A FEASIBILITY STUDY CONCERNING THE LEASE OF MANJIMUP FARMLAND FOR PINE FORESTS

Forests Department of Western Australia
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A FEASIBILITY STUDY CONCERNING THE LEASE OF MANJIMUP FARMLAND FOR PINE FORESTS

PROJECT REPORT (ABRIDGED)*

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* Sections 6 and 11, listing details of farm and forest management budgets, and diagrams 1, 2, 4 and 5, are not included, as data was provided from private sources on the condition of confidentiality. Sections 16 and 17 of the summary and main report, concerning personal comments from the author to the Forests Department, have also been excluded.

SUMMARY

1. Project Title

This is a pilot study of the potential for co-operative ventures, between the Forests Department and farmers in the Manjimup region, which operate pine plantations on land owned by the farmers.

2. Proviso

Data has been accepted without question from Departmental sources and time and the budget have not permitted completely detailed analysis. Recommendations should be seen as being indicative rather than definite.

3. Method

The pine plantations would replace existing grazing activities on cleared land and would have a planning horizon of thirty two years. Therefore, the theoretical framework of evaluation of long-term investment projects is used.

This requires comparison of net present values per hectare at various rates of discount.

4. Data in Forestry

Basic data were provided by the Department. It was agreed that present technology and costs and present stumpages would be applied to the entire thirty two years of a plantation rotation.

An important adjunct to the Departmental data was data obtained from a local firm managing private pine plantations.

Also, extensive data on Tasmanian plantations and some data from Victoria were obtained.

5. Data on Farming

After consultation in the Department of Agriculture and receipt of data from that Department, a series of budgets was drawn up for the grazing activities most likely to be alternatives to plantations.

6. Budgets for Farming

7. Potato Farming

A budget for potato farming is presented to show that it yields higher net returns from suitable soils than grazing yields on the soils being considered for plantations.

8. Net Present Values for Farming

A brief explanation of method is presented.

9. The Value of Land

Based on independent advice, the land suitable for plantations is valued at $1,000 per hectare.

It is explained why it is preferred to debit this value of land in the first year of the thirty two year period and credit it again in the thirty second year, rather than omit it.

10. The Internal Rate of Return in Farming

This rate of return is calculated to be from 4.0 to 5.3% p.a. for three farming budgets. The fourth did not yield a positive net return at all after family labour had been charged for on an opportunity cost basis.

Some theorising is entered into concerning the explanation of intenral rates of return of this order and their relationship to social rates of discount and to the value of land.

11. Budgets for Pine Plantations

Graphical Comparisons of Farming and Pine Plantations

These reveal an economic preference for pine plantations at likely rates of discount, even when a pessimistic assessment is made of plantation costs and returns. Thus a prima facie case is made for pine plantations as a better land use than the particular grazing activities which were budgeted.

12. Explanation of the Unexploited Superior Returns from Plantations

It is explained how perfect market forces would have caused pines to replace grazing before now if the superior returns were true and obvious.

A series of possible market imperfections and personal attitudes deviating from the norm of the "rational investor" is then explored to outline reasons why these superior returns in fact have not been exploited.

It is recommended that the Department's extension service publicise all the Department's experimental, plantation, and marketing data in the same way as is done by the Department of Agriculture, as a means of overcoming

likely ignorance of the economic opportunities offered by plantations.

Reasons are presented as to why farmers might continue rationally to not plant pines despite their higher profitability.

The two major reasons discussed in later Sections are:

(i) The unattractive pattern of cash flows;
(ii) The reduced opportunity for on-site employment of farm family labour.

13. A Cash Flow for Farm Woodlots

A simple form of annuity scheme is described, according to which the Department could fully compensate a farmer for the loss of net returns from his grazing activity due to the planting of pines, while maintaining the long-term economic superiority of pines.

It is recommended that such a scheme, which could be by means of a lease or other legal indenture, should include (inter alia):

(i) annual payment to the farmer of an indexed amount per hectare sufficient to induce him voluntarily to participate and less than the critical maximum amount which the plantation could "afford";

(ii) control over silviculture and receipt of income to vest in the Department;

(iii) termination on clear-felling with the Department to return arable cleared land to the farmer if so requested, or renegotiate another agreement;

(iv) renegotiation or termination in the event of destruction by fire.

14. Finding Employment for Farm Family Labour

In the farming budgets, notional wages for family labour were included among the costs.

However, if family labour were to have no on-going local employment opportunities to fully compensate for the "wage-earning" opportunities lost when grazing was replaced by pines, resident farmers might well find pines an unattractive proposition.

This problem is explained in some detail and is considered to be of substantial importance.

Calculations of the alternative employment available in the plantations (excluding that associated with harvesting logs) indicate that it would be substantially less than that foregone. Rough guesses at the effects on secondary local employment of switching land from grazing to pines indicate that they probably would be either insignificant by comparison, or negative.

It is recommended that in any co-operative scheme every opportunity be taken to employ the resident farmers in the plantations on their land. Nevertheless, a substantial obstacle to adoption may remain.

