PLANTATIONS DELIVERING POSITIVE OUTCOMES

HOW MUCH DOES A PLANTATION COST TO ESTABLISH?

PLANTATIONS AND WATER USE

Summer 2006

A quarterly publication by Private Forests Tasmania
Welcome to **TREE Line**

This **TREE Line** issue has a plantation focus. The time, effort and money devoted to establishing a plantation is considerable. The cost of establishing a plantation is typically between $2,000 and $4,000 per hectare, or $2 to $4 per tree.

The vast majority of the work done to establish a plantation is done by Tasmanians for Tasmanian companies. From seed collection, nurseries, silvicultural contractors preparing the land, tree planters and tree fertilising, and pruning and thinning; small and large Tasmanian forestry related businesses provide employment for many Tasmanians, state-wide. Landowners are leasing land or entering into joint venture with plantation companies and seeking to diversify their businesses and help strengthen rural Tasmania.

The decision to invest in a plantation needs to be carefully considered. People considering investing in a plantation should also consider using Private Forests Tasmania’s Farm Forestry Toolbox to explore the options and potential. Copies of the Toolbox and assistance are available from Private Forests Tasmania.

Readers will also find an insert in this edition outlining the involvement of PFT Board Director Mark Leech in helping the people of Malawi.

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Cover Photo: Young *Pinus radiata* plantation on private property with the Great Western Tiers in the background.

**Plantations delivering positive outcomes**

Recently, the Australian Government released a report outlining the socio-economic benefits to regional areas of the establishment of timber plantations.\(^1\) The report focused on two case studies (South West Slopes region in NSW and the Great Southern region in WA) and the results of the study demonstrate that plantations make a positive contribution to stable economic growth, employment, land values, wages and overall population levels in regional areas.

These benefits are greatest following the establishment phase when plantations require pruning, thinning, harvesting, transporting of harvested products and processing of those products.

The findings are of interest and direct relevance to Tasmania given the current debate over the rate and locations of plantation establishment.

The Tasmanian Government’s “Policy on Maintaining a Permanent Native Forest Estate” substantially limits the amount of native forest that can be converted to plantations or any other alternative land use. The policy requires that 95% of the 1996 level of native forest be permanently retained – meaning an amount of 3,046,888 hectares must be retained as native forest.\(^2\) [The policy will still permit harvesting of native forest and regeneration back to native forest.] In addition, there will be a prohibition on all broadscale clearing and conversion on private property from 2015, although a definition of broadscale clearing and conversion has yet to be determined.

The alternative for individuals and companies wishing to establish plantations therefore is to establish them on already cleared land. This has led to erroneous claims that the socio-economic life of regional Tasmania is being placed in jeopardy by the expansion of the plantation estate, particularly where plantations are established on cleared land as the result of purchase of farms by forestry/agribusiness companies. An analysis of plantation expansion by Private Forests Tasmania shows that these claims lack substance and credibility.

As at 31 December 2004 (the most recent date for which annual figures have been compiled), there were 133,690...
hectares of plantations established on private property in Tasmania - 113,313 hectares of hardwood plantations and 20,377 hectares of softwood plantations. A total of 49,381 hectares (37% of the total) has been established in the period 2000 - 2004. If the critics are to be believed these plantations are being established largely on prime agricultural land (generally Class 1 – 3 land), which is primarily used for dairying and intensive cropping activities. The facts (as they usually do) paint an altogether different picture.

In 2004, there were 11,872 ha of plantations established in Tasmania, of which only 53 ha were on Class 1 – 3 land (0.4% of the total new plantings).

Of the total 133,690 ha of plantations established on private land, just 4,306 ha (3.2%) have been established on prime agricultural land. And this figure (4,306 hectares) represents just 4.6% of all prime agricultural land in the state.

During the period 1 January – 31 October 2005, the large plantation companies purchased a total of 47 properties comprising a total area of 14,831 hectares. However, this figure is distorted by the once-off huge “Evercreech” property purchased by Gunns Limited.

