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Trees in the Peel-Harvey catchment

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The Peel-Harvey catchment has been the focus for an intensive research and extension programme to reduce phosphorus run-off flowing into the Peel Inlet and Harvey Estuary, while maintaining agricultural productivity.

One of the proposed management strategies is to plant large areas of trees on the catchment's leaching sands. Farmers would be encouraged to take this option if growing trees was at least equal, in financial return, to the present agricultural land uses.

The environmental advantage of trees as a crop for the Peel-Harvey catchment is largely because of their role as 'water pumps'. Trees use more water than the pastures that predominate in the Peel-Harvey coastal plain catchment. By drawing water out of the groundwater, they will create a deficit of water underneath a plantation. This 'deficit area' could act as a 'sink' to collect nutrient-rich water at the break of the season when phosphorus is mobilized from paddock soils.

The trees are efficient users of this water and the nutrient it carries, preventing it from reaching the drainage system, and hence the estuary. Trees may also help to reduce the soil salinity that is becoming more obvious on the coastal plain.

Preliminary data indicate that growing Eucalyptus globulus (Tasmanian bluegum) for woodchipping may be at least as profitable as agriculture. Tree plantations also have the added potential to reduce long-term phosphorus losses from the soil.

Department of Agriculture tree species trial

In 1984, staff from the Department of Agriculture's Harvey office planted a variety of trees on the Joel and Gavin phases of the Bassendean Sands, west of Harvey to compare their potential for woodchipping. Bassendean Sands are deep grey sands, extensive areas of which are underlain by an impermeable hardpan locally known as 'coffee rock'. The Joel phase is swampy, low lying and sometimes fairly peaty, while the Gavin phase is the high, dry and often non-wetting ridges.

Six hectares of newly cleared Bassendean Sand were selected and planted to a range of trees in June and July 1984 at a density of 1,250 stems per hectare. The trees have been fertilized annually. Two-thirds of this area is classed as the Joel phase of the Bassendean Sands (Site 1). The remainder is in the Gavin and poor Transitional...
phase of the Bassendean Sands (Site 2). The natural vegetation was jarrah and banksia on the Gavin ridge running down the slope into predominantly paperbarks and ti-tree on the Joel Sands. A small area of old pastured land on a well-drained Transitional phase of the Bassendean Sands was also selected (Site 3). The original vegetation of jarrah and banksia had been replaced by a sparse pasture of lupins, serradella and volunteer grasses. The performance of the trees 34 months after planting is shown in Table 1.

With hindsight, more attention should have been paid to site preparation before planting. Trees planted on the Gavin ridge may have established better and survived if the site had first been ripped and furrow-lined. Such practices are believed to increase water and root penetration in the important seedling establishment phase.

The Joel Sand area is very wet in winter and planting the trees on to constructed mounds would now be recommended. Vigorous ti-tree growth on the newly-cleared site was almost uncontrollable and competed strongly with the tree seedlings.

The trees on Site 3 grew the best, probably because the site was neither very high and dry (Site 1) nor very wet (Site 2). Weed competition was far less than on the newly cleared sites 1 and 2. Site 3 had also been fertilized in the past. Survival rates on the pasture site are not included in Table 1 because they were affected by some inconsistent herbicide spraying and an uncontrolled wingless grasshopper attack.

The next assessment of the trees will include a diameter at breast height measurement (1.3 m) to calculate the volume of timber.

Eucalyptus grandis in particular, E. globulus, E. saligna and E. camaldulensis were the most promising species. At present most large scale commercial plantings are to Tasmanian bluegum (E. globulus) because it has a proven market for paper pulp. Other species may be used in time. Farmers are interested in growing trees for woodchip but are concerned that it will be a monoculture of E. globulus. They are also concerned about the ability of Tasmanian bluegum to grow successfully on some of the coastal plain soils.

Three old pastured sites, two on the duplex soils of the Coolup series and one on a Bassendean Sand ridge, were planted to a similar range of trees in June 1988. Careful attention has been paid to site preparation. Observation wells have been, or are being, installed across all sites to monitor the effect of the plantings on ground water levels.

**CALM research**

In 1988, the Department of Conservation and Land Management (CALM) started a research programme, supported by the Federal Government under the National Afforestation Program (NAP) to investigate all aspects of E. globulus plantation establishment on the coastal plain and elsewhere in the south-west of Western Australia.

The NAP project includes experiments on: site suitability and preparation; weed control; fertilizer strategy; seedling growth and preparation; water usage; projected yield; and an ongoing investigation of the economics of tree farming.