15. Marketing the Idea of Plantations

It is recommended that if the idea of co-operative ventures for the growing of pines is pursued, some form of preliminary market research be undertaken, especially into the possible resistance by farmers for reasons suggested in the Report.

PROJECT REPORT

1. DEFINITION OF PROJECT

The Forests Department approved the definition of the project in the terms of two documents.

The first, under the letterhead of the Minister for Forests, stated:

> "The objective of the study is to determine the potential for co-operative ventures between the Forests Department and farmers in the South West which would permit pine plantation establishment on privately owned land."

The second, News Release P83/358 from the Department of the Premier and Cabinet dated 2.6.83 stated:

> "Investigation of the practicality of farmers leasing land to the Forests Department for pine planting. The Centre of Applied Business Research at the University of Western Australia will be commissioned to conduct a pilot study on the costs and benefits of such a scheme for farmers, councils and the department".....

The clear general guidelines set by these statements were elaborated by representatives of the Department at a meeting with representatives of the Centre on 13th July, 1983.

The Department specified that:

(a) The pilot study should refer to potential plantation sites in the Shire of Manjimup

(b) The Department would provide its own data on the physical inputs, costs at present factor prices, estimated yields, and present product prices relevant to the types of sites it wished to have studied.

(c) The study should assume that the final output from the pine plantations would be predominantly sawlogs, with the other output from thinnings and fellings being chipwood, in the proportions given by the client's data.

2. PROVISO

As advised in the Project Proposal, this Report is a pilot study based on data provided by the Department and accepted without question and on data to be obtained from a non-representative small sample of farmers. The budget is small and the time period too brief for results to be generalisable with scientific certainty.

Therefore, as is usually the case with pilot studies, the results and recommendations should be seen as being indicative rather than definite.

3. METHOD OF INVESTIGATION

The Project Proposal outlined the method of investigation in this way:

> "The pine plantations are expected to take 30 years to grow to maturity and clear felling ..... Therefore the theoretical framework of evaluation of long-term investment projects will be used. This theoretical framework requires (for the pine plantation activity and for the farming activities which it replaces) the identification of factor usages, factor prices, outputs of products and product prices on a year-by-year basis for each of the 30 or more years to the planning horizon.

> Then for each activity, appropriate summary measurements such as net present values at various rates of discount, and the external rate of return, will be calculated and the two activities compared to reveal whether there is a prima facie case for a private landowner to prefer pine plantations to existing or proposed farming activiites on this basis of standard criteria of return on investment. Whether or not this comparison reveals a prima facie case for pine plantations, other aspects of the long-term objectives and constraints of the private land-owners might cause them not to favour growing pine trees."

The Project Proposal went on to speculate on reasons why farmers might not favour growing pine trees even if they were a more profitable use of land, and stated that the Project would include:

> "unstructured interviews with some local farmers, the purpose being to explore attitudes sufficiently to identify problems worthy of further behavioural research, and to draft collaborative ventures through which the Department might overcome the objections."

However, when preliminary results were presented to the Department in person on 30 November, 1983 and it was emphasised, as recorded in the Project Proposal on page 6, that this exploration of attitudes would require the farmers to be given the full information on alternatives, the Department decided that these interviews with farmers should not form part of the Project but be left aside for possible future research.

4. THE DATA ON FORESTRY

Basic data on the pine plantation activity were provided by the Department. The Project Proposal referred to these data in the following terms.

> "The data provided by the Department take the form of estimates of the cost (per hectare actually planted to Pinus radiata) of the various operations, such as clearing, cultivation, planting, purning, and annual maintenance. The estimates are derived from recent experience.
>
> A thoroughly scientific study would audit the records from which these estimates were derived to check their accuracy as a representation of present average costs per hectare, and to obtain estimates of the physical (as distinct from financial) factor inputs which the costs covered. Then, some form of forecasting of technology would have to be used to generate predictions of the number of man-hours, machine-hours, quantities of fuel, etc. needed per hectare in the various future years for the given operations. Then some form of forecasting of relative wages and prices would have to be used to generate predicted units costs which would be multiplied by the forecasts of physical inputs to generate forecasts of total costs.
>
> Similarly, forecasts would have to be made of the future Western Australian demand and supply of both pine sawlogs and chiplogs, so that the most likely free market prices for logs could be predicted."

However, this being a pilot study only, it cannot accommodate such sophisticated forecasting. Instead, the assumption will be accepted that present technology and costs, and present "stumpages" charged by the Department for logs, as provided by the Department, can be used as the basis for assessment for the entire 30 years of one plantation life.

The foregoing quoted paragraphs make it very clear that the data obtained from the Department should be regarded as approximate long term estimates. Therefore a number of other sources of information were tapped to provide data which, while not being strictly comparable in terms of location and environment, were acceptably comparable in terms of total yields and, being fairly recent Australian examples, might be acceptably comparable in terms of unit costs and indeed unit prices. These examples were threefold.

(i) Western Australian data from a firm managing private pine plantations in the Manjimup area and elsewhere.

(ii) Victorian data from a publication by officers of the Forests Commission and Department of Agriculture, Victoria.

