



Economic analysis of slash pine forest carbon sequestration in the southern U. S.*

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Abstract

The impact of a carbon subsidy and tax policy on slash pine (*Pinus elliottii*) plantations is investigated using a modified Hartman model. Such a policy is shown to increase the optimal rotation age, land expectation value and the supply of sequestered carbon. The supply of carbon increases at a decreasing rate with the price of carbon. The supply of sawtimber increases while the supply of pulpwood decreases. The increase in land expectation value was substantial, suggesting inclusion of carbon sequestration benefits and emission costs would benefit private forestland owners. As the value of forestland increases in response to a carbon policy, more land could be devoted to forestry as opposed to other land uses such as agriculture and urban development.

Key words: carbon sequestration, global warming, slash pine, optimal rotation, timber supply.

Introduction

There is growing concern over the accumulation of “greenhouse gasses”, particularly carbon dioxide (CO₂), and associated global warming. As a result of global warming, sea levels may rise causing inundation of some coastal areas and the earth’s environment may be altered affecting biodiversity and food security in many regions. Since the early 1990s, governmental and non-governmental organizations across the globe have been discussing strategies to mitigate atmospheric concentrations of greenhouse gasses (Hedger 1998). In 1997 the United Nations Convention on Climate Change adopted the Kyoto Protocol requiring industrialized countries to reduce their greenhouse gas emissions to approximately 5 % below 1990 levels by 2008–2012. The details of the Protocol were worked out in November 2001 in Marrakesh, Morocco and it appears likely that it will enter into

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force in the next couple of years. The current U.S. administration, however, has opted out of the Kyoto Protocol and has developed an alternative that it claims would be less harmful to the U.S. economy.

It is widely recognized that forests play an important role in the global carbon cycle by sequestering and storing carbon, enabling the switch from more energy-intensive materials such as steel to forest products, and facilitating substitution of biomass fuels for fossil fuels (Brand 1998). It is this role of forests in climate change that has influenced participants of the Kyoto Protocol to allow countries to count carbon sequestered in forest to be counted toward a country's emission requirements. As the U.S. has long been a proponent of this idea, the Bush administration has proposed over 3 billion dollars in its alternative climate change proposal for forestry and agricultural carbon sequestration activities (Bush 2002). Preliminary research indicates that carbon sequestration through forestry practices can be cost effective. For example, Dixon (1997) estimated that sequestration of carbon through silvicultural practices could cost between \$2–56 per metric ton. Current projections by the Resources Planning Act assessment models show that through the year 2040 about 15 percent of projected U.S. carbon emissions will be sequestered by forests (Murray et al. 2000). These projections are based on current management trends such as decreased logging in the Pacific Northwest.

Carbon sequestration varies depending upon the nature of forests. Old growth forests are expected to have large stocks of carbon with limited potential for carbon sequestration since net biomass growth is negligible. A young forest, on the other hand, will have low stocks of carbon but large carbon uptake due to rapid growth of young trees. Some researchers have noted that harvest of old growth forests would result in a net flux of carbon to the atmosphere that would take hundreds of years before recovering the original net carbon stored (Harman 1990). This has provided a rationale to be cautious about the harvest of old growth forests from a climate change perspective. However, forests already under management for commodity production could sequester additional carbon by lengthening the rotation and producing more products with a long product life such as sawtimber as opposed to products with a shorter product life such as pulpwood.

There is a problem, however, in capitalizing on the comparative advantage of producing an additional amount of timber and associated carbon. In the absence of markets for forest carbon, private timber producers consider carbon external to their production decisions. As a result, forest biomass production and associated carbon sequestration may be lower than is socially desirable. In the case of public lands, this problem can be resolved by manipulating government budget allocations. However, in the case of private lands, incentives may be necessary to stimulate landowners to consider carbon sequestration benefits in their production decisions (Alavalapati 1998).

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