It is more than just gilding the lily to say that plantations are displacing traditional farming activities to the detriment of rural communities, it is a deliberate misuse of the facts and a distortion of what is really happening in Tasmania’s rural areas.

The continued activity of major plantation companies in Tasmania is to be supported, giving as they do a vibrant alternative source of revenue for farmers and other rural landowners through joint venture opportunities, leases, sale of timber rights or outright sale of land.


2 Even at the 95% threshold (3,046,888 ha), Tasmania will continue to have substantially more native forest proportionately than any other state at 44.9% (it is currently 46.7%). The next highest is VIC with 34.9%, followed by NSW (33.2%), QLD (32.3%), NT (24.4%), SA (11%) and WA (9.3%).

3 Private Forests Tasmania GIS coverage and analysis of inventory and land classifications, November 2005.
How much does a plantation cost to establish?

There are 225,000 hectares of plantation in Tasmania with 11,800 hectares established on new areas in 2004. The cost to establish and manage a new plantation to final harvest varies between $1,000 to $5,000 per hectare, with the majority of plantations costing $2,000 to $4,000 per hectare.

Variations in site characteristics and scale of operations are largely responsible for the wide variation in costs. No two sites are the same and the majority of contractors are not willing to quote a single rate per hour or per hectare but determine costs on a site-by-site basis. Most of the plantation establishment is undertaken by specialised silvicultural contractors.

The costing information was collated by Private Forests Tasmania in November 2005 and reports on cost by individual activity. For any particular site not all of the activities are necessary. The costs are based on establishing 10 hectares with 1,000 trees per hectare.

ESTABLISHING THE PLANTATION

<table>
<thead>
<tr>
<th>Ground preparation</th>
<th>Costs range</th>
</tr>
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<tbody>
<tr>
<td>windrow</td>
<td>$100 – $1,000 per hectare</td>
</tr>
<tr>
<td>ripping</td>
<td></td>
</tr>
<tr>
<td>mounding</td>
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The ground preparation phase can include several separate operations depending on the nature of the site. A flat pasture with little grass can easily be ripped and mounded in a single operation, whereas an area where the mature forest has been harvested, with erodible soils and on sloping site, will require excavators and dozers to create windrows and an excavator with Wilco attachment to form individual mounds or planting spots. Each operation costs $100 – $125 per hour and often can take 10-12 hours per hectare.

<table>
<thead>
<tr>
<th>Chemical weed control</th>
<th>Costs range</th>
</tr>
</thead>
<tbody>
<tr>
<td>pre and post planting spraying 1-3 operations may be required</td>
<td>$100 – $250 per hectare</td>
</tr>
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</table>

The effective control of weeds is essential to ensure successful plantation establishment. The costs will vary according to:
- the severity of the weed problem and the need for multiple operations. Thick gorse and blackberry will severely hinder operations and greatly add to the cost;
- the type of chemicals required to control the weeds—the terrain will influence the method of application, whether manual or tractor-based or aerial application is used; and
- scale - large, flat plantations will allow mechanised operations and reduce costs.

<table>
<thead>
<tr>
<th>Fencing</th>
<th>Costs range</th>
</tr>
</thead>
<tbody>
<tr>
<td>(protection from)</td>
<td></td>
</tr>
<tr>
<td>wallaby</td>
<td>$0 – $1,600 per hectare</td>
</tr>
<tr>
<td>livestock</td>
<td></td>
</tr>
<tr>
<td>rabbits and/or hares</td>
<td></td>
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</table>

The installation of fencing is very expensive and should be carried out when the potential browsing intensity would jeopardize the viability of the planting. Some areas may not need to be fenced. Fencing may be needed to exclude wildlife or livestock or both and costs will vary depending on the type of fence required. The nature of the terrain (steep areas require more posts) and dimensions of the plantations (long narrow plantations enclose less area per kilometre of fence than a square area) also affect the final costs.