(iii) Tasmanian data from amongst large quantities of original calculations given to the Principal Researcher by the Tasmanian Forestry Commission.

These data substantiated in general terms the calculations by the Department of net present values, assuming yields as estimated by the Department. The data from the private plantation manager, which were based on a silvicultural regime different from the Department's, indicated that in the private sphere expectations could be more optimistic than those of the Department.

Use of the four sources of data was one way of arriving at the estimation of a rough range of possible economic outcomes for the plantation activity. A second way was to use a range of possible values to each key yield, price and cost. In these ways, as suggested in the Project Proposal, comparisons could be made ranging from the most pessimistic to the most optimistic.

5. THE DATA ON FARMING

In the Project Proposal, it was proposed that the data on farming would be obtained by the Principal Researcher from a small sample of farmers, and that the Principal Researcher would attempt the difficult statistical task of disentangling, from the aggregate data referring to whole farms, those data referring just to potential plantation sites.

In the event, a somewhat different approach was used. Officers of the Department of Agriculture at Perth and Bunbury, after consultation with a Forests Department soil scientist at Busselton, provided actual data pertaining to seven farms and typical approximate data for beef and sheep grazing activities. From these data, a range of economic outcomes for cattle grazing was deduced; cattle grazing being a more profitable farming activity than sheep grazing according to these data.

7. POTATO FARMING

It was made clear by the Forests Department that pine plantations could not economically replace intensive horticulture, and therefore that it would be idle to make detailed comparisons for the deep karri loams on which horticulture is concentrated.

This decision was independently revealed to the researcher to be correct when amongst the sample of farm records, appeared a potato farm with a minor cattle-fattening sideline.

8. NET PRESENT VALUES FOR FARMING

The graphs for farming of Net Present Value against Rate of Discount were constructed very simply in the examples where the cost of land was not debited. Because for each farming budget the identical income and outgo is assumed to apply in each year, each point on a grpah is found by the formula for the sum of a geometric series over the appropriate number of years. The number of years is given by the length of the pine plantation rotation.

9. SHOULD THE VALUE OF LAND BE DEBITED?

For the purposes of economic comparisons, the pine plantation activity and the most profitable alternative farming activity are mutually exclusive uses of land. In the literature on social evaluation of such alternatives, one opinion to be found is that under these circumstances it should not be necessary to debit the cost (value) of land in the initial year and then credit it again in the final year of the rotation.

However, from the point of view of evaluation of profitability to the landowner, the concept of return on investment is well-known and relevant and the total investment clearly includes the cost of land which could be sold at the current market price and the proceeds used to provide a flow of alternative income. For this reason, net present value graphs are presented for which land is assumed to be purchased in the initial year and sold at the same price of $1,000 per hectare, in the final year.

10. THE INTERNAL RATE OF RETURN IN FARMING

For land valued at $1,000 per hectare, an internal rate of return (discount rate at which the net present value is zero) is readily calculated for each farm budget, being the annual net return divided by 1,000 and expressed as a percentage, assuming no net return in the year when land cost is debited.

That is:

for	FARM 6A	5.313% p.a.
	FARM 6B	negative net return
	FARM 6C	4.072% p.a.
	FARM 6D	4.233% p.a.

For horticultural land valued at $2,500 per hectare, the internal rate of return from the budgeted potato growing activity is for Budget 7 : 9.900% p.a.

It might be asked why the rates of return to farming appear to be so low, when in common parlance a rate of return of 12-20% p.a. might be considered reasonable.

In part, the explanation is that the rates of return in common parlance are in money terms and thus include the rate of inflation.

The rates calculated above are in real terms (dollars of constant value having been used) and thus are rates of return over the above what ever might be the rate of inflation. In particular, the manner in which net present values are calculated in this Report assumes that inflation affects income and outgo identically and affects the value of land likewise. This assumption enables the 1983 prices to be applied to every income and outgo, including the notional purchase and sale of land, regardless of the future year in which it occurs. The assumption is believed to be reasonably unbiased in the sense that there is no apparent reason why long

term trends in relative prices should favour farming rather than pine plantations or vice-versa, and reasonably accurate so far as land value is concerned because there are strong indications that the real value of agricultural land will be maintained.

Economic theory is quite specific in setting down the determinants of the market value of a capital asset such as land. In a well-informed market such as the market for agricultural land, and given the large number of potential actors in that market and the relative ease of buying and selling land in relatively small areas, economic theory states that the capital value of land is the discounted value of the stream of future net earnings which the land can command, net of the cost of all purchased inputs and the notional cost of non-traded inputs such as family labour valued at their opportunity cost. This market capital value is in a sense a marginal valuation set by the interaction between the marginal landholder offering land to the market (and in doing so balancing his assessment of his net returns from farming against his expected returns from alternative uses of the funds to be generated by the sale), and the marginal purchaser exhibiting an effective demand for land (and in doing so balancing the same sorts of alternatives as the person offering land for sale).

Through this process an equilibrium price for land is established which incorporates all the information on alternative costs and returns and all the information on the rates of discount of the actors in the land market.

