wood pellet sector as pulpwood prices and the wood paying capability of the pellet sector is too low to influence this market. It's also important to note that rotation lengths may typically fall into a range e.g. 25-35 years for pine plantations in the US South or 65-100 years for naturally regenerated hardwood stands. Therefore when considering lengthening or shortening rotations this natural range should also be taken into account. On highly productive sites, where trees reach a larger size at a younger age, then rotation length may be at the lower end of the natural range, with the opposite being true on sites with lower productivity. One of the other key drivers behind rotation age is management objectives and whether the key target is return on investment, maximise total revenue or ability to liquidate capital."

2.3.2 Scenario 10a

2.3.2.1 Are the practices described in scenarios 10a already occurring?

Table 2-16 High level summary of comments associated with question

Scenario 10a Summary of comments on whether the practices described are already happening.

The rate of harvest is independent of demand for pellets and is determined by other products, i.e. saw timber or pulp demand. The annual allowable cut is determined by the provincial Governments and related to other markets. No changes in forest management plans for fibre for pellet production is contemplated. In some provinces Provincial law proscribes harvest of wood before maturity on public land.

- Still in transition. Practices not yet well developed.
- “In Canada the rate of harvest is independent of demand for fibre for pellets, as AAC is set by provincial governments related to production of primary products such as pulp and wood products. In the US, the private land ownership context may result in different driving forces for harvest rates.”
- “In Canada the rate of harvest is independent of demand for fibre for pellets, as AAC is set by provincial governments related to production of primary products such as pulp and wood products. May be 5% of forest in Ontario affected by this. BC – 40% - due to MPB”
- “No changes from the forest management plans are contemplated.”
- “Cutting cycles and quantities in East Canada are largely determined by the annual allowable cut regime, which takes a multitude of factors into account. Demand for pellet material would not be determining component in this process. There are some privately owned forests which may also have quantities restricted as they are marketed through co-operatives. It is fundamentally wrong to assume that increased demand for pulpwood from the wood pellet sector would influence the rotation lengths that forest owners choose to manage on. This assumption does not take account of (i) a surplus of suitable fibre within a catchment area and (ii) the age class distribution within the forest stand. A new pellet mill would not be able to secure financing unless it could demonstrate a clear surplus of fibre and a lack of competition from other markets. Part of the standard due diligence when locating a new wood pellet mill is to look at the age class distribution of the forest resource and forecast the potential quantity of sustainable annual harvest and calculate the likely surplus over existing and potential future demand. If there was not a significant surplus then the pellet mill would not receive financing and would not locate in that catchment area. To invest and construct a pellet mill under the speculative assumption that forest owners will change the rotation length of the forest in order to produce more volume (which would reduce revenue and return for them) would not be prudent. In answer to this question, rotation lengths would not be so dramatically reduced because:
 - (i) there is no need to do this as pellet mills are located in fibre baskets with a substantial surplus which can be brought to market when demand increases
 - (ii) this practice would not be in the best interests of the forest owner since it would reduce the total volume (and therefore revenue) and reduce the proportion of higher value trees at the time of harvesting
 The wood pellet sector would not be able to increase pulpwood prices sufficiently to compensate for the loss of the saw log grade material.”

2.3.3 Scenario 10b

2.3.3.1 Are the practices described in scenario 10b already occurring?

Table 2-17 Summary of comments associated with the question.

Scenario 10b Summary of comments on whether the practices described are already happening.

The rate of harvest is independent of demand for pellets and is determined by other products, i.e. saw timber or pulp demand. The annual allowable cut is determined by the provincial Governments and related to other markets. No changes in forest management plans for fibre for pellet production is contemplated. In some provinces Provincial law proscribes harvest of wood before maturity on public land.

- “Provincial law proscribes harvest of wood before maturity (90 years) on public land. We always follow the principle of the AAC for forest management. And the harvest practice is for high value product only.”

2.3.4 Scenario 11

2.3.4.1 Are the practices described in scenario 11 already occurring?

Table 2-18 Summary of comments associated with the question

Scenario 11 Summary of comments on whether the practices described are already happening.

The rate of harvest is independent of demand for pellets and is determined by other products, i.e. saw timber or pulp demand. The annual allowable cut is determined by the provincial Governments and related to other markets. No changes in forest management plans for fibre for pellet production is contemplated. In some provinces Provincial law proscribes harvest of wood before maturity on public land. In BC the increase in pellets is due to the pine beetle infestation.

2.3.5 Scenarios 12a and b

2.3.5.1 Are the practices described in scenario 12 already occurring?

Table 2-19 Summary of comments associated with the question

Scenarios 12a and 12 b Summary of comments on whether the practices described are already happening.

The rate of harvest is independent of demand for pellets and is determined by other products, i.e. saw timber or pulp demand. The annual allowable cut is determined by the provincial Governments and related to other markets (pellets are unlikely to compete with timber prices). No changes in forest management plans for fibre for pellet production is contemplated. In some provinces Provincial law proscribes harvest of wood before maturity on public land.

- “Pellet prices are not likely to compete with timber prices”
- “In Canada the rate of harvest is independent of demand for fibre for pellets, as AAC is set by provincial governments related to production of primary products such as pulp and wood products. May be 5% of forest in Ontario affected by this. BC – 40% - due to MPB”
- “Provincial law proscribes harvest of wood before maturity (90 years) on public land. We always follow the principle of the AAC for forest management. And the harvest is practice for high value product only.”

2.3.6 Scenarios 13a and b

2.3.6.1 Are the practices described in scenario 13 already occurring?

Scenarios 13a and 13 b Summary of comments on whether the practices described are already happening.

The main comments focussed on the issues with changing harvest periods as a result of pellet demand. This was considered unlikely to happen because saw logs are the more valuable product, providing the greater financial return and therefore tend to dictate harvest period. Rotation periods vary widely and are influenced by a number of other factors as well. So it is difficult to prove any change as a result of pellet demand. Most respondents agree that a change of 10 years would be

unlikely and that financial considerations are likely to constrain changes to 1-2 years. Many say that rotation periods are typically much lower than BEAC envisages; one respondent said that changes can happen but not uniquely linked to pellet demand, but that it is more important to understand the scale of these changes.

The main dissenting voice is from a group of stakeholders who say that additional harvest of hardwood pulpwood is resulting from pellet demand. It is not clear if this changes the rotation periods, but they say that it does increase the harvest of trees that do not meet the saw timber market requirements.

- “The rotation of hardwood from natural stands is driven by markets other than the pellet market. Also, pellet manufacturers do not use saw logs which are the primary products from these natural forests.”
- “Pellet prices are not likely to compete with timber prices.”
- “I’m sure there are anecdotal cases of this, but we have no evidence for large-scale changes in our landscape scale forest inventory data.”
- “Current pellet demand is driving additional harvest of hardwood pulpwood including large trees that do not meet saw timber specs. Hardwood pulpwood in the South is any tree, regardless of size or age that does not have a saw timber market. Hardwood pulpwood demand in the South has been steady since 2009. While pulp mill closures have reduced demand in certain areas, pellet demand is increasing harvesting well beyond the post closure status quo, and in the VA/NC region where Enviva sources increasing pellet demand is projected to raise harvesting to levels where removals would exceed growth⁸. However, since 2009, hardwood consumption for paper has remained stable, and is projected to remain stable over the next 5 years. The overall demand for hardwood pulpwood in the region is projected to increase by 5% over the next 5 years⁹. It can be seen that the demand for hardwood paper feedstocks declined between 2008 and 2009; this was caused by closures of paper mills (22 out of an initial 100 paper mills closed in the US South between 1990 and 2010¹⁰) – This comment submitted by 3 other respondents.
- “With housing starts down, most landowners are delaying the harvest of their forestland and presumably pellet manufacturers are not able to pay sawtimber prices for their raw material. Furthermore, I’m not sure that anyone, with any accuracy could, clearly distinguish between a 60 year old hardwood forest versus a 70 or 80 year old hardwood forest.”
- “Additional demand for pellets would have no effect on hardwood forest management. Hardwood for use in pellets is much less desirable than softwood. According to FIA data, the actual average hardwood rotation age is currently lower than both the scenarios and the counterfactuals. The assumption of 10 year rotation age adjustments is totally unrealistic.”
- “Pellet markets are unlikely to affect the rotation age of naturally regenerated forests. The pellet market, like the paper market, makes use of the least valuable component of the forest stand and typically has little impact on harvesting decisions. Sawtimber drives harvesting decisions. US Forest Service Inventory and Analysis data (FIA) data indicate the average age of hardwood removals is 54 which is substantially different from the counterfactual and practices described above. The 10 year swings in rotation age included in the above scenarios would result in totally unrealistic amounts of wood being absorbed by the market. Even a 1-2 year swing in rotation age at any significant geographic scale would produce large volumes of wood. The scenarios are totally unrealistic.” A variation on this comment was submitted by 5 other respondents.
- “The presence of a pellet market does not influence when we choose to re-enter a hardwood stand. The higher value of sawlog markets determines our harvest decision. We envision hardwood pulpwood to be a very small component of what we supply to export pellet markets, which will be from pine thinnings”
- “Scenario 13a: Historically additional wood has come from improvements in productivity driven by markets for timber. Output, productivity and inventories have all increased over past few

⁸ See R.C. Abt, North Carolina State University, “Projected Impacts of Enviva Feedstock Demand in Southeastern Virginia and Northeastern North Carolina,” May 12, 2014, page 3 and Figure 6. See also Southern Environmental Law Center Memo to UK and EU Policy Makers, June 2, 2015 submitted via email to Jennifer Jenkins and at https://www.southernenvironment.org/uploads/audio/2015_06_02_Cover_letter_to_UK_EU_Re_SIG_report.pdf

⁹ Stephenson and MacKay 2014, p79

¹⁰ Forisk, 2014

decades, while the proportion of sawtimber has also continued to increase. It is highly likely that improved silvicultural will continue to generate extra material, not just for the pellet market but for other sectors too. Between 1953 and 2012 the total area of forest in the US increased by just 3% whereas the growing stock, or inventory increased by 58%, and the annual growth rate by 90% (USDA, 2014). Given that this scenario considers just a 10 year variation of rotation length, this is what might be expected within a normal range. Regenerated hardwood forests in the US South are commonly managed on rotations between 50 and 75 years¹¹. The exact rotation age will depend on the species, site productivity, local markets and ownership objectives. The owner would always try to maximise revenue by producing the highest value product. A higher proportion of saw logs from the older stands will generate more revenue and therefore the owner would be unlikely to adjust the rotation age for wood pellet production. S13b: Again this choice would be driven by the sawlog market. Where demand and pricing is good the owner is likely to continue on a normal rotation of 70 years. If sawlog demand and pricing is poor then they may defer harvesting until the market recovers. We have seen this happening during the recent downturn.

2.3.6.2 In the future (to 2030), if demand for fibre for pellets stays at the current level, how likely do you think it is?

No comments from Canada

- This scenario is not happening on any scale and would be unlikely to happen in the future despite any changes in demand for pellets. The key factors here are:
 - In the US South markets have responded to increased demand by increasing the productivity of woodlands. As one component of the market, fibre for pellets will assist in helping working forests stay as working forests, and will help contribute towards the increasing productivity of the sector.
 - Wood paying capability; the pellet sector just does not have the capacity to pay that could compete with other pulpwood markets or with higher value markets like saw logs. Therefore the pellet sector would not be able to influence rotation age or change management practices, other than to encourage more thinning and improvements in silviculture and productivity.
 - The small scale of total demand and the location of pellet mills in areas of surplus fibre; the total projected demand for wood pellets is limited and will be significantly lower than previously forecast. Therefore, in comparison to demand from other markets the wood pellet sector is insignificant and is likely to remain so. Given that pellet mills have to locate in areas of surplus fibre, to secure financing and because they cannot compete with other pulpwood users, then there would be no requirement to change rotation lengths as sufficient fibre already exists without harvesting the same forest areas more frequently.
 - The short term nature of the wood pellet market, with demand likely to dramatically reduce after 2027, means that it is not in the long term interests of forest owners to change their management practices to suit a short term low value market.

2.3.6.3 Assuming pellet demand increases what is the likelihood of it happening (a) at current fibre prices (b) If prices rise by up to 15% (c) If prices increase by 30%.

Table 2-20 High level summaries of comments associated with question

Scenario 10 - 12 Summary of responses to the question: Assuming pellet demand increases what is the likelihood of it happening at current prices and at increased fibre prices?

Respondents said that they cannot increase their rate of harvest, or if they could, perhaps by 10 years at the most. The annual allowable cut (AAC) set by Provincial Government is not connected to the rates of harvesting, but is much more complex. The AAC has not been achieved for some years, so it is unlikely that rotation periods would be shortened to meet pellet demand. Most natural regenerated sites are on remote, slower growing sites and unlikely to be impacted by pellet demand.

¹¹ Pöyry data and information from US Foresters

The slow growth of trees is important in setting the time of harvest and pellet demand is not sufficient to impact this.

- “Our actual AAC in eastern Canada has been undercut for several years now”
- “We cannot increase the rate of harvest of our hardwood forest, maybe we can hope a rotation of 80 to 90 years. The reason is that we are working with natural trees in less disturbed sites.”
- “Annual allowable cut is not connected to rates of harvesting, it’s a much more complicated equation run by the provincial authorities.”
- “Hardwood forest rotation is generally dictated by the landowner's objectives and needs and by price. Usually, the ultimate goal is creation of high-value saw timber. Removal of lower value material for pellets is unlikely to affect rotation length, which is often on an individual tree basis. In any event, 70 years appears to be outside the current rotation range for southern hardwood. Changes in rotation length would unlikely occur over the entire region but would be localized, or even site-specific, events. Subsequent harvests would occur based on future conditions and landowner objectives but would be planned for saw timber production.”
- 10a: “Our actual AAC in eastern Canada has been undercut for several years now”
- 10b: “Our tenure system does not encourage measures like this on Crown land”
- 11: “Most natural regeneration is in remote slower growing sites”
- 12a: “The tenure system does not encourage growing more wood and trees grow too slowly”
- 12b “Local demand for biomass based energy is low. Pellets would have to be exported”

Table 2-21 High level summaries of comments on scenarios 13a and b associated with question

Scenario 13a and b: Summary of responses to the question: Assuming pellet demand increases what is the likelihood of it happening at current prices and at increased fibre prices?

Management decisions are dictated by land owner objectives, typically driven by saw timber prices, not pellet fibre prices. Ten year changes in rotation period are unlikely and would result in over supply of timber on the market, which would impact market-based decisions. It is unlikely that pellet demand would change rotation in anything other than a marginal way.

There are local concerns about the harvest of naturally regenerated hardwoods in the vicinity of pellet mills. These concern the additional harvest for pellet fibre of trees that are not suitable for saw timber or other markets.

- “Hardwood forests tend to be uneven aged and pegging the typical age of hardwood forests at 70 years is speculative. Management decisions are dictated by landowner objectives and are typically driven by sawtimber prices, not fibre prices. Ten year swings in rotation age are very unlikely and would force large volumes of wood on the market, an unlikely outcome. Pellet mills typically don't use much hardwood and are therefore unlikely to have much impact on hardwood management. They certainly don't use hardwood sawtimber.
- This practice is already occurring. Future increases in price will only make it all the more profitable. (Received from three respondents)
- Rotation length will be dictated by the landowner's objectives and the sawtimber market. Pellet mills do not use hardwood sawtimber, so this market is unlikely to affect any change in rotation length.
- “The rotation length of hardwood forests will be dictated by the landowner's objectives and/or by the price and value creation (growth) of sawtimber products. Currently, this age is not 70 years and any changes in rotation length will occur in 1 or 2 year increments, not 10 year increments. Moreover, south eastern hardwood forests are not managed in a strict, regulated-rotation format. Small harvest level changes in one sub-region do not have the huge inventory and carbon storage effects illustrated by the BEAC model. Because pellet mills do not now and are unlikely in the future to purchase hardwood sawtimber, they are unlikely to affect rotation length. If prices were high enough at the present time to dictate a lower harvest age, it would be an isolated occurrence; subsequent harvests would be timed based on current pricing and landowner objectives.”

- “Most of the area is private forest land and is managed according to sustainable forestry. Pressure for forest management comes from NGO and general public.”
- “Landowner objectives and the price/value of sawtimber products dictate the rotation length of hardwood forests. Pellet mills do not purchase hardwood sawtimber nor are they likely to purchase hardwood sawtimber in the future. Pellets mills do not impact rotation length whatsoever.”
- 13a: “A 10 year variation in rotation age could fall within the normal range under which a forest is managed, although it is more likely that rotations would be extended to produce more sawlog grade material, rather than harvesting early. This decision would not be based on wood pellet demand or prices unless they were on a par with sawlog prices. 13b: Some harvesting has been delayed in recent years due to the decline in sawlog demand during the recession. Wood pellet demand has not had an impact on this.”

2.3.6.4 Which of the following changes would encourage the practices described in this scenario to occur?

Table 2-22 High level summary of comments associated with question

Scenario 10-12 Summary of responses to practices that would encourage the scenario to occur

The agreed conditions for the annual allowable cut set forest management conditions and pellet demand is unlikely to change these. This is because saw timber and paper and pulp production are the markets that are considered in the annual allowable cut and the pellet market is too small and low value to be considered above these needs. Respondents did not think that economic conditions would allow a pellet producer to use wood from a mature forest in a way that resulted in a shorter rotation or additional harvest. The only change that might bring this about is a comparable decrease in the value of saw timber or disease or forest fires. However, a significant increase in traditional lumber markets would provide the financial incentive to increase harvesting and more residues would then be generated alongside this lumber. In addition in some Provinces the supply of wood exceeds current demand. Therefore it is more likely that existing supply within the annual allowable cut would be used to meet additional demand for fibre for pellets rather than a reduction in rotation.

Canadian responses

- “In Canada the rate of harvest is independent of demand for fibre for pellets, as AAC is set by provincial governments related to production of primary products such as pulp and wood products. This is unlikely to change for pellets alone.”
- “We are unaware of any scenario under which it would make economic sense for a pellet producer to utilize wood from a mature natural forest.”
- “It is possible that diseased or burnt roundwood (unmerchantable timber) could be harvested under this scenario.”
- “A comparative decrease in value of saw timber is the most likely cause of such a scenario, and are possible given increasing competition from South America, etc. wood energy demand could offset this for total harvest levels, but the lack of need for larger wood could lead to economic incentives to harvest earlier where harvests do occur.”
- “Increased demand likely will not affect harvest rotation”
- “Significant increase in traditional lumber markets provides financial incentive to increase harvesting and generates more residues that are harvested alongside the lumber.”
- “The harvest of wood, on public forests cannot go over annual allowable cut (AAC) calculated volume, and we don't want to change the tree rotation for the pellets market because the other uses of wood (such as sawmill and veneer) has more value.”
- “In northern Ontario, the supply of hardwood exceeds current demand. As a result, increased demand for fibre for pellets would be met first by using available supply, with no need to reduce rotation ages.”
- “It is possible that diseased or burnt roundwood (unmerchantable timber) could be harvested under this scenario.”

US responses**Table 2-23 High level summary of comments associated with question****Scenarios 13a, 13b: High level summary of comments associated with question**

Most respondents commented that any of the options provided were unlikely to occur without either a comparative decrease in the value of timber or sufficient return from the change in rotation, both of which are unlikely. One respondent said that the pellet industry is only financially viable because of subsidies. Other respondents commented that demand is already resulting in clear cutting of large trees in areas where pellet mills are situated.

- “We are unaware of any scenario under which it would make economic sense for a pellet producer to utilize wood from a mature natural forest.”
- “A comparative decrease in value of saw timber is the most likely cause of such a scenario, and are possible given increasing competition from South America, etc... wood energy demand could offset this for total harvest levels, but the lack of need for larger wood could lead to economic incentive to harvest earlier where harvests do occur.”
- “Existing demand is already causing cutting of large trees often through clearcutting. Projected increased demand will just accelerate this practice in areas where pellet mills are located. There are no current or likely U.S. legal or policy changes that will slow this cutting pressure on these highly bio-diverse wetland forests. Pellet makers want clean chips, and boles, tops and large limbs are the easiest way to get the clean chip volume.” Response submitted by 3 participants
- “As everyone now knows, and as Drax admits, the pellet industry is only economically viable because of the UK subsidies”
- “We do not believe the low value pellet market will drive harvesting decisions in naturally regenerated forests. And changes in rotation age described in the scenarios are totally unrealistic.”
- “The demand for pellets has no measurable effect on harvesting decisions for naturally regenerated forests as forests are not managed or harvested for low-value markets, but instead for high-value markets like sawtimber or other landowner objectives such as recreation or legacy. All of the (above) options would be very unlikely to encourage change in harvesting practices.”
- “We do not see any of these as factors that would occur at such a degree that would influence a change in existing hardwood management”
- “Comments for increased demand for fibre for pellets: The key point here is the financial return and scale of demand. In theory, if the pellet sector could pay more than the saw mills for fibre, and the scale of demand was sufficiently large and long term, then it could influence rotation length. However, the reality is that the pellet sector cannot afford to pay and demand is limited both in terms of scale and timing. (Comments for Low demand for saw timber) Again this is theoretically possible, although historical evidence suggests that this scenario leads to forest owners extending rotation lengths rather than shortening them, waiting for sawlog markets to recover (as in the recent downturn). (Comments for Changes in forestry incentives) This is completely theoretical and unlikely to happen. But yes, if there was a sufficient financial return then owners would consider changing rotation lengths.”

2.3.6.5 Which of the following changes would prevent the practices described in scenarios 10-13 from occurring in the future?

Table 2-24 High level summary of comments associated with question**Scenario 10-12 Summary of response to question on what would prevent this scenario from happening?**

Pellet demand is not sufficient and the returns are not significant enough to result in a change in rotation period. If it does happen it will not be at large scale because the risks outweigh the benefits.

The dynamics at play are significantly more complicated than simply rotation time. Pellets will be part of a larger market but will not drive the market.

It is unlikely that any changes would be the same across Canada, as responses would be different for different regions based on jurisdiction and pulp and wood product facilities.

- “Practices likely will not happen regardless.”
- “For the first option: this is happening now and also supports some ecological targets we have.”
- “I don’t understand question 2: roundwood is a pre-step towards saw timber (and other products), how can you differentiate?”
- “The effect of these factors would differ by jurisdiction, based on the current spectrum of types of pulp and wood product production facilities in each province.”
- “This will likely happen, but probably not at large scale. The cost/risk of such a scenario to the environment is likely less than the potential benefits of increasing the value of forest products (making comparatively competitive to urban use) and economic landowner benefit of ability to replace weak demand from the pulp sector.”
- “The way in which the scenarios have been built does not make sense. In reality, the dynamics at play are significantly more complicated than simply rotation time.”

US Comments

Table 2-25 High level summary of comments associated with question

Scenarios 13 a and b Summary of response to question on what would prevent this scenario from happening?

