Farmers' Attitudes Towards Pine Afforestation on Farms in the Manjimup Area

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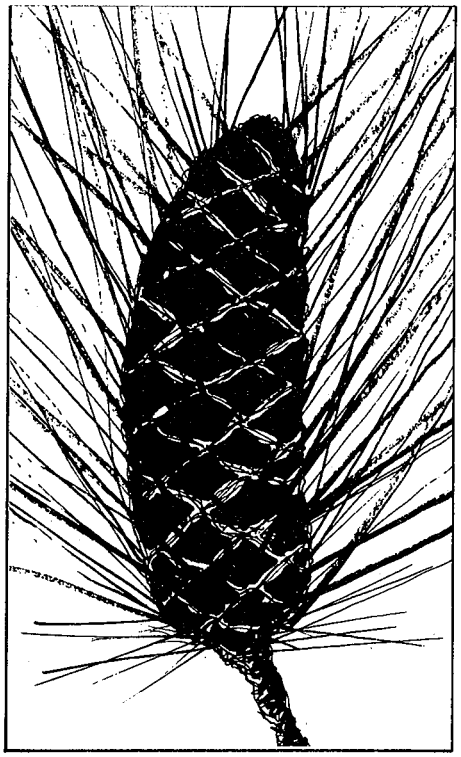

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PREFACE

This survey of farmers' attitudes was carried out by Geoffrey N. Soutar and Yvonne M. Wallis of the Centre for Applied Business Research, University of Western Australia through a contract with the Forests Department (now incorporated into the Department of Conservation and Land Management).

The need for this survey arose from the State Government's decision to initiate a pine planting programme in the Manjimup area and to locate that programme as far as possible on already cleared or substantially cleared land. This decision generated considerable local controversy. When the Government further proposed to develop some form of incentive scheme to encourage farmers to plant pines on their own land, it became necessary to carry out this survey to ascertain farmers' preferences for financial arrangements for pine afforestation.

A questionnaire was developed to obtain this information and to provide an estimate of the area of farmland which might be available for pine planting under various types of incentive schemes.

The report to the Forests Department is published in full apart from the deletion of an appendix containing an internal report to the researchers from the interviewers employed for the study.

S.R. Shea

Executive Director

Department of Conservation and Land Management

INTRODUCTION

The major objective of the present study was to determine the attitudes of farmers in the Southern Region of Western Australia to a pine afforestation programme and to subsequently determine the features of such a programme that might encourage farmers' participation.

A secondary objective of the study was to describe the current structure of farms in the area in terms of their land usage, current profitability, and availability for afforestation. A final objective was to determine farmers' attitudes towards a number of the local and government authorities with administrative responsibility in the area.

The Sample

To obtain the information for this study a questionnaire was distributed to a random sample of farmers in the Southern Region of Western Australia. A total of 390 respondents were selected from the electoral rolls of the Manjimup and Bridgetown - Greenbushes Shires for properties exceeding 20 hectares in area, within 70 kilometres of Manjimup, and having an annual rainfall in excess of 700 mm.

The selection process required every sixth name to be taken from the electoral rolls of these shires. Where this property did not satisfy the selection criteria, the third listed property above or below this property was instead included in the sample. A further 19 properties were selected in a similar fashion from the Boyup Brook Shire, for which the minimum rainfall criteria was lowered to 650 mm.

Data collection began in July 1984 and was completed in September 1984. Sample members were initially contacted by mail to advise that interviewers would be calling on them within the following seven day period. When contact was made, the interviewers remained to give instructions and assistance while respondents completed the questionnaire, which is provided in Appendix A.

Three hundred and thirty two (332) completed questionnaires were finally obtained, giving a response rate of 81 per cent. Non response was typically because landowners could not be contacted and only 2 per cent of sample members actually refused to complete the questionnaire. The locations sampled and number of questionnaires obtained from each location are shown in Table 1.