<table>
<thead>
<tr>
<th>Browsing control</th>
<th>Costs range</th>
</tr>
</thead>
<tbody>
<tr>
<td>for</td>
<td></td>
</tr>
<tr>
<td>wallaby</td>
<td>$0 - $100 per hectare</td>
</tr>
<tr>
<td>livestock</td>
<td></td>
</tr>
<tr>
<td>rabbits and/or hares</td>
<td></td>
</tr>
</tbody>
</table>

Browsing control is usually conducted on an hourly not a per hectare basis. Costs vary depending on browsing species to be controlled, proximity to areas with suitable habitat for the browsing animals, access and terrain and increase as browsing intensity or risk increases. Wildlife control by poisoning can only be carried out by a licensed commercial operator and with a valid permit.

<table>
<thead>
<tr>
<th>Plant supply</th>
<th>Costs range</th>
</tr>
</thead>
<tbody>
<tr>
<td>(per 1,000 plants or 1 hectare)</td>
<td></td>
</tr>
<tr>
<td>conifers (bare-root &amp; container)</td>
<td>$300 - $1,000</td>
</tr>
<tr>
<td>eucalypts (container)</td>
<td>$420 - $750</td>
</tr>
<tr>
<td>blackwoods (container)</td>
<td>$800</td>
</tr>
</tbody>
</table>

The costs of plants (seedlings) will depend on the species, quantity and seedling type (bare-rooted or containerized plants). It is possible to purchase seedlings, especially Radiata pine seedlings, with specific genetic characteristics.

Bare-rooted plants are cheaper than the containerized stock, but bare-rooted seedlings have poorer viability and on planting are more likely to suffer from ‘planting shock’ and take longer to start to grow. Radiata pine seedlings are usually provided as bare-rooted seedlings.
Planting Costs range

• conifers $200 - $500 per hectare
• eucalypts
• blackwood

The planting activity requires considerable logistical management. This is especially the case with large-scale plantings where it is essential plants are delivered to the site at the right time to the planting crews to avoid any delay in planting. Seedlings start to deteriorate when they are lifted from the ground in the nursery (bare-rooted seedlings) or leave the protected holding areas in the nursery. It is essential to carefully time the delivery of seedlings from the nursery and the planting of the seedlings. Delays due to weather or otherwise that delay planting will cause the seedlings that have not been planted to deteriorate.

 Experienced planting contactors can plant up to 3,000 trees per person per day if the ground conditions are good (mounds well prepared on flat ground) and the plants are supplied to the planters in a timely manner. The cost of planting is directly dependent on the plant specifications (bare-root or container), access to and over the area to be planted, terrain, soil type, cultivation method (moulds, spot cultivation or rip line) and scale of the planting.

Fertilising Costs range

• nitrogen, potassium, phosphorous $0 - $250 per hectare
• trace elements

The necessity, composition and quantity of fertiliser a plantation needs depends on the soil type and the predicted growth responses to its application. In addition, the access, terrain, cultivation and scale will determine the method of application – manual, tractor or aerial. Manual application is the most expensive and aerial the cheapest. Typically on a site requiring fertilising 100 grams of DAP fertiliser is applied per tree.

Pruning and thinning a plantation will increase the value of the product being grown. When a plantation is pruned it must also be thinned. Thinning costs may be offset by revenue received from the sale of the thinned material.