The return to the land owner may be insufficient and land owner objectives may include conservation; stands may be inaccessible. All of these prevent the scenario from happening. One respondent said that harvesting large trees and leaving pulpwood in stands during times of low pulpwood demand results in degradation of the stand quality and reduces productivity. Therefore they avoid this practice in most cases.

A number of respondents said that cutting incentives for pellet use in the UK would prevent this scenario happening.

- “Landowner objectives include hardwood stand conservation or stands may be in inaccessible or environmentally sensitive areas.”
- “First--if the income to the landowner isn't enough to offset the costs. This encompasses the first, second, fifth and sixth above.”
- “The best way to eliminate this cutting of mature trees for pellets is for the UK and EU to stop subsidizing this practice and to require a full accounting of the carbon put into the atmosphere when these trees are burned.” (Response submitted by 3 participants)
- “Reduction or elimination of UK subsidies that will drastically alter the pellet business model and ensure an insufficient financial return so that premature harvesting is not economically feasible.”
- “Landowner objectives may include conservation of hardwood stands due to recreation, hunting, aesthetics, etc. (Response submitted by 5 participants)
- “These selections would likely prevent the scenarios in 10-13 from occurring. Other – the landowner objective may be hardwood conservation or hardwoods may be in environmentally sensitive and protected areas which would also prevent changes in harvesting practices.”
- “Harvesting larger trees and leaving pulpwood during times of low pulpwood demand degrades the quality of the stand and reduces productivity. Therefore we specifically avoid this practice except in rare cases where over story thinning would be beneficial to the site in terms of forest productivity or quality of habitat.”
- “(Comments for the market demand for fibre for pellets) Demand for wood pellets will be limited and a small market in comparison to the existing industry. The paying capability of the wood pellet sector is not sufficient to drive this change. (Comments for an alternative market) Housing starts are increasing, saw log demand is increasing, saw log prices are forecast to increase. This market will continue to drive forest management practices.”

2.3.6.6 If you are familiar with a region and aware of changes in this region – what percentage of forest is affected by this scenario?

Table 2-26 High level summary of comments on this question

Summary of comments on scenarios 10-12 in response to the impact of the region

The annual allowable cut has not been achieved in regions across Canada making it unlikely that rotations would be shortened.

US Comments

Table 2-27 High level summary of comments associated with question

Summary of comments on scenarios 13a and b in response to the impact of the region

There was a split in responses. The majority said <1%, but some respondents said 100%. The latter was associated with evidence on the destruction of wetland forests.

- “What percentage of forest is affected by it? 100% in the Mid-Atlantic Coastal Plain¹² (response submitted by 4 participants)
- “Wood Pellet Feedstock Investigations¹³”
- “In the regions where we operate we have seen no evidence that export pellet markets are causing changes to forestry regimes”
- “Current US Forest Service Forest Inventory and Analysis data suggests that the average age of hardwood removals in the US South is 54 years, which is lower than both the scenarios and the counterfactuals.”

2.3.6.7 Additional comments on Scenarios 10-13

There were **no additional comments** from Canada for these scenarios.

Additional Comments from US on Scenarios 13a and b

Table 2-28 High level summary of comments associated with question

Summary of additional comments on Scenarios 13a and b

A large number of respondents comment that the drivers of rotation/harvest are higher value markets, such as that for saw logs. For most timber land it is clear that financial return dictates harvest period. Pellet demand could influence this only at the margins (i.e. it could make a marginal difference to rotation period), although most respondents thought pellet demand would make little difference.

Rotation periods are different to those envisaged in BEAC, as they are typically shorter.

There is one clear exception to the above, as a number of respondents voiced concerns about the additional demand for fibre for pellets in specific regions is having on hardwood harvests in these regions. It is difficult to demonstrate that rotation has been shortened by pellet demand in these regions, but concern is voiced over additional harvest of wood that is not used for saw logs.

- “This will likely happen, but probably not at large scale. The cost/risk of such a scenario to the environment is likely less than the potential benefits of increasing the value of forest products (making comparatively competitive to urban use) and economic landowner benefit of ability to replace weak demand from the pulp sector.”
- “A shift in rotation age will be influenced by demand for solid wood products, paper, wood for direct combustion and for pellets. It will also depend on the supply of timber by age class in

¹² Evidence: “Wood Pellet Feedstock Investigation in Ahoskie, North Carolina: December, 2014.” Latest Updates:

<http://www.nrdc.org/energy/forestsnotfuel/>. “Uncovering the Truth: Investigating the Destruction of Precious Wetland Forests.” Adam Macon blog, Dogwood Alliance. June 11, 2015. <http://www.dogwoodalliance.org/2015/06/uncovering-the-truth-investigating-the-destruction-of-precious-wetland-forests/>.

¹³ <http://www.dogwoodalliance.org/wpcontent/uploads/2015/06/05-13-15-InvestigationFlyer.pdf> and <http://www.nrdc.org/energy/forestsnotfuel/>

various regions and how the age class distribution will be changing in the near future. It could also be influenced by changes in exchange rates which would influence the net imports/exports of products that placed demand on roundwood resources¹⁴.”

- “The influences on rotation age can vary over time and quickly with changes in market conditions, including trade conditions, for primary and secondary wood products. You are asking if demand for pellets can have a marginal effect on rotation age under these changing conditions. The answer would be yes but the degree of marginal change may differ with these changing overall influences on rotation age. If these pressures already are pressing for a short rotation age then the marginal effect of increased pellet use to decrease rotation age may be small. The effect of increased pellet use to decrease rotation age may increase as other pressures decrease.”
- “The BEAC calculator and what is happening on the ground in the South U.S. particularly NC and VA now, clearly show that additional harvesting on hardwood trees for pellets is seriously increasing rather than decreasing atmospheric carbon for the foreseeable future up to 100 years. A recent analysis performed by Spatial Informatics Group LLC, confirmed that the evidence shows that Enviva and Drax are sourcing pellets in a manner consistent with Scenario 13 a. The analysis shows that Drax/Enviva sourcing and combustion would create emissions 2 ½ time higher than burning coal for 40 years and more than 3 times coal over 100 years¹⁵.” - Response submitted by 4 respondents
- “The emergence of pellet demand neither increases nor decreases the probability of scenarios 10-13 happening.”
- “These scenarios, as currently constructed, completely miss the mark on illustrating how naturally regenerated forests in the US South are managed. The assumed ages for both the bioenergy and counterfactual scenarios are far from reality, and the arbitrarily applied rotation age change of 10 years would severely disrupt sawtimber markets with a huge supply glut. The framework of these scenarios fails to consider historical land management and harvest levels and the likely counterfactual of increased land use change or use by some other industry in the absence of bioenergy markets.

Also it is important to note that much of the hardwood used for pellets is a by-product of softwood sawtimber harvest. In many cases, once the pine stands reach a certain height where competition from hardwood undergrowth is no longer an issue, low value hardwood trees are allowed to grow up in the understory beneath the pine. This material may be removed during thinnings and then again at final harvest. Since it is of such low quality, there is no other use for it, and thus makes good feedstock for pellet production. A new scenario or fibre source within naturally managed coniferous forests should be added to reflect this. As stated before, the value of hardwood sawtimber is up to 4 times more valuable than that of residues and pulpwood. A landowner that decided decades ago to manage his stand for sawtimber is not going to harvest a stand 10 years earlier for pellet feedstock and forego the future financial benefit. Further, the added benefit of the extra revenue for the otherwise unmerchantable fibre supports landowner efforts to keep managing their forests into the future, rather than converting them to development. This in turn supports forests and the production of high value sawtimber which offers long-term carbon storage.”

- “The emergence of the pellet market has no impact on rotation lengths. However, it does influence the regularity of thinning operations. During the recent housing recession, which coincided with an increase in pellet demand, we saw a decline in saw log harvesting and an increase in thinning. We did not see any manipulation of the rotation age or the use of saw grade timber in the wood pellet sector.”

¹⁴ See Skog, K h E.; Abt, R C.; Abt, K 2014. Chapter 6: Wood energy and competing wood product markets. 1) In: wood energy in developed economies Resource management, economics and policy. Routledge, New York. 2014; pp. 161-188.

¹⁵ See Thomas Buchholz and John Gunn, Spatial Informatics Group, “Carbon Emission Estimates for Drax biomass power plants in the UK sourcing from Enviva Pellet Mills in U.S. Southeastern Hardwoods using the BEAC model,” report prepared for the Southern Environmental Law Center, May 27, 2015 (https://www.southernenvironment.org/uploads/audio/2015-05-27_BEAC_calculations_SE_hardwoods.pdf) See also NRDC Issue Brief “Think Wood Pellets are Green? Think Again,” May 2015 (<http://www.nrdc.org/land/files/bioenergy-modelling-IB.pdf>); and see Southern Environmental Law Center Memo to UK and EU Policy Makers, June 2, 2015, RE: “New Study Shows Drax/Enviva Reliance on Southeast U.S. Hardwoods for Pellets Will Result in Greater Carbon Emissions Than Continued Reliance on Coal. The full report can be found at: https://www.southernenvironment.org/uploads/audio/2015-05-27_BEAC_calculations_SE_hardwoods.pdf

2.3.7 High level summaries of scenarios 10-13

Table 2-29 High level summary of comments on scenario 10-12

Summary of comments on Scenarios 10-12

In Canada the length of rotation or allowable harvest is set in the annual allowable cut. This is set based on a number of factors but includes an understanding of the high value markets (saw timber and pulp wood). The return on pellets and the size of the market is not sufficient to change this. So rotation periods will not be changed as a result of pellet demand. Thus the dynamics at play are significantly more complicated than simply rotation time. Pellets will be part of a larger market but will not drive the market.

The counterfactual is more complex than assuming that all the rotation period will decrease. In Canada what happens in the absence of pellet demand is determined by local regulations and the management plan agreed in the licence or tenure management plan. Currently the annual allowable cut is not exceeded in Canadian provinces, so it is unlikely that rotation periods will be decreased as a result of pellet demand.

Table 2-30 High level summary of comments on scenario 13a and b

Summary of comments on Scenarios 13a and b

In the US South the rotation length is (in general) set by financial return to the land owner. This will vary with the region, growing conditions and land owner objectives. Consequently average rotations for naturally regenerated timber land across the South vary by up to 20 years. Average rotations were given as 54 years, but rotation varies between 35 and 70 years depending on the type of forest and other factors. It is not always easy to tell the difference in age in mature stands, so this makes it more difficult to know if rotation has been brought forward. This makes the counterfactual for these scenarios difficult to demonstrate and the scenarios difficult to prove.

Most respondents thought that pellet demand would not influence rotation at all, or if it did, only at the margins. It might decrease rotation by a year or so, but more than this would affect the return from saw log harvests.

There was particular concern about the demand for additional fibre for pellets on hardwood in regions where pellet mills are situated. It is not clear if this demand increases rotation, but the respondents are concerned about increased harvest in these areas.

2.4 Scenarios 10P-13P

2.4.1.1 Please can you provide an explanation of why do you do artificial regeneration of forest?

Canadian responses

- “For our fire dependent and shade intolerant species (e.g. jack pine), we often plant to meet sustainability requirements. According to FSC, our artificial plantings do not qualify as “plantations” because of the variety of species conserved as well.”
- “Forest in Canada are regenerated through a combination of natural and/or artificial regeneration to produce ecologically appropriate stands. Natural or artificial regeneration is often supplemented by each other. E.g. natural regeneration with artificial seeding to fill in gaps and artificial regeneration with some naturals.”
- “To fill the gaps in naturally regenerate forests and install forest on abandoned agricultural lands.”

US Responses

- “U.S. National Forests are required by policy to replant if natural regeneration is not expected within a reasonable number of years after harvest. Some replanting is also done after natural disturbances (wildfire, invasive species mortality, etc.), but is highly limited by available funding. Greater availability of markets for materials resulting from forest health treatments (post-burn salvage, invasive materials and dead wood, etc.) would increase the ability/opportunity for such planting.”
- “Maximization of return for forest owners, control of stocking levels, ability to conduct intermediate silvicultural operations efficiently”
- “Plantations provide a fast growing source of fibre for pulp mills and sawmills. They also provide much more volume per acre than natural stands and the cash flow and rate-of-return is better than with natural stands.”
- “In the southeast US this is to have a fast growing crop of trees to supply the pulp and paper market but also to simulate, in an economical fashion, the secondary growth, fire adapted, pine forests that existed in the area before European colonization.”
- “Plantations are much more productive than artificial regeneration and supply the pulp and paper industry but most plantations are also managed to provide higher value forest products such as sawtimber. Most plantations in the South US are managed for multiple products and are not limited to rotation ages that would only produce pulpwood.
- “In the US South, we and many other landowners have concluded that planted pine provides superior financial returns when compared to other silvicultural regimes.” (Variations on this comment from 2 other respondents)
- “Plantations are much more productive than natural regeneration and supply the pulp and paper industry but most plantations are also managed to provide higher value forest products such as saw timber. Most plantations in the South US are managed for multiple products and are not limited to rotation ages that would only produce pulpwood. In Canada they are only used to fill in the gaps in naturally regenerated forests.”
- “Faster and more predictable growth rate of the forest asset, easier thinning (evenly spaced stands), leading to higher and more predictable financial returns. Additionally, artificially regenerated pine forests where thinning is performed and economic more closely resemble

tertiary successional forests where fire was a common and frequent occurrence than in non-managed forests. This means that they actually have real and verifiable ecosystem benefits.”

- “In Southern US forests are the basis of private landowners' livelihoods, forests will be regenerated as long as wood products markets are robust and there are not local countervailing urban/suburban development drivers that permanently remove forests.”
- “My understanding is that forest owners in the South plant softwood seedlings in order to ultimately produce high value saw timber as fast as possible by controlling the quality of the seedlings and the management techniques employed. This will also produce thinnings of intermediate value.”
- “We make the decision to invest in artificial regeneration primarily to increase forest productivity in our southern US pine forests. Risk of a failure in natural regeneration in these forests is low, but the risk of too much stocking is high. Artificial regeneration gives us the opportunity to control stocking and to utilize seedlings that have been bred for better growth and resistance to insect and disease. We do not conduct artificial regeneration in hardwood stands.”
- “Well managed plantations generally produce a higher yield of better quality trees in a shorter time period than from naturally regenerated forest. However, establishment and maintenance costs are usually higher and this can impact the financial return. Where naturally regenerated forests are prevalent and good quality forest cover of high value species can be achieved without planting, then this option is often preferred (as in much of Canada). However, on land where regeneration is less reliable, or the species mix does not provide optimal value, it can be more beneficial to plant trees for a specific market. Generally these plantations will use improved planting stock, fertilisation, ground preparation and weed control, all designed to maximise productivity. The stands will also be thinned to generate early revenue and to improve the quality and value of the final crop.”

2.4.1.2 Is the counterfactual provided above an accurate description of what currently happens when there is no or low demand for fibre for pellets?

Summary of comments on the counterfactual for Scenarios 10P – 12P

A number of respondents answered that their region's forests do not qualify as plantations. Artificial seeding is practiced to ensure regeneration is appropriate in naturally regenerated forests. Biomass demand does not influence harvesting decisions due to the low value of biomass pellets. One respondent answered that future developments in tree genetics and processing technology are the factors that will drive down rotation periods.

- “The current rotation has not changed and remains the same as it was prior to the pellet industry. We do not anticipate any change to our rotation period and would only make a change if it were sustainable, economically viable, and driven by our primary market which is sawtimber. The presence or absence of a pellet market does not change our rotation practices in any way.”
- “Future developments in tree genetics and processing technology will drive rotation lengths for softwood plantations further down.”
- “In Quebec, 60 years are needed for maturing planted trees.”
- “Biomass demand will not influence harvesting decisions due to low value.”

Summary of comments on the counterfactual for Scenarios 13Pa, b

Plantations in the US South generally tend to be softwood, rather than hardwood. Most respondents say that pellet demand will not determine the rotation periods of plantations, as the primary economic driver is saw timber. Plantation rotation is developed to maximise total revenue and economic return. The scenario was criticised for not providing the rotation period. Drawing from the responses we suggest that rotation period for the counterfactual should be the period that offers the optimum revenue and financial return for the market in the absence of pellet demand.

- “The current rotation has not changed and remains the same as it was prior to the pellet industry. We do not anticipate any change to our rotation period and would only make a change

if it were sustainable, economically viable, and driver by our primary market which is sawtimber. The presence or absence of a pellet market does not change our rotation practices in any way.”

- “Many small landowner operations are economically marginal, so may be subject to land use change/liquidation without pellet markets.”
- “Not many hardwood plantations in South US”. (This comment from 3 respondents)
- “It should be noted that, while the objective of growing sawtimber does not change, landowners have a financial incentive to achieve that objective in as short a rotation as possible. Given the increasing productivity of plantations in the US South, it is reasonable to expect that timber yields will increase and rotation ages will decrease as productivity improvements are achieved¹⁶. This increase in plantation productivity will provide much of the additional volume (thinnings, top wood, etc.) along with additional sawmill residues resulting from a recovering housing market needed to supply both existing users of fibre and the growing pellet market. None of the available responses to the question are appropriate.”
- “This question does not specify what the current average rotation length is, so this is difficult to answer.”
- “Because the rotation length is not specified, it is difficult to quantify. However, bioenergy has not changed current practices because management decisions were made long before a pellet industry ever existed. In fact, if landowners are making decisions now because of the pellet market, they will likely result in there being more fibre available in the future. This means supporting replanting/ natural regeneration, increased thinning activity, and choosing to continue to manage lands as forest after harvest.”
- “Plantations are established to supply a particular market, generally the saw log market. The rotation length has been determined in order to maximise both total revenue and financial return. Regardless of demand from the wood pellet sector, plantations will be harvested at the point at which the proportion of high value saw log material is maximised, in balance with the cost of extending the rotation over a longer period.”

2.4.1.3 Are the practices in Scenario 10Pa already occurring? (Additional wood (in comparison to the counterfactual) generated by increasing the rate of harvest of hardwood plantations in East Canada (a) by decreasing the rotation period up to 50%).

Summary of comments on whether scenario 10Pa is already occurring

There are no hardwood plantations in East Canada/Quebec.

- “There are no hardwood plantations in East Canada.”
- “This would represent an extreme change in management practice, significantly reducing revenue for the forest owner.”

2.4.1.4 Are the practices in Scenario 10Pb already occurring? (Additional wood (in comparison to the counterfactual) generated by increasing the rate of harvest of hardwood plantations in East Canada (b) by decreasing the rotation period by up to 20%)

Summary of comments on whether scenario 10Pb is already occurring

There are no hardwood plantations in East Canada/Quebec

- “There are no hardwood plantations on public land in Quebec.”
- “This would represent an extreme change in management practice, significantly reducing revenue for the forest owner.”

2.4.1.5 Are the practices in Scenario 11P already occurring? (Additional wood (in comparison to the counterfactual) generated by increasing the rate of harvest of a conifer plantation in Pacific Canada by decreasing the rotation period by up to 20%.)

Summary of comments on whether scenario 11P is already occurring

¹⁶ Fox, T.R., E.J. Jokela and H.L. Allen. 2007. The development of pine plantation silviculture in the southern United States. J. Forestry 105:337-347.

There are no hardwood plantations in Pacific Canada. Changing the rotation to produce pellet fibre is less likely than changing thinning regimes. It is likely that changing the rotations would be constrained by forest practices and regulations.

- “There are no conifer plantations in Pacific Canada”
 - “Changing the rotation is less likely than changing the thinning regimes, etc.”
 - “Likely constrained by forest practices regulations/BMPs.”
- “This would represent an extreme change in management practice, significantly reducing revenue for the forest owner.”

2.4.1.6 Are the practices in Scenario 12Pa or 12Pb already occurring? Additional wood (in comparison to the counterfactual) generated by increasing the rate of harvest of a conifer plantation in boreal Canada (a) by decreasing the rotation by up to 50%

Summary of comments on whether scenarios 12Pa and 12Pb is already occurring

There are no hardwood plantations in Boreal Canada.

- “There are no conifer plantations in boreal Canada.”
- “There are few conifer plantations in boreal Canada.”

2.4.1.7 Are the practices in Scenario 13Pa already occurring? Additional wood (in comparison to the counterfactual) generated by increasing the rate of harvest of hardwood plantations in South USA - by decreasing the rotation period up to 15%.

Are the practices in Scenario 13Pa already occurring?

There are insufficient hardwood plantations in South USA to be able to tell.

- “Few hardwood plantations; not enough hardwood plantation to say” (This comment was received from 4 respondents)
- “Do you mean softwood? If so then very unlikely as you would change the thinning rate vs changing the age of final harvest.”
- “Plantation hardwood is so small that this change would generate an insignificant volume. 98.8% of all hardwood volume is naturally generated.”
- “Current US Forest Service Forest Inventory and Analysis data shows hardwood plantations as just 1.2% of total hardwood inventory. Hardwood plantations are very rare and a quick informal survey of our members indicated that none of our members are sourcing fibre for pellets from hardwood plantations.” (This comment was received from 3 respondents)

2.4.1.8 Are the practices in Scenario 13Pb already occurring? Additional wood (in comparison to the counterfactual) generated by increasing the rate of harvest of hardwood plantations in South USA - by decreasing the rotation period up to 5 years.

Are the practices in Scenario 13Pb already occurring?

There are insufficient hardwood plantations in South USA to be able to tell.

- “I don't think there is a trend right now towards increasing rotation lengths”
- “While there may be cases where harvest rotations are shortened, there are likely also cases where harvest rotations are LENGTHENED as markets for pre-commercial thinning products allow economic extension of saw-timber growth period. Surety in markets is the only way such longer term investments can be made, and lack of policy clarity/certainty likely contributes to decreasing rotation ages, even when other management regimes may provide more wood and economic returns on average.
- “There is no significant acreage of operational hardwood plantations in the South USA” (similar comments received from 3 other respondents)
- “Hardwood plantations in the US South are not at all common and will play an insignificant role as a feedstock for pellets.”

- “Current US Forest Service Forest Inventory and Analysis data shows hardwood plantations as just 1.2% of total hardwood inventory. Hardwood plantations are very rare and a quick informal survey of our members indicated that none of our members are sourcing fibre for pellets from hardwood plantations” (similar comments received from 3 other respondents)
- “Whether the plantation is harvested at a normal age or harvesting is delayed for 5 years would depend on the demand for saw logs and the potential revenue from this market. When demand or prices are low the rotation may be extended slightly.”

2.4.1.9 If you are familiar with a region and aware of changes in this region – what percentage of forest is affected by this scenario?

0% - Canada

<1.2% - USA

2.4.1.10 In the future (between now and 2030), if demand for fibre for pellets stays at the current level how likely do you think it is that each scenario below would occur (or continue to occur, if it already happens)?

No comments

2.4.1.11 Assuming pellet demand increases in the future, what is the likelihood of the scenario (a) at current fibre prices (b) if prices rise by up to 15% and (c) if prices rise by 30%?

Table 2-31 High level summary of comments on question.