Table 1 - Locations and Questionnaires

Location	Number of Questionnaires Returned	% of Sample
Manjimup Shire		
North Ward	73	22
North Perup	30	9
Warren	44	13
Pemberton	51	15
Northcliffe	45	14
Bridgetown Shire	46	14
Boyup Brook Shire	18	5
Perth Resident Owners	25	8
	332	100

The Results

Preference for Hardwoods versus Softwoods

Data were initially obtained on the type of afforestation scheme farmers would prefer to see in the area. While farmers were asked only to indicate whether they would prefer to see a hardwood or a softwood afforestation scheme, some farmers clearly indicated alternative options.

These included a preference for no afforestation scheme, a preference for a balance of both hardwoods and softwoods in such a scheme, and an indication of no strong preference for either timber types. Table 2 gives the percentage of farmers responding in each of these categories.

Table 2 - Preferred Timbers

Preferred Timber	%
1. Hardwood	61.5
2. Softwood	19.0
3. Neither	4.2
4. Balance of Hardwood and Softwood	9.3
5. Either - No strong preference	6.0
	100.0

A clear preference for a hardwoods afforestation scheme is indicated with 61.5 per cent of farmers giving this preference. Nineteen (19) per cent of farmers would prefer to see a softwoods scheme, 9.3 per cent felt that a mix of both hardwood and softwood would be appropriate, while 6 per cent had no strong preference for either hardwoods or softwoods.

Four (4) per cent of farmers rejected the idea of an afforestation scheme of any type. It should be noted, however, that indications of preference do not necessarily imply that the farmers would like their own land to be involved in an afforestation scheme but responses are indicative of the overall attitude farmers hold towards the planting of these timber types in their area.

Reasons for Preference

With 61.5 per cent of farmers preferring only hardwoods, there is clearly considerable resistance to a softwood afforestation scheme. This is further indicated in the reasons given for their choice of scheme. Of those farmers preferring hardwoods, some 60 per cent indicated that their choice was at least partially due to their negative opinions towards pine rather than simply positive opinions towards hardwoods. Alternatively, all respondents who preferred softwoods cited positive attributes of pine as their reason for this choice with little indication of any negativity towards hardwoods.

Most farmers listed more than one reason for their choice of afforestation scheme. For those preferring hardwoods, there were five major reasons given. It seems that most respondents believe that for aesthetic and/or ecological reasons the area is, and should remain, a hardwood area. Fifty eight (58) per cent of those preferring hardwoods included this as a reason for their choice and this pervasive attitude was found to be fairly evenly spread throughout the various locations sampled.

Twenty five (25) per cent suggested that their choice of a hardwood scheme was largely because they felt that hardwoods were a much better timber than pine, while 20 per cent suggested that, in comparison to pine, the future for hardwoods was more highly assured. Such respondents perceived that a shortage of hardwoods was likely to occur in the near future which would increase the value of hardwoods, while a future oversupply of pine was felt to be likely in the near future, with areas such as New Zealand being suggested as likely major suppliers.

Seventeen (17) per cent of those preferring hardwoods indicated that planting pines presented major difficulties in returning the soil to a condition appropriate for agricultural use, while 16 per cent felt that pines presented an excessive fire risk.

Some effort to provide reliable information and/or an assurance of assistance may be an appropriate way to discourage this type of negativity toward pine. Other less frequently cited reasons for choosing hardwoods included: hardwoods are easier to sell, hardwoods require lower maintenance, and pines are too susceptible to disease. Appendix B gives a summary of these reasons for preference.

For those respondents preferring softwoods, the major reason was clearly associated with the perceived economics of pine. Eighty (80) per cent indicated a preference for pine because they felt that monetary returns would be greater and more rapid as the crop reached maturity earlier. Many respondents also indicated that they perceived pines to be more commercially viable whereas there was a considerable amount of doubt as to whether hardwoods represented a commercial proposition. A further 6 per cent felt pine was a more useful, versatile timber, while 5 per cent indicated that their choice of pine was due to their belief that the area was well suited to pine, and 7 per cent admitted that, while they would prefer pine for economical reasons, for aesthetic reasons they would prefer an afforestation scheme to include hardwoods.

These responses indicate that the major reason for a preference for hardwoods was an attitude that the area should retain its natural vegetation, whereas the major reason for a preference for pine was based upon perceived financial return.