Pruning (per hectare costs) Costs range

<table>
<thead>
<tr>
<th>Form pruning (blackwoods) - 600 stems per hectare 3-4 times</th>
<th>$300</th>
</tr>
</thead>
<tbody>
<tr>
<td>1st lift @ 360sph - pine tree - eucalypt</td>
<td>$470 – $860</td>
</tr>
<tr>
<td>2nd lift @ 330sph- pine tree - eucalypt</td>
<td>$470 – $490</td>
</tr>
<tr>
<td>3rd lift @ 300sph- pine tree - eucalypt</td>
<td>$460 – $480</td>
</tr>
</tbody>
</table>

The production of clear saw logs, with a small knotty core confined to an inner diameter of 15 – 20 centimetres will maximise the clearwood (knot free wood) on a tree. Clearwood can command a higher market price. At a cost of approximately $4.50 per tree for hardwoods and $5.30 – $7.20 for conifers, the timber can be upgraded from pulp or a knotty sawlog with a value $0 to $25/m³ to a clear saw log or veneer log worth $25 to $70/m³.

Tasmania’s Plantation Estate December 2004 (hectares)

| Total area of plantation by tree ownership |
|---|---|
| Public ownership hardwood | 22,331 |
| softwood | 2,898 |
| Private ownership hardwood | 120,411 |
| softwood | 19,780 |
| Joint ownership hardwood | 8,530 |
| softwood | 51,741 |
| Total area all species | 225,691 |


The Forest Practices Authority requires a fee is paid when a plan is lodged. This fee varies depending on the nature of the operation, the forest type and the scale of the operation.

In some cases, a local government development permit is required to establish a plantation and a fee is payable. Private Forests Tasmania collects $14 per hectare levy on the net area of operation, payable within six months of certification of the FPP.

Adding Value to the Plantation

In the vast majority of cases a certified Forest Practices Plan (FPP) is required before work can commence on establishing a plantation. The costs of preparing an FPP will depend on the complexity of the plan, the range of special values and the total time spent to assess these values. Forestry consultants charge approximately $50 – $75 per hour to prepare a plan.

In the Spring issue of TREE Line includes a summary of the fee structure.

Pruning and thinning a plantation will increase the value of the product being grown. When a plantation is pruned it must also be thinned. Thinning costs may be offset by revenue received from the sale of the thinned material.

The Forest Practices Plan (FPP) Cost range / ha

<table>
<thead>
<tr>
<th>Forest Practices Plan (FPP)</th>
<th>Cost range / ha</th>
</tr>
</thead>
<tbody>
<tr>
<td>cost of preparing plan</td>
<td>$75 – $150</td>
</tr>
<tr>
<td>Forest Practices Plan fee</td>
<td>$6 – $60</td>
</tr>
<tr>
<td>Private Forests Tasmania levy</td>
<td>$14</td>
</tr>
<tr>
<td>Council Development Application (DA)</td>
<td>approx $140 per application</td>
</tr>
</tbody>
</table>
Plantations and their water use

In Tasmania, tree plantations are regarded as an agricultural land use, and like all crops they use water. There are no specific restraints on the extent of a particular land-use in any catchment apart from land-use zones in local planning schemes and legislation such as clearing controls. Nearly all of the current agricultural land has been cleared of native forest. This clearing has significantly altered the natural hydrological balance across the landscape.

Plantation development in Australia is currently being driven by managed investment schemes underpinned by the Australian Government's vision to increase the plantation area to three million hectares by the year 2020. In many areas of Australia, plantations can fight dryland salinity, absorb greenhouse gases, and create new wood resources to reduce the dependence on timber from native forests and imported products. Plantations are significant contributors to many rural economies and since 1998 $3.4 billion has been injected into regional communities for plantation forestry. The plantation industry also can significantly contribute to regional economies. For example, in the Mount Gambier region of South Australia, agriculture (including 'high value' products such as dairy and wine) uses 10 times as much land as plantations but produces only 25% more regional economic output (including the contribution by local processing of plantation products).

In Tasmania the average catchment area planted to plantations is about 6%. Scientists believe that as a generalisation, only where more than 20% of a catchment is planted to a high water using, rapidly growing forest, is any impact on surface water yield detected. Plantations are often established in areas of high annual rainfall (above 1,000mm/yr) because trees will grow faster, produce more wood and increase the financial return on the investment.