Summary to responses for 10P-12P on whether the scenarios would occur if pellet demand increases at current and increased price for fibre

The tenure system in Canada which includes ecological requirements for mature forests would prevent these scenarios from happening. Conifer species require a long time to mature, at least 60-80 years. The lumber market overrides the possibility that rotations would decrease to supply the pellet market.

Canadian comments

- “The tenure system and ecological requirements for mature forest would limit this”
- “We do not have hardwood plantation, except some acres on private woodlots only.”
- “Our coniferous species need more time to be mature, at least 60 to 80 years in plantation.
- “Currently we have a lumber market, so we are not interested in sending our coniferous wood to the pellet market, except perhaps only the pulp logs from commercial thinning.”
- “More factors will play into this.”

US Comments

Table 2-32 High level summary of comments on question.

Summary to responses for 13Pa and 13Pb on whether the scenarios would occur if pellet demand increases at current and increased price for fibre

The majority of respondents said this scenario is unlikely to occur as there are few hardwood plantations in South eastern USA. Any management decision on rotation would be determined by saw log prices and financial return, not by pellet fibre prices.

Three respondents commented that it was already occurring and that higher prices would make it more likely.

- “This scenario is already occurring at current price levels. If prices rise it will only increase the amounts and frequency.” (This comment submitted by two respondents)
- “Hardwood Plantations are extremely rare in the Southern United States” (This comment submitted by three respondents)

- “As we indicated in our response to the original survey questions, hardwood plantations are so rare in the south eastern US (only 1.2% of all hardwood forests in the US) that this scenario would be highly unlikely. This is a non-issue”. (This comment submitted by two respondents)
- “The existence of hardwood plantations in the southern US is very rare. This combined with our responses to 13a and 13b make it very unlikely for this scenario to occur.”
- “Wood pellet prices will not drive this type of management decision. Even if pellet prices increased by significantly more than 30% to be on a par with sawlog prices, it would still make more sense to maximise volume production and harvest at the age of maximum mean annual increment or the point of maximum NPV. If demand and prices are sustained in the long term then forest owners would not need to change the rotation length, especially where there is a surplus of fibre. Premature harvesting may only occur in a small number of circumstances if the forest owner is in a distressed position and forced to harvest or if price increases are very temporary and owners want to make short term opportunistic decisions.”

2.4.1.12 Which of the following changes would encourage the practices described in scenarios 10P to 12P to occur?

Table 2-33 Summary of comment for question what would encourage the practices in the scenarios to occur

Summary of comments on practices that would encourage the practices described in scenarios 10P-12P to occur

The tenure system in Canada would not encourage these practices to occur.

2.4.1.13 Which of the following changes would encourage the practices described in scenarios 13Pa and b to occur?

Table 2-34 Summary of comments for question on what would encourage the practices in the scenarios to occur

Summary of comments on practices that would encourage the practices described in scenarios 13Pa and b to occur

Increased demand for pellet fibre would not drive these changes unless price increases as well. Hardwood plantations are rare in the US South so these changes are unlikely to happen.

- “Increased demand for renewable/low carbon energy will definitely incentivize changes in existing forest management. Whether those changes are positive or negative depends completely on the long term certainty and cost-competitiveness of wood being allowed in the new markets. Uncertainty of market access and high-cost barriers to entry are the most likely to lead to negative outcomes.”
- “Extremely unlikely and the acreage and volume of hardwood plantation is so insignificant that it is irrelevant”
- “All of these are extremely unlikely. Hardwood plantations are a rarity in the US. Demand would not be a driver for this type of change. Price would be the key driver, in combination with a significant long term demand. As previously stated the wood pellet sector does not have the ability to pay for pulp wood that would drive this change. It is also a limited and relatively short term market in comparison to the existing wood products industry. (Comments on Low demand for saw timber) Industry experts are forecasting an increase in saw log demand and pricing as housing starts increase. Historical evidence also shows that, even when saw log demand is reduced, forest owners do not harvest prematurely to supply a lower value market, they would thin and delay final harvest until saw log demand has recovered. (Comments on Changes in forestry incentives) Sufficient financial return would be a driver of change, but it is hard to see how or why this is likely to happen, especially to the extent required to displace the saw log market.

2.4.1.14 Which of the following changes would prevent the practices described in scenario 10P-13P from occurring in the future?

Table 2-35 Summary of comments for question on what would prevent the practices in the scenarios from occurring

Summary of comments on practices that would prevent the practices described in scenarios 10P-12P from occurring

The rate of harvest is determined by Provincial forestry policies and the need to ensure sustainable forest management. It will not be possible to change the rotation for pellets because other markets for wood have more value.

- “Rates of harvest are determined by Forester in Chief for mature tree zones only and to ensure sustainable forest management (SFM). It is not possible to change the tree rotation for the pellets market because the other uses of wood (such as sawmill and veneer) have more value.”
- “Harvest levels are set by provincial policy, not by biomass or sawlog demand.”

2.4.1.15 Which of the following changes would prevent the practices described in scenario 13Pa and b from occurring in the future?

Table 2-36 Summary of comments for question on what would prevent the practices in the scenarios from occurring

Summary of comments on practices that would prevent the practices described in scenarios 13a and b from occurring

There are few hardwood plantations in the US South and this situation is unlikely to change, particularly in response to pellet demand, unless there are policy changes.

- “We do not harvest or grow hardwood for pellets”
- “There is no realistic scenario where fibre price for energy exceeds saw-log price... energy sector competition from other renewables essentially ensures this. As such, the use of possible saw log material (roundwood, etc.) for energy will only occur where there is no available saw timber market or where the relative costs of production (e.g. transport costs of nearby pellet mill vs. a distant sawmill) overwhelmingly favour the energy market. The potential market for low-value wood fibre for energy will be mostly dependent on policy.”
- “The small amount of hardwood plantations that currently exist were planted experimentally by large industrial landowners. The practice was never officially adopted because the plantations did not end up being economically viable, and these forests are no longer being actively managed. Thus, our answer to this question is not applicable because there is little to no effect of the housing market on these type of forests in the SE US.”
- “This is the current situation and it is unlikely to change. Demand will be limited in scale and the paying capability of the wood pellet sector is limited and with small margins. (Comments for market determined by sawlog demand) This has always been the case, even in times of recession. Sawlog demand and pricing is now increasing and is forecast to continue on this trend in the medium term. Therefore this sector will drive and influence forest management practices. (Comments for Long term orientation of forest management strategies) The industrial wood pellet sector is likely to be around for only the next 12 years. Even during this period of time the scale of wood pellet demand will be very small in comparison to other traditional markets. Overall levels of harvest in 2013 were 294 million m³ in the US and 147 million m³ in Canada¹⁷. If the entire projected wood pellet demand of 20.7 million tonnes in 2020¹⁸ were to come from the North America, this would represent just 9% of the 2013 harvest. A significant proportion of pellet furnish will be sawmill or forest residues, therefore the proportion of pulpwood going into pellets will be under 5% of the total harvest (assuming all pellet demand is met only from North America). Much of this increase in demand for pulpwood will come from

¹⁷ FAO

¹⁸ Pöyry

increased productivity if the past trends of US forestry continue, as demonstrated by the USDA data previously referenced. Therefore it is not logical for forest owners to change the long term management practice in their forest to suit a short term low value market.”

2.4.1.16 Additional comments on Scenario 13Pa and b

- “Many talk about the danger of rising commodity prices via energy policy... for the forest sector in the US, this is completely wrong. The danger of commodity prices in the US is that they are too low, not that they are too high. Current practices already struggle to compete with alternative land-use options, and the tight margins of current wood prices are a large barrier to doing necessary forest health treatments such as wildfire mitigation, invasive species control, uneven age management regimes, etc. The whole reason why the US government is in favour of wood energy is BECAUSE it will increase commodity prices.”
- “Reduction or elimination of UK subsidies that will drastically alter the pellet business model and ensure an insufficient financial return so that premature harvesting is not economically feasible.”
- “Over the years, some forest owners in the south have dabbled with hardwood plantations to meet feedstock needs for paper but this practice never became operational at any level of significance. Hardwood stands tend to have more constraints from both an environmental and a perspective and therefore it makes it a poor choice for focusing plantation investment dollars.”

2.4.2 High level summary of scenarios 10P-13P

Table 2-37 High level summary of comments for scenarios 10P-13P (i) Canadian comments

Scenarios 10P-13P High level summary of Canadian comments

The tenure system in Canada does not encourage these scenarios to occur. Conifer species require a long time to mature, at least 60-80 years. The lumber market overrides the possibility that rotations would decrease to supply the pellet market.

(ii) US comments

Scenarios 10Pa and b High level summary of US comments

Hardwood plantations are rare in the US south it is unlikely that these scenarios would have a great impact. Hardwood stands tend to have more constraints from both an environmental and a perspective and therefore it makes it a poor choice for focusing plantation investment.

Respondents added that pellet fibre demand is also unlikely to have a great impact on softwood rotation. This is because rotation is driven by financial return, which is dictated by the highest value markets, not by pellet prices. This scenario would only be driven by policy changes or a much higher return on pellet fibre, neither of which was thought to be likely. The area of forest land impacted by this scenario is thought to be minimal.

2.5 Scenario 14

Summary of scenario 14

Additional wood (in comparison to the counterfactual) from intensively-managed pine plantation, in South USA.

Counterfactual: Reducing the frequency of harvest to every 35 years.

BEAC definition of existing intensively-managed plantations: An area where trees have been planted, especially for commercial purposes)

Note BEAC says: Intensively-managed plantations in South USA are used to produce saw logs, chip-n-saw and pulpwood. The thinnings, smaller diameter sections of the final harvested trees, and low-quality logs are used for pulpwood, and the larger, high-quality trees are used for chip-n-saw and saw logs.

2.5.1 Counterfactual

Table 2-38 high level summary of comments on counterfactual for scenario 14

Summary of comments on counterfactual for scenario 14

Rotations for intensively managed softwood plantations in US south vary from 25-45 years. Some respondents commented that rotations were around 25 years in their regions. Respondents thought that this could be shortened through productivity gains. This means that the counterfactual of 35 years is unrealistic for part of the region.

Rotation length is dictated by financial return from the saw timber markets and pellet demand is unlikely to influence this. Respondents did not think that the absence of pellet demand would result in longer rotation periods ("a lack of demand for small diameter roundwood would likely not cause an increase in rotation length. What would likely cause this is only a lack of demand in saw logs as landowners would likely delay final harvest."). A couple of respondents provided comments on financial modelling of the scenario. These showed that decrease in rotation is likely to be of the order of 3-4 years at the most, but that the greatest impact would be on thinning. One respondent said there are several risks associated with no-thin regimes, including density induced mortality (lost volume), insect infestations, forest health decline, fire hazard, etc. Plus the inherent financial risk of managing for one or two end products rather than growing a tree that has multiple market options. For these reasons the scenario was considered unlikely.

- "The pellet industry has no influence on the rotation for pine plantations. Sawtimber and other markets are the key drivers and the presence or absence of the pellet industry as a whole are not considered when making rotation decisions."
- "Current rotation ages on private industrial lands vary from approximately 25-45 years depending on specifics of the site and markets, with genetic productivity gains and market pressure from investors pushing this length to shorten."
- "Again, Changing the rotation is less likely than changing the thinning regimes, etc. This would be true for many of your questions. It is not simply about changing rotations."
- "There is no reason to believe that a lack of pellets demand will cause rotation age to increase from where it is currently at."
- "Most landowners will time their harvest to maximize value regardless of demand for pellets, unless there are no other markets available. Housing recovery plays a wild card in that if housing does recover, increased demand for pulpwood sized material and clean chips due to the paper and paperboard market combined with pellets and (OSB) Oriented Strand Board will further destroy the small pine grow-drain in the Coastal SE USA." (This comment was given by 1 other respondents)
- "The average rotation age or frequency of harvest in SE Georgia and NE Florida has been less than 25 years for the last 40 years. Frequency of harvest has been decreasing due to intensive

management and increased genetic gain long before anyone had heard of pellets in the US. The additional wood from intensively managed forests is grown for saw timber and is in no way related to pellet demand and has been changing for the last 50 years.

- “Pellets do not drive plantation management; saw logs do. Landowners may plant at a greater density to produce more pulpwood at thinning but the economic driver for the silvicultural regime is saw logs. Simple economics incentivises landowners to produce the desired saw logs in as short a rotation as possible and the increasing productivity of plantations facilitates the shortening of rotations¹⁹.”
- “35 year rotations are longer than the current normal 25 year rotations in our area. Rotation age wouldn't increase. First, it is a misconception that all plantations are managed “intensively.” Second, the purpose of intensively managed plantation pine is for the rapid growth of stem wood volume, particularly targeted for saw timber production. Decisions for rotation age are typically based on a Discounted Cash Flow (DCF) or Net Present Value (NPV) model with saw timber volume and saw timber price per unit being the main drivers behind future, discounted dollars. As such the price per ton of saw timber is the primary driver in moving rotation age targets. While smaller volume products such as pulpwood may have some impact, their volume is significantly lower than saw timber. As a result, a substantial price per unit change would be required to impact the DCF or NPV model output. In addition, studies have shown that forest productivity is higher than it has ever been, and that productivity will continue to improve, the result of better understanding of tree, soil and nutrient issues from one rotation to the next. As a result of these productivity increases, shorter rotation lengths are possible. (This comment was given by 2 other respondents)
- “A lack of demand for small diameter roundwood would likely not cause an increase in rotation length. What would likely cause this is only a lack of demand in saw logs as landowners would likely delay final harvest. This would then cause less pulpwood to be harvested when forests are finally harvested though.”
- “The goal of an intensively managed pine plantation is rapid growth of forest volume for sawtimber production. Landowners typically use models to determine rotation age in a plantation with sawtimber values being the main input, making the price of sawtimber the main driver for rotation age.”
- “The frequency of harvest in managed pine plantations for many of the landowners/ managers we deal with is already around or lower than 35 years. Timberland of the largest landowners is on a 25-35 year rotation, depending on markets. No one has suggested to us that pellet demand will cause them to change the rotation lengths of the plantation, rather they have discussed increasing density of stands.”
- “The purpose of intensively managed plantation pine is for the rapid growth of volume targeted for sawtimber production. Decisions for rotation age are typically based on models with sawtimber volume and sawtimber price being the main drivers in adjusting rotation age targets. The volume of pulpwood is significantly lower than sawtimber and, while considered in the models, has a much smaller impact on the outputs. Residues even less so. Studies show that forest productivity is higher than it has ever been and will continue to improve. This is the consequence of better management practices and seedling selection coupled with an increased understanding of tree, soil and nutrient issues from one rotation to the next. As a result of these productivity increases, shorter sawtimber rotation lengths are possible. Of course, not all pine plantations are managed intensively, so longer rotations will remain for some ownerships both currently and in the future.”
- “1) The pulpwood component of a silvicultural regime does not drive changes to rotation length because it is the lowest value component. 2) Our forest productivity team ran multiple model runs to address this and other scenario 14 questions. This is a proprietary modelling tool that utilizes southern pine growth models in combination with financial discounted cash flow analysis to determine financially optimal silvicultural regimes. Site quality data from actual stands is input along with product specific pricing data and multiple iterations are executed by the model to determine the optimal regime. We use this model to inform the harvest planning process, updated in each geographic location every three years. For scenario 14, we used site data from a typical stand and BAU prices that result in a 25 year rotation, a fairly common situation for us.

¹⁹ Fox, T.R., E.J. Jokela and H.L. Allen. 2007. The development of pine plantation silviculture in the southern United States. J. Forestry 105:337-347.

(3) The model was run with pulpwood stumpage pricing dropped to \$5 to represent the counterfactual. \$5 would be historically low for the south and represents somewhat of a "break-even" price when depletions are accounted for. Depletions represent the "cost basis" of the pulpwood, i.e. the capital cost for the pulpwood component of having purchased or grown timber. Prices below \$5 would therefore trigger other regime or land use changes (see below). The model resulted in the lengthening of rotation from 25 to 28 years the "bare land value" (BLV) was reduced by 14%. BLV represents "land rent" or the present value of the productive capacity of the land. Even in areas where pulpwood demand has significantly declined, we have not utilized a \$5 pulpwood price for harvest modelling. 4) The model run in #3 assumes two thins. At low prices such as \$5, forest owners would reluctantly reduce to one thin or no thinning at all. When we modelled to one thin or no thin, the rotation age decreases to 19-23 with a much greater negative impact to BLV. There are several risks associated with no-thin regimes, including density induced mortality (lost volume), insect infestations, forest health decline, fire hazard, etc. Plus the inherent financial risk of managing for one or two end products rather than growing a tree that has multiple market options. Note that reduction of BLV ties directly to conversion to other uses. 5) Over the long term, management changes would be slow and variable as land owners change management based on their long term perception of the future. Management changes could include: - Landowners stop thinning - Trees begin to thin themselves naturally and mortality accelerates over time. - Some landowners harvest early to salvage their existing investment and begin a new regime - As stands are cut, planting occurs at lower densities - Innovation occurs for new forms of stocking competition control."

- "Wood pellet demand does not influence the rotation length. This counterfactual may occur when saw log demand is limited, when an owner may want to wait for increased prices and demand from this sector and at the same time produce bigger trees with more volume per acre. Demand for pellets would not influence this since the decision to harvest would be based on sawlog revenue. Extending the rotation length in this way would reduce the NPV of the investment, therefore this is unlikely in the case of a corporate owner. However, revenue generated at the time of harvest would be greater (since more volume and bigger trees) and this may be attractive for smaller private growers. Although the decision to harvest would be determined either by a pre-determined management plan (providing market conditions were normal) or their personal circumstances and need to generate revenue."

2.5.1.1 Scenario 14a: Is this scenario already occurring? (Scenario 14(a) Additional wood (in comparison to the counterfactual) is generated from intensively-managed pine plantation, in South USA by (a) – continuing harvesting at current rotation length (25 years)

Table 2-39 Summary of comments on question: is scenario 14a already occurring

Summary of comments on: is scenario 14a already occurring?

A number of respondents commented that current rotations have increased in length due to the housing recession. However, they thought this situation would change only if the housing market picked up: the pellet industry has no influence on the rotation for pine plantations. Saw timber and other markets drive rotation length. A number commented that current rotations were in place for at least a decade before pellet demand existed. Financial modelling of pellet demand demonstrated a one year change in rotation period given good conditions (prices and quantities) for pellet fibre relative to other markets.

Pellet demand is more likely to impact thinnings, perhaps by encouraging an additional thinning. Rotation length is more likely to change as a result of advances aimed at decreasing rotation period or in response to weaker demand in other markets.

Comments

- "The pellet industry has no influence on the rotation for pine plantations. Saw timber and other markets are the key drivers and the presence or absence of the pellet industry as a whole are not considered when making rotation decisions. The current 25 year rotation was in place at least a decade before the pellet industry existed."
- "Market pressures continue to push for earlier harvest times (less than maximum annual increment), and increased use of OSB and other composite wood materials mean the large timber is less necessary. Mid-rotation economic returns from thinning for energy could actually

economically enable lengthening of some rotations while increasing total productivity as rotations are pushed closer towards maximum annual increment.”

- “Reduction in rotation age likely to happen given pellet demand” (This comment came from 3 other respondents)
- “Most landowners will time their harvest to maximize value regardless of demand for pellets, unless there are no other markets available. Housing recovery plays a wild card in that if housing does recover, increased demand for pulpwood sized material and clean chips due to the paper and paperboard market combined with pellets and (OSB) Oriented Strand Board will further destroy the small pine grow-drain in the Coastal SE USA
- “Volumes from intensively managed plantations have been increasing for the last 50 years with a purpose of increasing saw timber volumes to increase financial return.”
- “All landowners would like to shorten rotations, strictly driven by financial drivers. But pellet demand will not decrease pine plantation rotation length. Additional wood will come as a result of greater plantation productivity. Rotation age will likely decrease as productivity increases.”
- “Most landowners will time their harvest to maximize value regardless of demand for pellets, unless there are no other markets available. Housing recovery plays a wild card in that if housing does recover, increased demand for pulpwood sized material and clean chips due to the paper and paperboard market combined with pellets and (OSB) Oriented Strand Board will further destroy the small pine grow-drain in the Coastal SE USA.”
- “An average rotation length of 25 years is a fair estimate of a typical intensively managed plantation. However, saw timber price will drive any change in rotation length. In higher price saw timber periods, some landowners can manage intensively enough for a rotation age shorter than 25 years. Depressed saw timber prices will have the opposite effect, lengthening rotation age beyond 25 years. According to Forest Inventory and Analysis data from the US Forest Service, the current average harvest age for plantation pine is 31 years. In general, a 1-2 year variance may occur in rotation length. A 5-year variance would be at the upper end of the range. At some point, however, it will be sub-optimal for forest landowners to reduce rotation ages further, as it will erode saw timber volume and the significant revenues that saw timber represents.”
- “As mentioned above, sawtimber will drive the rotation length”
- “According to the US Forest Service, the average harvest age for a pine plantation is 31 years, so a 25 year estimate here is fair.”
- “The pellet industry has no influence on the rotation for pine plantations. Sawtimber and other markets are the key drivers and the presence or absence of the pellet industry as a whole are not considered when making rotation decisions. The current 25 year rotation was in place at least a decade before the pellet industry existed. An average rotation length of 25 years is a fair estimate of a typical intensively managed plantation. However, sawtimber price will drive any change in rotation length. In higher price sawtimber periods, some landowners can manage intensively enough for a rotation age shorter than 25 years. Depressed sawtimber prices will have the opposite effect, lengthening rotation age beyond 25 years. According to Forest Inventory and Analysis data from the US Forest Service, the current average harvest age for plantation pine is 31 years. In general, a 1-2 year variance may occur in rotation length. A 5-year variance would be at the upper end of the range. At some point, however, it will be sub-optimal for forest landowners to reduce rotation ages further, as it will erode sawtimber volume and the significant revenues that sawtimber represents.” (A variation on this comment was given by two other respondent)
- “1) Experience with the model we use (described in comments on counterfactual) shows that pulpwood price is not a major driver in determining rotation age. Lowering sawlog prices has a greater impact. This is because the reward for waiting for the size premium no longer offsets the time value of money (discount price). 2) Using our model we modelled the 25 year BAU stand at 10-20-30 (pulpwood-chip-n-saw-sawlog). With a counterfactual of reduced traditional pulpwood demand, if "additional wood" for pellets is generated by reduced traditional product demand, the price split remains 10-20-30 and nothing changes. If pellet demand significantly exceeds supply generated by loss of traditional pulpwood demand and pulpwood prices increase by 50%, our model results in a 24 or a 25 year old rotation as generating the same BLV, so rotation is almost reduced by 1 year but not quite. This price increase would be unlikely given the additional supply from increased forest productivity (see #4 below) and the small

projected future size of pellet markets compared to the paper market. 3) In addition to reduced traditional product demand supplying increased pellet demand, additional wood for pellets can be met by increased forest productivity. Since 1998, forest productivity in our pine plantations has increased by 54%. As a tangible example, consider that, in the year 2000, first thins yielded 20-25 tons of pulpwood per acre. In 2015 they are yielding 35 to 40 tons of pulpwood per acre. This alone represents a 60 to 70% increase of pulpwood produced by first thins.”