Respondents who indicated a preference for both timber types also held this view. Pine was seen as economical but the hardwood nature of the country was such that both timber types should be included in any afforestation scheme. A large number in this group also suggested that both timber types be incorporated in an afforestation scheme by taking into account the soil type in each area. Generally it was felt that only poorer soils should be used for pine and that to balance timber planting according to soil type would be most desirable. The six per cent of respondents who indicated that they had no strong preference for timber type used essentially the same arguments as this group, seeing advantages in each type but being reasonably happy to follow whatever trend emerged.

Those respondents rejecting any afforestation scheme in the area, stated that they preferred to use their farms for agricultural purposes. Some respondents also felt that their farms were too small (86%); that timber production involved too high a fire risk (7%) or that timber production did not provide a good return (7%).

It should be noted, however, that responses to this question of timber preference do not necessarily imply a desire for personal involvement.

Preference for Afforestation Scheme by Area

Responses to timber type preference showed some variation between areas. Table 3 shows the percentage of farmers preferring hardwoods versus softwoods in the locations sampled. (Comparisons of percentages for alternative preferences (Neither, Both, Either) should be treated cautiously as group numbers in these categories are very small.)

In every area, the tendency was to prefer a hardwood afforestation scheme. This may represent a conscience vote and be influenced by peer group pressure or "collective wisdom" as the highest percentage of farmers interested in softwoods (44%) were landowners resident in Perth. Alternatively, this group may also be most likely to view their farm solely as a business proposition and hence be more highly motivated by perceptions of monetary returns. The North Ward also included a higher percentage of farmers interested in pine (28%) than most other areas, while Warren shows the least interest (9%) in a softwood only scheme.

Table 3 - Hardwoods versus Softwoods by Area

Location	Soft-woods %	Hard-woods %	Neither %	Both %	Either %
Perth Residents	36	44	8	4	8
North Ward	28	55	1	10	6
North Perup	20	67	7	7	0
Boyup Brook	17	61	11	6	5
Pemberton	16	63	2	12	7
Bridgetown	15	63	6	9	7
Northcliffe	13	69	0	13	5
Warren	9	68	7	9	7

Interest in Involvement in a Pine Afforestation Scheme

Respondents were initially asked to give some general expression of interest in being involved in a pine afforestation scheme on their own land. The alternatives probed are given in Table 4.

Table 4 - Interest in Pine Afforestation Scheme

OPTION	EXTREMELY INTERESTED %	SOMEWHAT INTERESTED %	NOT AT ALL INTERESTED %
(A) Selling some land to Forests Department for pine afforestation purposes	6	7	87
(B) Afforesting independently of Forests Department	3	13	84
(C) Afforesting with some assistance from Forests Department	4	20	76
(D) Leasing some land to Forests Department for afforestation purposes	11	19	70

Overall, farmers were not interested in any of the alternatives offered though a small percentage of farmers expressed interest in each option. Leasing land to the Forests Department was found to be the most popular alternative, with 30 per cent of farmers showing some interest and 11 per cent being extremely interested. Of this 11 per cent, only 44 per cent had previously indicated a preference for a pine afforestation scheme.

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It seems therefore, that some farmers are expressing extreme interest in a pine afforestation scheme even though hardwoods would be their first preference. This may suggest that, for at least some farmers, if the return is acceptable, the timber type will not be a dominant factor in their decision to be involved. A further section of this report analyses in detail the features of a pine afforestation programme most likely to attract farmer participation.

Present land usage and availability for afforestation

Respondents were asked a series of questions about the nature of their farm and the amount of land they would consider involving in an afforestation scheme.

(i) Land Usage

Table 5 gives a summary of the major activities engaged in by farmers in this area. The percentage undertaking each activity is given along with the area devoted to, and the percentage of the farm's income derived from, each activity.

Table 5 - Land Usage Summary

Activity	Percentage Involved in Activity	Income Earned from Activity		Area Devoted to Activity	
		Mean (%)	Median (%)	Mean (ha)	Median (ha)
Grazing	86.4	73.4	100.0	280	180
Cereal Crops	17.2	14.6	5.0	80	50
Other Crops	4.8	32.5	10.0	14	15
Vegetables	26.5	56.5	60.0	11.5	10
Fruit	13.8	42.3	30.0	6.2	5

Farms are predominantly engaged in grazing activities, with more than 50 per cent of farmers deriving their total income from this source and approximately 95 per cent of farm land being devoted to this activity. It seems likely, therefore, that land which might be considered for afforestation would be currently used for grazing purposes. In these circumstances, financial incentives for participation in an afforestation scheme should use grazing value as a reference point.