Hydrology concerns water movement and storage above and below the ground. Trees influence catchment hydrology as they take up water from the soil and transpire through the leaves; intercept or store rainwater on branches, leaves and forest litter on the ground; and take up water from ground water-tables.

How much water do trees use? Tree water use depends on a complex combination of factors – soil texture, structure and water holding capacity, catchment topography, water-table levels, annual rainfall, sunlight, temperature, wind, humidity, tree species and age. Water use is also influenced by plantation management including harvesting. Research in southern Australia shows plantation trees can use up to about two to three times the mean annual rainfall.1 The impact of plantations on ground water recharge also varies with the proportion of the catchment planted to plantations.

Trees use more water than pasture. Figure 1 shows the water used by trees (native forest) and pasture (grass).1 The solid line curves have been developed for 19 catchments in Victoria (by scientists Holmes and Sinclair) and the dotted line curves for over 250 catchments worldwide (by scientist Zhang). The curves show that, as rainfall increases above 500mm/yr, trees use an increasing amount of water compared to grass. For example, where the annual rainfall is 600 mm/yr trees transpire 40mm/yr more water than grass. Where annual rainfall is 800mm/yr the difference increases to 90mm/yr and at 1300mm/yr rainfall the difference increases further to 215mm/yr. (100mm of annual rainfall equals 1.0 megalitre of water)

Figure 1. Water use by Forests, Plantations and Grass.

Trees influence the amount of water flowing in streams. This ‘run-off’ is often measured as ‘stream-flow’ at points (stream gauging stations) low in the catchment. Research in southern NSW shows that as rainfall increases so does the difference in run-off between grass and trees. Scientific modelling shows where catchments are completely planted to trees, run-off will be reduced in high rainfall areas and pine plantations will have a greater impact than eucalypts. As seen in Figure 2, the mean annual run-off for areas with 800mm mean annual rainfall may decline by up to 165mm under eucalypt forest and up to 210mm under pine plantations.1 For areas with mean annual rainfall of 1200mm, the decline may be up to 265mm for eucalypts and 350mm for pine. Water use will be less depending on both the proportion of the catchment planted and its management.

Figure 2. Run-off from grass and trees
Ground water is recharged by annual rainfall. Recharge by annual crops and pastures is higher than for trees. Studies show that grassed catchments, with rainfall less than 700mm, recharge ranges from 0 – 75mm and increases to 250mm for sites with greater than 700mm annual rainfall. Under trees there is no recharge until the mean annual rainfall exceeds 1100mm. In addition to reducing recharge, trees can also draw down water-tables and this is desirable where rising water-tables need to be controlled.

Plantation development on a large scale will influence catchment hydrology – water yield and water-table recharge, distribution of run-off and timing and size of peak stream flows. The full effects may not be felt for 10 or more years and groundwater changes may take 30 years to appear.

Water users are concerned about the distribution of run-off and periods of low flow especially when stream flows are naturally low either in late summer or during periods of prolonged drought. To date science has had difficulty predicting the effects of plantations on low flows because of variability of rainfall and erratic run-off during dry periods. One reliable 10 year study at Tumut NSW showed that run-off only occurred for 60% of the time 10 – 15 years after planting a catchment to pine, whereas run-off continued all year from a grassed catchment. Research in New Zealand showed that pine plantations reduced low flows by up to 20%. Generally it takes 15 – 20 years for the maximum impact on low flows to be felt. NZ research also shows that flood peaks can be significantly reduced by about 60% where catchments were completely planted and Australian research shows plantation development offers significant flood control as peak stream flows can be reduced by 50%.\(^1\)

Forest hydrology is very complex and further research is needed to better estimate the impact of land use during times of low stream flows. Dr Robert Vertessy, one of Australia’s foremost hydrologists, believes the estimated impacts of plantations can be reduced by: locating plantations in low to medium rainfall zones; planting only parts of catchments; having plantations of different ages in each catchment; and managing harvesting.\(^2\) A new hydrology model, TASLUCAS, has been developed for Tasmania by CSIRO and will be released late in 2005. It will enable the impacts of different land uses on stream flow to be evaluated in catchments between 100 – 10,000 hectares.

