

A financial calculator: software for evaluating plantation scenarios

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Revised manuscript received 16 March 2004

Summary

STEPS (Software Tools for Evaluating Plantation Scenarios) has been designed with commercial plantation growers in mind, and is species-independent in its application. It has been used already by DPI Forestry, a commercial business group of the Queensland Department of Primary Industries and Fisheries, and has potential to be applied to any timber plantation in Australia or elsewhere. It is particularly useful for growers and managers who need to evaluate different scenarios relating to solid wood products, as it allows comparison of different sawlog classes and a range of other products. STEPS also caters for detailed pricing structures for sawlog products. STEPS is a tool that can be used for strategic and management-level planning as it collates all costs, prices and revenues for thinning and clearfelling regimes into one neat package.

Keywords: forest plantations; forest management; economic analysis; planning; financial planning; decision making; Queensland

Introduction

Commercial plantation growers make frequent management decisions that determine the financial performance of their resource. Many decisions are in response to fairly straightforward factors such as stocking rate at planting, clearfall age, or the number of pre-commercial thinnings. These decisions are driven by a combination of market influences and financial return on investment. Plantation management decisions become more complex, however, when there is a need to consider multiple factors simultaneously. In these situations, errors (for example those associated with yield estimates, or a delay in timing of thinnings, or increases in real prices) have a greater impact on financial performance. In such cases, decision support tools can greatly assist and enhance decision making.

A state-of-the-art decision support tool has been released to assist plantation managers to test alternative financial scenarios. The tool, STEPS (Software Tools for Evaluating Plantation Scenarios), is one outcome of a comprehensive decision support project being undertaken by forestry researchers from the Queensland Government's Department of Primary Industries and Fisheries (DPI&F), with joint support and funding from DPI Forestry (a commercial business group of the Queensland Department of Primary Industries and Fisheries) and the Cooperative Research Centre for Sustainable Production Forestry (CRC-SPF).

Software Tools for Evaluating Plantation Scenarios (STEPS)

STEPS has been developed with large commercial growers in mind. It is species-independent, and its output integrates all costs, prices and revenues. It caters for both commercial thinning and no-thinning regimes. Its value as a management tool is that it allows strategic and estate-level decisions to be tested both before and after planting. It has a focus on, but is not restricted to, those users producing solid wood products.

STEPS requires a series of inputs and produces outputs that are associated with growing a plantation. The inputs include:

- *costs* — fixed annual costs, stand establishment and post-establishment costs, and costs associated with thinning and clearfelling.
- *prices for the products generated at thinning and clearfelling.* STEPS allows for five product types, the first being sawlogs and the remaining four being specified by the user. The user has the option of partitioning sawlog volume into classes, and prices are required for these partitioned volumes. These classes are specified by the user and may relate, for example, to size class or quality class.
- *growth data.* The user has two options for providing this essential input. Option 1 requires the user to create a text file that, for a no-thinning regime, must contain initial stocking, site index, age at clearfelling and clearfall volume. Thinning regimes, in addition, require data on thinning age(s) and thinning volume(s). Option 2 allows the user to nominate parameters for the simple growth model calculator that is built into the software. In both options it is the volumes at clearfelling and thinning that are used in all calculations. It is important to note that the user has responsibility for providing STEPS with volume data or parameters for the inbuilt growth model and that STEPS itself has no capacity for growth modelling.

The outputs are:

- *economic variables* consisting of net present value, internal rate of return, average sawlog prices, merchantable volume prices and revenues at thinning and clearfelling;
- *stand variables* consisting of diameter at breast height, predominant height and volume produced at thinning and clearfelling, and the average stem volume and mean annual increment produced at clearfelling;

- *summaries* of the fraction (percentage) of total volume distributed across each product.

STEPS simultaneously compares three alternative scenarios with a user-defined 'benchmark' (Scenario 1). The benchmark corresponds to the input growth data, and once loaded the volume data remain fixed for this scenario. The user is able to alter the costs and prices, as well as the timing of thinning and site index options, for the benchmark scenario. In the remaining three scenarios the user is able to adjust the volume as well as the costs, prices, timing of thinning and site index options for comparisons against the benchmark.

The outputs are provided in a series of worksheets that list each scenario consecutively, including the benchmark. The outputs are calculated for each combination of thinning age, clearfelling age, stocking and site index that are specified in the input data. An understanding of the costs, prices and growth data is imperative for ensuring correct interpretation of the outputs.