The effect of planting a tree crop on lowering catchment run-off and nutrient loss is also

<table>
<thead>
<tr>
<th>Site 1 Joel Sand (Swampy)</th>
<th>Site 2 Poor Transitional (Dry ridge)</th>
<th>Site 3 Transitional Sand (Pastured)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Survival %</td>
<td>Mean height m</td>
<td>Survival %</td>
</tr>
<tr>
<td>E. camaldulensis</td>
<td>92</td>
<td>2.12</td>
</tr>
<tr>
<td>E. grandis</td>
<td>67</td>
<td>1.99</td>
</tr>
<tr>
<td>E. globulus</td>
<td>79</td>
<td>2.01</td>
</tr>
<tr>
<td>E. saligna</td>
<td>91</td>
<td>1.90</td>
</tr>
<tr>
<td>E. viminalis</td>
<td>25</td>
<td>1.24</td>
</tr>
<tr>
<td>E. maculata</td>
<td>66</td>
<td>1.30</td>
</tr>
<tr>
<td>P. radiata</td>
<td>80</td>
<td>1.17</td>
</tr>
<tr>
<td>P. pinaster</td>
<td>44</td>
<td>1.23</td>
</tr>
</tbody>
</table>

No survival rates are reported for Site 3 because damage from herbicide spraying and wingless grasshoppers may give an unfair comparison.
being investigated by CALM in a detailed paired catchment study on Bassendean Sands. Run-off nutrient loss will be measured from vee-notch weirs from 1989, and trees will be planted in 1991. The experiments will run through a tree rotation of about 10 years.

Land Conservation Districts

In addition to research by the Department of Agriculture and CALM, farmers in the Meredith Land Conservation District have started several tree planting projects. Their district is a deep Bassendean Sand catchment draining into the Peel-Harvey system. They are planting shelter belts of *E. grandis* and a mixture of acacias at different widths of shelter belt. Observation wells are to be located across the tree belts and extending 50 m into the paddocks to monitor the effect on the watertable. An area of *tagasaste* (tree lucerne) will also be planted on the Gavan phase, and growth rates and effect on soil moisture monitored.

Farmers in the Serpentine-Jarrahdale Land Conservation District are planting areas of *tagasaste* on their poor soils. They are also concerned about increasing soil salinity. A small project looking at the reclamation of one hectare of a bad salt scald with *E. occidentalis*, *E. spathulata*, *E. sargentii* and *Casuarina obesa* has been successful. The trees, planted in 1985, have survived and the site looks much improved. The members are also planning to start other tree-planting projects on suitable sites.

Commercial plantations

Two types of commercial plantations are envisaged as appropriate in the Peel-Harvey catchment.

The first is block plantations on whole paddocks or groups of paddocks, with a total area of over 40 ha. These plantations may particularly suit landholders not actively farming or who anticipate retiring in five to ten years, or those who are looking for a crop that requires less intensive attention.

Alternatively, farmers may wish to preserve their existing agricultural enterprises, and plant shelter-pulp belts 30 to 100 m wide running along their paddocks. These shelter-pulp belts may line up with those of a neighbour to give a greater planted area. In areas where the original vegetation has disappeared the farmers would gain shelter for their stock, with the belt itself being a saleable crop. Farmers are also interested in more long term tree crops for hardwood timber production.

In addition to broad scale farming, intensive agricultural activities such as horticulture, piggeries, stock handling facilities and feed lots pose a severe threat to the estuary as they become the source of nutrient-enriched waters which can enter the drainage system. Plantations of trees around these sites could act to intercept some of this water, thus preventing it entering the estuary.

Hardwood sharefarming scheme

CALM has started establishing plantations of Tasmanian bluegums for future paper-pulp production. These plantations are on existing farmlands, in a sharefarming arrangement with the landholders. Under this scheme, the land is effectively leased from the farmer for an annual payment agreed and fixed by contract. The payment is calculated on projected yield from the site and indexed to the consumer price index. The farmer also receives an agreed percentage of the return at harvest (10 years). The contract runs for 20 years which is two tree rotations.

After the first harvest, the stumps, are allowed to coppice and a second harvest can be made from the same stump. In 1989, about 700 ha have been planted within the Peel-Harvey coastal plain catchment. It is expected that a private enterprise funded ‘Tree Trust’ will take over the underwriting of the programme in the future, and CALM will be retained as plantation managers.

The farmer can contract to do most of the establishment and maintenance work, such as ripping, furrow-lining, spraying, planting, maintenance of firebreaks and fencing, thus substantially boosting the annuity payment.

The future

Trees grown under the right conditions are a viable alternative crop which may compete purely on economic grounds with more traditional agriculture. The projection for the world pulp market in the short to medium term (5 to 15 years) is for a shortage of paper pulp, so trees should prove a sound investment. However, the opportunity to establish markets and infrastructure may only be open for a short period. Plantations must be established to ensure farmers can take advantage of the opening and have a crop to sell at the right time.

The role of trees other than for commercial purposes should not be overlooked. The planting of suitable trees on poor soils for fodder or to prevent land degradation, or the planting of permanent shelter belts or clumps, must all be beneficial to agriculture and