



Southern Pine Tree Planting and Lumber Production

Southern pine sawtimber prices have been stuck in a rut since the Great Recession began in 2008—at least until very recently. There is a surplus of sawtimber in the southern forest as we discussed ten years ago in Vol 8 No 4 *Housing Starts and Lumber Production*. In some of our work to understand the size of that surplus, we put southern pine planting activity and southern pine lumber production in a graph years ago. We wanted to see if something jumped out at us. Would it be obvious that too many acres were being planted? Press reports have said that the most recent federal program to promote tree planting contributed to the sawtimber surplus (e.g., Dezember and Monga, 2021). Or has southern pine lumber production been astonishingly low?

Part I: The Red Herring

Figure 1 is an update of that earlier, unpublished chart. There appears to be a relationship between the two. The acres of southern pine planted each year increased over time with occasional sharp spikes. (The spikes were caused by federal programs that promoted tree planting.) Southern pine lumber production also increased over time, with spikes along the way. It looks like southern

pine lumber production peaks about 20 years after southern pine planting peaks.

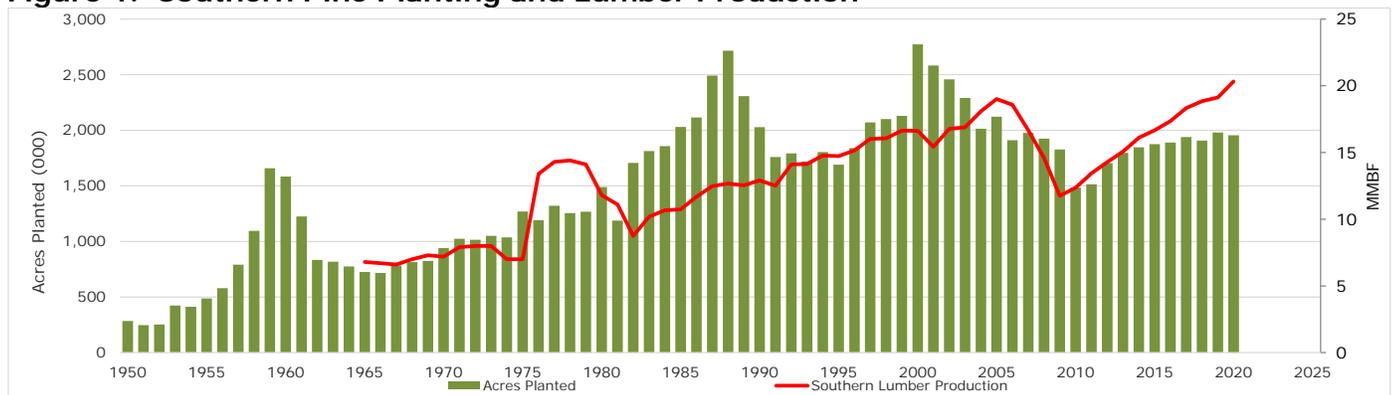


Southern Pine Seedling

Figure 2 measures the number of years between the planting peak and corresponding lumber production peak. Planting peaked first in 1959 and lumber production peaked 19 years later. There were 17 years between the second planting peak in 1988 and the lumber peak in 2005, and 20 years between the third set of planting and lumber peaks.

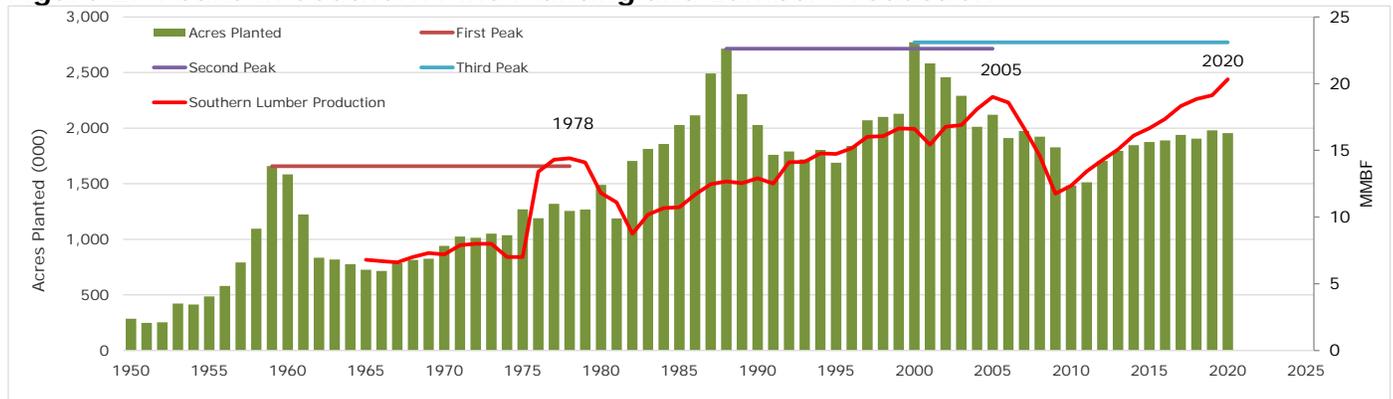
We calculated the correlation coefficients (R) for planting and production with 17 to 20 years between the two (Table 1). While all four intervals show very strong correlations, the 18-year R is the strongest at 0.8965.