Modelling plantation scenarios

STEPS has a range of features that allow the user to adjust a large number of options in each scenario. These features include:

- the ability to select a different thinning age and site index for each scenario. This allows the performances of plantations with different site indices and/or different thinning ages to be compared and evaluated.
- the ability to enter different relative performances of the three alternative scenarios against the benchmark, in terms of volume (Fig. 1). One option is to enter percentages, where a percentage greater than 100 indicates more volume is attributed to that scenario, and a percentage less than 100 indicates a lower volume is attributed to that scenario. The second option is to select the number of years of growth lost due to a management regime that is different from the benchmark regime. This concept is referred to as 'slowdown' rate in the software, where either the alternative scenario

would take a greater time (a positive slowdown rate) or a reduced time (a negative slowdown rate) to achieve the same clearfelling volume as the corresponding benchmark. These options can be used to test the performance of different genetic material with different growth rates against the benchmark.

- the ability to assign percentage reductions in direct costs and annual costs, as well as price increases, to each scenario separately. These financial features add flexibility to the calculations of net present value and internal rates of return.
- the ability to partition thinning volume and clearfelling volume across specified products, and to partition sawlog volume across specified classes (Fig. 2). This provides flexibility so that different distributions of volume across products can be evaluated, for both whole products and individual sawlog classes. This feature will be extremely useful for solid wood producers who need to evaluate different product distributions.
- the ability to assign prices to the products generated at thinning and clearfelling (Fig. 3). Prices can be assigned for both whole products and individual sawlog classes. In the case of clearfelling regimes, a very comprehensive pricing structure can be established using age-dependent clearfall sawlog prices if desired. This allows for a very thorough analysis of the plantation where prices for products can vary with age and sawlog class.
- the ability to save all costs and prices to a file, which can be reused at a later time.

Conclusion

STEPS is a decision support tool that may be used by forest managers to assist with financial decisions relating to plantation silviculture and stand management. It requires a detailed understanding of the inputs — growth data, and costs and prices — so that informed decisions are made for the resource. STEPS is particularly useful for decision-makers to test, in scenarios, a variety of silvicultural options, and to examine the effect of these options on internal rate of return and net present value.

Relative performance of benchmark and alternative scenarios				
Reset percent volumes to 100 %				
	Scenario 1	Scenario 2	Scenario 3	Scenario 4
Volume as percentage of benchmark volume	100	100	130	95
T1 thinning growth "slowdown" rate (yr)	0	4	0	0
T2 thinning growth "slowdown" rate (yr)				
Clearfall growth "slowdown" rate (yr)	0	-2	0	0

Figure 1. Screen displaying relative performance of benchmark and alternative scenarios

