GEORGIA FORESTRY COMMISSION

Investing in Reforestation of Slash Pine in the Lower Coastal Plain Based on Various Future Timber Price Scenarios

By: John Sunday-Staff Forester

Introduction

Slash pine is commonly planted throughout the coastal plain of Georgia as it is known for its exceptional growth rate and ability to grow well in poor soils. Slash pine is also favored for its high resin content, making it a staple for the naval industries and products such as railroad ties. Recent uncertainty in the global economy has led many forest landowners to question the benefits of timber investments. While there is uncertainty in stumpage values, one thing that is certain is that timber grows each year, increasing the overall value. Annual growth, barring no natural disasters, can be rarely said about other investments. This report serves to guide landowners or potential timber investors on a range of possible financial returns.

Scenarios

This paper provides financial returns for a slash pine reforestation investment in the lower coastal plain region of Georgia using the SiMS2009 Growth and Yield modeling software. Different discount rates, site index levels, and stumpage rate scenarios were applied to the slash pine management regime so that the landowner can acquire a good range of financial returns that would best relate to their forest management portfolio and timber market conditions.

Discount Rate: The discount rate refers to the interest rate used in financial formulas that reflect what one could receive from an alternate investment of similar risks. Discount rates of 4% and 8% were used for this financial analysis. These rates were polarized to exemplify a range of possibilities from a forest investment.

Site Index Levels: Site index refers to the height of tree at full stocking conditions at a base age for a given soil type. Site index levels used for this analysis are a low of 50, medium of 65, and a high of 80, all at a base age of 25 years. The low and high site index levels are extreme cases and the majority of timberland will probably fall into the medium site index level.

Stumpage Rates: Stumpage rates are the timber prices, usually on a per ton basis, which a landowner may receive during a timber sale. Nine different stumpage situations were considered for this analysis ranging from a flat pulpwood/flat sawtimber price to an aggressive pulpwood/aggressive sawtimber price, as defined in Table 1.

Table 1. Stumpage rate scenarios used for this analysis.

Alternative Stumpage Scenarios	
PW,CNS, ST per gr ton[a]	
Flat PW-Flat ST	$8, $16, $26
Flat PW-Mod ST	$8, $18, $32
Flat PW- Aggr ST	$8, $24, $44
Mod PW-Flat ST	$12, $16, $26
Mod PW-Mod ST	$12, $18, $32
Mod PW-Aggr ST	$12, $24, $44
Aggr PW-Flat ST	$14, $16, $24
Aggr PW-Mod ST	$14, $18, $32
Aggr PW-Aggr ST	$14, $24, $44

[a]Pulpwood, chip-n-saw, & sawtimber

Results

Table 2 and Table 3 present the estimated returns on a reforestation investment for a medium site index level of 65 feet at 25 years. Net Present Value (NPV), Internal Rate of Return (IRR), and Annual Equivalent Value (AEV) were calculated for each alternate stumpage scenario, and discount rates of 4% and 8% were used for the calculations. Inflation was not factored into any of the following results.

Table 2. Estimated returns for coastal plain slash pine at various stumpage rate scenarios. Discount Rate equals 4% and Site Index=65.

Coastal Plain Slash SI 65 @ 4% Discount					
	Rotation Ages	Thinning Ages	NPV	IRR	AEV
Flat PW-Flat ST	37	15, 28	$471.22	6.85%	$ 24.62
Flat PW-Mod ST	38	15, 28	$632.18	7.38%	$ 32.64
Flat PW-Aggr ST	38	15, 28	$967.92	8.33%	$ 49.98
Mod PW-Flat ST	37	15, 28	$575.08	7.48%	$ 30.04
Mod PW-Mod ST	37	15, 28	$734.26	8.00%	$ 38.36
Mod PW-Aggr ST	38	15, 28	$1,069.77	8.81%	$ 55.23
Aggr PW-Flat PW	37	15, 28	$626.46	7.78%	$ 32.73
Aggr PW-Mod ST	37	15, 28	$785.64	8.28%	$ 41.04
Aggr PW-Aggr ST	38	15, 28	$1,120.70	9.05%	$ 57.86

Table 3. Estimated returns for coastal plain slash pine at various stumpage scenarios. Discount Rate equals 4% and Site Index=65.