Figure 1. Southern Pine Planting and Lumber Production



Source: US Forest Service, Southern Forest Products Association

Figure 2. Peaks in Southern Pine Planting and Lumber Production



Source: US Forest Service, Southern Forest Products Association

Table 1. Correlations Between Planting and Lumber Production

Acres Planted	Southern Lumber Production			
	17-Year-Lag	18-Year-Lag	19-Year-Lag	20-Year-Lag
1.0000	0.8925	0.8956	0.8502	0.7664

This suggests that, if we know how many acres were planted one year, we can estimate the volume of softwood lumber production we will see 18 years later.

The coefficient of determination (R^2) is 0.80, which is supposed to mean that 80 percent of the lumber production in a year can be explained by the number of acres planted 18 years before.

But...!!!

This *looks* like a strong relationship and the correlation and determination coefficients are very strong, but there is one obvious issue and some less obvious issues.

Rotation Age

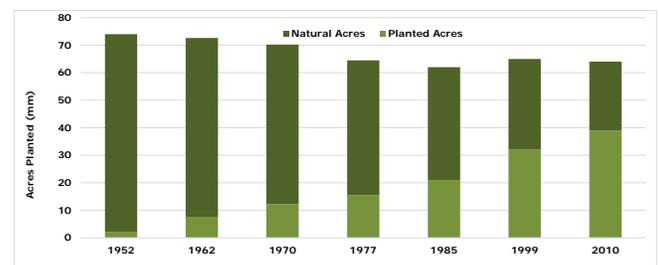
The most obvious issue is that 18 years is too short a rotation age for southern pine. This is especially true for the 1950s and 1960s--trees planted in 1960 were not harvested in 1978. The Timber Division at Container Corporation of America (CCA) in Fernandina Beach, FL was working with a 30-year rotation age in 1980. Plantation rotation ages have been falling over time as genetic improvements and silviculture treatments have intensified, and 25-year rotations are becoming common for intensively managed stand, but even now very few are as low as 20 years.

Naturally Regenerated Stands

Our little *Planting Acres = Lumber Production* model ignores timber harvested from natural stands. There were less than 2 million acres of southern pine plantations in the 1950s (South and Buckner, 2004). So there was a lot of wood being sawn into lumber in the 1970s that was not from trees planted in the 1950s. Our analysis under-estimates the total number of acres of timber used to produce lumber, especially in the early years.

Figure 3 shows the acres of naturally regenerated and planted pine stands in the South since 1952. Plantations now account for 60 percent of the pine stands in the South, but there are still 25 million acres (very roughly 10 million hectares) of naturally-regenerated stands producing sawtimber.

Figure 3. Southern Pine Acres by Source (mm acres)



Source: USFS

Increasing Growth & Yields

Our analysis also ignores increasing yields per acre over time. Those CCA foresters in 1980 were using an average yield of a cord per acre per year (2.6 – 2.7 tons per acre per year) in 1980. More recent yields approach 10 or more tons per acre.

Figure 4 shows southern pine yields in terms of cubic feet per acre from 1940 through 2000. Yields in 2000 were four times higher than they were in 1940.

Figure 4. Southern Pine Yields



This means more lumber can be produced from each planted acre as we move through time in the analysis.

Processing Technology

Our analysis does not allow for changes in sawmill technology that have occurred over time. Sawmills are able to recover more volume from a log than they could in the 1950s. Again, this means still more lumber can be produced from each planted acre.



Cause and Effect?

There is also no good case for a cause-and-effect relationship between planting pine trees and producing lumber from them—*planting* the trees does not mean they *will* be turned into lumber 25 or 30 or 50 years later. An increase in available pine sawtimber *allows* an increase in lumber production, but it does not *cause* an increase in lumber production.

