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# Alternative land uses

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# ALTERNATIVE Land Uses

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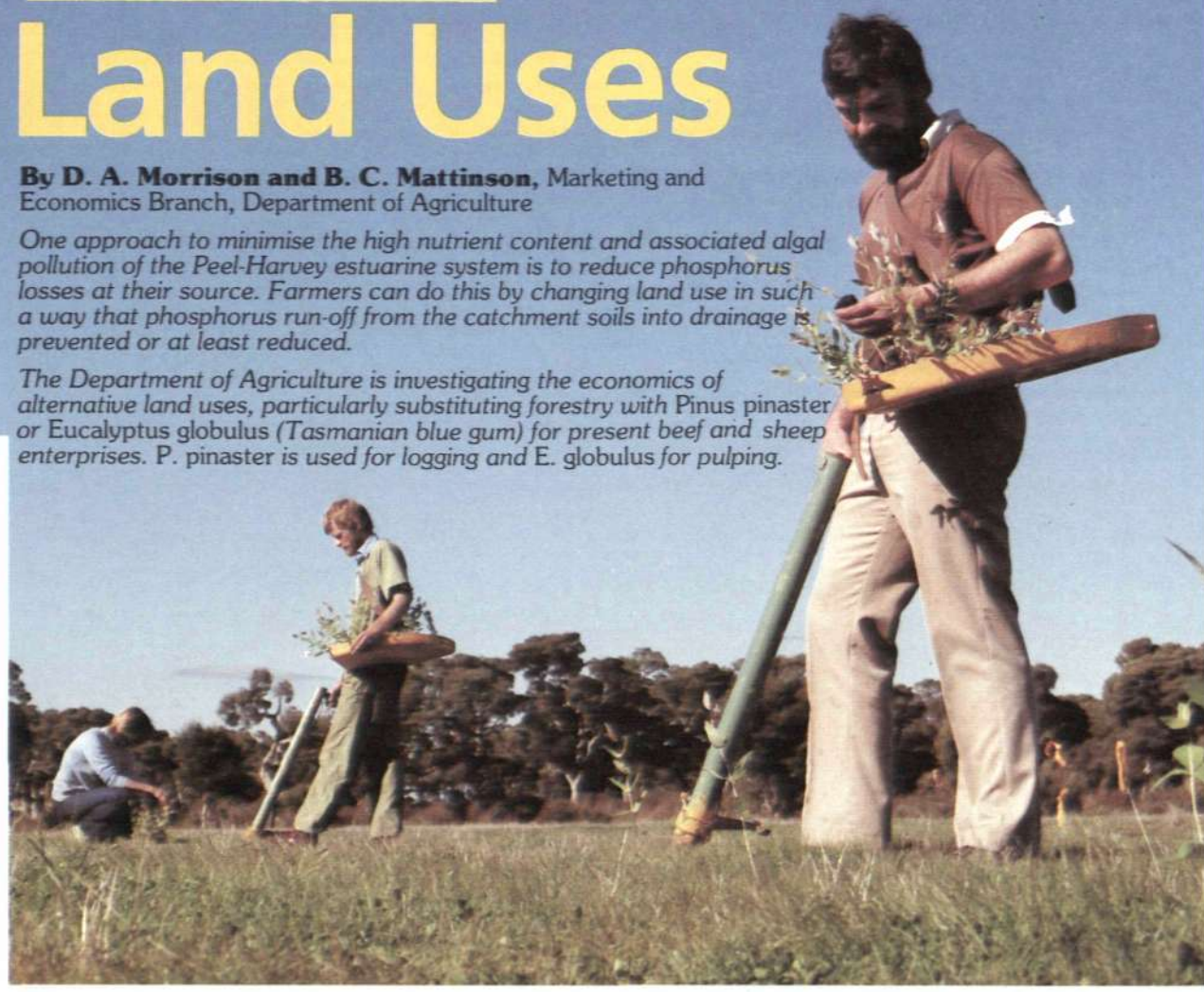
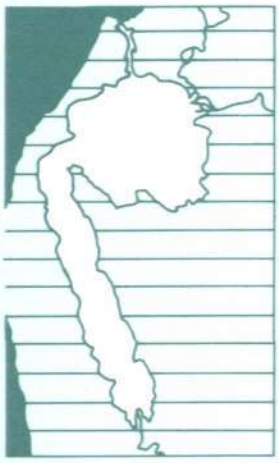
*One approach to minimise the high nutrient content and associated algal pollution of the Peel-Harvey estuarine system is to reduce phosphorus losses at their source. Farmers can do this by changing land use in such a way that phosphorus run-off from the catchment soils into drainage is prevented or at least reduced.*

*The Department of Agriculture is investigating the economics of alternative land uses, particularly substituting forestry with* Pinus pinaster *or* Eucalyptus globulus *(Tasmanian blue gum) for present beef and sheep enterprises.* P. pinaster *is used for logging and* E. globulus *for pulping.*





PEEL-HARVEY
*Estuarine System*

Forestry can be expected to lead to less phosphorus run-off into the drainage system than agriculture because:

- less fertiliser phosphorus is applied,
- trees intercept more phosphorus, hence reducing phosphorus leaching,
- water tables are lowered, resulting in reduced flow to the estuary of water containing phosphorus.

## Profitability

The concept of alternative land use is attractive because forestry generates net income while reducing the phosphorus pollution problem of the estuary. However, there are costs associated with the agricultural production forgone. The important economic questions are: how profitable are these alternative land uses in relation to agriculture, and how cost effective is changing land use versus other methods of reducing phosphorus losses.