- “This is a fairly typical rotation length for intensively managed plantations in the private (corporate) sector. Although it would depend on the productivity of the site and the management inputs. The history of pine production in the South is that markets have driven innovation and extra productivity from the same acreage. As demand and removals have grown, the productivity of forests has responded and inventories have got even larger over time. This added productivity is the most likely source of additional fibre. On sites with lower productivity the rotation age may be longer.”

2.5.1.2 Scenario 14 b: Is this scenario already occurring? (Additional wood (in comparison to the counterfactual) is generated from intensively-managed pine plantation, in South USA (b) reduce rotation length (e.g. to 20 years) in response to increased demand for fibre for pellets)

Summary of comments on: is scenario 14b already occurring?

No evidence was provided in support of this scenario occurring. Most respondents thought it was unlikely because rotation length is driven by financial return in other markets and pellet demand is not sufficient to impact this. One respondent produced evidence to show that a significant increase in demand (>400%) and price (~50% increase) would be required to make this happen, which is unlikely; another that analysis changing saw timber and pulp demand showed that even in extremely favourable conditions for pellet fibre the change in rotation is likely to be two years at the most.

Respondents said that rotation lengths were decreasing as a result of other factors before pellet demand happened.

- “This is a false assumption as the industry does not manage their harvest cycles based on the pellet industry. The pellet industry is not a driver and only uses materials that others do not want.”
- “While there are likely a few places where this is happening, I'm guessing this is pushing the envelope in most.”
- “Due to increased demand for pulp wood, there may be some semi natural pine forests on marginal land that were planted as mixed use forests and were less than optimally productive or where the sawlog market was far away. These may be planted as high density pulpwood tracts but these will be rare and would often be just as equally at risk of being converted to uses other than forest. In any case this would be rare.
- “Reduction in rotation age likely to happen given pellet demand.” (This comment was given by 2 respondents)
- “Most landowners will time their harvest to maximize value regardless of demand for pellets, unless there are no other markets available. Housing recovery plays a wild card in that if housing does recover, increased demand for pulpwood sized material and clean chips due to the paper and paperboard market combined with pellets and (OSB) Oriented Strand Board will further destroy the small pine grow-drain in the Coastal SE USA.”
- “Many larger land owners with capital for intensive management decreased rotation length to 20 years or below in the 1990's which is long before any pellet demand in the US.”
- “Sawtimber production is the driver, not pellet demand.”
- “Pulpwood markets, not pellet markets drive the production and harvesting of pine roundwood in our sourcing area. If a Discounted Cash Flow (DCF) or Net Present Value (NPV) model were run, based on pulpwood price, the model would likely generate the same rotation length because of the lower volumes. At the most, it might reduce a rotation by two years
- “Due to increased demand for pulp wood, there may be some semi natural pine forests on marginal land that were planted as mixed use forests and were less than optimally productive

or where the sawlog market was far away. These may be planted as high density pulpwood tracts but these will be rare and would often be just as equally at risk of being converted to uses other than forest. In any case this would be rare.”

- “Pellet demand in general would not cause a reduction in rotation age, and even pulpwood and other higher-value industries would not cause a 5 year reduction, as production volumes would be lower making revenues lower. At most, rotation age would be changed 1 or 2 years based upon high-value market demands.”
- “This happens rarely, only in small isolated pockets, primarily in the Coastal Plains; these harvests are what the industry considers outliers. They do not occur across the entire South. Pellet demand, in general, will not be the cause of a reduction in rotation age of 5 years. If a Discounted Cash Flow (DCF) or Net Present Value (NPV) model were run, based on pulpwood price, the model would likely generate the same rotation length because of the lower volumes. At the most, it might reduce a rotation by two years. An analysis conducted by the National Alliance of Forest Owners and Forisk “concluded that forecast pine pulpwood prices in the South in 2016 would have to increase from \$11.47 per ton to higher than chip-n-saw prices of \$17.09 per ton for landowners to be economically indifferent between a pulpwood-dominated forest and a sawtimber-dominated forest. Across the South, bioenergy demand would have to increase 435% by 2016, from an expected 22 million green tons a year to 120 million green tons per year, for pine pulpwood prices to reach \$17.09/ton*. This level of bioenergy demand in the region by 2016 is extremely unlikely. In comparison, the forest industry in the South consumed 103.3 million green tons of pulpwood in 2010. Biomass energy wood use will have to be high enough for a sustained period to maintain high pine pulpwood prices to cause a shift in landowner behaviour. At the same time, competing higher-valued product prices would have to remain at prices low enough to incentivise switching from pulpwood to sawtimber rotations. Once established, these prices would have to remain economically feasible for over 23 years to incentivise multiple pulpwood rotations on the same property. Overall, the analysis suggests that a significant shift from sawtimber to pulpwood rotations in the South is highly improbable²⁰.” (* Please note that these are stumpage prices, and not complete delivered fibre prices which would be much higher.)
- “I am not aware of this change in rotation management decision with any landowners we've worked with for sourcing pellet material”
- “An intensively-managed plantation, by definition, means a considerable investment in seedlings and management practices to support a return of value through sawtimber production. Pellet markets are unlikely to affect the models in any significant to reduce rotation length by five years. This is not say that isolated instances of shorter rotation will not occur but it will not be a general practice.
- “As a general principle, even if prices by product class were not considered, the growth rate of southern pine exceeds the discount rate and it pays to wait another year to benefit from the extra growth, even after paying the discount rate. This is the case until rate growth slows down to less than the discount rate. Increases in forest productivity have enabled growth rates for a longer number of years with trees becoming much closer to sawlog size before the growth rate slows. In the 1990s paper companies dabbled with "pulpwood rotations" with pulpwood only harvests at about 20 years. This did not become an operational regime for variety of reasons. With the increases in forest productivity since then, the financial feasibility of a pulpwood rotation is even lower. 2) We pushed the model by running an extreme assumption as a sensitivity test. Remember from question 106 that our BAU case is \$10-\$20-\$30 (pulpwood-chip-n-saw-sawlog). For this test we increased pulpwood by 100% and at the same time reduce sawlog from 30 to 25 (20- 20-25). This is historically unprecedented and extremely unlikely given supply from increases in forest productivity along with lost traditional demand. Even so, the outcome of the model is that rotation length is reduced by only 2 years”.
- “This is not happening, or happening very rarely. Prices for pulpwood would need to be significantly higher to justify this change in management regime, some reports suggest that an increase of 200% would be required in pulpwood prices to make this option viable.”

²⁰ Mendell et al., 2011

2.5.1.3 In the future (between now and 2030), if demand for fibre for pellets stays at the current level how likely do you think it is that each scenario below would occur (or continue to occur, if it already happens)?

Table 2-40 Scenario 14: Summary of comments on question: If pellet demand stays the same in the future how likely do you think it is that this scenario would occur

Scenario 14: Summary of comments on question: If pellet demand stays the same in the future how likely do you think it is that this scenario would occur

Most comments said that the counterfactual is flawed as rotation lengths are currently shorter than it suggests. In addition pellet demand does not drive rotation length. A shorter rotation is unlikely to provide optimal financial return to the land owner.

- “The counterfactual described is hard to discuss because it is so far from reality. Pine plantations are currently on rotations shorter than 35 years due to good management and landowners are financially motivated to produce the desired stand as quickly as possible, primarily driven by sawlog production. It is very unlikely that pellet demand will change rotation length.” (A variation on this comment was received from two other respondents).
- “Rotation lengths for intensively managed plantations will be driven mostly by sawtimber price-valuation decisions. In addition, pellet demand is not likely to affect prices to the extent that it will change rotation lengths. Pellet demand is just one of many market dynamics that prompt timber price changes.”
- “The counterfactual for this scenario is seriously flawed. Most intensively managed pine plantations in the Southern US are already managed at 25 years for sawtimber production. Our own forest lands were at 25 years long before the pellet industry existed and the absence or presence of a pellet market does not influence this decision making process. The suggestion that a 35 year rotation could exist indicates a lack of understanding of forestry practices in the US South - a properly managed forest is ready for harvest in much less than 35 years.”
- “The existence of hardwood plantations in the southern US is very rare. This combined with our responses to 13a and 13b make it very unlikely for this scenario to occur.”
- S14a “A normal rotation range for plantation pine in the US South is 25-35 years. If the site specifics and local markets dictate that the current optimum rotation for a particular stand is 25 years then this likely to remain the case. Rotations would only be extended to produce larger diameter and higher volumes of saw logs, or if sawlog demand was very low and did not justify harvesting at the current time, this may be delayed until markets recovered.”
- S14b “A much shorter rotation is unlikely to provide optimum NPV for the forest owners, regardless of a price increase in wood pellets. Growth rates would still be increasing at this age and the extra volume production gained by waiting another 5-10 years is likely to provide a much better return to the forest owner. Assuming that wood pellet demand and price increases are long term then the owner is much more likely to wait and maximise volume production than to harvest prematurely.”

2.5.1.4 Assuming pellet demand increases in the future, what is the likelihood of the scenario (a) at current fibre prices (b) if prices rise by up to 15% and (c) if prices rise by 30%?

Table 2-41 Scenario 14: Summary of comments on question: Assuming pellet demand increases in the future how likely do you think it is that this scenario would occur at current prices and if prices rise?

Scenario 14: Summary of comments on question: Assuming pellet demand increases in the future how likely do you think it is that this scenario would occur at current prices and if prices rise?

Most comments said that the counterfactual is flawed as rotation lengths are currently shorter than it suggests. In addition pellet demand does not drive rotation length. A shorter rotation is unlikely to provide optimal financial return to the land owner.

- “The counterfactual described is hard to discuss because it is so far from reality. Pine plantations are currently on rotations shorter than 35 years due to good management and

landowners are financially motivated to produce the desired stand as quickly as possible, primarily driven by sawlog production. It is very unlikely that pellet demand will change rotation length.” (A variation on this comment was received from two other respondents).

- “Rotation lengths for intensively managed plantations will be driven mostly by sawtimber price-valuation decisions. In addition, pellet demand is not likely to affect prices to the extent that it will change rotation lengths. Pellet demand is just one of many market dynamics that prompt timber price changes.”
- “The counterfactual for this scenario is seriously flawed. Most intensively managed pine plantations in the Southern US are already managed at 25 years for sawtimber production. Our own forest lands were at 25 years long before the pellet industry existed and the absence or presence of a pellet market does not influence this decision making process. The suggestion that a 35 year rotation could exist indicates a lack of understanding of forestry practices in the US South - a properly managed forest is ready for harvest in much less than 35 years.”
- “The existence of hardwood plantations in the southern US is very rare. This combined with our responses to 13a and 13b make it very unlikely for this scenario to occur.”
- S14a “A normal rotation range for plantation pine in the US South is 25-35 years. If the site specifics and local markets dictate that the current optimum rotation for a particular stand is 25 years then this likely to remain the case. Rotations would only be extended to produce larger diameter and higher volumes of saw logs, or if sawlog demand was very low and did not justify harvesting at the current time, this may be delayed until markets recovered.”
- S14b “A much shorter rotation is unlikely to provide optimum NPV for the forest owners, regardless of a price increase in wood pellets. Growth rates would still be increasing at this age and the extra volume production gained by waiting another 5-10 years is likely to provide a much better return to the forest owner. Assuming that wood pellet demand and price increases are long term then the owner is much more likely to wait and maximise volume production than to harvest prematurely.”

2.5.1.5 Comments on the percentage land affected by scenario 14

<5% or minimal

Exception: Georgia: 100% could be affected.

Table 2-42 Summary of comments on the percentage of land affected by scenario 14.

Summary of comments on the percentage land affected by scenario 14

Most respondents said they have seen no evidence that this scenario is occurring. On the other hand there were comments that this is happening in Georgia due to the concentration of pulp and paper mills in the area as well as bioenergy or pellet facilities. The evidence for this was drawn from the study by Evans et al (2013).

Comments

- “I have seen no evidence that this is occurring.” (This comment from 7 respondents)
- “As far as the reports show, overall rotations length is not being affected by pellet markets.”
- Comment on Georgia: “Georgia Biomass is located in sourcing area that overlaps with eight active pulp and paper mills as well as five bioenergy or pellet facilities active as of April 2013.”²¹

2.5.1.6 Factors that would encourage scenario 14 to occur

Table 2-43-44 Summary of comments on factors that would encourage scenario 14 to occur

Summary of comments on factors that would encourage scenario 14 to occur

²¹ See GA Biomass study in Evans, J.M., R.J. Fletcher, Jr., J.R.R. Alavalapati, A.L. Smith, D. Geller, P. Lal, D. Vasudev, M. Acevedo, J. Calabria, and T. Upadhyay. 2013. Forestry Bioenergy in the Southeast United States: Implications for Wildlife Habitat and Biodiversity. National Wildlife Federation, Merrifield, VA, EX. Summary 6-7 and text at pp 45-73.
https://www.southernenvironment.org/uploads/pages/file/biomass/nwf_exec_summary.pdf
http://www.nwf.org/pdf/Conservation/NWF_Biomass_Biodiversity_Final.pdf

Although theoretical changes in financial return or other factors might appear to encourage the scenario, respondents commented that they thought these were unlikely to happen.

- “The pellet industry has no influence over rotation. We would only move to shorter rotation cycles if it were economically feasible, provided that our rotation was not so short as to jeopardize overall forest sustainability.”
- “We answered this question but believe it is extremely unlikely that pellet demand will shorten rotations.”
- “Note that option 3 should not be attributed to energy markets, it would need to be included in any baseline analysis.”
- “Ultimately sawtimber prices control rotation age”

2.5.1.7 Factors that would prevent scenario 14 from occurring

Table 2-45 Summary of comments on factors that would prevent scenario 14 from occurring

Summary of comments on factors that would prevent scenario 14 from occurring

Financial returns from other more attractive markets and alternative objectives for land owners are both likely to prevent a decrease in rotation from pellet demand.

- “Pellet demand has no effect on forest management in the US South. The emergence of pellet demand neither increases nor decreases the probability of scenario happening.”
- “Sawtimber economics drives management decisions. Landowners have a financial incentive to produce saw logs in as short a rotation as possible but pellet demand will not impact rotation length. Regarding this question, we do not believe a reduced volume of sawmill chips, with the emergence of a pellet market, will either increase or decrease the likelihood of shortened rotations. We just came through such a period and by and large deferred harvest in anticipation of an improving market.”
- “Lack of markets for wood increase the likelihood that forest land will either be converted to agriculture or development” (This comment from two respondents)
- “During the housing recession that started in 2008, some forest owners deferred final harvests while waiting for demand to return. Because they were trying to hold saw logs longer, they undertook more thinnings and therefore produced more pulpwood. As pulpwood was in higher demand to compensate for fewer sawmill residuals being on the market, the demand for pulpwood made this possible.”
- “Lack of markets for wood increase the likelihood that forestland will either be converted to agriculture or development. Current FIA data suggests that the average age of hardwood removals sustainable sourcing of biomass for bioenergy states that “the greatest loss [in forestland] is expected to occur in areas where forest product markets are weak and development pressures are strong. The economic values associated with the South’s forests may be a critical factor in keeping private lands as forest, and maintaining the conservation values provided by a mosaic of native and plantation forests, in a variety of ages and successional stages.”
- “Ultimately, sawtimber prices control rotation age.”
- “We base our comments on model runs of our financial model as evidence. While these economic principles are more likely to be followed by a large corporate owner who is accountable to our shareholders for financial performance, we observe that they are also followed somewhat and more intuitively by even small landowners. If some forest owners are unlikely to follow these financial trends because of ownership objectives, they are also unlikely to change management based on the presence of pellet markets.”

2.5.1.8 Additional Comments on Scenario 14

- “Estimated pellet demand was found to have a small relative impact on regional forest product prices, removals, and inventories²²”
- “Results indicated that until the price paid for biomass reaches \$17.94, \$21.16, or \$22.05/green ton, integrated or conventional management systems that produce forest products such as sawtimber will result in superior financial returns to the landowner²³.”
- “Forecast pine pulpwood prices in the South in 2016 would have to increase from \$11.47 per ton to higher than chip-n-saw prices of \$17.09 per ton for landowners to be economically indifferent between a pulpwood-dominated forest and a sawtimber-dominated forest²⁴.”
- “With multiple product classes the two highest paying products play the largest part in determining the rotation decision²⁵.”
- “Even with increased use of small diameter roundwood as a pellet feedstock, it is unlikely that pulpwood prices will increase to a level where land managers will shorten rotations to produce more pulpwood. A forest economic study published in Global Change-Bioenergy used timber supply modeling to project the effect of increasing pellet demand in the Southeast. The authors found that “Estimated pellet demand was found to have a small relative impact on regional forest product prices, removals, and inventories... Pulpwood provided the majority of feedstock to meet the 12.2 million metric tons of estimated pellet consumption and thus bore the brunt of expected harvest change. Even so, projected levels of price change for this feedstock were found to fall within levels of historic variation.” (Galik and Abt, 2015)

2.5.2 High level summary of comments on Scenario 14

Table 2-46 Scenario 14; high level summary of comments

Scenario 14: High level summary of comments

Few respondents provided evidence that these scenarios would occur. Most comments focused on the low financial returns from pellet fibre compared to other forest products, which means that pellet demand is unlikely to be a strong determinant of management decisions for intensively managed pine plantations. Evidence of the significant changes both in demand and return that would be required to alter this situation was presented. Respondents did not think that it was likely that these conditions would occur.

There were a number of comments on scenario 14 b that lower rotation lengths were witnessed prior to the increase in pellet demand, driven by the desire to increase productivity in general.

There was one set of comments that contradicted this, related to Georgia. In this region the respondents thought that the demand from paper, pulp and pellet mills in combination would impact management of plantations. Evidence was based on a study of the potential demand against supply in the region.

²² Galik, C. and Abt, R. 2015. Sustainability Guidelines and Forest Market Response: An Assessment of European Union pellet Demand in the Southeastern United States. GCB Bioenergy, May. (<http://onlinelibrary.wiley.com/doi/10.1111/gcbb.12273/full>)

²³ Love, J. 2011. An Analysis of the Feasibility of Forest Biomass Production from Pine Plantations in Georgia. Georgia Forestry Commission. <http://www.gfc.state.ga.us/utilization/economic-impacts/AnalysisoftheFeasibilityofForestBiomassProductionApr2011.pdf>

²⁴ Mendell, B., Hamsley, A. and Sydor, T. 2011. Woody Biomass as a Forest Product: Wood Supply and Market Implications. National Alliance of Forest Owners/Forisk Consulting. <http://www.forisk.com/wordpress/wp-content/assets/NAFO-US-Wood-Markets-Report-102411.pdf>

²⁵ Optimal Forest Rotation with Multiple Product Classes RJ Brazee, P Dwivedi Forest Science 61 (3), 458-465

2.6 Scenarios 19-21

Scenarios 19-21: Displacing non-bioenergy wood uses

This set of scenarios examine a situation in which demand for pulpwood increases, which could result in pulpwood which would otherwise be used for non-bioenergy purposes being used for pellets instead. The displaced wood product might then instead be imported, which would result in indirect GHG consequences in that region. Currently the main importers of wood into the USA are: Canada, Brazil, Chile, and China. The scenarios below examine a range of potential indirect changes resulting from higher demand for fibre for bioenergy.

Scenario 19 Pulpwood from South USA, causing indirect impact of Eucalyptus plantation replacing Brazilian rainforest.

Scenario 20 Pulpwood from South USA, causing indirect impact of Eucalyptus plantation replacing Brazilian abandoned degraded pasture land, which would otherwise revert to tropical savannah (IEA, 2011).

Scenario 21 Pulpwood from South USA, causing indirect impact of increasing the harvest rate of naturally-regenerated coniferous forest in Pacific Canada, from every 70 years to every 50 years.

Counterfactual: Pulpwood produced in South USA used for non-bioenergy purposes.

2.6.1 Counterfactual

2.6.1.1 Is the counterfactual provided above an accurate description of what currently happens when there is no or low demand for fibre for pellets?

Table 2-47 Scenarios 19-21 Summary of comments on counterfactual?

Scenarios 19-21 Summary of comments on counterfactual

Comments support the counterfactual, although some respondents say that there is an excess of raw materials currently used for pellets and this material would otherwise not be utilised. The pulp industry in the USA has been consolidating for more than two decades, so there is weak pulp demand generally. This is location dependent. When there is no non-bioenergy market for pulp wood it is left in the forest. Two respondents commented that this means that the forest self-thins (through mortality) and can become unmanageable and vulnerable to alternative uses.

- “There is an excess of raw materials currently used for pellets and this material would otherwise not be utilized”
- “True, though increasing competition from foreign sources and weak pulp demand generally has meant the available market for this wood is pretty flat. The pulp industry in the US has been consolidating and contracting for 20+ years.”
- “Most of the time fibre would go into pulp and paper but could also go into a future bioenergy market. But if there was less demand for pulpwood then there would also be a decrease returns and land owner choices to leave land in forest.”
- “Yes, unfortunately we know that the combination of increased pellet feedstock demand, the age class distribution of inventory, and the inelastic supply response of land owners to a change in price have led to increased pellet feedstock prices and increased harvests in the U.S. South.²⁶”
- “Pulpwood is purchased by pulp and paper, OSB and MDF manufacturing, and non-pellet energy markets.”
- “Pulpwood is used in the pulp and paper industry, the panel board industry, and in other biomass or bio-fuel industries. When demand from other industries is low, more material may be left in the forest.”

²⁶ Lang 2014.

- “There are times, in some locations, when the low demand for pulpwood results in it being left in the wood.” (This comment was given by two respondents)
- “Even if there are no pulpwood markets for pulp mills, there can be other non-bioenergy markets in the US. When a market exists for pulpwood, it is currently purchased by pulp and paper companies, OSB manufacturers and non-pellet domestic energy markets. When no market exists for pulpwood, however, it is left in the forest.” (This comment was given by 3 respondents)
- “Currently pulpwood mostly goes to pulp and paper and OSB manufacturers, and for domestic energy use. Pulpwood that has no market to sell into is left in the forest.”
- “Currently pulp and paper markets are at an all-time low in the Southeast, so in most situations the pellet demand is picking up wood demand that is otherwise underutilized. Competition between pellets and pulp/paper is dependent on location and proximity of the facilities that could create some competition.”
- “Again, markets control. If there are markets for non-bioenergy products such as pulp and OSB, then the counterfactual is accurate. However, if no markets exist, the forest becomes unmanageable and becomes vulnerable to alternative uses.”
- “Due to decline in traditional demand for pulpwood and increased forest productivity, sometimes thinning backlogs develop when there is no pellet demand. This leads to mortality through self-thinning rather than pulpwood production for non-bioenergy purposes.”