In the opinion of the Principal Researcher, it is not at all unexpected that the market value of agricultural land should be such as to yield an internal real rate of return of about 4% per annum to average management. This order of real rate of return is historically common in Australia if one abstracts from the fortuitous and unpredictable increases in net returns caused by scientific discoveries (such as the effects of trace elements, development of new varieties...), caused by unpredictable shifts in demand (such as droughts in other countries) and caused by changes in statutory limitations to land-use (such as re-zonings to higher valued uses).

Indeed, the internal real rate of return to investment in urban housing and commerical premises (abstracting from the same conjectural factors) would seem to be most liekly about 4% per annum and almost certainly less than 6% per annum.

All the foregoing argument is just another way of saying that a range of real rates of discount between about 3.5% p.a. and 6% p.a. would seem to reflect best the rates at which individual producers and consumers discount the future, if one leaves aside technological change and leaves aside guesses as to government policies with respect to land use.

Putting it all in yet another way, one can say that if the rate of time - preference amongst farmers is 4% p.a. and if the markets are perfect for all farming inputs and outputs and for farming land, then in the long term average farmers will extract no surplus after they have accounted for the opportunity cost of capital tied up in land. The internal rate of return will equal the rate of time preference and will equal the opportunity cost of capital. Transient exception to this rule will be observable as favourable shifts in demand and new technological opportunities create positive profit margins. However, in the perfect market for

land, these profit margins, once generally expected, cause the value of land to be bid up. It will be bid up precisely to the value causing the internal rate of return to fall to the rate of time preference.

By this means, farmers continue to receive "surpluses" but these surpluses are attributable to their status as owners of the land rather than attributable to their carrying out farming activities on the land.

Diagram 3 shows that pessimistically budgeted pine plantations yield a higher discounted net return per hectare than average to above-average farming at rates of discount up to about 6 percent per annum, if land is $1,000/ha. in 1983 terms. At higher rates of discount, pessimistically budgeted plantations are significantly worse than farming. But opitmistically budgeted plantations have the advantage over farming at all sensible rates of discount.

Diagram 6 shows that pessimistically budgeted pine plantations yield a higher discounted net return per hectare than average to above-average farming at rates of discount up to about 6 percent per annum, if the cost of land is ignored.

12. INTERPRETATION OF THE APPARENT OPPORTUNITY FOR HIGHER NET RETURNS FROM PINES

As can be seen from the graphs for rates of discount below about 6% p.a., the pine plantation activity probably yields higher net return per hectare than the best grazing activity, even if pessimistic expectations are applied to the level of Departmental overheads, the price of chiplogs, and the annual maintenance and insurance costs. It is sensible to ask how, in relatively well-informed markets, such a margin could exist without being exploited.

DIAGRAM 3 :- COMPARISONS OF PLANTATIONS AND FARMING

COST OF LAND $1000/ha.