(ii) Size of Farms

Farms sampled ranged in size from 4 to 2500 hectares. The mean area was 251ha, while the median value of 130 ha showed that 50 per cent of farms were less than that size. Table 6 gives a breakdown of farm sizes in the area.

Table 6 - Size of Farms

FARM SIZE(HA)	Percentage of Farms	Cumulative Percentage
1- 19	4	4
20- 50	21	25
51- 100	18	43
101- 200	20	63
201- 300	11	74
300- 500	13	87
500-1000	10	97
1000-2500	3	100

(iii) Farm Area Constituting Bush

Farmers were also asked to indicate the percentage of their farm that was still bush. The mean in this case was 20 per cent, while the median indicated that for 50 per cent of farms, less than 10 per cent of the land was still bush. Much of this was also stated to be subject to clearing bans. Table 7 provides this information.

Table 7 - Bush on Farm

% of Farm Uncleared Bush	Percentage of Farms	Cumulative Percentage
0	18	18
1 - 5	17	35
6 - 10	16	51
11 - 20	14	65
21 - 30	13	78
31 - 50	14	92
51 -100	8	100

Mean 20 per cent

Median 10 per cent

(iv) Farm Area Considered for Afforestation

Finally, respondents were asked what percentage of their cleared land they would consider afforesting. Fifty five (55) per cent indicated that they would not consider afforesting any of their land. This would seem to be a lower percentage than might be expected from previous results, although it would appear that in some cases, farmers were inclined to include the following in this response:

1. Land subject to clearing bans.

2. Areas of land inconvenient for alternative productive use.

3. Areas of land as yet uncleared.

4. Areas of land farmers are only willing to afforest in hardwoods.

Therefore, as the data did not clearly distinguish these specific categories, an estimate from this data is likely to be inflated should the Forests Department wish only to incorporate land already cleared by the farmer in a pine afforestation scheme. Bearing these qualifications in mind, and as shown in Table 8, 15 per cent of farmers indicated they would consider afforesting between 1 and 5% of their land, 10 per cent between 6 and 20 per cent, 10 per cent between 21 and 30 per cent and the remaining 10 per cent between 31 and 100 per cent.

Given the qualifications imposed by farmers upon their responses to this question, data from this question should probably be seen primarily as an expression of interest pending further information and a suggestion that various different land types be considered in an afforestation scheme.

Table 8 - Farm Considered for Afforestation

% of Farm Considered for Afforestation	Percentage of Farms	Cumulative Percentage
0	55.4	55.4
1 - 5	14.6	70.0
6 - 10	7.1	77.1
11 - 20	2.9	80.0
21 - 30	10.0	90.0
31 - 50	4.1	94.1
51 - 100	5.9	100.0

Mean 10.9%

Median 0.0%

Further, from comments made in response to this question it seems probable that, at this point in time, farmers believe that to afforest land currently used for regular farm activities would result in lower returns. This notion is supported further by the apparent relationship found between the current profitability of the farm and landowners' interest in afforestation. Seventy (70) per cent of farmers who consider their farms to be not at all successful would consider afforestation whereas only 36 and 42 per cent respectively of farmers who consider their farms to be extremely or quite successful would consider such a scheme.

Further, farmers who earn their entire income from their farms (42 per cent of farmers) are less likely to be interested in an afforestation programme than those farmers earning income from alternative sources. Table 9 illustrates these findings.

Table 9 - Interest in Afforestation

(i) by Successfulness of Farm

	Farm very successful	Farm quite successful	Farm not successful
	(22%)	(65%)	(13%)
Not interested in afforestation	63%	57%	30%
Interested in afforestation	37%	42%	70%
	100%	100%	100%

(ii) by Percentage of Income Earned by Farm.