Elsewhere in this issue is an article on Pruned Stand Certification that highlights the very important point that value is more often than not a product of an appropriate management regime for your forest resource. This is particularly important where the volume to be harvested is not great, and this is typical of many smaller plantations, particularly those established in areas of low to medium annual rainfall (600mm-800mm). Much of the area below the 800mm rainfall level is not attractive to industrial or investor capital due to lower productivity, and hence lower rates of return.

Despite the many challenges involved in establishing a viable small plantation in such areas, there has been considerable success in this area over the past decade, with approximately 400 plantations established with an average area of nine hectares. Establishing a plantation is only the first step and has posed a number of challenges for landowners and Private Forests Tasmania alike:

- How do we keep track of who has planted what, where, and how much?
- How do we ensure that operations such as pruning and thinning are carried out on time and to quality standards?
- What will be the impacts on future wood flows?
- The fixed costs are a substantial proportion of an operation and the economics of undertaking silvicultural and harvesting operations for small-scale plantation establishment often don’t stack up, when considered in isolation.

It is important for both resource growers and processors to have as complete an understanding as possible of the volume and the quality of the resource that is likely to be available in the future. That requires the development of appropriate methodologies for capturing and analyzing data related to the private forest estate.

Private Forests Tasmania, with Commonwealth funding, engaged Tasmanian Land and Forests to develop a database as a tool for collecting information on stands and timing operations, and thus the Stand History and Management Advisory System, or SHAMAS, was created. The two main means of accessing information relating to plantations are by landowner name or by individual stand.

Each stand, when created in the database, is given a unique identifier code. Estimates of site productivity are made and entered into SHAMAS. Site factors relating to climate and soil properties are included and Farm Forestry Toolbox outputs can be used to estimate a Site Quality Index. With site productivity estimates, market availability and landowner aspirations, both species selection and a proposed management regime are entered for each stand. There is capacity to also distinguish between the proposed regime and what actually happens on the ground over the life of the plantation.

The history of each stand is built up over time through ongoing data collection. This includes data on site preparation and early management, such as weed, browsing animals and nutrition. Silvicultural operations such as pruning and thinning, as well as harvesting are also included. There is an audit trail for any data entry and any changes made to a stand’s data. The current status of each stand is recorded as planned, site prepared, established or archived (harvested or failed stands). Should the management of part of a stand change, (e.g. only half the stand was pruned or some site variation caused an operation to be delayed on part of the stand) then the stand may be split into sub-stands.

For the landowner the advisory component of SHAMAS is very valuable. There are a number of reports that can be generated. A landowner stand summary provides an indication of which stands require inspection and the current stage of management. SHAMAS can generate a report by age classes, by region, by landowner and individual stands. This enables an extension officer to target stand assessments, and hence program silvicultural contractors in individual regions. For example, a printout of all five year old stands in the Carrick-Westbury area would identify those stands to be inspected and, with landowner agreement, a contractor engaged to carry out a first lift pruning of the stands.

Pre and post-pruning assessments are entered into SHAMAS. Reports on overdue operations can be generated if entries are not made at the time predicted by the silvicultural regime input.

The primary purpose of SHAMAS is to improve the value of a plantation to a landowner by assisting in the proper management of the plantation during all stages of its life, from establishment to harvest. That is not only good for landowners, it is good for Tasmania.
How do you prove you have pruned properly?

PFT recommends that all private plantation growers consider using Pruned Stand Certification to help underpin their marketing of pruned plantation stands.

What is Pruned Stand Certification?

Properly pruned and thinned plantations are more valuable than those where these management activities have not been carried out.

Pruned Stand Certification (PSC) is a set of procedures that provides statistical assessment data on the effectiveness of a pruning operation and a formal record of the assessment results.