2.6.1.2 Scenario 19 is this already occurring? Use of pulpwood from the South USA results in the indirect impact of Eucalyptus plantation replacing Brazilian rainforest

Table 2-48 Summary of comments on the question: scenario 19 – is this already occurring

Summary of comments on the question: scenario 19 – is this already occurring

A number of respondent commented that pulp and paper fibre demand in the US is not related to pellet industry demand. Other comments are that the development of Brazilian pulp supply pre-dates the pellet industry in the US South. The market for Brazilian pulp mills is different to that for South eastern US pulp and the two are not connected.

A number of respondents commented that it is not possible to know if this substitution is happening as there are many factors involved in depletion of the Brazilian rain forest, in particular agricultural pressures within Brazil. Evidence from USDA and Pöyry was drawn on to show that pulp demand in the US south is expected to change, with a decline in pulp and paper demand. A number of comments said that there is no evidence that demand for pellets drives these changes.

- “Pulp and paper fibre demand in the US South is not related to pellet industry demand or consumption.”
- “Lack of use or market access of US wood would lead to this... currently the causality here is opposite. Increases in southern hemisphere production are increasingly outcompeting US producers who have higher labour and land costs. For example, it is now cheaper to bring in roundwood from Chile/Brazil to Maryland, rather than harvest from Virginia (neighbouring State).”
- “Eucalyptus is a substitute for hardwood pulpwood in the US SE only. There are very few hardwood pulp mills remaining in the SE US as they have all already moved to Brazil and so those pellet mills utilizing hardwood (in the mid-Atlantic) are filling a void in that market. Further, hardwood is mainly used for printing and graphical papers for which global demand continues to decline due to the growth of digital media. Hardwood pulpwood is not often used for engineered wood products.”
- “I don't know and I doubt that anyone else can answer this question with any certainty. There are simply way too many other factors and issues involved in addressing the depletion of the Brazilian rain-forest. We do know that negatively impacting business in the United States can result in other regions out competing the US and driving US businesses off-shore.
- “The demand for pellets will not affect Eucalyptus plantations in Brazil. The decision by pulp and paper to import Eucalyptus will be driven by logistics cost (harvesting, chipping, transportation). Conversion to eucalyptus plantations will be driven by global demand of pulp

and paper. Hardwood consuming pulp and paper mills in the US South have almost all closed with only a couple remaining.

- “Conversions of rain forests are usually associated with agriculture. Conversion to plantations, if it occurs, is driven by global paper demand, not the bioenergy market. Many of the paper mills in the US South that used hardwood have closed.

Pellet demand. In this case pellet demand is not displacing non-bioenergy use and is providing In addition - “In July 2012 the USDA commissioned a study to assess the expected development of US forest inventory and growth rates across the entire US out to 2050, based on both historic data and growth rate modelling. This data showed that in the US Southeast, between 2014 and 2025, it is expected that available softwood volumes will increase by ~11%. Hardwood volumes are assumed to remain stable over the same period. As a result of this, the total wood supply potential in the US Southeast can be expected to increase by 10 million odt, reaching 150 million odt by 2025. There is also expected to be a significant change in demand in this region. The pulp and paper sector is likely to see a decline in demand, due to a fall in demand for writing and newsprint papers which make up the large majority of production in this region. Balancing out this fall in demand are anticipated increases in demand from the wood based panels and wood pellets industries. The wood based panels industry is estimated to grow with a CAGR of 5% out to 2020, but slowing down to only 1% CAGR by 2025. The wood pellet industry will also see a significant growth in demand of 15 million odt, with new pellet mill capacity being built to meet the increasing demand coming from Europe. Overall, due to the increase in supply and decrease in demand from the pulp and paper industry, there will continue to be a surplus of material in the US Southeast totalling 20 million odt. 12 million odt of this surplus will be from immobilised material, with the remainder mostly consisting of harvesting residues.²⁷”

- “Conversions of rainforest are more to agricultural land versus eucalyptus. Any conversions are due to global markets, not necessarily the pellet market in the US. New Pulp mills have already been built outside the US due to fibre supply and labour cost. Conversion of rainforest is more likely to be to agricultural land. Conversions of rainforest to Eucalyptus plantation, if this were occurring, would be primarily a result of global demand for paper and packaging products. Reduced capacity at pulp and paper mills and regulatory conditions blocking new mill construction in the South USA may lead more mills to be built in Brazil. Demand for fibre from pellets is not, and will not be, a driver of these conversions. It should also be noted that, prior to the pellet industry developing in the South USA, almost all hardwood consuming pulp and paper mills in the South USA closed, leaving excess hardwood supply in the region, which is now available for pellets. As a result, pellet demand for hardwood will not be displacing any non-bioenergy wood use” (This comment was given by four respondents)
- “Conversion to eucalyptus plantations would more likely be the result of an increase in paper and packaging demand. The past several decades have seen many pulp and paper mills close and others reduce capacity. This, plus some regulatory issues preventing new mill construction in the southern US may lead to more mills being built in Brazil if there is increased demand for paper and packaging products globally. Demand from pellets is not, and will never be, a driver of these types of conversions. The closing and reduction of capacity of pulp and paper mills across the US South in the past 10-20 years has left excess fibre supply in the marketplace, which can now be used by the pellet industry. US Forest Service data shows a 14% decline in pulpwood production in the last 20 years from almost 300 million metric tons/year to less than 260 million metric tons/year. Projections for pellet exports from the US to reach almost 20 million metric tons/year in 2017, which is less than half of the excess supply left by the decline of pulpwood production.
- “Ostensibly indirect effects would only take effect if the U.S. pulp and paper market were not already in decline, or at least this effect would be muted. It would be useful to see a modelling analysis taking into account these dynamics, I haven't seen this to date.”
- “In 2014, only 2% of our pulpwood production in the US south was sold to pellet mills. This only occurred in areas where traditional demand for pulpwood had previously declined due to plant closures. Therefore, displacement due to pellet demand on our lands cannot already be occurring.”

²⁷ From Pöyry – Risk of Indirect Wood Use Change prepared for Energie Nederland – July, 2014.

- “Importing wood chips or pulpwood from Brazil is not economically viable. There are a number of other reasons why this scenario would not happen: (i) there is a substantial surplus of pulpwood and forest inventory in the US South and it would be much cheaper to transport pulpwood regionally across the US than to do so from Brazil. (ii) It would be illegal to replace Brazilian rainforest with eucalyptus. This region of Brazil is also so remote and isolated that the logistical costs would be extremely high and prohibitive. (iii) This type of operation would take at least 8-10 years before the eucalyptus was mature, by which time wood pellet demand would be declining. It also ignores the fact that eucalyptus is a hardwood species and could not be used in a softwood pulp mill.”

2.6.1.3 Scenario 20 is this already occurring? Use of pulpwood from the South USA results in the indirect impact of Eucalyptus plantation replacing Brazilian rainforest

Table 2-49 Summary of comments on the question: scenario 20 – is this already occurring?

Summary of comments on the question: scenario 20 – is this already occurring?

Most comments referred us to the comments on Scenario 19. The market for pellets is not linked to that for pulp and paper. Pulp and paper production in Brazil pre-dates the production of pellets in South USA. Causality is difficult to prove. One respondent said that if this happens it is only sometimes and in a peripheral manner.

- “The causality is the opposite.”
- “As above, (for scenario 19) (this comment was given by 3 respondents)
- “The demand for pellets will not affect Eucalyptus plantations in Brazil. The decision by pulp and paper to import Eucalyptus will be driven by logistics cost (harvesting, chipping, transportation)”
- “Answer: sometimes: When it occurs it is due to global paper demand and the desire of the landowners to increase profitability. See response to Scenario 19.”
- “Sometimes: Only in a peripheral manner, as the conversions are generally the result of increased demand for pulp and paper worldwide and the desire to increase productivity and profitability of these degraded lands (this comment was given by two respondents)
- “These conversions are typically done with the desire to increase productivity of the degraded land with the hope of increasing profitability. As with the eucalyptus plantations, this type of conversion would come from an increase in global demand for paper and packaging.
- “Demand for bioenergy will not drive this scenario, as conversions are generally the result of increased demand for pulp and paper worldwide and the desire to increase productivity and profitability of these degraded lands”.

2.6.1.4 Scenario 21 is this already occurring? Use of pulpwood from the South USA results in the indirect impact of Eucalyptus plantation replacing Brazilian rainforest

Table 2-50 Summary of comments on the question: scenario 20 – is this already occurring?

Summary of comments on the question: scenario 20 – is this already occurring?

A range of comments were provided but we were referred back to comments on scenario 19. In particular that causality is difficult to prove. In theory it could happen but this would be the opposite to previous trends that saw Canadian mills closed and more opened in the USA. One comment was that there is no evidence of any correlation whatsoever. The areas and products are too disjointed to have any impact. Harvest and rotation lengths in Pacific Canada are driven by saw timber demand. Forest policy in Canada is driven by the Crown and change of this type would be difficult.

- “Again, lack of use or market access for southern US wood would lead to these impacts”
- “Theoretically, a rise in prices for pine pulpwood could displace softwood demand from USA to Canada over time. This would actually be a reversal of previous trends where Canadian mills closed and more opened in the US but it would not cause a reduction in rotation time. It would actually help stimulate a market in Canada for the pulpwood fraction of final harvests and

sawmill residues which have historically been piled and burned or incinerated in beehive burners.”

- “I don't know and I doubt that anyone else can answer this question with any certainty. And I seriously doubt that this scenario can even be measured, at least in the short-term. Over time it may be possible to assess if this scenario is occurring.”
- “There is no evidence of any correlation of the use of pulpwood in the US South to harvests in Pacific Canada. None whatsoever. The areas and products are too disjointed to have any type of impact. Harvest rates and rotation lengths in Pacific Canada will continue to be driven by sawtimber demand. Forest policy in Canada is driven by the Crown and any change will be difficult.” (Variations on this comment were provided by three other respondents)
- “The geographies and markets involved make this scenario most unlikely. While numerous factors can influence harvest rates, ultimately rotation length is determined by the governments in Canada. See response to scenario 19”
- “Harvest rotations in Pacific Canada will continue to be driven by solid wood products and the growth rates needed to produce adequately sized material. Given the pine beetle infestations in this region, it is doubtful that this scenario would have much impact in Canada.”
- “Importing wood chips from Canada to the US South would be even more expensive, and the market could certainly not afford to pay the price that would be required to incentivise premature harvesting and the loss of sawlog revenue. There is a substantial surplus of fibre in the US South it would be much cheaper and easier to mobilise this material.”

2.6.1.5 If you are familiar with a region and aware of changes in this region, please provide the name of the region with an indication of the percentage forest affected by it, with evidence to support this

No comments – hardly any area affected.

2.6.1.6 In the future (between now and 2030), if demand for fibre for pellets stays at the current level how likely do you think it is that these scenarios will occur (or continue to occur, if they already happen)?

Table 2-51 Scenarios 19-21 Summary of comments on the question: in the future if demand for fibre for pellets stays at current level how likely is it that these scenarios will occur?

Summary of comments on the question: in the future if demand for fibre for pellets stays at current level how likely is it that these scenarios will occur?

Many respondents commented that these scenarios are not likely to happen and that there is no relationship between the Brazilian rainforest or forest in Pacific Canada and the pellet industry in the US South. If US pulp supply was shifted due to pellet fibre demand then it would most likely be to neighbouring regions.

- “none of these scenarios are real or likely to happen”
- “There is no relationship between the Brazilian rainforest and the US South pellet industry.”
- “There is no relationship between the coniferous forest in Pacific Canada and the US South pellet industry.”
- “Brazilian policy will be determinant of these impacts, not anything indirect via US production. For example, projections of increased deforestation due to incentivizing bioenergy in the 2005 and 2007 US energy laws turned out to be absolutely opposite... Brazilian deforestation has decreased tremendously, despite sometimes large increases in commodity agricultural prices.
- “Wood prices have fluctuated hugely over the past 4-5 decades. Harvest levels throughout North America have not been very price sensitive, and instead more dependent on policy (e.g. Spotted Owl protections in the US Pacific Northwest), etc.”
- “The effect of increased pulpwood use in the south for pellets would result in shifting of pulpwood use for pulp (to meet US and export demands) closest to the source – the south, then other regions of the US, then other countries. I think the effect of a one unit increase in pulpwood use in the south on harvest in pacific - Canada would be a very small fraction of one

unit.... I think the effect of a one unit increase in pulpwood use in the south on harvest in Pacific-Canada or Brazil would be a very small fraction of one unit.”

- “Other factors may cause this to happen if demand for fibre from pellets stay at the current level. The greater concern is this scenario is more likely to happen if the subsidized pellet production increases as projected in the South USA.”
- “S19 Conversion of rainforest is more likely to be to agricultural land. Conversions of rainforest to Eucalyptus plantation, if this were occurring, would be primarily a result of global demand for paper and packaging products. Reduced capacity at pulp and paper mills and regulatory conditions blocking new mill construction in the South USA may lead more mills to be built in Brazil. Demand for fibre from pellets is not, and will not be, a driver of these conversions. It should also be noted that, prior to the pellet industry developing in the South USA, almost all hardwood consuming pulp and paper mills in the South USA closed, leaving excess hardwood supply in the region, which is now available for pellets. As a result, pellet demand for hardwood will not be displacing any pulp & paper use.”
- “S20 Demand for bioenergy will not drive this scenario, as conversions are generally the result of increased demand for pulp and paper worldwide and the desire to increase productivity and profitability of these degraded lands.”
- “S21 The areas and products are too disjointed to have this type of impact. Harvest rotations in Pacific Canada will continue to be driven by solid wood products and the growth rates needed to produce adequately sized material. In addition, if pulpwood use increased in Pacific Canada, it would have a positive effect, because the lack of pulpwood demand in the region leads to prescribed burns. It should also be noted that the Crown Forest Service would make decisions about rotation lengths in the area; they are not necessarily market driven.”

2.6.1.7 Assuming pellet demand increases in the future, what is the likelihood of the scenario (a) at current fibre prices (b) if prices rise by up to 15% and (c) if prices rise by 30%?

Table 2-52 Scenarios 19-21 Comments on the question: Assuming pellet demand increases in the future, what is the likelihood of the scenario (a) at current fibre prices (b) if prices rise by up to 15% and (c) if prices rise by 30%?

Scenarios 19-21 Comments on the question: Assuming pellet demand increases in the future, what is the likelihood of the scenario (a) at current fibre prices (b) if prices rise by up to 15% and (c) if prices rise by 30%?

Respondents commented as above. There is no connection between these markets and long term pellet demand is unlikely to have a significant impact on these markets.

- “Market conditions in areas outside of the US South will dictate what happens in those areas; US South timber prices will not override this. Long term pellet demand is unlikely to have a significant impact on these markets.”
- S19 and S20: “Paper mills that are certified to forestry standards are not likely to accept timber from conversion lands.”
- S21: “Canadian coniferous forests are not merchantable. This scenario would not be profitable.”
- “Timber prices in the South will not override market forces operating in these areas. It is very unlikely that any price increase in the Southeastern US will have a material effect on the Pacific Canada or Brazilian markets and/ or their resources. Moreover, pellet demand is very unlikely to lead to price increases that would be significant enough to affect these markets.”
- “Timber prices in the US South will not have an effect on the Canadian or Brazilian markets. We covered this at length in our original survey responses.”
- “Timber prices in the South, particularly fibre prices, are extremely unlikely to drive land use change or rate of harvest changes in geographies that are far removed. Decisions on management in Brazil and Pacific Canada will be driven by the markets they serve and economic drivers unique to those areas.”

2.6.1.8 Scenarios 19-21 Comments on the question: Which of the following changes would encourage the practices described in scenarios 19-21 to occur?

Table 2-53 Summary of comments on the question: Which of the following changes would encourage the practices described in scenarios 19-21 to occur?

Summary of comments on the question: Which of the following changes would encourage the practices described in scenarios 19-21 to occur?

Factors that would encourage these scenarios include legislation in affected countries and increased subsidies, but respondents thought it unlikely that they would occur. One respondent said that there is nothing that would encourage these scenarios, no matter how high demand and prices for pellets were.

- “Pellets likely will replace some pulp demand in the US. That is not a bad thing.”
- “This is a conditional for which I do not think the above premises would ever lead to the conclusions.”
- “For this discussion it is assumed that incentives equal market subsidies”
- “Assuming changes in legislation would be in the affected countries, in this case Brazil and Canada”
- “There is nothing that would encourage these scenarios, no matter how high demand and prices for pellets were to be.”

2.6.1.9 Scenarios 19-21 Comments on the question: Which of the following changes would prevent the practices described in scenarios 19-21 from occurring?

Table 2-54 Summary of comments on the question: Which of the following changes would prevent the practices described in scenarios 19-21 from occurring?

Summary of comments on the question: Which of the following changes would prevent the practices described in scenarios 19-21 from occurring?

Factors that would prevent these scenarios include removal of subsidies from pellet use. However, respondents continued to comment that these scenarios do not economic, practical or logical sense so they would not occur.

- “Removal of the UK subsidies for pellets. The market demand for fibre for pellets will only be economically feasible if subsidized.” (This comment was received from two respondents)
- “These scenarios would not occur because they do not make economic, practical or logical sense.”
- “Additional pulpwood for pellets will first be supplied by reduced demand from traditional pulpwood consumers under current projections of future pellet demand. Secondly, increased forest productivity in the south will create future additional supply surplus.”

2.6.2 Additional comments on Scenarios 19-21

- “There is no relationship between the US south pellet industry and fibre grown in South America.”
- “The whole idea of REDD+ policy and investments is to make developing nations more responsible for and capable for managing their forests and land use. Any displacement in developed nations should be counteracted and accounted for by commitments to reduce GHG emissions overall.”
- “The European subsidies have already greatly increased costs of raw material for some U.S. paper and wood products facilities. For example, assuming that other market factors such as pulp/OSB production and the availability of residual sawmill chips remain unchanged, Forisk Consulting predicts average pine pulpwood stumpage prices across the South could increase by 31 percent from 2014 to 2019 as a result of increased bioenergy demand, with 97 percent of the increase being pellet related. Forisk expects pine pulpwood use at pellet plants in the South to increase from 4.9 million tons in 2014 to 16.9 million tons by 2019 – an increase of 245 percent. The share of pulpwood/chips, both pine and hardwood that will be used to make

wood pellets, is expected to reach 10 percent in 2019, up from about 3 percent in 2013 and 4 percent in 2014.”

- “The more uses and markets that exist will result in more forested acreage. Private landowners need markets for incentive to keep the land they own in forest versus other uses. The price of pellets and margin to producers prevent pellet producers from paying more for stumpage than non-bioenergy competitors. Because of reduced demand for pulp and paper, pellet demand is replacing rather than displacing thus providing another market for landowners and incentives for landowners to keep land in trees.”
- “The current subsidy provided to pellet users is not high enough to provide a pellet price that would allow pellet manufacturers to outcompete paper. The capacity to pay of pulp and paper mills is significantly higher than the capacity to pay of pellet manufacturers²⁸. In some cases, pellets are replacing abandoned markets rather than displacing them.”
- “Current subsidy levels for pellet users are not high enough to give pellet producers buying power over pulp and paper mills, so pellet demand will not result in displacement of pulpwood. (This comment was given by two other respondents)
- “According to unpublished data from Forisk, 20 paper mills with a potential demand of 22.6 million tons of pulpwood were closed since 1998 in the US south. We work with pellet producers to invest in the same locations where those closures previously took place. We prefer paper customers for pulpwood where demand continues to be healthy because they have the ability to pay higher prices according to our negotiation experience (and supported by analysis) - The productivity of our pine plantations has increased by 54% since 1998.”
- “The USDA Economic Research Service did a report looking at actual indirect effects of US bioenergy production, which basically showed that the feared impacts some predicted for past policy were far overstated. The ISO technical committee developing a standard for Bioenergy Sustainability Criteria also looked at indirect impacts, and found no strong evidence that such were a major problem that had to be addressed.”
- “Again, while displacing USA fibre to other regions can occur, I don't see how this is measurable today. Over time, into the future, we may be able to measure this type of impact on whether or not these scenarios are occurring.”

2.6.3 High level summary of the comments on scenarios 19-21

Table 2-55 High level summary of comments on scenarios 19-21

High level summary of comments on scenarios 19-21

Respondents commonly commented that there was no relationship between the pellet market in South USA and the pulp and paper markets in Brazil and Pacific Canada and that causality for these scenarios would be difficult to prove. The trends in pulp and paper production in Brazil preceded pellet demand in South USA by at least two decades. This market produces paper for different markets to the US South. Any displacement of the US South pulp and paper market is likely to be into neighbouring regions.

A number of respondents said that the ability to pay for pellet producers was lower than for pulp and paper mills so this displacement should not occur.

Other comments were that these scenarios could be prevented by not subsidising the use of pellets for electricity generation in the UK.

²⁸ . Pöyry chart (Dovetail report), Iriarte, L. and Fritsche, U. 2014 (Dovetail report) Impact of Promotion Mechanisms for Advanced and Low- iLUC Biofuels on Markets. IEA Bioenergy, Task 40: Sustainable International Bioenergy Trade. <http://www.bioenergytrade.org/downloads/t40-low-ilucpellet-august-2014.pdf>

2.7 Scenarios 22-25

Summary of scenarios 22-25: New Plantations Replacing Naturally-regenerated Forests in South USA

It is assumed that additional wood created in these scenarios in comparison to the counterfactual is used for bioenergy.

Scenario 22 Additional wood (in comparison to the counterfactual) from the conversion of a naturally-regenerated coniferous forest in South USA that is harvested every 50 years, to an intensively-managed pine plantation that is harvested (a) every 25 years, (b) every 20 years.

Counterfactual: Continue harvesting the forest every 50 years, and leaving to regenerate naturally

Scenario 23 Additional wood (in comparison to the counterfactual) from the conversion of a naturally-regenerated hardwood forest in South USA that is harvested every 70 years, to an intensively-managed pine plantation that is harvested (a) every 25 years and (b) every 20 years

Continue harvesting the forest every 70 years, and leaving to regenerate naturally.

Scenario 24 Additional wood (in comparison to the counterfactual) from the conversion of a naturally-regenerated coniferous forest in South USA that is harvested every 50 years, to an SRC hardwood plantation that is coppiced every 3 years. Conversion takes (a) 3 years; (b) Conversion over 50 years

Counterfactual: Continue harvesting the forest every 70 years, and leaving to regenerate naturally.

Scenario 25 Additional wood (in comparison to the counterfactual) from the conversion of a naturally-regenerated hardwood forest in South USA that is harvested every 70 years, to an SRC hardwood plantation that is coppiced every 3 years. Conversion takes (a) 3 years; (b) 70 years.

Counterfactual: Continue harvesting the forest every 70 years, and leaving to regenerate naturally.

2.7.1 Counterfactual

2.7.1.1 Is the counterfactual provided above an accurate description of what currently happens when there is no or low demand for fibre for pellets?

Table 2-56 Scenarios 22-25 Summary of comments on counterfactual?