	Income earned from farm		
	100%	50 - 99%	< 50%
	(42% of farmers)	(13% of farmers)	(45% of farmers)
Not interested in afforestation	70%	49%	43%
Interested in afforestation	30%	51%	57%
	100%	100%	100%

These findings lend further support to the suggestion that, where farm returns are lower than average, afforestation may be seen as a more attractive financial alternative and so is more likely to be considered. Additionally, for farmers whose total life style is farming and who generate their entire income this way, there is less interest in afforestation schemes.

Opinions of Authoritative Organisations

Farmers were asked to indicate how helpful a number of organizations were perceived to be with respect to farm activities. Table 10 summarises this information.

Table 10 - Opinion of Authoritative Organisations

	EXTREMELY UNHELPFUL	SOMEWHAT UNHELPFUL	NEITHER HELPFUL NOR UNHELPFUL	SOMEWHAT HELPFUL	EXTREMELY HELPFUL	NO OPINION	MEAN
Forests Dpt	2.1	4.2	10.5	46.1	28.9	8.1	4.0
Local Shire	7.5	11.4	18.1	42.5	14.8	5.7	3.5
State Government	14.5	12.3	23.2	18.7	3.6	27.7	2.8
State Dpt Agric	1.8	3.6	5.4	38.6	44.0	6.6	4.3
Public Works Dpt	9.3	6.3	15.1	19.0	6.0	44.3	3.1

Overall, the State Department of Agriculture, the Forests Department and local shires are perceived to be helpful, whereas the State Government is viewed less positively. Many farmers were unfamiliar with the Public Works Department, although those aware of this department expressed a wide variation of opinions. In these circumstances the favourable perception held of both the Forests Department and the Department of Agriculture might suggest that a united front be presented to farmers with respect to an afforestation scheme. This may be most appropriate if reliable, technical information regarding such issues as the effect of pine on soil is to be distributed for educational purposes.

PREFERENCES FOR ALTERNATIVE PINE AFFORESTATION SCHEMES

Despite the overall lack of interest in pine afforestation schemes, it is clear that there was some interest by a minority of landowners, particularly among those owners who lived in Perth and those who felt that their farms were not very successful. A total of 106 respondents filled out the section of the questionnaire which enables us to establish the importance they attach to the various aspects of a financial package and how they trade off one attribute of the package for another. Sixty two respondents completed this section sufficiently for inclusion in the analysis.

It was clear in initial analysis that not all of these respondents wanted the same things in a financial package. Consequently the first step was to group together those people with similar desires. When this was done using a computerised clustering programme developed by Milligan and Sokol (1980) it was found that there was one large group including 68 per cent of farmers in the analysis and three other smaller groups including 8%, 8% and 6% of respondents respectively. The remaining 10% of respondents could not be analysed as it seemed they filled in the questionnaire randomly. Consequently the subsequent analysis was carried out on the four groups.

The financial packages were made up of five different attributes. Namely:

(1) Annual Rental Paid to Farmer.

(a) 10% less than grazing value.

(b) Same as grazing value.

(c) 10% more than grazing value.

(2) Timing of Rental Payment to Farmer.

(a) Lump sum at beginning of the project.

(b) Every four years.

(c) Annually.

(3) Farmer's Share of Profit of Pine Crop.

(a) No share.

(b) Twenty five percent.

(c) Fifty percent.

(4) Responsibilities for Pine Crop Maintenance

(a) Farmer's responsibility.

(b) Shared farmer and Forests Department.

(c) Forests Department.

(It should be noted that these options were outlined specifically, as can be seen from Appendix C.)

(5) Grazing in Pine Plantation.

(a) Allowed.

(b) Not allowed.

From these attributes a set of 16 different packages was developed using a partial factorial experimental design which ensured that all attributes were independent of each other and enabled a test of the additive effects of the attributes to be undertaken [Green 1974] using a conjoint analysis type procedure.

In this case it was decided to use the LINMAP computer programme developed by Shocker and Srinivasan (1979) as it has been found useful in previous applications and provides good measures of fit [Howieson 1983; Soutar and Savery 1983]. In this case four separate analyses were undertaken for each of the groups previously obtained and the results are outlined in each case.