PSC is a nationally run system, under the auspices of Australian Forest Growers (AFG), with PFT providing expert support training in Tasmania.

Immediately following a pruning lift, the effectiveness of the operation can be quantified by measuring an appropriate sample of trees for the maximum diameter over pruned branch stubs (DOS) and by assessing sweep. These measurements, when used with the pruned log diameter at harvest time, indicate how much potential clearwood is in the stand and thus can positively influence the price paid for the logs by the purchaser.

The assessment procedure is straightforward and can be carried out by the grower, using the detailed manual and having attended the one day course which goes through the following:

- Locating the sample plots in the plantation;
- Measuring the sample trees;
- Recording the information on the special form; and
- Quality control of pruning and measuring.

However, for these measurements to be credible, they have to be authenticated by an independent auditor. PFT is training more experienced forest managers and growers as auditors. In addition, many growers are also doing the course to save on the cost of certification – and they learn a lot about their trees in the process as well! AFG also independently assesses some audits to ensure that auditors comply with the standards.

Auditors measure a random subset of the sample plots and send their report together with a detailed map of the plantation to AFG in Canberra, where a formal certificate is issued to the grower.

The auditor will charge for the work and AFG has a set fee (currently $88 inc GST) for processing and issuing each certificate. The auditor can carry out the full assessment, but will obviously charge more for this.

Growers can save a considerable amount of money if they measure the pruning lifts themselves for their plantation (usually 3 lifts per stand), so that the auditor then only needs to spend much less time on site, checking the subset of plot measurements. On this basis, the cost of PSC would add about $1 to $5 per m³ for a block up to 5 hectares and less for larger blocks. This is expected to be recovered through a premium paid by the purchaser for a proven audited quality product.

Any plantation can be certified, although the primary focus is on pines and eucalypts.

Want More Information?

For more information on this and other forestry matters, contact your local PFT office.
Doing a good job with the mound plough

The key to successful tree planting is preparation. The seedlings need to have the best possible conditions when they are planted and good site preparation is essential. Research findings and experience reinforces the need for good weed control. A combination of herbicide use and soil cultivation has proven to be the best approach. There are a range of herbicides that can be used to control weeds but when used in combination with soil cultivation less herbicide is needed and weeds are controlled for a longer period.

Soil cultivation helps control weeds and it is easier plant seedlings into cultivated soil.

Private Forests Tasmania has available a specialised ‘mound plough’ that produces a cultivated mound, ideal for tree planting. The plough produces a mound using a set of discs. The plough also has a height adjustable winged ripper.

A 75 horsepower four wheel drive or larger tractor with a 3 point linkage is required to pull the plough. A larger 85 or 100 horsepower tractor is preferable, the greater the horsepower the better the mounds.

The plough is used to create strips or lines of mounded soil. In some soil condition it is not necessary to use the ripper. The aim is to turn the soil over and bury the weeds and the surface soil layers that contain weed seed.

The clumps of soil turned over need to ‘break down’ so there are no air pockets underneath. If seedling roots encounter an air pocket it will die. It may be necessary to plough the mound a second time or use the tractor wheels to break up the clumps.

A separate pass using a ‘smudger’ is recommended when the clumps are large and have a high clay content. The ‘smudger’ fits on to the 3 point linkage and is basically a mould which is pulled over mounds. The top of the mound is flattened and the sides formed into uniform sloping embankments.

Mound ploughing is most effective when combined with a spraying program. Only the weeds on the mounded area need to be controlled but in some cases the area between mounds is also sprayed. Herbicide application is more uniform and effective over ‘smudged’ mounds. Ploughing the whole area before mounding is also recommended.

Seedlings are planted on top of the mound. Typically mounds are 4 metres apart and seedlings planted 2.5 metres apart on the mounds, resulting in 1,000 seedlings planted per hectare. Trees can be planted on the side of the mound and the mould provides shelter for seedlings from wind blown sand. The spacing between rows of mounds is to allow machinery to move along the rows. At 4 metres row spacing it is easy to drive between rows.