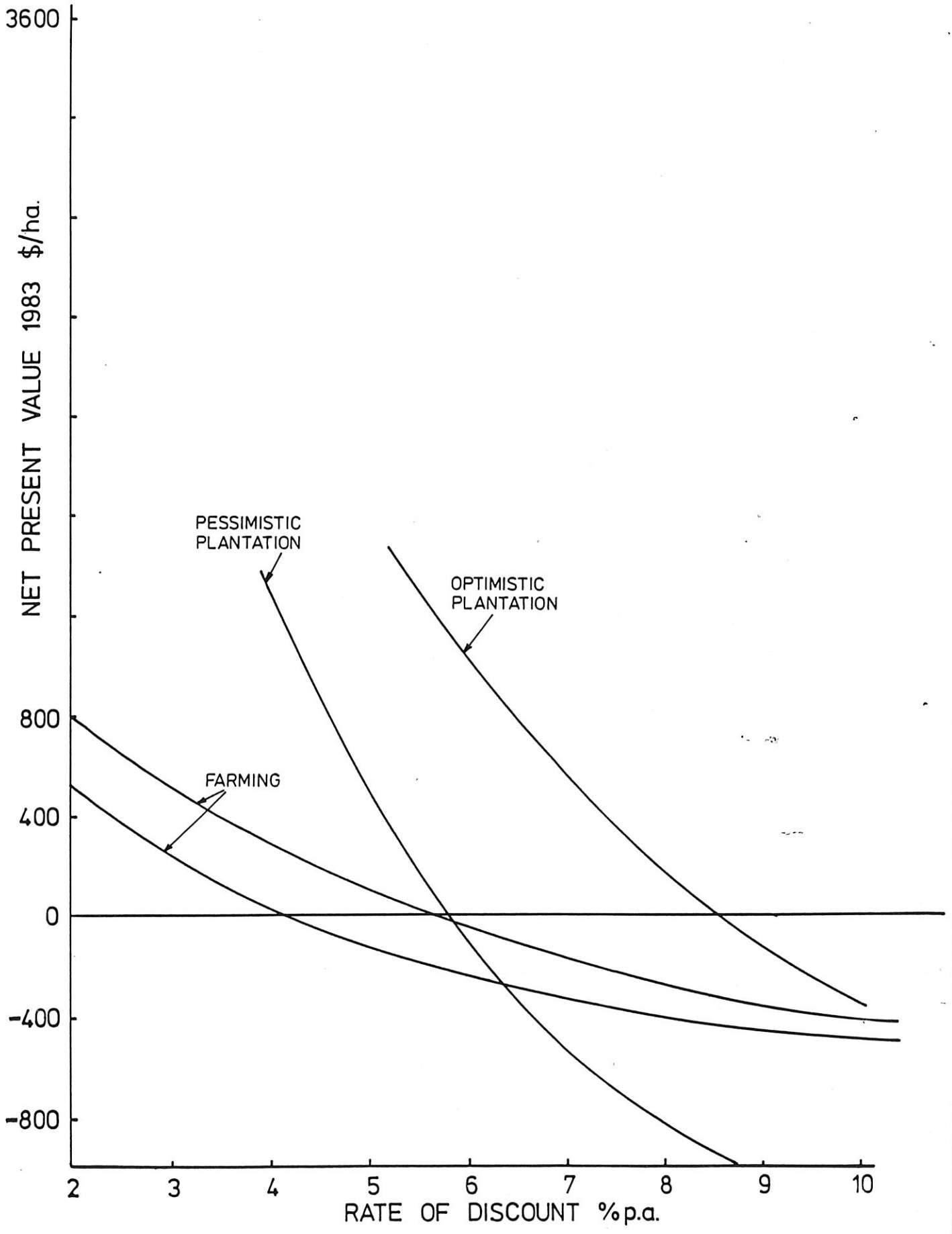
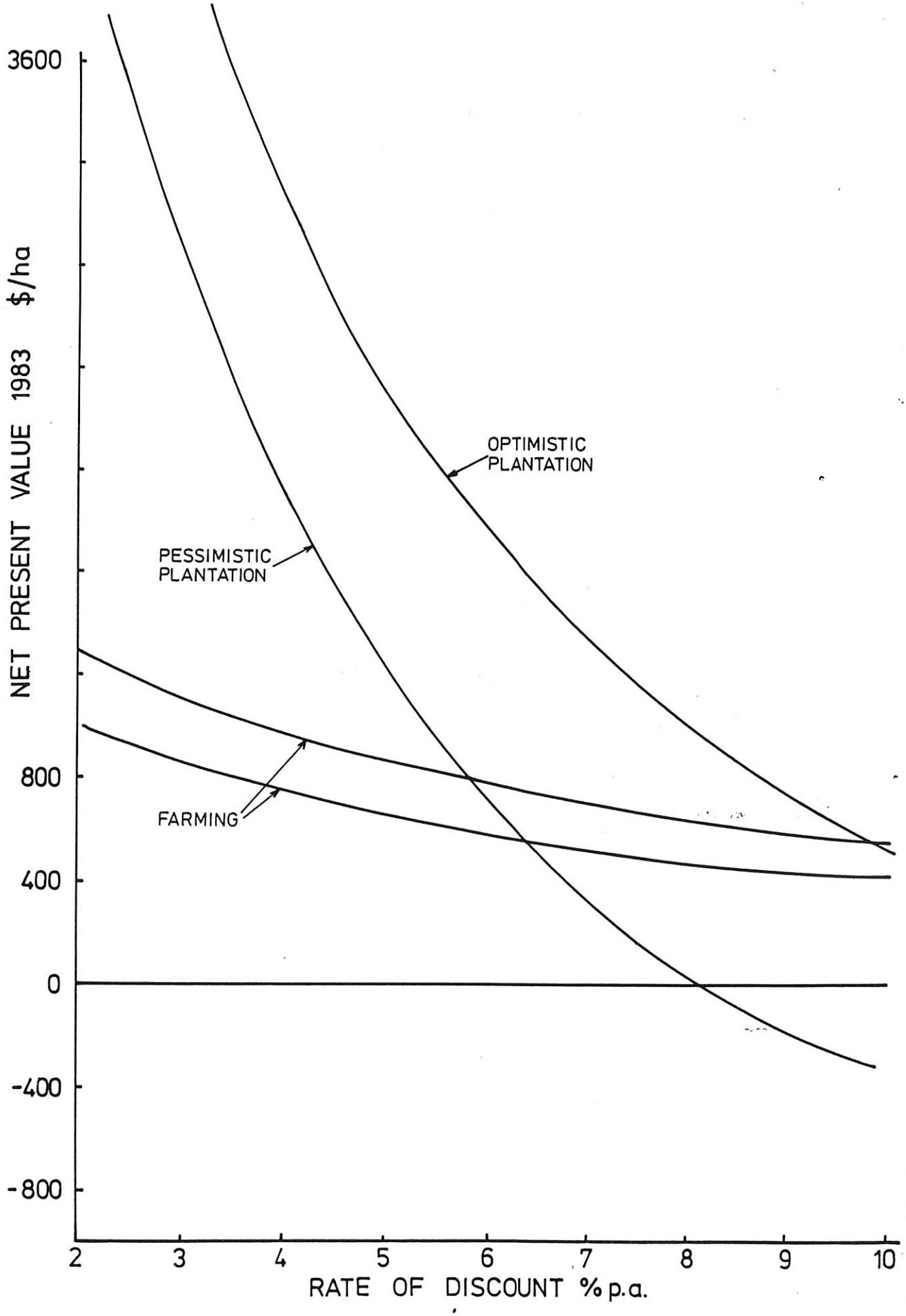


DIAGRAM 6 :- COMPARISONS OF PLANTATIONS AND FARMING

COST OF LAND IGNORED



In perfect markets in which actors are seeking to maximise net returns one would expect the following chain of events to have occurred.

