

# U.S. Forest Service Response on the UK's Request for Comment

February 1, 2018

The following is supplied by the U.S. Department of Agriculture's (USDA) Forest Service, Research and Development Branch, in response to selected questions raised in a "call for evidence" from the Committee on Climate Change in preparation for Bioenergy Review to be published later this year (see [www.theccc.org.uk/publication/bioenergy-review/](http://www.theccc.org.uk/publication/bioenergy-review/)).

*The questions of interest are (verbatim from Question 3):*

Currently the UK imports a significant proportion of wood pellets for biomass electricity production from North America, particularly the Southeast USA.

- a) What are the wider market impacts of demand for wood pellets on forestry management practices and carbon stocks at the landscape level in North America?
- b) What evidence is there that wood pellet production displaces other uses of forestry products in North America? (e.g., panel board or lumber production)
- c) What are the most likely alternative/counterfactual uses of forestry products used for wood pellet production?
- d) How are these wider market impacts (sub-questions a-c) likely to change over time if demand for wood pellets significantly increases?

## **SUMMARY RESPONSE**

Increased use of timber in pellet production in the U.S. South has not shifted total timber production outside of its historical range of variation and is not expected to lead to changes outside the historical range. Increases in the production of wood pellets, however, will increase competition with local pulpwood users, slightly decrease rates of carbon sequestration (but not carbon inventories), and increase income to private landowners. An increase in pellet production could also increase the production of sawtimber and lumber (increasing the storage of carbon in harvested wood products) and could lead to an increase in the amount of timberland, with consequent increases in the stock of forest carbon.

## **DETAILED RESPONSES TO QUESTION 3**

### **What are the wider market impacts of demand for wood pellets on forestry management practices and carbon stocks at the landscape level in (the U.S.)?**

#### *Forestry management practices*

While wood pellets from the Southeast comprise a large portion of U.K. imports, they represent a small portion (less than 5%) of total timber production from the Southeastern U.S. The region's product mix is dominated by softwood sawtimber, softwood pulpwood, and hardwood pulpwood. Coincident with recent increases in the wood pellet production, pulpwood production has declined so that total output at the regional level has not increased over the past two decades. Pellet production changes are focused on a small portion of the region.

In places where pellets have contributed to increases in demand for hardwood pulpwood and residues, timber harvest practices have changed. Previously, hardwood timber harvests often left behind large

quantities of both standing and down woody residues, largely because there was no market for low quality hardwoods. Current practices in areas with increased wood pellet production remove these standing and down residues, raising landowners' timber revenues and better preparing harvested sites for conversion to pine plantations. Harvest practices on pine sites are less likely to change in locations with active pellet markets, as utilization of timber on these sites is already high.

Emergence and growth in local wood pellet manufacturing capacity are expected to raise the amount of natural forest harvested land that will be converted to pine plantations and raise the level of harvesting activity in previously un-profitable or less-profitable stands. However, neither increased conversion nor heightened pressure on lower value stands has been documented with empirical research evidence.

### *Carbon stocks*

We anticipate little change in forest carbon stocks resulting from increased pellet production. Pellet production is a small component of total production (<5%), and the recent history of timber harvesting has been coincident with a strong expansion in forest carbon inventories in the region. Southeastern U.S. carbon stocks increased between 1990 and today and are projected to exhibit a rate of net forest carbon sequestration in excess of 60 teragrams of carbon per year (Tg C/yr) through 2030 (Coulston et al. 2015). Empirical simulation models project future carbon stock dynamics based on continuing harvests at historical rates show a continued expansion in forest carbon inventories, as the region's forests continue to mature and young stands rapidly accumulate carbon. These simulations show that carbon sequestration in the Southeastern U.S. is projected to peak in 2020 at roughly 70 Tg C/yr and then stabilize at 58 Tg C/yr through 2037 (Wear and Coulston 2015). For the period 2007-2012, forest inventory data indicate that although total forest cutting caused net decreases in Carbon (-76.7 Tg C /yr), these harvests were more than offset by forest growth (+143.77 Tg C/yr) (Coulston et al.2015; Woodall et al. 2015). Conversions of forests to other land uses, including developed uses and agricultural uses, have the greatest negative impacts on future forest carbon inventories; increased rates of conversions could dampen forest carbon sequestration substantially (Wear and Coulston 2015; Coulston et al. 2015).

Economic theory implies, and to date, empirical evidence concurs, that increased prices for forestry products will lead to increased land area in timberland (Hardie et al. 2000). Several studies demonstrate a significant price-driven interaction between forest and agricultural land uses especially (e.g., Lubowski et al., Hardie et al. 2000). Increased timberland area has substantially augmented forest carbon stocks in the Southeastern U.S. (Coulston et al. 2015).

### **What evidence is there that wood pellet production displaces other uses of forestry products in (the U.S.)? (e.g., panel board or lumber production)**

Evidence of policy impacts in a market are obtained from economic theory, from observations/anecdotal evidence, from empirical/statistical analyses, and from simulation studies.