Results indicate that farmers are unlikely to choose to convert from agriculture to forestry. *P. pinaster* is much less profitable than agriculture as a comparison of net present values[1] over the shown range of appropriate discount rates[2] shows in Figure 1. The lower profitability of pines is largely because of the unsuitable location. At other locations in the south-west of Western Australia which are better suited to growing pines, and where *P. radiata* can be used in place of *P. pinaster*, pines have been found to be more profitable than agriculture[3].

Although best estimates indicate that *E. globulus* is slightly more profitable than agriculture (Figure 1), there is a high degree of uncertainty about its markets and yield. Consequently a farmer changing from agriculture to *E. globulus* would be taking a considerable risk given present knowledge. *E. globulus* is more profitable than *P. pinaster* because of the earlier return provided by a higher yield and shorter production cycle (15 years versus 45 years), in spite of a much lower product price.

Another reason for farmers to prefer to stay with agriculture is the cash flow problem of forestry caused by the delay before forestry products generate income. The different labour and management requirements of forestry also mean that farm resources may be better used by continuing with agriculture.

## Cost effectiveness

Because of the community's interest in reducing phosphorus pollution of the estuarine system, government expenditure to facilitate a change in land use may be warranted in spite of the shortcomings of forestry as an alternative to agriculture. This depends upon the cost effectiveness of this expenditure in reducing

[1] Net present value is benefits and cost discounted to their present value and summed. Discounting achieves consistency with respect to time.

[2] A literature review indicated strongest theoretical support for discount rates in the range 3 to 5 per cent. This is considered to be the appropriate range.

[3] Treloar, D. W. G. (1984). Pilot study of the potential for co-operative ventures between Forests Department and farmers in the Manjimup region, which operate pine plantations on land owned by farmers. Report to the Government of Western Australia.

■ Land use trials involve planting various tree seedlings on the catchment soils. Inset: A stand of *Pinus pinaster*.

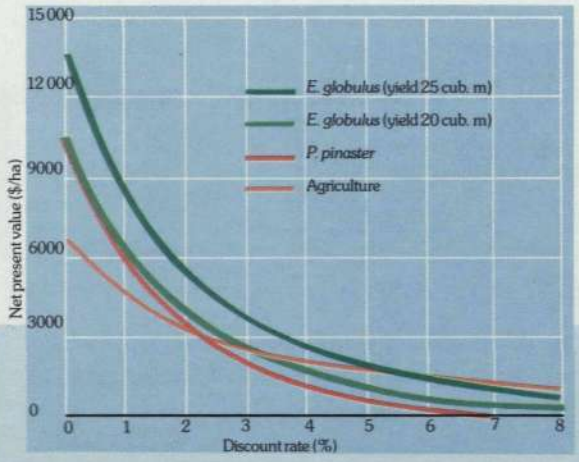



Figure 1. Net present value to the farmer of alternative land uses. (*E. globulus* using lower prices of $6.77/cubic metre).

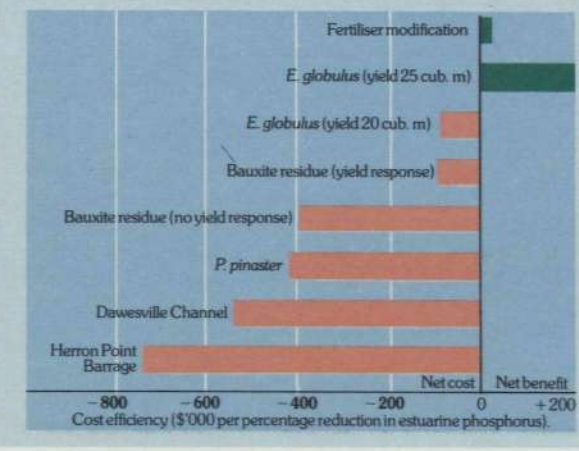



Figure 2. Cost efficiency of alternative options for reducing phsophorus levels in the estuarine system.

phosphorus pollution and how it compares with alternative strategies.

Figure 2 shows that *E. globulus* is one of the two most cost effective means for reducing phosphorus pollution.

However, the other highly cost effective method based on modifying farmer fertiliser practice is superior because it is likely to reduce phosphorus pollution sooner without having the uncertainty, cash flow, labour and management problems which would be associated with *E. globulus*.

*P. pinaster* is only moderately cost effective. It is much less cost effective than the fertiliser modification method or *E. globulus*. However, it is more cost effective than the large engineering alternatives which would treat phosphorus pollution in the estuary rather than at its catchment source. The cost effectiveness of growing *P. pinaster* is similar to that of incorporating bauxite residue from Alcoa to modify the highly leaching sandy soils.

## Conclusions

There is *prima facie* evidence that *E. globulus* is one of the two most cost effective methods for reducing phosphorus pollution, whereas *P. pinaster* is only moderately cost effective. The four most cost effective methods are all based on reducing phosphorus losses from the catchment. They are fertiliser modification, growing *E. globulus*, bauxite residue incorporation and growing *P. pinaster*.

## More information

Before a firm conclusion can be drawn as to the most cost effective overall strategy for reducing phosphorus run-off and the algal pollution problem of the Peel-Harvey estuary, more information is required:

- The optimum level of reduction in phosphorus loss should be estimated. This is important because if the optimum level is a 70 per cent reduction, the cost effective methods such as modifying fertiliser practice and growing *E. globulus* are in themselves insufficient. The most cost effective strategy would then be either a combination of a low cost catchment strategy (modified fertiliser practice or growing *E. globulus*) and a high cost engineering strategy or a moderately expensive catchment strategy (bauxite residue incorporation).
- Another important information gap, to which findings are very sensitive, concerns soil modification with bauxite residue. Depending upon the rate at which it is applied, this treatment varies from the third most cost effective method to one of the least cost effective. Research is required to determine the minimum rate of broadscale application which effectively stops phosphorus leaching from the soil into the drainage system.