First, present or potential landowners would have perceived the possibilities of higher profits from pines. So would firms offering management expertise.

Second, and assuming that their goal is the maximisation of long term net returns, landowners would switch land use from grazing to pines, if necessary employing management expertise.

Third, such actions would itself cause an equilibrating force to limit the process of switching to pines. The force would be through the relationship between price and consumption in domestic markets, such that as more and more pines were planted the expected prices per cubic metre for poles, chiplogs and sawlogs would fall.

Fourth, as knowledge of the profit margin from pines became more widespread, the value of land would be bid up until the internal rate of return again equalled the rate of time preference. So, the Net Present Value curve for pine plantations (including the cost of land) would shift to the left until it cut the horizontal axis at say 4% p.a.

This process would of course shift the curve for grazing on the same land even further to the left so that pine plantations would remain the superior land use. However, the long term net return from pine plantations at the general rate of time preference would have fallen to zero. All the "surplus" or "economic rent" would have been captured by the landowners via the bidding up of the value of land (as described before). This is the inevitable result; landowners (in this case) capturing the net returns of new technical information (in this case information about the profitability of pines);

just as the net returns from upward shifts in overseas and domestic demand, and the net returns from rezoning of urban land to higher uses, and the net returns from the discovery of new varieties of plants and animals, all get capitalised into the value of the fundamental assets to which are related the rights of production.

The implication from the graphs is that this switching to pines and bidding up of the price of land has not taken place. The opportunity has not been exploited. This is so despite reasonable availability from the Forests Department of the data used in this Report, despite active advertising by private firms interested in buying land for plantations or managing plantations for others and despite the existence of substantial areas of pines dating back more than a decade, which could demonstrate the point.

When data suggest such unexploited opportunities in other arenas of production, a number of explanations come to mind. To outline these explanations here could assist towards further research.

The most obvious explanation is that the data are incorrect; more particularly that the plantation data are too optimistic or the farming data too pessimistic. The only way of answering such a suggestion is to undertake a more detailed audit of plantation activities of the Department and private landowners. This Report used the data sets provided by these sources, checked only within narrow confines.

A second explantation is that the data are reasonably accurate but are not believed to be so by present and prospective landowners. This possibility poses a clear challenge to the Department's Extension service, which could be given the task of publicising all the Department's experimental, plantation, and marketing data in the same way as is done by the Department of Agriculture.

A third explanation is that the rate of time preference for land owners really is in excess of some 7% p.a. at which rates the net present value from plantations is less than that for grazing. There is scarcely any direct research data available which might indicate what Western Australian farmers' rates of time preference are, but there is considerable indirect evidence that it is less than 7% p.a. inasmuch as the long term internal rate of return in farming seems to be less than 7% p.a.

Nevertheless, this is a possible explanation which, if true would render undesirable any attempt to induce farmers to grown pines.

A fourth explanation is that farmers get such psychic, or non-pecuniary, utility out of farming that it is worth quite a few percent of return. In other words, farmers are not just trying to maximise net returns or capital values, nor just trying to make good wages for themselves, but directly obtaining a benefit from being farmers. If so, and if pines is not "farming" to them, they could rationally desist from planting pines though it cost them lost revenue. Incidentally, those who desisted would still gain from any increase in land values caused by others finding out by experience that pines were more profitable (just as the owner of a signle residence with an adjacent vacant tennis court re-zoned for flats gains an increase in the book value of his vacant land though he refuses to consider selling his tennis court for flats).

A fifth explanation is that farmers might see the growing of pines as anathema; that is they would directly experience a loss of utility if pines were planted on their paddocks. Many such non-pecuniary attributes of land-use are evident in the Manjimup area, ranging from deliberate retention of native forest on land which could more

profitably be farmed to deliberately unprofitable hobby farming or holding cleared pastured land in a completely idle state. Such non-pecuniary attitudes should not be seen as irrational or things which government policy should attack. If they represent firmly held preferences rather than ignorance of alternatives, they are indeed amongst the ultimate social values which a democratic government presumably should represent.

A sixth explanation is that the simplifying mathematics of reducing thirty years of costs and returns to a summary graph of net present value related to rate of discount is actually an over-simplification. It may be that the pattern of cash flows from a pine plantation is fundamentally unattractive to a farmer who, as explained previously, if he bought his farm at the current price is constrained by market forces to earn a sort of basic wage supplemented by adventitious spurts of profitability which fairly quickly have been competed away and have disappeared into increases in land values. Such a farmer is very unlikely to be attracted by a plantation activity which involves decades of net outgo terminated by a relatively enormous income in a single year. The existing system of income tax re-inforces its unattractiveness.