Scenarios 22-25 Summary of comments on counterfactual

The use of forests in the US South is dynamic, depending on factors such as saw log market conditions, location and management decisions by family forest owners. However, conversion to plantation is not driven by pellet fibre considerations.

FIA data suggests that average rotation periods are shorter than the counterfactual (41 years)

- “Forest use in the South is dynamic. Some new plantations are established. Other plantations are reverted to more natural regen patterns. In general, conversion to forest plantation is of far less concern than the much more common land use conversion to urban use. Keeping as a plantation is a large benefit comparatively.”
- “Forest management decisions are not driven by the demand for fibre for pellets. As we have stated in our answers to previous questions, sawtimber value is the dominant economic consideration when making forest management decisions. The difference in value of sawtimber and fibre for pellets is so great that fibre for pellets is an afterthought when considering whether to plant or rely on natural regeneration. Industrial owners have already decided whether to plant or not and most decide to plant. The family forest owner category is quite diverse and the drivers for management choices vary by landowner. Timber production is just one of many factors they consider when making management choices and producing fibre for pellets is not likely to influence their decisions.”

- “The management of natural pine forest is not related to fibre demand from pellets. Rather it is for the production of saw timber and/or a multitude of other landowner objectives. Any conversion of a natural stand to plantation (or vice-versa) is also unrelated to fibre demand from pellets. Furthermore, the counterfactual assumes natural timber harvests are on a rotation of 50 years. FIA data suggests the harvest age for natural pine is shorter: an average of 41 years. Forests owned by industrial land owners are already managed; non-industrial private landowners, however, cite many reasons for owning forest land, and timber production is one of the reasons for less than 20 percent²⁹.” (A variation on this comment was provided by three other respondents)
- “This answer is a struggle between definitely not and sometimes, absolutes being difficult to defend. However, the answer choices for this question are difficult to defend as they assume the pellet market always has an influence. As stated frequently in this survey, forest owners generally plan for an ultimate sawtimber harvest for highest return. Larger forest owners utilize plantations. Smaller forest owners, who likely own most of the natural stands cite many reasons for owning forest land, and timber production is one of the reasons for less than 20 percent. The odds of all pine being allowed to regenerate naturally are slim to none, given that pine plantations are decades old.”
- “Many smaller private forest owners will let their forests naturally regenerate after harvesting. However, some of the corporate (or larger scale) forest owners, may replace naturally regenerated pine forest with a pine plantation in order to increase productivity and quality and therefore secure a greater financial return. However, this practice is not related at all to the wood pellet sector. This is clearly demonstrated by the fact that a typical pine plantation would take at least 25 years to grow before final harvest, so a forest converted now in 2015 would not be ready for harvesting until 2040 by which time there would be no demand for industrial wood pellets.”

2.7.1.2 Scenario 22a is this already occurring?

Table 2-57 Summary of comments on the question: scenario 22a – is this already occurring

Summary of comments on the question: scenario 22a– is this already occurring?

Conversion of forests to plantations happens for a number of reasons in the absence of the pellet industry. It will be difficult to prove that this is due to pellet demand. High in the list of considerations for the land owner will be the financial return from the plantation, given the costs of establishment and in comparison with alternative uses for the land (e.g. potential expansion of agricultural land or urban expansion). Many small-scale land owners cannot afford intensive plantation management. Natural regeneration is ‘free’ to the land owner, but conversion to plantation will require investment. Conversion will be dependent on timber prices, not pellet demand.

Rotation period is determined by saw timber harvest, not pellet demand. Rotation periods for plantations average more than 25 years at present.

- “Because of sawtimber and pulp & paper markets it is likely that natural forests, when harvested, could be converted to plantations. This would occur even in the absence of the pellet industry.”
- “How a southern forest is regenerated has little impact on its rotation age. If it was naturally regenerated before that was because the landowner either didn't have the money to replant higher quality stock or had alternative management objectives. If this occurs, it is only because there was a change in landownership, and that is just as likely to result in an urban interface owner that doesn't want to harvest at all as it is someone that wants to.”
- “Econometric studies indicate increasing timber prices will influence conversion and expansion of forest area from agricultural area. Pellet demand would support this to the extent that it raises timber prices.”

²⁹ Butler, et al (2007) “Understanding and Reaching Family Forest Owners: Lessons from Social Marketing Research.” Journal of Forestry October/November 2007, pp. 348-357” The reasons for ownership are given as: These reasons include: Beauty and scenery 70.9% Nature and biological diversity 56.9% Land investment 42.6% Part of home 62.6% Part of farm 43.5% Privacy 64.3% Pass land on to heirs 61.6% non-timber forest products 10.4% Firewood production 17.8% Timber production 19.6% Hunting 39.1% Other recreation 35.8%.

- “But note that the coniferous forest that was harvested every fifty years was not likely a forest that was well managed or maintained for high carbon storage. The intensively managed forest likely has higher average carbon storage and greater production of all wood products. This would only happen in very odd pockets where all conditions were right.”
- “Conversion of naturally regenerated forests to plantations has been happening since the 1940s. The landowner's decision to do this is based on many factors most of them financial to the landowner. The pellet demand has not affected this and won't in the future. Rotation age is determined by sawtimber markets and not pellet demand.”
- “Some landowners will choose to convert natural coniferous forest to planted ones but those decisions will be driven by sawtimber economics, not pellet or pulpwood. Much naturally regenerated coniferous forest is owned by family forest owners who are less responsive to product prices than corporate owners. The rotation ages used in the scenario are arbitrary and make it difficult to respond. In the South the average harvest age for coniferous forests is less than 50 and the rotation age for plantations averages greater than 25. Neither rotation age will be driven by the pellet market. Pellet and pulpwood are “come along” by-products of sawtimber management.”
- “Our pine forests, like most commercial forest owners in the south, are already pine plantations. Smaller owners with naturally regenerated pine may consider planting pine after harvesting but it will not be driven by pellet markets. Planting for pellet markets now requires strong confidence that pellet markets will still be strong 15 years from now, after pellet subsidies have ceased. Even unrealistically robust pellet prices alone cannot generate a return on investment strong enough to warrant investing. Sawlog pricing would be required to incentivize the planting investment.”
- “Sometimes - While there are conversions of natural timber to plantation timber (and vice-versa), it is difficult to quantitatively assess the percentage of acreage affected because of the specificity of the rotation ages suggested in the scenarios. In addition, not all plantations are intensively managed. Rotation age is currently - and will continue to be - determined by sawtimber markets. Currently, naturally regenerated coniferous forests in the South USA are harvested at an average age of 41 years.” (A variation on this comment was received from four respondents)
- “Also (in addition to point above), the costs of intensive management may be prohibitive in many cases for family forest owners. Owners would need to implement the use of chemicals and thinning operations. Many landowners manage their land for timber as a secondary income source, and so the time and effort required to manage a forest intensively frequently cannot be afforded by the landowner. Natural regeneration is incentivised by the removal of wood from the site for pellet production and is free to the landowner. Last, it is important that the model understands that just because a site is planted doesn't mean it will be intensively managed. In the SE if pine is planted on a site, many times hardwood is left to grow underneath it, creating a mixed stand.”

2.7.1.3 Scenario 22b is this already occurring?

Table 2-58 Summary of comments on the question: scenario 22b – is this already occurring

Summary of comments on the question: scenario 22b– is this already occurring

The comments to scenario 22a apply, but most respondents commented that this would not be common. A 20 year rotation is unrealistic for softwood saw timber use and this makes it very unlikely to happen.

- “A 20 year rotation is not realistic for softwood sawtimber use.” (A variation on this comment received from 2 respondents)
- “This is such an extreme change in management objective that is HIGHLY unlikely to happen.”
- “Same comments as above but likely happens less often than the above”
- “Including mixed hardwood/softwood (Oak/Pine) forest types in this category.”
- “Conversion of naturally regenerated forests to plantations has been happening since the 1940's. The landowner's decision to do this is based on many factors most of them financial to the landowner. The pellet demand has not affected this and won't in the future.”

- “(This happens if we) include mixed hardwood/softwood (Oak/Pine) forest types in this category.”(This comment received from 4 respondents)
- “The “sometimes” response is because it is not impossible, not because it is at all common. This would only occur in very localized markets with high fibre demand and low sawtimber demand. Impossible to attribute this to pellets.” (A variation on this comment received from 3 respondents)
- “Sometimes- While there are conversions of natural timber to plantation timber (and vice-versa), it is difficult to quantitatively assess the percentage of acreage affected because of the specificity of the rotation ages suggested in the scenarios. In addition, not all plantations are intensively managed. Rotation age is currently—and will continue to be-- determined by sawtimber markets. Currently, naturally regenerated coniferous forests in the South USA are harvested at an average age of 41 years.” (A variation on this comment received from 3 respondents)
- “This type of rotation length is likely to be too short for the owner to maximise return on investment. Generally 25 years is optimum even on sites with the highest growth rates.”
- “Because forest landowners cannot know what the market will be in 20 years, this would not be part of the decision making process for converting a natural pine stand to a plantation pine stand. While we conceptualize this might occur in very localized markets with high fibre and low sawtimber demand, we think it highly unlikely. Any instances would be rare and considered industry outliers.”

2.7.1.4 Scenario 23a is this already occurring?

Table 2-59 Summary of comments on the question: scenario 23a – is this already occurring

Summary of comments on the question: scenario 23a– is this already occurring?

This would be counter to certification conditions and would not be something practiced by large scale forestry. It might happen in upland hardwood areas, but it is difficult to quantify. It would be driven by saw timber market conditions, not pellet demand.

There were comments that this may happen if it includes mixed hardwood/softwood forest types.

- “This is such an extreme change in management objective that is HIGHLY unlikely to happen.”
- “This definitely depends on the land type. If upland and a new market arrives that makes planting a semi natural pine forest economically viable then it is very likely that the forest had grown up in scrub hardwoods and was being converted to a higher and better use with greater environmental and economic outputs. If lowland then not usually suitable for softwood.
- “(This happens if we) include mixed hardwood/softwood (Oak/Pine) forest types in this category.”(This comment received from 4 respondents)
- “Conversion of naturally regenerated forests to plantations has been happening since the 1940's. The landowner's decision to do this is based on many factors most of them financial to the landowner. The pellet demand has not affected this and won't in the future.”
- “Again, this decision is driven by sawtimber economics, not pellets. Our impression is that most of this type of conversion affects degraded, upland hardwood forest types.”
- “Sometimes - See comment above. Any naturally regenerated hardwood stand with a rotation age of 70 years is likely to be a degraded upland hardwood stand, which is less ideal for carbon storage than pine plantation aged 25 years. While there are conversions of natural timber to plantation timber (and vice-versa), it is difficult to quantitatively assess the percentage of acreage affected because of the specificity of the rotation ages suggested in the scenarios. In addition, not all plantations are intensively managed. Rotation age is currently - and will continue to be - determined by sawtimber markets. Currently, naturally regenerated coniferous forests in the South USA are harvested at an average age of 41 years.”
- “Sometimes - The average rotation age for naturally regenerated hardwood forest is 54 years. Any stand with a rotation of 70 years is probably quite degraded, and is less ideal for carbon storage than a 25 year old pine plantation.” (A variation on this comment received from 2 respondents)

- “This would likely happen only rarely and then in situations with a highly degraded hardwood stand which must be clear cut, thus producing the opportunity, assuming soil and other conditions are compatible, to establish a pine plantation. Whether that plantation is then intensively managed with a 25-year rotation is up to the objectives of the particular forest owner.”
- “Conversions of hardwood stands to pine plantations occurred sometimes 20 years and more ago, but only at the margins where it could be done cost effectively. That practice has all but completely ceased because of Best Management Practices (BMPs) and forest certification. If it were to occur in a rare and marginal situation, the investment would be motivated by sawlog pricing, not pellet pricing - as described above.” (A variation on this comment received from 2 respondents).
- “This is unlikely to happen and certainly would not be driven by wood pellet demand. Material from hardwood stands converted to pine plantations would not meet the sustainability requirements of European generators. Sites that are naturally regenerated with hardwoods are likely to be sub-optimal for pine plantations due to the suitability of the site conditions. It would be more effective to convert naturally regenerated pine to a pine plantation. There will of course be exceptions where this is possible and may have occurred although it would not be common practice and it would be driven by the desire to produce sawlog grade material rather than pulpwood.”

2.7.1.5 Scenario 23b is this already occurring?

Table 2-60 Summary of comments on the question: scenario 23b – is this already occurring

Summary of comments on the question: scenario 23b – is this already occurring

Comments were the same as above, but that this was even less likely ('highly unlikely to occur'). There were comments that this may happen if it includes mixed hardwood/softwood forest types,

- “This is such an extreme change in management objective that is HIGHLY unlikely to happen.”
- “Certification schemes would not support this activity.”
- “Same comments as above, but less likely”
- “(This happens if we) include mixed hardwood/softwood (Oak/Pine) forest types in this category.” (This comment received from 4 respondents)
- “Conversion of naturally regenerated forests to plantations has been happening since the 1940's. The landowner's decision to do this is based on many factors most of them financial to the landowner. The pellet demand has not affected this and won't in the future.”
- “This would only occur in very localized markets with high fibre demand and low sawtimber demand. The "sometimes" response is because it is not impossible, not because it is at all common. Again, this would probably involve degraded, upland hardwood types.”
- “This is unlikely to happen and certainly would not be driven by wood pellet demand. Material from hardwood stands converted to pine plantations would not meet the sustainability requirements of European generators. Sites that are naturally regenerated with hardwoods are likely to be suboptimal for pine plantations due to the suitability of the site conditions. It would be more effective to convert naturally regenerated pine to a pine plantation. There will of course be exceptions where this is possible and may have occurred although it would not be common practice and it would be driven by the desire to produce sawlog grade material rather than pulpwood.”
- “See comment above. Any naturally regenerated hardwood stand with a rotation age of 70 years is likely to be a degraded upland hardwood stand, which is less ideal for carbon storage than pine plantation aged 25 years.”
- “Sometimes - The average rotation age for naturally regenerated hardwood forest is 54 years. Any stand with a rotation of 70 years is probably quite degraded, and is less ideal for carbon storage than a 25 year old pine plantation.” (This comment received from 2 respondents)

2.7.1.6 Scenario 24a is this already occurring?**2.7.1.7 Table 2-61 Summary of comments on the question: scenario 24a – is this already occurring?****Summary of comments on the question: scenario 24a– is this already occurring**

SRC hardwood plantations are not planted in the US south and would not provide sufficient returns to be attractive. In addition they would not meet the sustainability requirements for pellet use in Europe and are unsuitable for coal conversion or co-firing boilers.

- “As a general rule, short-rotation coppice is not planted in the South US.”
- “Only would occur if the SRC has much greater economic returns, and then still probably pretty rare. Don't know of it happening at any scale currently. Maybe some test plots at most.”
- “Our modelling has not found conversion of naturally regenerated forest to SRWC is economical over 50 year projections. It may be economical to convert some agricultural land.”
- “No commercial SRC plantations in the region and against most of our sustainability requirements.”
- “Conversion of naturally regenerated forests to plantations has been happening since the 1940's. The landowner's decision to do this is based on many factors most of them financial to the landowner. The pellet demand has not affected this and won't in the future. Hardwood plantations make up less than 2% of hardwood inventory in the US South. The hardwood plantations I am aware of were planted in the 90's and I have seen no growth in this practice.”
- “There is almost no coppiced hardwood plantation on forest land in the South and the pellet market will not cause it to increase.” (A variation on this comment from 6 respondents)
- “The amount of hardwood plantation and coppicing in the South USA is not material. These practices are not common. Also current regulations prevent the use of this material for pellets so pellet production would not drive this change.”
- “SRC not suitable for pellets - inadequate return on investment - would not make sense to liquidate immature hardwood for a large scale conversion over 3 years”
- “There is no market for SRC at present in the wood pellet sector. SRC requires intensive management and therefore more expensive per tonne of fibre produced than conventional pulpwood. In a market where there is a substantial surplus of cheap pulpwood, where is the incentive to produce SRC and who would want to buy this? SRC also has undesirable properties that make it unsuitable for use in converted coal boilers.”

2.7.1.8 Scenario 24b is this already occurring?**Table 2-62 Summary of comments on the question: scenario 24b – is this already occurring****Summary of comments on the question: scenario 24b – is this already occurring?**

SRC hardwood plantations are not planted in the US south and would not provide sufficient returns to be attractive. In addition they would not meet the sustainability requirements for pellet use in Europe and are unsuitable for coal conversion or co-firing boilers.

- “As a general rule, short-rotation coppice is not planted in the South US.”
- “Only would occur if the SRC has much greater economic returns, and then still probably pretty rare, as likely would have fewer other benefits (hunting licensing, landowner enjoyment, etc.). Don't know of it happening at any scale currently. Some test plots happening at most. Over 50 years you might get some landownership change if it was much better economically, but unlikely to happen under current landowners.”
- “Hardwood plantations are not common in the US South”
- “Conversion of naturally regenerated forests to plantations has been happening since the 1940's. The landowner's decision to do this is based on many factors most of them financial to the landowner. The pellet demand has not affected this and won't in the future. Hardwood plantations make up less than 2% of hardwood inventory in the US South. The hardwood plantations I am aware of were planted in the 90's and I have seen no growth in this practice.”

- “We know of almost no conversion of forests to coppice operations. There is almost no coppiced hardwood plantation on forest land in the South and the pellet market will not cause it to increase.”
- “There are very few, if any, operational SRC hardwood plantations in South USA” (A variation on this comment from 5 respondents)

2.7.1.9 Scenario 25a is this already occurring?

Table 2-63 Summary of comments on the question: scenario 25a – is this already occurring?

Summary of comments on the question: scenario 25a– is this already occurring?

SRC hardwood plantations are not planted in the US south and would not provide sufficient returns to be attractive. In addition they would not meet the sustainability requirements for pellet use in Europe and are unsuitable for coal conversion or co-firing boilers.

- “As a general rule, short-rotation coppice is not planted in the South US.”
- “Only would occur if the SRC has much greater economic returns, and then still probably pretty rare, as likely would have fewer other benefits (hunting licensing, landowner enjoyment, etc.). Don't know of it happening at any scale currently. Some test plots happening at most. Certainly wouldn't happen quickly, as would not match the majority of current landowners multiple management objectives.”
- “Hardwood plantations are not common in the US South”
- “There are very few, if any, operational SRC hardwood plantations in South USA”. (A variation on this comment from 5 respondents)

2.7.1.10 Scenario 25b is this already occurring?

Table 2-64 Summary of comments on the question: scenario 25b – is this already occurring?

Summary of comments on the question: scenario 25b – is this already occurring?

SRC hardwood plantations are not planted in the US south and would not provide sufficient returns to be attractive. In addition they would not meet the sustainability requirements for pellet use in Europe and are unsuitable for coal conversion or co-firing boilers.

- “As a general rule, short-rotation coppice is not planted in the South US.”
- “Don't know of it happening at any scale currently. Maybe some test plots at most. Over 50 years you might get some landownership change if it was much better economically, but unlikely to happen under current landowners.”
- “Hardwood plantations are not common in the US South”
- “There are very few, if any, operational SRC hardwood plantations in South USA.” (A variation on this comment from 5 respondents)
- “Conversion of naturally regenerated forests to plantations has been happening since the 1940's. The landowner's decision to do this is based on many factors most of them financial to the landowner. The pellet demand has not affected this and won't in the future. Hardwood plantations make up less than 2% of hardwood inventory in the US South. The hardwood plantations I am aware of were planted in the 90's and I have seen no growth in this practice.”

2.7.1.11 What proportion of land is affected in the region?

For scenarios 22 and 23 answered varied between <10% to 100%; for scenario 24 and 25 - 0%

- “Localized affects - 16% region-wide”
- “For 100% Evidence: “Pine plantations have expanded steadily, from very little in the 1950s to more than 30 million acres in the late 1990s. Pine plantations now account for about 16 percent of all timberland in the South. As of 2010, 82% of the Coastal Plain forest type – where pellet facilities are concentrated – was comprised of planted pine. The area of plantations is forecast to grow from 32 million acres to 43 million acres. This growth in plantations is most likely to

occur at the expense of naturally regenerated pine forests – where declines are projected to be the greatest throughout the US South³⁰.” (This evidence was submitted by 4 respondents)

- “Less than 2% of hardwood inventory is in hardwood plantations Evidence: Forest2Market analysis of data describing forest inventory from the Forest Inventory and Analysis (USFS) inventory data”
- “The long-standing higher-value markets for forest products indicate that the counterfactual is inaccurate, as are extended rotations for pine, while hardwood plantations are a minor component.”
- “There is evidence over the past 60 years in the US south that plantations increase in productivity in the presence of markets. There is no or little evidence for the other scenarios in this section.”

2.7.1.12 In the future (between now and 2030), if demand for fibre for pellets stays at the current level how likely do you think it is that these scenarios will occur (or continue to occur, if they already happen)?

- “Demand for pellets will have no impact on these scenarios. SRC is not likely to be used for wood pellet production because it is both expensive and less suitable for many boilers due to the chemistry. Any conversion of naturally regenerated forests to plantation will have no impact on the pellet market as they will take too long to mature and industrial wood pellet demand will have declined by the time they are ready to harvest”
- Scenario 22a: “Some owners may choose to do this. It has been the response in the sector over the past decades, but pellet markets will only play a part in this, they will not be the sole cause.”
- Scenario 22b: “20 years is likely to be too short to optimise a return on investment”
- Scenario 23a: “Material from conversions like this do not meet UK requirements – such feedstocks cannot be used by generators”
- Scenario 23b: “Material from conversions like this do not meet UK requirements – such feedstocks cannot be used by generators”

Scenarios 24 and 25 – No comments

Table 2-65 Scenarios 22-25 Summary of comments on the question: in the future if demand for fibre for pellets stays at current level how likely is it that these scenarios will occur?

Summary of comments on the question: in the future if demand for fibre for pellets stays at current level how likely is it that these scenarios will occur?

Most of the respondents dealt with this in their comments to the question on whether the scenarios are already occurring. The changes are not considered likely on the basis of financial return and sustainability requirements. For SRC conversions, the financial return is considered too low and the short term risk too high. Conversions are more likely from agriculture.

2.7.1.13 Assuming pellet demand increases in the future, what is the likelihood of the scenario (a) at current fibre prices (b) if prices rise by up to 15% and (c) if prices rise by 30%?

Table 2-66 Scenarios 22-25 Comments on the question: Assuming pellet demand increases in the future, what is the likelihood of the scenario (a) at current fibre prices (b) if prices rise by up to 15% and (c) if prices rise by 30%?

Scenarios 22-25 Comments on the question: Assuming pellet demand increases in the future, what is the likelihood of the scenario (a) at current fibre prices (b) if prices rise by up to 15% and (c) if prices rise by 30%?