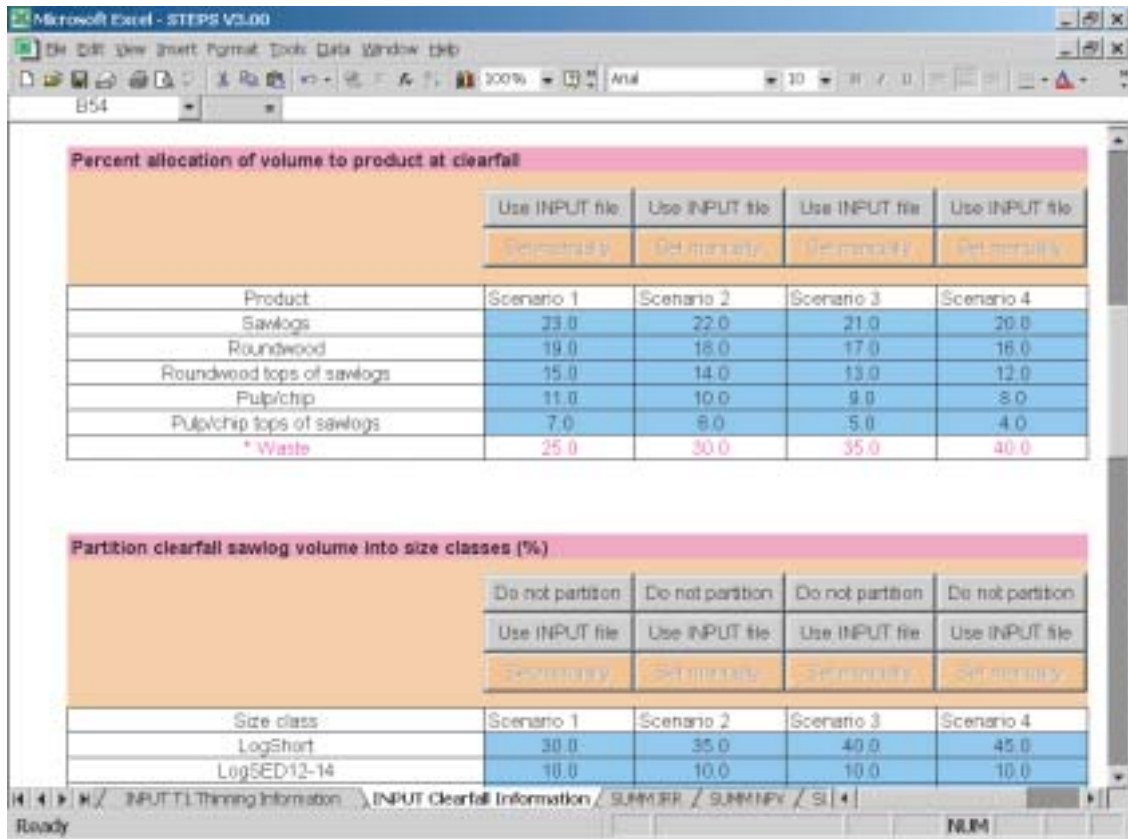


Figure 2. Screen displaying partitioning of volume into products, and sawlog volume from clearfelling into classes

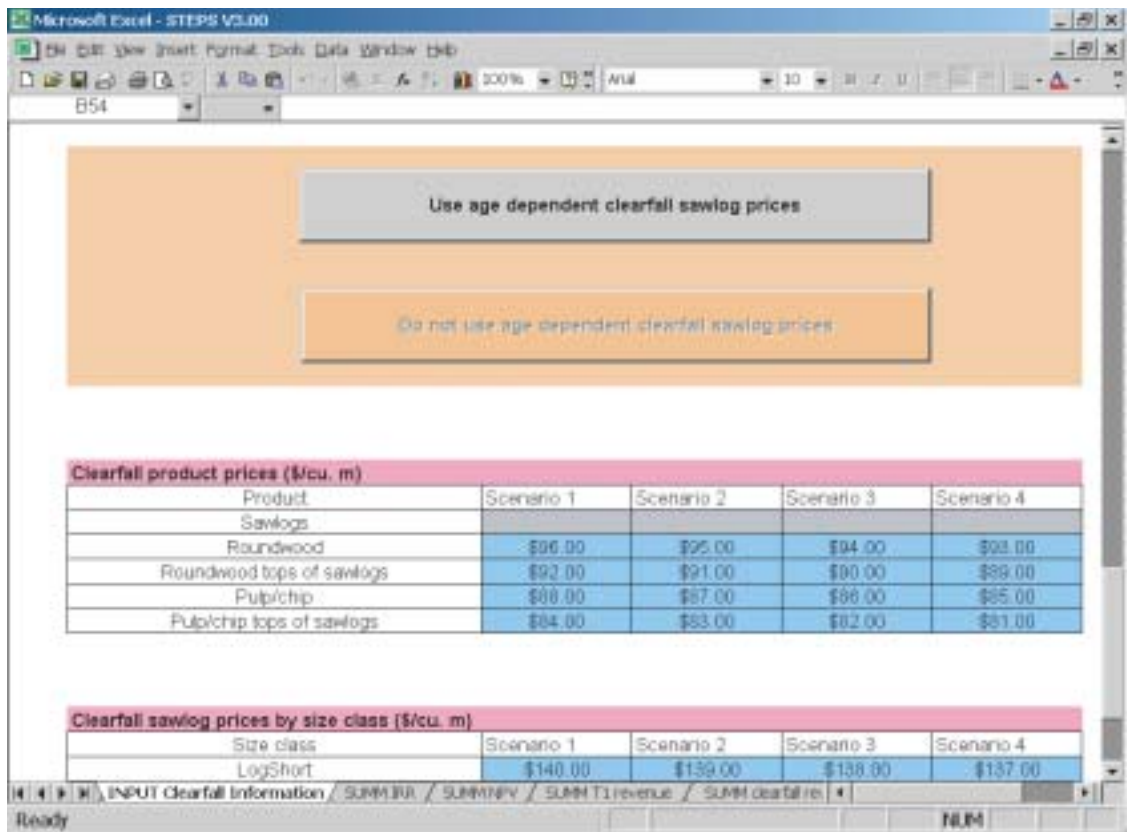


Figure 3. Screen displaying allocation of prices to products