Planting trees affects the *supply of* sawtimber, but it does not affect the *demand for* sawtimber.

Part II: Better Use of the Planting Data(?)

While the planting data does not tell us the volume of lumber that *will* be produced, it could help us estimate the volume of lumber that *could* be produced. We can estimate how much timber will be available from planted acres.

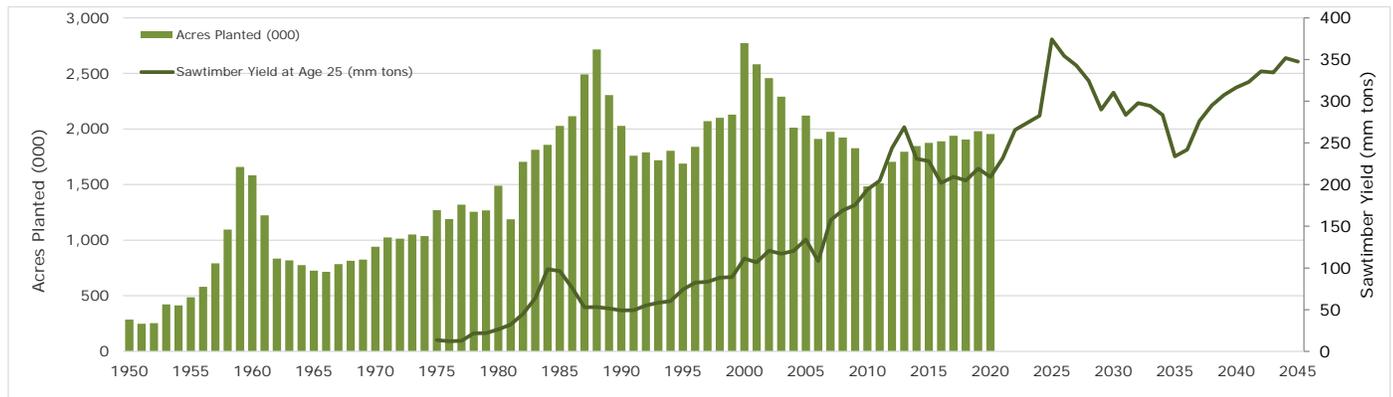
We can apply the yields in Figure 4 to the acres planted each year. Using forest economist license, we assumed a constant incremental increase in yields between the years shown in the chart. For example, yields increased from 3,500 cf/acre in 1980 to 4,000 cf/acre in 1990, so we assumed yields increased 50 cf/acre/year during that time. Yields increased 100 cf/acre/year between 1990 and 2000. Those without the fuzzy vision of a forest economist might suppose that growth between years is not constant, but subject to jumps as silviculture research and genetic improvements introduce jumps in yield.

The data in the chart end at 2000, so we assumed a 100 cf/acre/year increase between 2000 and 2010. We did not increase yields after 2010 as it appeared that we would eventually be able to supply all the timber the world needs from a single acre of southern pine.

After converting cf/acre to tons/acre, we then assumed 50% of that volume would be sawtimber.

We did not make any adjustments based on declining rotation ages over the past 70 years but realize that getting more wood sooner from an acre would produce even more available sawtimber.

Figure 5. Estimating available sawtimber from planted acres



Source: UN FAO

Figure 5 shows the volume of sawtimber that could be produced from acres planted 25 years before. Note that the projected volume available in 2045 (planted in 2000) is approaching the levels projected to be available in 2025 (planted in 2000).

If we assume no yield increases after 2000, the sawtimber available in 2045 is about the same as the yield from the acres planted in 1988, though 750,000 more acres were planted in 1988 than in 2000.



Summary

We started with two data series that seemed to be related and were very strongly correlated. But that strong relationship didn't make sense given what we know about southern pine growth and management. Further analysis in a different

direction suggests there will be plenty of southern pine sawtimber available in the future. The supply should peak within a couple of years, then begin to rebound about 10 years after that.

References

Dezember, Ryan and Vipal Monga, 2021, Lumber Prices Are Soaring. Why Are Tree Growers Miserable? The Wall Street Journal, February 24, 2021

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Jack Lutz, PhD
Forest Economist
Forest Research Group
78 Stoneybrook Way
Hermon, ME 04401
207-605-0037
jlutz@forestresearchgroup.com
www.forestresearchgroup.com