Coastal Plain Slash SI 65 @ 8% Discount Rate					
	Rotation Ages	Thinning Ages	NPV	IRR	AEV
Flat PW-Flat ST	32	19, 28	($78.53)	7.00%	$ (6.87)
Flat PW-Mod ST	32	19, 28	($32.59)	7.62%	$ (2.85)
Flat PW-Aggr ST	32	19, 28	$64.00	8.65%	$ 5.60
Mod PW-Flat ST	31	19, 28	($23.98)	7.70%	$ (2.11)
Mod PW-Mod ST	32	19, 28	$20.75	8.24%	$ 1.81
Mod PW-Aggr ST	32	19, 28	$117.35	9.18%	$ 10.26
Aggr PW-Flat PW	30	19, 28	$3.40	8.04%	$ 0.30
Aggr PW-Mod ST	31	19, 28	$47.62	8.55%	$ 4.20
Aggr PW-Aggr ST	32	19, 28	$144.02	9.44%	$ 12.59

NPV for a Medium Site Index

On a medium site quality in the lower coastal plain region of Georgia, a reforestation investment can have a favorable NPV range of $471.22 to $1,120.70 per acre when a 4% discount rate is assumed. A moderate stumpage scenario brings a positive NPV of $734.26. The 4% discount rate results in a

longer rotation and an additional thinning, when maximizing NPV. An 8% discount rate provided positive returns with a range of -$78.53 to $144.02 per acre with a moderate stumpage level NPV of $20.75/acre. As the discount rate increases, much shorter rotations are required to maximize NPV.

IRR for Medium Site Index

Internal rate of return (IRR) for a medium quality site has a range of 6.85% to 9.05% when following the longer rotations prescribed by a discount rate of 4%. A moderate stumpage scenario has an IRR of 8.00%. As shorter rotations are used for the 8% discount rate, the IRR range for the alternate stumpage scenarios increases to 7.00% to 9.44% with a moderate stumpage scenario IRR of 8.24%. It should be noted that IRR should not be compared to investments of different rotation lengths, but are useful in comparisons with other investments with similar timeframes.

AEV for Medium Site Index

Annual Equivalent Value (AEV) is the expected dollars per acre per year that an investment will make for the life of the project. Managing the longer rotations prescribed by a 4% discount rate yields a range of estimated AEV of $24.62-$57.86/ac/yr, with the moderate stumpage scenario providing an AEV of $38.36/ac/yr. Managing for shorter rotations prescribed by the 8% discount rate provides an AEV range for a medium site index of -$6.87-$12.59/ac/yr, with the moderate stumpage scenario providing an AEV of $1.81/ac/yr .

NPV for SI 80 and SI 50

Figure 1 presents the Net Present Values for a low, medium, and high site index level when using a 4% discount rate. NPV for a high quality site (SI80) can have a range of $918.86-$1889.52 per acre. NPV for a low quality site (SI50) still has a mixed NPV range of -$30.40-$275.64 per acre.

Figure 1. Net Present Value for alternate stumpage scenarios and site index levels. Discount rate equals 4%. Rotation lengths range 34-40 years.