GROUP 1 - 68% OF RESPONDENTS

The results obtained for this group were very good, suggesting that the additive model, which assumes that there are no interactions between the attributes, is a reasonable assumption in this case. Kendall's Tau, which is a nonparametric measure of fit was 0.875, which is extremely high, and there was no case in which the assumptions of the additive model were strictly violated. Consequently the results obtained can be taken as a reasonable estimate of the trade offs likely to be made by people in this group.

The relative importance attached to the five attributes included in the study can be seen in Table 11.

Table 11: Attribute Importance (Group 1)

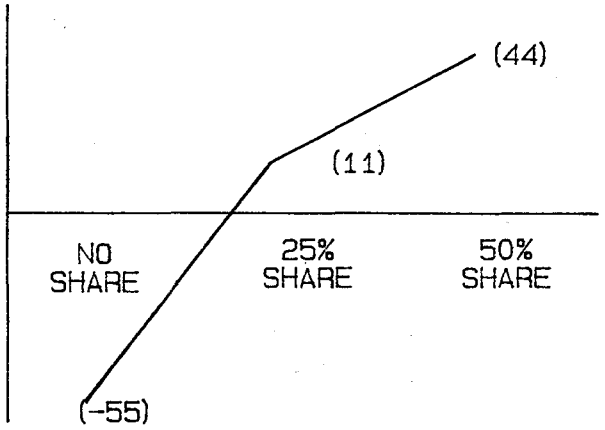
Attribute	Importance
Rental Paid	0.250
Time Rent Paid	0.000
Percent of Profit	0.375
Maintenance	0.125
Grazing or Not	0.250

The model cannot distinguish between the various time of payment options suggested within the study. This is not to say that farmers do not think that it is an important issue but rather there are so many differences even within the group that respondents' preferences can best be modelled by leaving this aspect out. Comments on the returned questionnaires suggest that the major reason for these differences was the different tax situation of respondents, which makes lump sum or periodic payments less or more desirable.

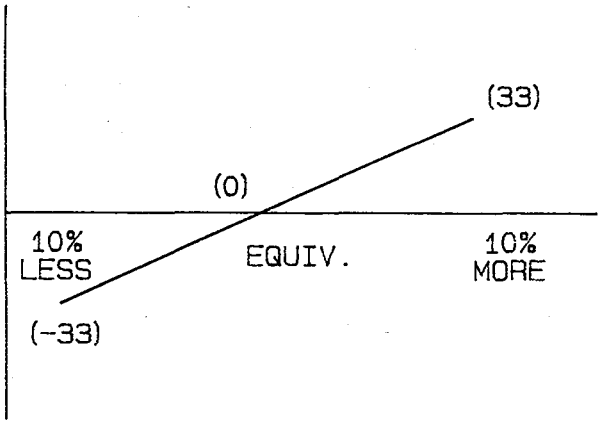
The most important attribute for this group was the share of profit obtained, followed by rental paid and grazing rights. The farmer's share of maintenance was also a factor but it was not as important as the other three already mentioned.

In looking specifically at these attributes in turn the trade offs being suggested can be shown diagrammatically. In each case the horizontal axis shows the attribute level while the vertical axis shows the "utility" or "desirability" attached to those levels, with higher scores implying that that level is more preferred. The functions shown in these figures represent the implicit worth attached to the various attribute levels and enable comparisons to be made within each attribute and also across the various attributes. For example, as can be seen in Figure 1, below, group 1 members imputed a decrement of 55 units of preference to no share of profits but an increase of 33 units of preference to 10% more than grazing value in rental. Consequently, these attribute preference values can be added together to determine the overall preference of a given package.

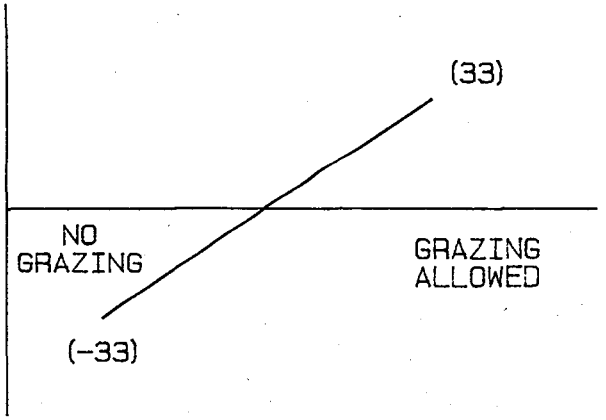
As mentioned above, the results for group 1 are shown in Figure 1. From this Figure it can be seen that this group wish to obtain as much share of profit as possible and that each increase offered increases the desirability of the option considerably.



