Independent review of Forestry Tasmania Sustainable Yield Systems

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Preamble:

The Prime Minister announced on 7 December 2010, as part of the Australian Government's response to the Tasmanian Forests Statement of Principles to Lead to an Agreement (Statement of Principles), that the Government would work with the Tasmanian Government to undertake an initial due diligence assessment of the Tasmanian forest management and wood processing industry in light of the Statement of Principles. Part of this due diligence is to ensure that all the parties have an understanding and confidence in the wood resources and the scheduling of those resources by Forestry Tasmania. The collection of this data and the integration of strategic scheduling activities is undertaken as part of the Yield Regulation System (YRS) used by Forestry Tasmania.

The YRS has had a long period of development and regular scrutiny. The Yield Regulation System is divided into a number of sub-systems:

1. Area: including the base maps; air photo interpretation; management decision classification; provisional coupe designation; and productive area discount
2. Forest information: including collection and storage of inventory data; modeling growth and yield; calibration against observed harvest data
3. Simulation and Optimization: including the inclusion of realistic regimes and constraints; and interpretation of inputs and presentation of results

As part of the Regional Forest Agreements, there have been regular 5 yearly reviews of the system and the under-pinning data. In addition, Forestry Tasmania commissioned independent audits, with the most recent audit completed in 2007 (Brack, 2007). At the completion of each of these audits, it has been concluded that the YRS meets best practice in Australia and is fit for the purpose of strategic planning for sustainable yields.

Throughout the audit processes, now covering over a decade, Forestry Tasmania has continued to progressively improve their yield regulation system. For example, considerable work has been undertaken since the 2007 audit to improve native forest growth modelling and product differentiation from plantation resources. Continuous improvement is designed into the work plans for the Inventory and Planning Branches of Forestry Tasmania, but any changes are not implemented without testing and comparisons of the whole system with and without the proposed changes. Some of the changes suggested in response to the 2007 audit are currently being developed but are not able to be incorporated into the YRS until at least early 2012 due to the timing of the testing and

quality assurance. Any effects of these changes in progress on future estimates are likely to be minor, and are unlikely to detract from conclusions drawn from scenarios.

To inform and support the due diligence assessment, independent expert advice was required to:

1. Review the wood yield data and forest management systems (YRS) maintained by Forestry Tasmania.
2. Assess the adequacy of the systems for developing wood production scenarios for the Statement of Principles.
3. Provide third party appraisal of FT outputs generated for the Statement of Principles Moratorium Reference Group for the benefit of the Statement of Principles signatories.

Consultant's Brief

Task 1: With reference to:

- the purpose and context of the wood yield calculations;
- previous audits; and
- relevant best practice applicable to Australian native eucalypt forest and eucalypt plantation management,

re-examine the basis of FT's calculation of native eucalypt forest sustainable yields and eucalypt plantation yields for forests managed by FT as applied in the production of the 2007 RFA Wood Review carried out by FT.

This task should examine and comment on the impact of any proposed or known changes since the 2007 RFA Wood Review with a view to the requirements of the next RFA Wood Review due in 2012.

1. report on the appropriateness of the data sets, models, systems and methodology used in the calculations for sustainable yield of native forests and plantations, and
2. comment on the usefulness of the resultant wood yield estimates for native forest and plantation.

Task 2: Examine and report on the application of the data sets, models, systems and methodology in Task 1 to modelling the implications of at least three wood supply scenarios to be modelled by FT:

- Future log supply from the existing public native forest and plantation estate
- reduced production estate by some 572,000 hectares of current state forest as identified by environment non-government organisations through reservation; and
- Identify the area of production estate required to provide a supply of 150 000 cubic metres of high quality sawlogs (based on current industry specifications, grade classifications and quality expectations), 265 000 cubic metres of peeler quality logs and 12 500 cubic metres of sawlog special species timbers each year from public forests and plantations.

In making this examination, the review team is to comment on the following items;

4. The long term security of the supply of high quality sawlog (based on current industry specifications and grade classifications)

5. The spatial constraints imposed on the solution by the impacts of the reserves and the intensification of operations on the remaining area

6. The sensitivity of the output to further changes in underlying data or changes in forest practices requirements.

Task 1 Methodology:

Key Forestry Tasmania staff (Mike McLarin and David Mannes) were interviewed by teleconference (Brack) and in person (Vanclay). The focus of these interviews was to determine any changes in the yield regulation system since the 2007 audit. The 2007 audit had concluded the system was, at that time, best practice. Given the time and travel constraints, we were unable to personally conduct any actual system runs or interrogate databases to confirm changes.

It was concluded that no major changes had occurred in the Area sub-system, apart from routine / scheduled updating.

Similarly, no major changes had occurred in the inventory data collection (part of the Forest Information sub-system), and this collection is reported to be up to date and appropriate. The inventory collection for the plantation estate has expanded with the majority of the plantation estate (70%) now being reported as having valid and timely inventory[1]. The site index data being used for the remaining plantation estate is also reported to have been improved in many areas with the use of airborne LiDAR.