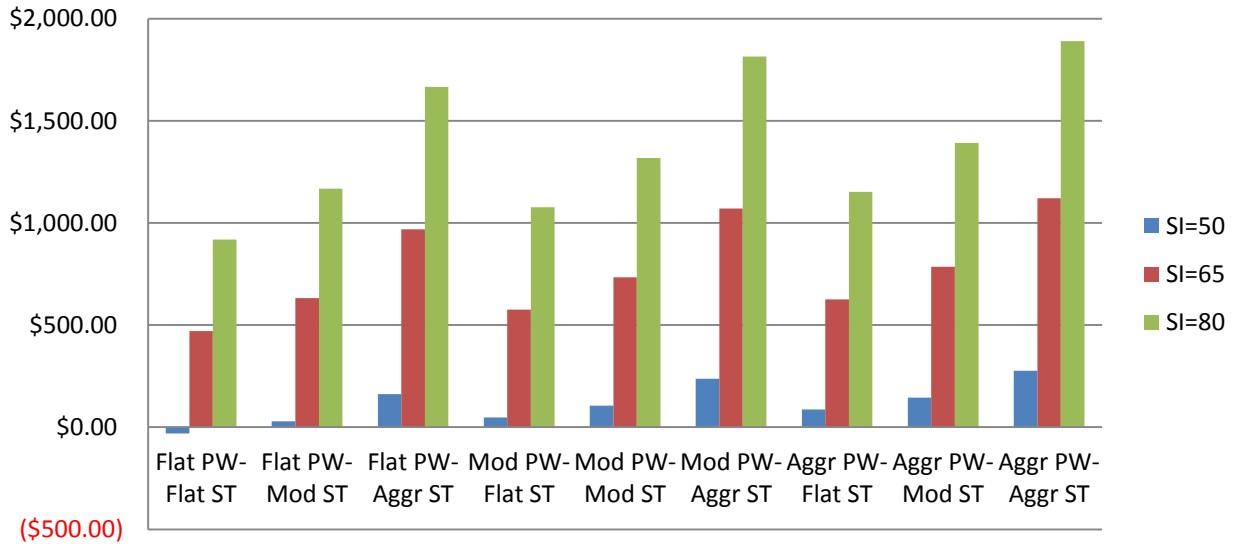

Figure 2 presents NPV's when utilizing an 8% discount rate. The high site quality (SI80) can achieve a NPV range of $137.28-$514.25/acre. A low site quality will yield a negative NPV range of -$265.87 to -$172.34.

Figure 2. Net Present Value for alternate stumpage scenarios and site index levels. Discount rate equals 8%. Rotation lengths range 26-34 years.

IRR for SI 80 and SI 50

Internal Rate of Return (IRR) can have a range of 9.14%-11.78% for a high quality site at the longer rotation management schemes examined and a range of 9.56%-12.48% for the shorter rotation management schemes prescribed on a high quality site. Moderate stumpage levels can achieve an IRR of 10.59% and 11.10% for the long and short rotation schemes, respectively. A low site index level has a range of 3.75% to 5.68% for the longer rotation alternative with an IRR of 4.77% on a moderate stumpage level. The short rotation alternatives and a low site index level can produce an IRR range of 3.45%-5.63% and an IRR of 4.64% for a moderate stumpage level.

AEV for SI 80 and SI 50

Annual Equivalent Value (AEV) for a high site index level can generate an excellent range of $49.91/ac/yr to $101.24/ac/yr with a moderate stumpage level AEV of $71.55/ac/yr; both with a discount rate of 4%. An 8% discount rate can generate an average AEV range of $12.42/ac/yr to $46.53/ac/yr. A moderate stumpage level at an 8% discount rate can produce an AEV of $27.55/ac/yr.

AEV for a low site index level can produce a low range of -$1.55/ac/yr to $13.93/ac/yr when a 4% discount rate is used. At a moderate stumpage level, an AEV of $5.43/ac/yr can be generated at a 4% discount rate. When assuming a discount rate of 8%, a negative AEV may be produced ranging from -$23.09/ac/yr to -$14.97/ac/yr with a moderate stumpage level AEV of -$19.01/ac/yr.

Annual Increments

Table 4 and Table 5 provide the annual increments by product class for the medium site index level at 4% and 8% discount rates. The annual increment for sawtimber production at a 4% discount rate is estimated at 2.89 tons/ac/yr and 2.49 tons/ac/yr for the 8% discount rate. Both scenarios yield around 5.5 tons/ac/yr.