Economic theory implies that an increase in the demand for small diameter timber (pulpwood) that is used in pellet production will lead to price increases for pulpwood, thus reducing pulpwood use by competing sectors, e.g., pulp and OSB/panel producers. Economic theory provides mixed implications of the impacts of an increase in the demand for pulpwood on users of sawtimber, e.g., lumber and plywood producers. Because sawtimber and pulpwood are produced from forests jointly, these products are complements at this level, indicating that an increased demand for pulpwood would result in an increased supply of sawtimber, thus lowering input costs to lumber producers and increasing the

production of lumber. However, increases in the demand for wood pellets also lead to increases in the demand for sawmill residues, a co-product of lumber production. Depending on the prices for lumber and mill residues, as well as the manufacturing details and input costs, an increased demand for wood pellets could lead to either increases or decreases in lumber production - increased prices for residue production, with the same input mix, is expected to lead to increased mill profits and increased production of both outputs whereas, using smaller diameter logs leads to more residues and decreased lumber production per unit of timber input. Finally, because the product definitions for softwood pulpwood, chip'n saw and sawtimber, are market responsive, an increase in the demand for wood pellets could lead to changes in merchandizing standards at the log deck. For example, an increase in the price of pellets could lead to reclassifying a log from chip'n saw (sending it to a sawmill) to pulpwood (sending it to a pellet mill). This in turn would lead to increased sawtimber prices and reduced lumber production.

Anecdotal/observational evidence indicates that there is increased competition between pellet/Oriented Strand Board (OSB)/pulp producers for pulpwood and sawmill residues. The outcome is said to be that procurement regions have expanded; prices have increased; and larger diameter timber is being sourced. Anecdotal evidence also indicates that sawmill residue markets are an important factor in sawmill location and acquisition.

Empirical/statistical analyses have not specifically addressed the substitutability or complementarity of the production of pellets as compared to the production of pulp or lumber. However, this addition of a new product follows the pattern established for pulpwood in the U.S. South over the last half-century, where pulp production used pulpwood as a complement to the use of sawtimber in lumber production, and later, OSB mills competed with pulp production for the use of pulpwood. Numerous studies have tested for complementarity and substitutability between these two competing uses of timber, generally finding that the production of pulpwood and sawtimber is complementary, although an increase in the demand for pulpwood leads to an increase in the price of pulpwood (thus OSB, pulp, and pellets would be described as substitutes) (Newman and Wear 1993, Polyakov et al. 2010, Prestemon and Wear 2000).

Finally, simulation models, which often use the results of the statistical analyses cited above, also generally conclude that increased demand for wood pellets leads to increased production of sawtimber and thus lumber (complements), while also leading to decreased production of OSB/panels and pulp (substitutes). (Ince and Nepal 2012; Johnson and Rinaldi 2017; Johnston and Van Kooten 2016; Duden et al. 2017; Abt et al. 2012, 2014; Skog et al. 2014)

### **What are the most likely alternative/counterfactual uses of forestry products used for wood pellet production?**

According to the USDA Forest Service, Forest Inventory and Analysis (2017a) Timber Product Output surveys (TPO), we know that the same forestry products (pulpwood sized timber) and sawmill residues are used in the production of panels (such as OSB), pulp (and thus eventually paper products), and wood pellets. TPO also provides information on users of low-quality hardwoods and logging residues. These products are typically only used in the production of wood energy or wood pellets. Finally, TPO tells us that some of the forestry products that would have previously been left in the woods either as standing timber or as logging residues (largely because there was not a local market) are now being used in the production of wood pellets and for domestic wood energy. This often results in a fuel hazard reduction.

## **How are these wider market impacts (sub-questions a-c) likely to change over time if demand for wood pellets significantly increases?**

Increasing demand for pellets will likely lead to:

- More conversion of natural pine and hardwood stands to plantations, which increases productivity and carbon sequestration, but may reduce biodiversity
- More harvest of 'marginal' stands, which may increase the harvest of timber on hydric soils or in less resilient locations
- More profits to landowners, which implies that fewer timberland acres will be converted to agricultural uses
- More impact on substitutes for pulpwood sized timber, raising prices for timber inputs into pulp and OSB production
- More impact on complements in production (sawtimber sized timber), reducing prices for timber inputs into lumber and plywood production

As pellets are now a small portion of total wood production in the Southern U.S. (4 and 6% of roundwood softwoods and hardwoods) (USDA Forest Service, Forest Inventory and Analysis 2017b), the effects are more local and isolated to the specific feedstocks used by the pellet mills. If this percentage continues to increase, however, the effects will also become larger.

### **Definitions**

- Forestry products include timber (including softwood sawtimber, pulpwood, and chip'n saw and hardwood sawtimber and pulpwood), as well as logging (or forestry or harvest) residues.
- Wood products include pulp, paper products, lumber, plywood, OSB, other panels, and pellets that use forestry products as inputs.
- Intermediate wood byproducts include sawmill residues.

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