The next section will discuss possible means of offering farmers a more attractive cash flow from pine plantations.

13. A CASH FLOW FOR FARM WOODLOTS

In previous Sections of this Report, it was shown that a prima facie case exists on the grounds of private long term profitability for farmers to plant pines on the land in question.

In the immediately preceding paragraph, it was suggested that one possible reason for them not doing so could be the unattractive flow of net returns.

If the flow of net returns is not seen also by the Forests Department as being unattractive, it is possible to set up a financial scheme under which the Department pays to the farmer an annual sum marginally above the annual net return from the best farming activity, thereby making the farmer better off in terms of net returns, and itself funds the plantation and eventually receives all or most of the income from sale of the plantation output, thereby acquiring most of the net returns of pines which are over and above those of farming.

The rudimentary mathematical justification of this conclusion can be seen by reference to the various budgets, as follows for a rather pessimistic set of assumptions.

Assume that the Department's rate of discount is 4% p.a. This rate could be thought of as implying either that the Government's marginal rate of interest paid on long term borrowings is 4% p.a. above the rate of inflation, or that the Government's rate of time preference on behalf of society is 4% p.a.; or indeed that the Government has alternative uses of funds which yield an internal rate of return of 4% p.a.

At a 4% rate of discount, the farm budget 6C in which the net return per annum is $40.72 per hectare, yields a zero net present value per hectare, if land is $1,000/ha.

As an example, if a pessimistic plantation outcome is realised, the Department could pay the farmer $40.72 per hectare p.a. and still realise an annual net return of $71 - $40.72 = $30.28 per hectare. This then, could be the basis of the sort of "co-operative venture between the Forests Department and farmers" which it was the objective of this Project to investigate.

It is vitally necessary to set out the major assumptions which must continue to hold throughout the 32 years for the economic conclusion and hence the scheme itself to be viable on a continuing basis.

(i) The annual payment to a farmer by the Forests Department should be at least $40.72 per hectare in 1983 dollars. The simplest way of building this into any agreement would seem to be indexation by a mutually agreed index such as the Consumer Price Index for Perth. It is true that the compensation of $40.72 is also related to the value of cleared land, but to have the annual payment expressed as a percentage (4%) of the value of cleared land would seem administratively cumbersome, particularly as it would involve the notional valuation of cleared land which in fact was under pines.

(ii) The control over silviculture and felling would, rest with the Department. All direct income would go to the Department which would bear all the risks.

(iii) The cost of insurance is included in the pessimistic budget as a market assessment of the expected costs of average fire damage which will occur despite fire control and prevention measures also included in the budget. The decision whether or not to insure would vest in the Department which rationally could decide to bear the risk itself, spread over its own holdings as well.

(iv) In the event of clear felling, the agreement would terminate and the Department would be responsible for returning cleared land to the farmer in a state negotiable as arable farming land. If destruction of stumps and other restoration measures take time, then the annual payments of $40.72 per hectare would continue until the measures were completed and the land were arable again : assuming that the farmer did not wish to renegotiate another agreement with the Department.

(v) The farmer would be responsible for paying local government rates and other charges on the land. These charges were not debited to the farming activity in the budgets. The farmer would not be responsible for any other direct expenses. The $40.72 would be taxable income in the farmer's hands.

(vi) The agreement should provide for a mutually agreeable renegotiation or termination in the event of destruction by fire.

The form of the agreement between the Department and the farmer may be a lease or other variety of indenture. A variety of forms have been used in other States. This Report makes no comment on their relative merits.

14. FINDING EMPLOYMENT FOR FARM FAMILY LABOUR

In the farming budgets, notional wages for family labour were included among the costs. This is a standard procedure and simply reflects the assumption that, especially in the long term such as these comparisons refer to, all labour could be employed in other activities at a market rate of pay. Although it is argued by some authors in the literature that in times of high unemployment or in countries with high under-employment, the opportunity cost of marginal labour may be zero, this Report does not accept the argument in the Austrlaian context.

This is a very important aspect of the comparisons. To see this importance, the net returns and notional allocation to family labour are tabulated below -

Budget	Net return per hectare	Family labour	Total
6A	53.13	52.41	105.54
6B	-16.65	34.11	17.46
6C	40.72	40.00	80.72
6D	42.33	52.63	94.96

From the final column of the Table it can be seen that if farm family labour had no alternative employment and therefore were valued at zero, then the internal rate of return from farming could be as high as 8.072, 9.496 or 10.554% p.a. and the net present value per hectare at any rate of discount substantially higher than that derived from the first column. Thus the range of farming productivity over which pine plantations would have a comparative economic advantage would be correspondingly far less, and may indeed by negligible.

Although from an aggregate social point of view this Report rejects a zero valuation for family labour, there is a context in which a zero valuation might be the way in which the farm family itself sees its own marginal labour, and thus it might not be attracted by the cash-flow funding proposition advanced in the previous Section.

Consider the example of a farmer who is contemplating continuing farming on his Manjimup farm while leasing 30 hectares of land to the Department for a pine plantation.