Table 4. Estimated average annual growth increments for coastal plain slash pine on site index 65 by product class when maximizing net present value and using a discount rate of 4%

Coastal Plain Slash SI 65 Annual Increments @ 4% Discount Rate						
Product	Management Regime	1st Thin	2nd Thin	Final	Total	Annual Increment
	harvest yrs	*green tons*				
Pulpwood	15, 28, 37	38.02	11.15	16.53	65.7	1.78
Chip-N-Saw		0.14	22.29	4.99	27.42	0.74
Sawtimber		0	17.42	89.36	106.8	2.89
Totals		38.16	50.86	89.61	178.6	5.41

Table 5. Estimated average annual growth increments for coastal plain slash pine on site index 65 by product class when maximizing net present value and using a discount rate of 8%

Coastal Plain Slash SI 65 Annual Increments @ 8% Discount Rate						
Product	Management Regime	1st Thin	2nd Thin	Final	Total	Annual Increment
	harvest yrs	*green tons*				
Pulpwood	15, 28, 32	38.02	11.15	19.04	68.21	2.13
Chip-N-Saw		0.14	22.29	8.29	30.72	0.96
Sawtimber		0	17.42	62.28	79.7	2.49
Totals		38.16	50.86	89.61	178.6	5.58

Discussion

Forest investments can produce attractive financial returns, even with low and stagnant stumpage prices. Landowners are paid on the volume of timber harvested, which continues to grow each year regardless of the stumpage price. In the case of a medium site index, the annual growth was around 5.5 tons per acre. Internal rate of return increased from 6.85% to 9.44% as stumpage rates increased from the flat scenarios to aggressive scenarios. Site fertility significantly influences financial returns, even more so than stumpage rates. The IRR range of 3.75% to 12.48% corresponds with the range of site index from a low site index (50) to a high site index (80).

It is very important to match soil fertility with the best suitable specie before investing in timber resources. Following alternative investment options throughout the rotation will help determine rotation lengths while following stumpage rates will aide in managing thinning ages. Landowners can achieve positive returns on their investments that are very comparable, if not favorable, to other types of investments. However, landowners should seek alternative revenue sources such as hunting

and pine straw leases to generate positive returns on low site index levels. Cost-share programs may significantly increase returns by reducing the initial investment costs and should be considered before planting, especially on low site index levels.

Assumptions

Management Regime

This financial analysis considered a slash pine plantation for the lower coastal plain region of Georgia under three site index levels; low (50), medium (65), and high (80). Base age for the site index was 25 years. Initial planting density was assumed at 605 trees per acre (6'x12' spacing) with a 90% first-year survival rate.

First thinning was assumed at a basal area of 130 ft^2/acre but no earlier than age 15. A second thinning was assumed when the basal area reached 120 ft^2/acre. Residual basal area was 70 ft^2/acre after each thinning. The rotation ages varied for all site index levels, stumpage scenarios, and discount rates and were determined by SiMS2009, basing it on maximizing the NPV criterion.

Site Preparation and Annual Costs

Site prep consisted of a chemical application ($95/acre), a prescribed burn ($10/acre), single chop ($50/acre), and single bed ($50/acre) for a site prep total of $205/acre. 3rd generation slash pine seedlings ($58/1000) were selected and machine planting ($0.08/tree) was assumed for a total of $83.49/acre. Annual property taxes were assumed at $6/acre, annual management costs at $2/acre, and annual protection costs at $2/acre.

Harvesting Costs

Harvesting costs were assumed at 8% of the total sales revenue. Harvesting costs could apply to the assistance of a consulting forester during a timber sale and it was assumed that one was used to achieve the stumpage premiums. Local severance taxes were assumed at a millage rate of 25 or .025% of the total sales revenue. Due to varying individual tax liabilities, state and federal income taxes were not assumed for this financial analysis.

Pests, Diseases, and Fire

This analysis did not include risk factors associated with damaging agents, such as wildfire and southern pine beetle outbreaks. Landowners should consider these risks and implement mitigation practices, such as firebreaks, prescribed fire, and frequent monitoring of stand conditions. Although management and fire protection costs are included in the analysis, additional costs may be incurred to maintain stand health.

Disclaimer:

The growth rates, wood volumes, financial returns, and other information in this document are not guaranteed and are only estimates based on information available to the Georgia Forestry Commission at this time. The Georgia Forestry Commission and employees of the Georgia Forestry Commission do not make any warranty, express or implied, including the warranties of merchantability and fitness for a particular purpose, or assumes any legal liability or responsibility for the accuracy, completeness, or usefulness of information, or represents that its use would not infringe privately owned rights. Neither the author nor his organizations accept any liability for losses that may occur as a result of use of this document.