³⁰ “The Southern Forest Futures Project: Technical Report” by David N. Wear and John G. Greis. August, 2013. Chapter 5. http://www.srs.fs.fed.us/pubs/gtr/gtr_srs178.pdf. And Evans, J.M., R.J. Fletcher, Jr., J.R.R. Alavalapati, A.L. Smith, D. Geller, P. Lal, D. Vasudev, M. Acevedo, J. Calabria, and T. Upadhyay. 2013. Forestry Bioenergy in the Southeast United States: Implications for Wildlife Habitat and Biodiversity. National Wildlife Federation, Merrifield, VA, EX. Summary 6-7 and text at pp 45-73. https://www.southernenvironment.org/uploads/pages/file/biomass/nwf_exec_summary.pdf http://www.nwf.org/pdf/Conservation/NWF_Biomass_Biodiversity_Final.pdf

Many respondents said that pellet demand does not offer sufficient financial return to enable these conversions, even if prices increase by 30%. This is due to the expense of conversion and the better return from saw logs. SRC plantations are not prevalent in the US South and demand from Europe is not likely to result in conversion. Some respondents said that conversion to plantations is already happening in the US South, but others said that this pre-dates pellet demand and is driven by saw log demand.

- “This practice is already occurring. Future increases in price will only make it all the more profitable.” (This comment submitted by three respondents)
- “Pellet demand is very unlikely to trigger the changes in 22a&b and 23a&b. The fibre needed for pellet production comes from the lowest valued component of harvested material. Even a significant increase in fibre prices is insufficient to change the management objectives of most landowners; sawtimber prices have a much greater influence on decision-making. Conversion decisions have been being made for decades, long before the advent of the pellet market. Conversion from natural pine to planted pine is expensive and conversion of hardwood to planted pine is even more expensive. Such decisions will be driven by the price trends for the more valuable portions of the stand, the sawtimber.” (A variation on this comment from 2 respondents)
- “The counterfactual is not likely. It does not take 35 years to grow sawtimber in the South in a properly managed forest, so harvest age is usually around 25 years. Any change in rotation lengths would be driven by the sawtimber market and sawtimber prices. The pellet industry is a small part of the overall forest industry in the south eastern US, and timber price changes are a result of multiple market dynamics. Even if pellet demand does increase prices, it would never be to the extent that it would cause a change in rotation length.”
- “The decision by a landowner to convert natural regenerated coniferous or hardwood forests to intensively managed coniferous plantations (and vice-versa; it goes in both directions) has occurred historically prior to pellet demand and will continue to occur in the presence or absence of pellet demand. This decision is made based on a myriad of factors and is more tied to decisions around cost of stand establishment, investment horizon, and anticipated future revenue distributions that are more likely tied to sawtimber price and its discounted value growth. Pellet demand is likely to affect the price of lower valued products (lower valued than sawtimber), and while it may have a marginal impact on this decision, it will not be a primary deciding factor. We think these conversions are very unlikely at the stated price increases. The cost of conversion from natural to plantation is high, and a 15 -30 percent increase in price would not justify this investment. Note: it is even more expensive to convert hardwood stands to pine stands, so these conversions would be even less likely to occur.”
- “SRC hardwood plantations are not prevalent in the Southeastern US and are very unlikely to occur in the future.”
- “There are no hardwood plantations in the SE USA”
- “Paper mills that are certified to forestry standards are not likely to accept timber from conversion lands.”
- “The decision to convert hardwood and softwood forests from natural to intensively managed forests or to convert from intensively managed to natural forests (both are possible) is not impacted by the presence or absence of pellet demand. For example, the rotation and management of our 500,000 acres of forest lands was determined prior to existence of the pellet industry and pellet markets are not a factor that we consider during the evaluation process. Our decisions are based on current and projected sawtimber markets. Furthermore, the stated price increases of up to 30% are not significant enough to warrant our considering a conversion of our forests.”
- Scenarios 24 and 24: “These scenarios are implausible as SRC hardwood plantations are not prevalent in the US South and are extremely unlikely to occur in the future”
- “This may happen on a small scale where large scale or corporate forest owners wish to maximise production and revenue in a shorter period of time by increasing the management intensity. This decision and the management practice will be driven by sawlog demand as a 30% increase in wood pellet prices (or pulpwood prices) would not be sufficient to replace sawlog as the primary product. Small scale and private forest owners are less likely to make

this conversion as they often do not have the financial and technical resources to manage their forests in this way.”

- Scenarios 22b, 23b: “20 years is likely to be too short a rotation to be able to maximise revenue, volume production and NPV.”
- Scenarios 23a, b: “Material from hardwood stands converted to pine plantations would not meet the sustainability requirements of European generators. Sites that are naturally regenerated with hardwoods are likely to be sub-optimal for pine plantations due to the suitability of the site conditions.”
- Scenarios 24 and 25: “SRC is not a desirable feedstock for wood pellet production, it is generally more expensive than pulpwood and residues and has undesirable chemical properties due to the very rapid growth rates. The very short term life span of wood pellet demand for EU utilities would not justify investment in SRC plantations, especially where there is a substantial surplus of conventional fibre.”
- Scenarios 22 and 23: “Most lands that are suitable for naturally regenerated hardwood forests are not suitable for pine plantations without significant cost (i.e. they are usually low lying bottoms which require bedding or similar land treatments) hence they are left as hardwood forests and grow into hardwood naturally. Existing softwood lands would be more intensively managed or degraded farm lands would be converted before conversion of hardwood forests was economically viable.”
- Scenarios 24 and 25: “SRC is currently unsuitable for pellets due to quality and the costs of SRC are often higher than that of forests derived wood. If this happened at all then it would come from converted farmland before forest land.”

2.7.1.14 Scenarios 22-25 Comments on the question: Which of the following changes would encourage the practices described in scenarios 22-25 to occur?

- “If there is a big invasive species threat (on the order of Chestnut Blight, etc.), that could change all these calculations, forcing liquidation of existing forest inventories. What comes back may be very different than current. In such a case, bioenergy is the least of our worries and we'll be happy for any potential use of the wood being liquidated.”
- “Given the time frame involved this type of change would be driven by other traditional markets (saw logs, pulp and panel) in addition to pellet markets, and by the owners' desire to increase productivity and financial return.”

Table 2-67 Summary of comments on the question: Which of the following changes would encourage the practices described in scenarios 22-25 to occur?

Summary of comments on the question: Which of the following changes would encourage the practices described in scenarios 22-25 to occur?

These practices are very unlikely to occur, as pellets do not drive the market. It would need a major threat to existing forestry to make people consider such changes.

2.7.1.15 Scenarios 22-25 Comments on the question: Which of the following changes would prevent the practices described in scenarios 22-25 from occurring in the future?

- “Folks could try to prevent this via legislation/regulation of the market, but is likely to create far more problems than it solves.”
- “Other uses make the land value more attractive so this is very unlikely.”
- “Reduction or elimination of UK subsidies that will drastically alter the pellet business model and prevent the need to use the practices described in scenarios 22-25.” (4 respondents).
- “The driver for harvesting pine will always be what the non-bioenergy markets are paying. Pellet markets cannot compete w/ non-bioenergy markets on price if demand drives pricing upward on pulpwood. No way can pellet markets pay saw timber prices to landowners.”
- “It is not certain that there will be a market for industrial pellets by the time these plantations are mature. Changes in management regime would also be determined by the highest value product not by the lowest.”

Table 2-68 Summary of comments on the question: Which of the following changes would prevent the practices described in scenarios 22-25 from occurring?

Summary of comments on the question: Which of the following changes would prevent the practices described in scenarios 22-25 from occurring in the future?

Pellets are a minor income stream whose long term future is uncertain, and unlikely to drive changes. Any such changes could most effectively be prevented by reducing or eliminating UK subsidies.

2.7.2 Additional comments on Scenarios 22-25

- “This is always trotted out as a potential concern of increased demand, but ignores the far greater threats (urban conversion, etc.) that such an activity is more likely to displace, and/or the potential benefits for increasing/maintaining forest land area (and rotation ages) that the demand would incentivize. The status quo of land use is simply not likely to occur.”
- “The questions seem to be framed to ‘prove’ something that is unprovable “The US South is the largest forest products economy in the world by a large margin and has the largest installed plantation base in the world by a large margin.” Dr Michael Clutter, former Dean of the University of Georgia Warnell School of Forestry and now VP of Forest Investment Associates in an address at the 2015 Forest Landowners Association Annual Meeting. The scale of the plantation base in the US South and the reasonable expectation that these plantations will continue to increase in productivity (see earlier references to work by Dr Tom Fox of Virginia Tech) position the South to be able to respond to increased demand for traditional forest products as well as pellets for energy. **The resource is not static; improvements in genetics, the understanding of soil nutrition, vegetation control and other factors have led to increased timber yields/acre accomplished over shorter rotations.** It is reasonable to expect productivity to continue to increase and this increase in productivity will result in many of the BEAC scenarios being irrelevant, even if bio-energy demand increases. It appears to us that there is little appreciation in the UK or the EU for the well documented ability of plantations in the US South to produce more wood more quickly with each succeeding generation of plantations. **The forest resource, including the plantation resource, in the US South is vast and one reason it is vast is the robust market for forest products that has provided a financial incentive for landowners to retain their forest land and invest in its management.** While the pellet market will only marginally contribute to that financial incentive, it can contribute.
 - In the Southeastern United States, demand for timber has a positive influence on the supply of timber. Put more bluntly, if you harvest more trees you get more trees. Why? Because landowners see there is a positive return on investment for planting trees so they choose to do that with their land. Below are some graphs citations that illustrate this point:
 - The most recent RPA report shows that timber price dominates the impact on forest area, with a high price resulting in more area in forest than a low price. Removing the influence of anything else (e.g. population, wealth) price changes (i.e. demand for wood) results in a difference of 9 million acres of forestland by 2050, which equates to 550 million metric ton CO₂e. RPA - Resource Planning Act”
- “It is moderately likely that naturally regenerated forests could be converted to pine plantations. However the estimation of harvest rates is **unlikely**. 50 years is a bit higher than average harvest rates for naturally regenerated coniferous forest and 25 years is a bit lower than average harvest rates for a plantation.”
- “As described elsewhere, additional wood required for pellet markets will first come from excess pulpwood supply created by reduced pulpwood demand from traditional markets, and secondly from increases in existing plantations rather than creation of new plantations. Forest productivity investment is focussed on getting more wood from existing pine plantations and virtually none in creating new plantations”.
- “Demand for pellets will have no impact on these scenarios. SRC is not likely to be used for wood pellet production because it is both expensive and less suitable for many boilers due to the chemistry. Any conversion of naturally regenerated forests to plantation will have no impact

on the pellet market as they will take too long to mature and industrial wood pellet demand will have declined by the time they are ready to harvest.”

2.7.3 Table 2-69 Summary of comments on the question: Additional comments on Scenarios 22-25

Summary of comments on the question: Which of the following changes would prevent the practices described in scenarios 22-25 from occurring in the future?

Conversion of naturally regenerating forest to plantation as a result of pellet demand is highly unlikely. Increased demand is most likely to be met from increased productivity of existing plantations, and indeed will support maintenance of forest area in the face of threats such as urbanisation.

2.7.4 High level summary of Scenarios 22-25

High level summary of scenarios 22-25

The factors that drive the conversion of naturally regenerated forest to plantation relate to financial return, land owner objectives and the alternative land used (e.g. conversion to agriculture or to urban land). Pellet demand would not drive this decision unless there is a guaranteed stable market for a long period of time.

There was disagreement about how much this happens now. Most comments were it might happen (not driven by pellet demand) but only at a small scale. One comment was that forests are dynamic and that land will go in and out of plantation and naturally regenerated forest, depending on circumstances.

Comments on the establishment of hardwood short rotation coppice were that this is not happening in the US South. The financial return is not sufficient to compete with alternative land uses.

2.8 Scenario 26

Scenario 26: New Plantations on Abandoned Agricultural Land

Additional wood (in comparison to the counterfactual) from the conversion of abandoned agricultural land in USA that was previously annually ploughed, to an SRC hardwood plantation that is coppiced every 3 years. Assumed exported to UK from South USA. SRC yields of:

- (a) 5 odt/ha/y
- (b) 10 odt/ha/y
- (c) 15 odt/ha/y
- (d) 30 odt/ha/y

Counterfactual: Abandoned agricultural land left to revert to sub-tropical, moist, deciduous forest

Note: BEAC assumes this agricultural land is abandoned owing to relocation of agriculture or its degradation from intensive use.

It is assumed that the additional wood created by the bioenergy scenario, in comparison to the counterfactual, is used for bioenergy, and any changes in carbon stock in the forest relative to the counterfactual are attributed to this wood output.

2.8.1 Scenario 26 Comments on specific questions

2.8.1.1 Is the counterfactual provided above an accurate description of what currently happens when there is no or low demand for fibre for pellets?

- “Abandoned agricultural land is coming back into agricultural production (due to increased agricultural commodity prices) or converting to urban. While historically this was true and much land came back into forestry, this trend is projected to decline and/or reverse in the next decade or two, particularly in the US South.”
- “While the above may happen in rare cases if left for a long period, what is more likely is that the land reverts to scrubland for a short amount of time before moving to some other land use (forest, agriculture, development). Scrubland offers little sustainability benefits and the average carbon storage over this time period is not much higher than the agricultural land alone. But this cannot be linked to pellet demand or lack thereof alone.”
- “Sometimes or very rarely. However, subtropical, moist deciduous forest would only apply to a small portion of the South USA. Most agricultural land in the South USA would revert to coniferous forest. This counterfactual will only apply to a small portion of the South USA. Only parts of Florida are currently considered subtropical.” (7 respondents)
- “Abandoned agricultural land often reverts to some type of forest, either pine, hardwood or mixed, but this has nothing to do with the pellet market.” (5 respondents)
- “Land conversion is related to landowner objectives, depressed markets for timber products and agricultural markets.” (4 respondents)
- “The demand for pellets alone would have no impact on what happens to abandoned agricultural land. Any newly planted plantations would not be mature for at least 25 years by which time there would be no demand for industrial wood pellets. It is not reasonable to say that this land would always revert to sub-tropical, moist, deciduous forest. This would depend on the local environment, climate and site type. It is also unreasonable to assume that the land would remain unutilised and revert to natural forest. It is equally likely that the land could be used for grazing or arable farming, hunting or recreation or for urban development. This type of land is generally in private ownership and it is likely that the owner would want to get some value from the land at some point.”

Table 2-70 Scenario 26 Summary of comments on counterfactual

Scenarios 26 Summary of comments on counterfactual

Use of abandoned agricultural land is not influenced by pellet demand. It depends on landowner objectives, and may include conversion to urban land or recreation as alternatives to natural forest regeneration. Abandoned agricultural land will revert to the local vegetation, most likely pine or mixed forest, with only a very small area having climatic conditions suitable for moist subtropical deciduous forest.

2.8.1.2 Comments on the question: Scenario 26-is this already occurring?

- “The planting of SRC hardwood is not an accepted practice in the South US.”
- “There are some anecdotes for pulp and paper but none for pellets in the US SE.”
- “There are very few operational SRC hardwood plantations in the South USA.” (2 respondents)
- “Hardwood plantations have never caught on in the US South. Less than 2% of hardwood inventory is in hardwood plantations.”
- “Hardwood plantations are very uncommon and few are coppiced every three years. There has been some recent hardwood plantation establishment on agricultural land by a paper producer but it too is very small scale.”
- “Coppicing is generally not practiced in the SE US but there may be few landowner here and there experimenting with it. There are in the South USA small acreages of miscanthus, cottonwood and eucalyptus; however, this is currently being planted for pulpwood production for the pulp and paper industry.” (3 respondents)
- “If a landowner was not managing his agricultural land, we would not be likely to invest in a woody biomass crop. It is more likely this land would revert to forest.”
- “Experimental fields of woody crops have been planted.”
- “There is very limited development of SRC in the US South. This fibre is expensive, in comparison to conventional pulpwood, it is also unsuitable for many of the markets that utilise industrial wood pellets due to the chemical content of the fibre.”

Table 2-71 Summary of comments on the question: scenario 26 – is this already occurring**Summary of comments on the question: scenario 26 – is this already occurring?**

Short rotation hardwood plantations are very rare in SE USA. There are a few small scale experimental plantations of miscanthus, cottonwood and eucalyptus, but these are for the pulp and paper market. The chemical content of the fibre is problematic for industrial wood pellets.

2.8.1.3 Scenario 26 Comments on the question: In the future (between now and 2030), if demand for fibre for pellets stays at the current level how likely do you think it is that these scenarios will occur (or continue to occur, if they already happen)?

None

Table 2-72 Scenario 26 Summary of comments on the question: in the future if demand for fibre for pellets stays at current level how likely is it that these scenarios will occur?**Summary of comments on the question: in the future if demand for fibre for pellets stays at current level how likely is it that this scenario will occur?**

None

2.8.1.4 Scenario 26 Comments on the question: Assuming pellet demand increases in the future, what is the likelihood of the scenario (a) at current fibre prices (b) if prices rise by up to 15% and (c) if prices rise by 30%?

Table 2-73 Scenarios 26 Summary of comments: Assuming pellet demand increases in the future, what is the likelihood of the scenario (a) at current fibre prices (b) if prices rise by up to 15% and (c) if prices rise by 30%?

- “Hardwood plantations are very expensive to establish and manage and there are few of them in the South. It is very unlikely that pellet demand will cause an increase in the negligible southern acreage in hardwood plantation.”
- “SRC hardwood plantations are not prevalent in the Southeastern US and are very unlikely to occur in the future” (This comment from five respondents)
- “SRC is not a desirable feedstock for wood pellet production, it is generally more expensive than pulpwood and residues and has undesirable chemical properties due to the very rapid growth rates. The very short term life span of wood pellet demand for EU utilities would not justify investment in SRC plantations, especially where there is a substantial surplus of conventional fibre.”
- “Farmland would more likely be converted than timberland”

Scenario 26 Summary of comments on the question: Assuming pellet demand increases in the future, what is the likelihood of the scenario (a) at current fibre prices (b) if prices rise by up to 15% and (c) if prices rise by 30%?

SRC hardwood plantations are not prevalent in the Southeastern US and are unlikely to occur in the future. SRC is not a desirable feedstock for wood pellet production. These plantations are difficult to establish and expensive.

2.8.1.5 Scenario 26 Comments on the question: Which of the following changes would encourage the practices described in scenario 26 to occur?

- “I doubt this can compete with agricultural and urban financial returns, but that is the only way this would happen and we'd be better off if it did. The counterfactual simply is not going to happen.”
- “I doubt that land will be converted to SRC in the US unless sustainability guidelines change.”
- “This practice is very expensive and to the extent it happens it is more likely to go into the paper market. Pellets produced from this type of operation are precluded by regulation in the UK and EU aren't they?”
- “All of these are extremely unlikely”
- “Specifications for industrial pellets make it unlikely that these feedstocks can be used to manufacture pellets. It is more likely that they will be used by pulp and paper manufacturers. In addition, because of the intense site preparation required, regulations preclude these types of feedstocks from being used to produce pellets.”
- “None of these changes would encourage these practices for the reasons previously described.”

Table 2-74 Summary of comments on the question: Which of the following changes would encourage the practices described in scenarios 26 to occur?

Summary of comments on the question: Which of the following changes would encourage the practices described in scenario 26 to occur?

It is doubtful that financial returns for SRC plantations could ever compete with agricultural and urban land use options. Current sustainability guidelines and technical specifications would need to change to enable use of fibre from this source for pellets.

2.8.1.6 Scenario 26 Comments on the question: Which of the following changes would prevent the practices described in scenarios 26 from occurring?

- “Reduction or elimination of UK subsidies that will drastically alter the pellet business model and ensure an insufficient financial return so that this practice is not economically feasible.” (2 respondents)
- “These practices would be prevented because SRC is less desirable and therefore would have no market demand.”

Table 2-75 Summary of comments on the question: Which of the following changes would encourage the practices described in scenarios 26 to occur?

Summary of comments on the question: Which of the following changes would prevent the practices described in scenario 26 from occurring?

These practices are very unlikely as SRC is an undesirable feedstock for pellets. Reduction or elimination of UK subsidies would ensure the practice is not economically feasible.

2.8.2 Additional comments on Scenario 26

- “Economics and lack of practicality for managing short rotation woody crops. Concept is government driven and not driven by economics.”
- “This counter-factual is simply not going to happen over the mid-long term given competing economic pressures of high agricultural commodity demand and urbanization. The only afforestation that is likely to happen at scale is going to be high-economic return practices (potentially to meet energy demand)... natural regeneration low productivity reversions simply can't compete economically.”
- “Even though saw timber demand is low during the recession and logging residue production is low, pulpwood is available at relatively low prices and those prices have not been sufficient to justify conversion of agricultural land to SRWC. An increase in saw timber production and availability of logging residue may further reduce the likelihood of development of SRWC for pellet feedstock supply.”
- “Whether or not agricultural land would be converted to forest depends upon a variety of factors that are hard to know going forward. What if agricultural prices increase? In Georgia, we are seeing some non-industrial landowners converting young pine plantations to blueberries because the blueberry demand is so high now. And 15-20 years ago, many farmers were planting Vidalia onions on their land vs. pine because the onion market was so strong...this has since changed. If all other variables—like saw timber and agricultural prices—were held constant, then the conversion of abandoned agricultural land to forests would be more likely during a recession.”
- “There should be a counterfactual for the natural conversion of abandoned agricultural land to natural pine forest. This forest type is more likely than a hardwood forest.”
- “We have discussed with some market players an interest in establishing short rotation crops on abandoned agricultural land, but the context is always domestic biofuels markets, not export pellet markets. Our interpretation of sustainability criteria that are developing in the EU is that these types of conversions will either not be allowed or are in a grey area. We understand from pellet companies that we do business with that they are not interested in this kind of material.”

2.8.3 High level summary of Scenario 26

High level summary of scenario 26

The conversion of abandoned agricultural land to SRC for pellet production is extremely rare to date in SE USA and is unlikely to happen for economic and practical reasons. In particular returns are unlikely to compete with alternative land uses, and the fibre produced is unsuitable for the technical specifications of industrial wood pellets. The counterfactual of reverting to natural moist semi tropical deciduous forest is unrealistic. Natural reversion is unlikely, and if it does occur it will be to the prevalent local pine or mixed forest.

2.9 Scenarios 30b-d

These scenarios concern bringing unmanaged forests into production

Unmanaged forest is defined as forest for which no deliberate planning decision has been made currently or in the future. Management includes 100% conservation and sustainable forest management, including harvest of forest products.

30b) in East Canada

30c) in Pacific Canada

30d) in Boreal Canada

2.9.1.1 Is there unmanaged forest in your region?

- “Remote access with no existing infrastructure (Boreal Canada). Unmanaged forest area - no road or rail access, wilderness. Too far from markets (East Canada)”
- “Lack of markets, no economically interesting products (low pulpwood market), or private owner with other interests.(Quebec)”
- “No value species.”
- “The only unmanaged Crown / public land forest in the region is north of the 50th parallel latitude. It is unmanaged primarily because of its distance from existing infrastructure and markets”

2.9.1.2 Has this forest been managed in the past & if so for what purpose?

- “In some cases, yes but for the most of them; no. Low prices for hardwood in southern part of the province leave previous private and public lands unmanaged. Private land is no more than 10 % of forest land in Quebec.”
- “Yes, but it is now downgraded”

2.9.1.3 What would be the main motivation to increase management in this forest?

- “Economic development. Opportunities for Aboriginal peoples”
- “Good demand and price for forest products (mainly hardwood).”
- “Profit, forest improvement”
- “A shortfall of supply in the currently managed forest, or a desire to provide small scale economic opportunities to First Nations communities in the region.”