Major revision and implementation of the growth and yield modelling has been reported. For the native forests, a series of comprehensive analyses by an external consultant - P. West – resulted in the development of a "correction equation" which removed a potential bias in the estimates of growth. In the 2007 audit, this bias was removed through the use of a ratio correction, but the West model appears more precise and reliable. The modelling work was reported in a number of documents (West 2007; 2008a,b,c). These reports were made available and appear to be thorough, appropriate and internally consistent. West reports the improvements using the repeat measurement inventory data collected by Forestry Tasmania. A "pruning assignment model" for the plantations has also been developed and reported as implemented. Documentation on the model (Musk undated) is again comprehensive and concludes that predictions of pruned logs (and therefore log quality) are much closer to observations and is a significant improvement on the YRS described in the 2007 audit.

The Simulation and Optimization sub-system has not been altered although plans for including other forest products and services (e.g. Carbon) are still being considered.

Task 1 conclusions:

1. The data sets, models, systems and methodology used in the calculations for sustainable yield of native forests and plantations are appropriate. The YRS as described in the 2007

[1] During the 2007 audit, only 12% of the plantation estate was old enough to undertake routine inventory data collection. The remaining estate required the use of models based on estimated Site Index to develop growth and yield predictions. The expansion of the inventory database as the plantations aged means that growth and yield estimates are significantly improved.

audit report would be fit for purpose, but the reported changes to the Forest Information sub-system (as a result of the analyses and developments by West and Musk) would result in improvements in the accuracy (both increased precision and reduced bias) of overall system, and thus also strengthen the 2007 audit conclusions of best practice.

2. The wood yield estimates for native forest and plantations resulting from the YRS described above would have the potential to produce estimates of wood volume, scheduling and constraint information that is useful for strategic planning. While it is impossible to rule out human errors, previous audits have observed the systems of quality assurance for the data are likely to keep such human errors to a feasible minimum. Sampling errors for the inventory are available, and in 2007 these were small enough to allow useful estimates. It must be noted however, that these estimates will be subject to random sampling errors in the inventory and modelling processes and due care must be taken not to assume a precision that is less than the sampling errors allow.

   The approach adopted of using a "base case" and then examining removals from that base-case also reduces any potential impact of bias in the growth or yield and inventory models and thus enhances the usefulness of the wood resource scenario comparisons.

Task 2 Methodology:

Although we assisted FT to distil a concise set of simulation requirements from the two requests tabled and presented to Mr Kelty, we did not participate in the compilation, analysis or interpretation of the modelling results of the Scenarios developed. Therefore our comments on this Task are restricted to those that can be deduced from our knowledge of how the YRS can be used, from discussions with key staff (Mike McLarin), and our experience with similar yield regulation studies.

One notable aspect of the three scenarios presented by FT is that they are based on the same model run, and differ only from the subtraction of areas contributing to the yields prior to smoothing over 5-year intervals. This approach means that some scenarios may differ slightly from the optimal scenario, but conversely means that the scenarios are directly comparable, since they are based on the same baseline analysis.

Task 2 conclusions:

3. Confidence in the long term security of the supply of high quality sawlog (based on current industry specifications and grade classifications) would be based on the degree of "slack" in the YRS solutions – i.e. how close the supply was to the commitments. If there is little slack then any imprecision or disadvantageous bias in the estimates could lead to a failure to meet commitments. The YRS has the potential to be re-run with poor or worst case estimates of growth and yield to determine if the long term security of production is constrained by underpinning assumptions. The reported improvements in the Native Forest growth models and the inventory and pruning models for the plantations should increase the confidence in the modelling of the high quality products.

   Confidence in the production of high quality sawlog material may also be inversely related to

the confidence in alternative products that could be produced by the same stand. In particular, veneer timber differs in wood quality (i.e., regarding knots and small end diameter) over sawlogs. While the models may reliably predict the total volume of timber, "pushing" the system to ensure all the veneer material is produced may impact on the amount of sawlog produced. The reliability of the pruning models and the product calibration exercises will be vital to improve the confidence of the long term supply of products.

4. Spatial constraints imposed on the solution by the impacts of reserves and the intensification of operations on the remaining area are often confounding. For example a nominated percentage reduction in available area often leads to a greater reduction in economically harvestable volume as extra patches of area become inaccessible. The list of spatially related factors that are reported as being included in the "headroom discount" have the potential to introduce a substantial reduction in the "operational supply". Experiences in Canada suggest that coupe dispersal practices, if comprehensively applied, can reduce operational supply significantly. The effect of other spatial constraints can only be determined by case studies as the quantum of the impacts is unique to the actual spatial patterns of the resource. A more precise estimate of the discount requires detailed simulation studies, but it is our considered opinion that it may be prudent to increase the 10% headroom discount.

5. The sensitivity of the output to changes in underlying data or changes in forest practices requirements can be estimates from an analysis of the "slack" variables in the simulation and optimisation outputs of the YRS, or given the time and resources estimated through a series of simulations. The 2007 audit incorporated the results of a number of sensitivity simulations to help identify the strategic importance of nominated modelling uncertainties.

Conclusions

The Reference Group can be confident that the scenarios presented by FT offer a reliable indication of resource availability, and that the scenarios are a reasonable basis for comparing options. While the underlying areas, inventory, and simulations conform to best practice, it is not possible to assert a precise long-term non-declining yield for any of the three scenarios without further specification of operational requirements (notably coupe dispersal and swift parrot requirements). Notwithstanding this limitation, the FT summaries offer a good basis for comparing scenarios.

References

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