The mound plough unit is transported on dual wheel trailer. The plough sits on trolley on the trailer which is rolled on and off the trailer using a small manual winch.

**Key information**

- **Tractor** – 75 horsepower four wheel drive or larger tractor with a 3 point linkage. A larger 85 or 100 horsepower tractor is preferable.
- **Trailer with plough gross weight** – 1600 kilograms (1.6 tonnes)
- **Cost** - $40 per hectare
**Staff changes at PFT**

After forty years Graeme Campbell has resigned from his long career in State Forestry.

He started as a trainee Technical Forest Ranger with the Tasmanian Forestry Commission, based at Weegeena, along with Ian Pickford (another former PFT staffer), and Phil Hay. In 1968 he was placed in charge of developing the Branch’s Creek Plantation.

Strahan was the next move in 1980, after which he headed for drier climes of the North East of Tasmania when he took up the position of Regional Technical Forester with Private Forestry Division in the mid 80’s. A dedicated and committed Forest Advisor, he has developed a close and respected working arrangement with hundreds of private landowners in the North East of the State, which has been his ‘territory’ whilst with PFT.

From his work colleagues here at PFT we wish him well with whatever he takes on in the future. We know Patsy is very keen for him to find something constructive which continues to allow her the freedom she has enjoyed while Graeme has been involved with Scout leadership, farming, bowls, fire fighting and his video venture ‘BellCam’.

Rob Smith has joined PFT as a Private Forest Advisor at our Hobart office. Rob is a proud Welshman, thanks mainly to the current form of the rugby team. He started his forestry career in 1986, and worked for a variety of forestry employers throughout Britain, including: UK Forestry Commission, Duke & Duchess of Devonshire, Isle of Man Forestry Division and even a stint as a harvesting contractor.

Following his graduation in MSc Forest Products Technology in 1995 he spent 3 years with Coed Cymru (Welsh Woods), before moving to Queensland to work as a Farm Forestry Extension Officer for Greening Australia Qld. Queensland was far too hot for a Taff (Welshman), so he moved to Tasmania in 2003 to work in native forest management and timber utilisation for Gunns Ltd.

Rob brings his varied experiences including plantation mensuration and different perspectives to complement the skill base within PFT.
Private forests occur throughout the state on a wide range of different soils, topography and climatic conditions.

PFT has a range of tools that help provide useful information and guidance on managing private forests for both individual landowners and also to fulfil PFT’s advisory and administrative roles within government.

The dynamic nature of forests means that forest areas change for many reasons:
- increases due to new plantings;
- harvesting and regeneration;
- natural activities (bushfires, disease, dieback); or
- conversion for
  - other agricultural pursuits (grazing)
  - infrastructure (roads, gas lines)
  - new dwellings.

Monitoring these many changes provides an ongoing challenge to PFT staff.

The Geographic Information System (GIS) or electronic mapping system is at the heart of the system that PFT has developed over the past decade.

The GIS provides a powerful computer-based process that includes adding new information to the existing information on different forest types and activities on private land as well as allowing sophisticated analysis of the huge amount of information stored.

With the large amount of change occurring, PFT is always trying to find new methods that can help improve the currency and accuracy of the information gathered.

Satellite imagery is now playing an important role in this process.

PFT has trialled a range of products involving different levels of resolution.

SPOT5, IKONOS and QUICKBIRD imagery have all been purchased and appraised for sample areas in NW, NE and southern Tasmania.

**Results so far**

The appraisal is continuing, but it is clear that there are several different imagery products that will increase PFT’s ability to provide information for active private forest management.

While high resolution imagery provides sub metre level detail, there are increased costs associated with purchasing the imagery and in its analysis.

PFT is working actively with other public and private land managers to acquire satellite imagery for Tasmania to help with active land management.