2.9.1.4 Is the counterfactual provided above an accurate description of what currently happens when there is no or low demand for fibre for pellets?

Table 2-76 Summary of comments on the counterfactual.

Scenario 30 b-d Is the counterfactual representative of what happens in the absence of pellet demand?

Yes, but respondents emphasised the dynamic nature of forests and that such forest is likely to be remote. Pellets would likely not offer adequate financial return to convert these forests.

- “The forests are currently and will continue to change. The status quo is not on the menu of available options.”
- “We are unaware of any specific tracts of land that meet this definition.”
- “Again, this is a stupid assumption. If forests are unmanaged, it is because they are in parks, conservation areas, or in remote northern areas. Biomass demand will not bring forests out of parks into management. As for remote northern forests, they would only come into demand if

a sawmill or veneer plant was built. Bioenergy alone will never be enough to bring remote northern forests into production”

2.9.1.5 Are the scenarios described above already occurring?

Table 2-77 Summary for Scenarios 30b-d – are these scenarios already occurring?

Summary for Scenarios 30 b-d – are these scenarios already occurring?

Respondents believe that it is the other way round: more land is becoming unmanaged (or unmanageable). Unmanaged forests are not managed for pellet production – other more valuable products would influence this, but the price of hardwood products are insufficient.

- “It is the other way around. More land is becoming unmanaged/unmanageable.”
- “We are unaware of any specific tracts of land that meet this definition.”
- East and Boreal Canada: “No unmanaged forests have been managed for pellet production. The main decisions for managing an unmanaged forest is value added forest product (sawn wood, veneer, panel, pulp and paper). The price of hardwood products is a problem.”
- “94% of the forests in Canada are in public ownership and can be considered to be under some form of management, even if the plan is for non-intervention³¹.”

2.9.1.6 In the future (between now and 2030), if demand for fibre for pellets stays at the current level how likely do you think it is that this scenario will occur (or continue to occur, if it already happens)?

No comments

2.9.1.7 Assuming pellet demand increases in the future, what is the likelihood of the scenario (a) at current fibre prices (b) if prices rise by up to 15% and (c) if prices rise by 30%?

Table 2-78 Scenarios 30b-d Summary of comments on question: Assuming pellet demand increases in the future, what is the likelihood of the scenario (a) at current fibre prices (b) if prices rise by up to 15% and (c) if prices rise by 30%?

Summary for Scenarios 30a-c question: Assuming pellet demand increases in the future, what is the likelihood of the scenario (a) at current fibre prices (b) if prices rise by up to 15% and (c) if prices rise by 30%?

The respondents said that the amount of unmanaged forests in their region was small and did not expect that this forest land would be managed for pellet production.

- “Unmanaged to us means a park. Most of our forests are natural and are “managed” to retain its natural characteristics.”
- “In British Columbia, we do not expect live roundwood to be used for pellets. The Province has a Forests for Tomorrow program to provide reforestation investment aimed at improving the future timber supply and addressing risks to other forest values through the re-establishment of young forests on land that would otherwise remain under-productive. The program focuses on land that is primarily within the timber harvesting land base yet outside of forest industry obligations.”
- “There isn’t really any to bring in, it’s all either managed by the Crown or is private land. The latter is almost meaningless acreage in comparison”

³¹ <http://www.nrcan.gc.ca/forests/canada/ownership/17495>

2.9.1.8 Which of the following changes would encourage the practices described in this scenario to occur?

Table 2-79 Summary of factors that would encourage scenarios 30 b-d to occur

Summary of comments on factors that would encourage scenarios 30 b-d to occur

It is unlikely that unmanaged woodland would be brought back into management. If it did it would most likely occur on private land, which makes up less than 10% of forest lands.

- “Other – it is very unlikely to happen.”
- “The changes could mostly arrive on private land. This lands cover 10 % of the Québec.”

2.9.1.9 Which of the following changes would prevent the practices described in scenario 30 from occurring in the future?

Table 2-80 Summary of factors that would prevent scenarios 30a-c from occurring

Summary of comments on factors that would prevent Scenarios 30 b-d from occurring

This practice is unlikely and would be prevented by low prices and market conditions for more valuable wood products. The conditions for the annual allowable cut would need to be respected if this were to happen.

- “This practice is unlikely”
- “Low roundwood demand results also by pulp and paper low prices.”
- “We will not enhance the tree harvest on public lands for pellets industry if the market for other products like sawn wood and veneer don't improve. In all cases, the AAC have to be respected.”

2.10 Scenario 30a

Scenario 30d This scenario concerns bringing unmanaged forests into production

Unmanaged forest is defined as forest for which no deliberate planning decision has been made currently or in the future. Management includes 100% conservation and sustainable forest management, including harvest of forest products.

30a) in South USA

2.10.1.1 Scenario 30 (South USA) Comments on question: If there is unmanaged forest in your region why is it unmanaged?

- “Landowner objectives, lack of financial capital and lack of markets.”
- “We are unaware of any specific tracts of land that meet this definition.”
- “Small landowners lack the knowledge or have competing management objectives.”
- “Access is too limited, swamps, wetlands, etc.”
- “No financial or market incentive for diameter trees from improvement cuttings and thinnings.”
- “Reasons vary – lack of market for product; landowner conservation objectives; hunting/recreation objectives; long term financial objectives.” (this comment from four respondents)
- “There are a variety of reasons including a lack of market for product; landowner conservation objectives; hunting/recreation objectives; long term financial objectives.”
- “Federal forests are largely unmanaged because of bureaucracy and litigation over active management. Many private forests are unmanaged because of owner's ignorance of forest management.” (from two respondents)
- “As defined, there is very little if any unmanaged forest in the SE Ga area. There are many varying degrees of forest management especially with small family owned forests. These include harvest with natural regeneration with no management other than waiting for the

- timber to mature and harvest again. Harvesting will occur at some time in the future depending on the financial needs of the landowner.”
- “The definition provided is confusing. Main drivers of unmanaged forests that come to mind are: Environmentally sensitive; High operating costs; Landowner objectives”
 - “The forests in the SE US are comprised of small, private landowners. Many of these forests are family owned. When the forestland passes to the heirs, it is often clearcut and then not replanted due to the financial cost of replanting. Other family forests are often not managed for timber and may be managed for other purposes such as hunting, aesthetics and recreation. Other reasons may be the cost of management is too high, some areas are environmentally sensitive so are left as is and some areas may be too inaccessible to manage.”
 - “Most often because there is not a financial return for management due to distance to markets, inaccessibility of land, set aside for ecological reasons (though this is then often managed for those reasons), or landowner objectives.”
 - “There are several reasons a forest may be unmanaged – the forest is environmentally sensitive and protected, the land is difficult to access, the cost of managing the forest is too high, or the landowner prefers unmanaged forest for aesthetic or recreational purposes.”
 - “Some of the reasons a forest may be unmanaged are: • The cost of management is too high. • The land is inaccessible due to its location. • The forest is environmentally sensitive, so it is being left as is and is likely to never be harvested. • Landowner objective is for forest to grow naturally for aesthetic reasons. • It is already protected, whether through ownership or conservation easement.”
 - “Some reasons might be: Forest owner objectives; Forest owner inattention; Management costs are too high; Location is inaccessible; Forest is in conservation status, either formal (e.g., state park) or informal, that precludes management.”
 - “The definition of unmanaged is unclear; how is it possible to determine now, whether a planning decision might be made at some point in the future? For the purpose of answering this question it is assumed that there is currently no active management and no current plan for future active management. By this definition there are unmanaged forest in each of the regions discussed in this survey. Generally speaking forests are not managed because the owner does not have the resources or motivation to invest in carrying out management. Where the owner chooses no physical intervention but does intend to harvest at some point in the future, then this can be considered a form of management, this could be considered an “under-managed forest” this type of forest could benefit from more activity (e.g. thinning, weed control, pest control, drainage, fertilisation, pruning etc.). Under-managed forests can be quite common in the US South and are a potential source of thinnings and pulpwood, where markets are located within a reasonable transport distance.”

Table 2-81 Summary of comments on the question: scenario 30d (south USA): If there is unmanaged forest in your region, why is it unmanaged.

Summary of comments on the question: scenario 30 (South USA) – If there is unmanaged forest in your region, why is it unmanaged.

The definition of unmanaged is unclear. Reasons a forest may be not be under a management plan include: poor access, uneconomic to exploit, environmentally sensitive/ protected, landowner objectives including aesthetics or alternative uses, landowner inattention.

2.10.1.2 Scenario 30 (South USA) Comments on question: Has this forest been managed in the past & if so for what purpose?

- “We are unaware of any specific tracts of land that meet this definition.”
- “In the US south, almost all of this formerly was converted to agricultural lands. Current forests are mostly regeneration that occurred the past 100 years.”

- “In the US South, very little forest has never been managed – although in some places it may have been one hundred years or more since the last harvest”. (4 respondents)
- “Federal lands used to be more actively managed for multiple use including forest products. Unmanaged private lands may cycle back and forth from managed to unmanaged depending on owners, change of ownership, etc.” (2 respondents)
- “By the definition above, only primary forest has not been managed in the past.”
- “Forests go in and out of forest management depending on the owner's management objectives. Some forests are managed primarily for timber while others may be managed for wildlife, hunting, aesthetics, recreation or a mixture of all of these, including timber management.”
- “If it was managed, which is likely, it was likely managed for timber but was taken out of production for one of the above reasons.”
- “This would have to be answered on a stand by stand basis.”
- “Under-managed forest have usually had some form of management in the past. It may have been harvested at some point in the past or used for some form of recreation or amenity. Where there is no history of management at all then this type of forest is likely to be primary or natural forest and would usually be protected or not available for commercial harvesting, it may also be too geographically remote to access any timber markets, hence no previous management.”

Table 2-82 Summary of comments on the question: scenario 30d (south USA): Has this forest been managed in the past & if so for what purpose?

Summary of comments on the question: scenario 30 (South USA) – Has this forest been managed in the past and if so for what purpose?

Almost all forest in the South USA has been managed at some time, but it may be more than 100 years since the last harvest. Management has been for timber and other landowner objectives such as recreation.

2.10.1.3 Scenario 30 (South USA) Comments on question: What would be the main motivation to increase management in this forest?

- “Economic return” (11 respondents)
- “Most of it is public land and it will not see active management.”
- “Improving forest health to reduce the risk of fire, insect and disease would be the main motivation for increased management in Federal forests. There is a lot of attention to this in the news but special interest group are blocking efforts. In the case of non-industrial private landowners, education on forest management and access to markets would be potential motivators for increased management.” (2 respondents)
- “Motivation to manage a forest is based on landowner's objectives. Often times, the lack of management is based on the size of the tract. The only management required is decision making on when to harvest.”
- “If you mean commercial management specifically then the main reason for management would be commercial. Management for other reasons would be for land owners' objectives such as aesthetics, hunting, environmental reasons, etc.”
- “It could be the opportunity to generate revenue due to a new local market. The opportunity to improve the quality of the forest either for timber production or for some form of recreational activity. It could also be management to improve the conservation value of the forest which may involve harvesting and the removal of some undesirable trees/species.”

Table 2-83 Summary of comments on the question: scenario 30d (south USA): What would be the main motivation to increase management in this forest?

Summary of comments on the question: scenario 30 (South USA) – What would be the main motivation to increase management in this forest?

Improved financial returns was the main motivation. Also mentioned were improved forest health and improved conservation value.

2.10.1.4 Scenario 30 (South USA) Comments on question: Is the counterfactual provided above (forest remains unmanaged) an accurate description of what currently happens when there is no or low demand for fibre for pellets?

- “The forests are currently and will continue to change. The status quo is not on the menu of available options.”
- “Definitely not, unless it is old growth the forest will continue to accumulate carbon.”
- “There are very few acres of forest that will not be harvested at some point in the future, and the demand for pellets will have absolutely no effect on the management of the forest.”
- “Pellet market would have little effect, if any, on whether these forests are managed.”
- “Many of these forests will remain unchanged regardless of pellet fibre demand.”
- “Markets for merchantable roundwood or a landowner's objectives would drive a management regime and not pellet demand.”
- “It may remain unmanaged until it converts to agricultural or development land. Land will always *tend* to revert to its highest and best use in the a free market economy and this is rarely unmanaged forests”
- “A change in management would occur in response to markets for sawtimber. Demand for low-value fibre such as fibre used for pellets will have little to no effect on forest management.”
- “Though extremely unlikely, if land is managed, it is more likely to be harvested for timber production in the future, though this will depend upon variables such as inventory and the value of merchantable roundwood products (sawtimber and pulpwood) as well as markets for this material and landowner objectives. The pellet market alone could never overcome the cost of bringing these lands into production.”
- “All forests change. If the question is whether the forest remains unharvested, the answer would be sometimes. If the question means that the land remains unmanaged, that is most of the time but that is the same answer for when there is a pellet market.”
- “It would depend on the owners’ objectives and access to other markets.”

Table 2-84 Summary of comments on the question: Is the counterfactual provided above (forest remains unmanaged) an accurate description of what currently happens when there is no or low demand for fibre for pellets?

Summary of comments on the question: Is the counterfactual provided above (forest remains unmanaged) an accurate description of what currently happens when there is no or low demand for fibre for pellets?

Demand for pellets will have little or no impact on whether or not the forest continues to be unmanaged. Future harvesting and management will depend on timber financial returns and owner objectives.

2.10.1.5 Scenario 30 (South USA) Comments on question: is this already occurring?

- “Other way around. More land is becoming unmanaged/unmanageable.”
- “Land that is not a working forest in the south is likely in a protected status that will likely not change.”
- Comment: “The majority of land in the South is owned by small landowners. Most of those landowners do not engage in deliberate planning decisions.” (4 respondents)
- “Many of these forests will remain unchanged regardless of pellet fibre demand.”
- “This sometimes occurs but is not driven by pellet demand and is driven by housing market or other landowner objectives.”
- “This happens sometimes, perhaps driven by a change in ownership or owner objectives or a change in sawtimber markets. Pellets would have little effect, if any.”

- “Landowner objectives, stand improvement and stabilization in the sawlog markets will drive this, not pellet demand. Unmanaged forests are sometimes being converted to managed forests. However, to tie this directly to pellet demand is not possible. This decision is more likely tied to landowner objectives for stand improvement and stabilization in the housing and saw timber markets.”
- “This will likely happen on the margin but this also leads to a growing number of forest lands staying in forest vs being converted to other land uses.”
- “Unmanaged forests are sometimes converted to managed forests, however this is not tied to pellet demand. This conversion is typically tied to landowner desire to improve their lands.”
- “Unmanaged forests are sometimes being converted to managed forests. However, to tie this directly to pellet demand is not possible. This decision is more likely tied to landowner objectives for stand improvement and stabilization of the housing and sawtimber markets. The pellet market alone could never overcome the cost of bringing these lands into production.”
- “Unmanaged forests are constantly being harvested throughout the south. If by production, the questions means converted to managed stands, a pellet market is unlikely to have that much influence. Unmanaged/managed are personal decisions of the forest owner. Objectives changes as lives evolve or as new owners succeed to the property either by purchase or through inheritance.”
- “New or expanding markets can sometimes bring under-managed forests back into management.”
- “Our forest land harvest levels have plummeted in the past 2 decades. We are managing much less than we probably could/should in order to optimize forest health, etc. The same is true of small private landowners.”

Table 2-85 Summary of comments on the question: scenario 30d – is this already occurring**Summary of comments on the question: scenario 30 (South USA) – is this already occurring?**

Unmanaged forests can be converted to managed forests, but this is not tied to pellet demand. It is likely to occur due to improvements in timber markets, change in land ownership, and objectives for stand improvement. Current trends are for less land to be actively managed.

2.10.1.6 Scenario 30 (South USA) Comments on question: In the future (between now and 2030), if demand for fibre for pellets stays at the current level how likely do you think it is that this scenario will occur (or continue to occur, if they already happen)?

- “Almost none as most southern forests, are managed to some extent.”
- “Under-managed forests are likely to continue to be brought back into some form of management to some degree. “Three-quarters of all respondents indicated willingness to manage their land for biomass production, compared with 43% of respondents who actively manage their land at present.”³²”

2.10.1.7 Scenario 30 (South USA) Comments on question: Assuming pellet demand increases in the future, what is the likelihood of the scenario (a) at current fibre prices (b) if prices rise by up to 15% and (c) if prices rise by 30%?

Table 2-86 Scenario 30d Comments on the question: Assuming pellet demand increases in the future, what is the likelihood of the scenario (a) at current fibre prices (b) if prices rise by up to 15% and (c) if prices rise by 30%?

Summary of comments on question: scenario 30: Assuming pellet demand increases in the future, what is the likelihood of the scenario (a) at current fibre prices (b) if prices rise by up to 15% and (c) if prices rise by 30%?

³² Paula, A., Bailey C., Barlow R. and Morse, W. 2011. Landowner Willingness to Supply for Biofuel: Results of an Alabama Survey of Family Forest Landowners. Southern Journal of Applied Forestry 35(2): 93-97.
<http://www.ingentaconnect.com/content/saf/sjaf/2011/00000035/00000002/ar.t00007>

Most respondents said that landowners who not currently managing their forests are unlikely to begin to manage it or to be aware of prices. Any decision is more likely to be related to saw timber prices.

There were a minority of respondents who said that this is already happening due to new demand from pellets and will increase with higher prices. However, other respondents said this does not happen to primary forests or those in protected areas.

- “This is already happening due to the new demand from pellets and will increase with higher prices”
- “Landowners who are not currently managing their forestland are very unlikely to begin to manage it, much less go to the expense of conversion, based on such modest increases in the price of the lowest valued component of the forest.”
- “Usually unmanaged forests have little carbon benefits. Converting them to managed forests actually would be carbon beneficial, but it would be expensive so these small price increases would do little to encourage this. Additionally, this decision would be based on the sawtimber market, independent of pellet demand or pellet prices.”
- “Unmanaged forests are generally scrub lands that have little carbon storage value. To convert these scrub lands to productive managed forests would cost more than the return, given the modest price increases. In addition, those who are not currently managing forests for production are unlikely to even know that prices are increasing, making conversion very unlikely. While this happens on rare occasions, price alone is rarely a prominent decision factor. More than likely this decision will be made and based on the sawtimber market, independent of pellet demand.” (A variation on this comment from two respondents)
- “If a new pellet mill locates in a region where there is surplus of accessible fibre but no current markets, therefore thinning and other forms of management are not undertaken, then this new demand may enable forest owners to more actively manage their forests. This does not apply to primary forests or those areas that are protected. Any price increase will allow the pellet mill to source from a wider catchment area therefore extending the range of forests that could be brought into management.”

Summary of comments on the question: Assuming pellet demand increases in the future, what is the likelihood of the scenario (a) at current fibre prices (b) if prices rise by up to 15% and (c) if prices rise by 30%?

2.10.1.8 Scenario 30: What percentage of land is affected by this?

- “Percentage area affected (i.e. where you have evidence that non-bioenergy uses have been displaced by demand for fibre for pellets): More than 70%.”
- “The South is dominated by private ownership. Over 5 million private forest owners across the region hold 200 million acres of forest land, 86 percent of the total forest land area. On average, families and individuals own two out of every three acres of this private forest land. 59% of family forest owners own between 1 and 9 acres of forest land. One third of family forest land is owned by people who have never harvested and sold trees from their land. Only 3 percent of the family forest owners have a written management plan and only 13 percent have received forest management advice³³.” (This comment from three respondents).
- “Percentage area affected (i.e. where you have evidence that non-bioenergy uses have been displaced by demand for fibre for pellets): Difficult to assess”

2.10.1.9 Scenario 30 (South USA) Comments on the question: Which of the following changes would encourage the practices described in this scenario to occur?

None

³³ “The Southern Forest Futures Project: Technical Report” by David N. Wear and John G. Greis. August, 2013. Chapter 6.
http://www.srs.fs.fed.us/pubs/gtr/gtr_srs178.pdf.

Table 2-87 Summary of comments on the question: Which of the following changes would encourage the practices described in scenarios 30 (South USA) to occur?

Summary of comments on the question: Which of the following changes would encourage the practices described in scenario 30 (South USA) to occur?

None

2.10.1.10 Scenario 30 (South USA) Comments on question: Which of the following changes would prevent the practices described in scenario 30 (South USA) from occurring?

Table 2-88 Summary of comments on the question: Which of the following changes would prevent the practices described in scenario 30 (South USA) from occurring?

- Most southern timberlands are already managed at various levels of intensity
- Lack of educational and incentive programs to encourage private landowners to manage their land more actively (2 respondents gave a variation on this comment)
- The pellet market is unlikely to drive any landowner decisions. Landowner objectives are very diverse ranging from timber income to aesthetics.
- Markets for sawtimber and pulpwood are poor and offer no financial incentive to convert. (4 respondents)
- The most likely occurrence to prevent improvement of management of forests would be deterioration of sawtimber and pulpwood markets. In the past increasing demand from these markets has led to increased productivity and increased inventories (more than doubling since 1953).
- "Only 20% of landowners cite timber production as a reason to own forest land. There are many other factors considered when deciding to convert to forest land or bring unmanaged forests under management³⁴." (2 respondents)
- "Forest management decisions are often driven by a range of factors that can change over time. Some of these will be financial, many will not be, and the relative importance of each factor will change over time. The pellet market is just one small part of this complex mix, and it will be very rare that it is the determining factor."

Summary of comments on the question: Which of the following changes would prevent the practices described in scenario 30 (South USA) from occurring?

Forests are likely to remain unmanaged if there is a deterioration in sawtimber and pulpwood markets. However, there are a range of other reasons for small private owners to retain unmanaged forest that are unrelated to timber and pellet markets.

2.10.2 Additional comments on Scenario 30 (South USA)

None

2.10.3 High level summary of Scenario 30 (South USA)

High level summary of scenario 30d (South USA)

The definition of 'unmanaged' was felt to be unclear. Most forest land in South USA has been managed in the past and is likely to be managed again in the future. The timing of management depends on when financial returns are attractive for timber and pulpwood, and on a range of other user objectives for small scale private owners. The counterfactual was not felt to be appropriate as respondents felt pellet demand would have little or no influence on when a forest is brought back into management.

³⁴ B J. Butler, M Tyrrell, G Feinberg, S Van Manen, L Wiseman, and S Wallinger. "Understanding and Reaching Family Forest Owners: Lessons from Social Marketing Research." Journal of Forestry October/November 2007. pp. 348-357



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