This releases to the farmer say 30 x 52.63 = $1,578.90 per annum worth of family labour (using Budget 6D). This notional income now foregone by cessation of farming on the 30 hectares must be replaced for the farmer to be as well off as before. The budgetary comparisons assume that alternative employment is available to precisely replace the $1,578.90 in each and every one of the 32 years.

However, due to the farmer remaining on his farm, where it is assumed there is no change in activities induced by surrendering the 30 hectares to pines, it is by no means certain that essentially local employment could be found to fit in with his farming activities. This would be especially true if more farmers leased part of their land to the Department. If no alternative employment could be found, farmers might not be willing to lease land for less than the $80 - $105 per hectare per annum indicated in the Table, which could well be too high a figure for pine planting to be justified, as explained in the previous Section.

It has been suggested that the Department itself offer employment to the farmers in the plantations grown on their land. The Department has provided very detailed estimates of the wages components in each one of their budgets to enable this employment to be estimated. For example, for the Blackwood Budget 11A, the wages components are as follows, excluding employment in harvesting operations, the details of which the Department regards as highly confidential.

Year	Operation	Cost $/hectare	F.D. Wages	Contract Wages
0	Weed control	35	11.20	-
1	Voroxing, planting	135	80.00	-
1	Roads & firebreaks	15	4.28	1.28
4	Weed control	30	9.60	-
5	Low prune	230	180.00	-
7	High Prune	200	160.00	-
9	High prune	150	125.00	-
13	Roading	33	9.43	2.64
1-31	Annual maintenance	12.69	6.35	-

However, these tabulated wages figures fall short of providing for all years after about the fifteenth even the minimal average of $34.11 per hectare p.a. required to compensate for loss of farm work, even if Departmental wage labour was replaced by the casual hiring of the farmers.

This situation would seem to pose a substantial problem to any Departmental plans for the growing of pines on parts of farms, and it is recommended that it be the subject of additional investigation.

The problem would not be present if entire farms were leased to the Department and the entire farm family used the mobility it thereby achieved to seek employment in wider labour markets.

A further aspect of the analysis of employment opportunities is the consideration of the effect on total employment in the Manjimup region generally, say in the area of the Shire of Manjimup, of the switching of land from farming to pine plantations.

An accurate calculation of this effect would entail a very detailed study of the buying and selling linkages between farms and other businesses and between these other businesses themselves, tracing linkages at least until they left the region; and repeating the exercise for the Forests Department. This would be equivalent to an Input-Output study of the Manjimup region.

Enquiries were made from State Government Departments as to whether any of the recent input-output studies known to have been done were sufficiently disaggregated at the regional level to provide a basis for calculations for the Manjimup region. Unfortunately they were not.

At the meeting with the Department on 30th November 1983 it was agreed that to attempt any such calculation would be therefore far beyond the brief of this Report.

Nevertheless, some broad generalisations will be attempted. They must be prefaced by the comment that they are grossly approximate.

Generalisation about these regional effects can begin by examination of the gross expenditure and gross income (rather than net) of the alternative land uses. It is in the local adding of value in the provision of inputs and processing of outputs that local employment is created, and a rough generalisation is that such employment is proportional to either gross expenditure or gross income or an average of both.

As an example of a plantation activity, the Blackwood Budget 11A with 20% overheads may be compared to Farm Budgets.

RD % Discounted present value of gross expenditure plus income

	11A (20%)	6A	6B	6C	6D
1	11,110	6,849	7,897	7,362	12,561
2	8,590	5,953	6,864	6,400	10,917
3	6,740	5,222	6,022	5,614	9,578
4	5,350	4,623	5,330	4,969	8,478
5	4,300	4,126	4,757	4,435	7,566
6	3,500	3,713	4,281	3,991	6,809
7	2,880	3,365	3,880	3,617	6,171

There are two notable conclusions. The first conclusion is that at the chosen rates of discount of 3.5-6% p.a. the pine plantation activity 11A has either lower or just marginally higher approximate local employment multiplier effects than most of farming activities 6A-D. The second conclusion is that relatively unprofitable farming acitivites like 6B can have greater indirect local multiplier effects than more profitable activities like 6A, simply because their unprofitability arises from their using more inputs per hectare for the same output.

In general, farming activities seem likely to create more employment in local service industries than alternative forestry activities, but this is a highly tentative conclusion.

It is anticipated that any co-operative venture will strike problems with this attitude of farmers to their own employment.

Any effort to offer farmers employment in the plantations could assist with the adoption of plantations.

Also, farmers could participate in equity in the plantations on their own land by being paid by the Department not only an annual indexed sum per hectare but also a share in income from the plantation as it accrues. This equity could serve the useful secondary purpose of inclining the farmers to adopt protective and custodial attitudes to the plantation, especially with respect to fire prevention.

15. MARKETING THE IDEA OF PLANTATIONS

For the reasons mentioned at various points in this Report, there will be resistance to the idea of pine plantations operated as co-operative ventures with the Department.

Cash-flow funding has been recommended and offered in other States without great success.

It is suggested that some form of market research, careful planning of the extension of the idea, and probing of reasons for resistance be undertaken before large-scale public Departmental commitment.