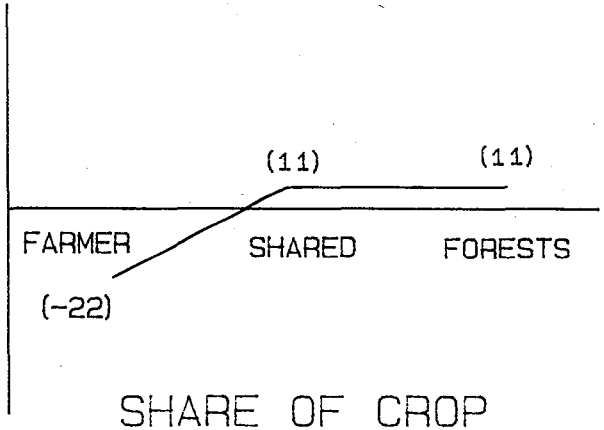
SHARE OF PROFIT



RENTAL PAYMENTS



GRAZING IN PLANTATION



SHARE OF CROP MAINTENANCE

FIGURE 1: TRADE OFFS FOR GROUP 1

It is unlikely that members of this group will be attracted to packages which do not contain profit sharing and that they will be most attracted to those options which maximise this aspect.

Rental was also important to this group and it is clear that the greater the rental offered the more preferred a package will be. Further, it is clear that percent of profit share can be traded off against the amount of rental to help the Forests Department's cash flow situation.

Figure 1 also suggests that this group wishes to graze within the plantation and that any option which prevents this will reduce its likelihood of acceptance. Interestingly, it may be possible to use this grazing preference to reduce cash ouflows from the Forests Department as farmers are willing to trade off rental and/or share of profits for such grazing rights.

The trade off results obtained for the share of crop maintenance are also shown in Figure 1. As is clear from this figure the sharing of such duties is less important. Interestingly, farmers are indifferent between sharing these duties and allowing the Forests Department to undertake them all but they do not wish to take overall responsibility themselves.

It seems that the Forests Department can decide about the costs and benefits of sharing responsibilities without worrying about farmers' preferences in this regard.

Overall, this group would prefer an option which allowed profit sharing, a high rental, grazing rights and at least some Forests Department share in maintenance. However, these respondents will trade off between these options so it is possible to design a package within likely Forests Department guidelines which will prove relatively attractive. Looking at the 16 hypothetical packages, the most preferred were package 3, package 6, package 15 and package 16.

GROUP 2 (8% OF RESPONDENTS)

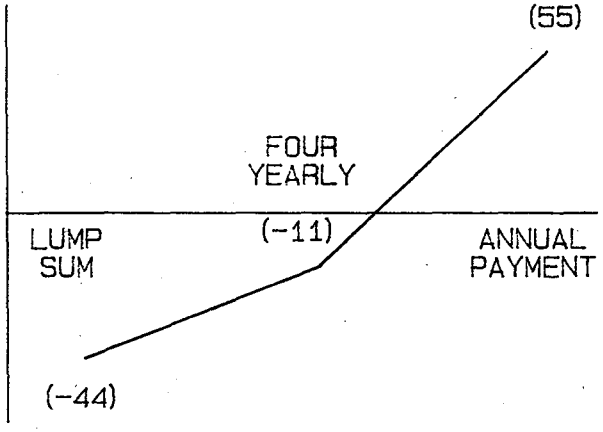
The results obtained for this group were also good, with a Kendall's Tau of 0.80, again suggesting that the additive model is a fair representation of the group's preferences. This group was quite different to the previous group, however, as can be seen in the importances they attach to the various attributes, as shown in Table 12, below. From this table it can be seen that the second group is most concerned with the time at which rental is paid, while the other four attributes are equally, although much less, important. The trade offs within these attributes can also be shown diagrammatically and are shown in Tables 2a and 2b.

Table 12: Importance Attached to Attributes (Group 2)

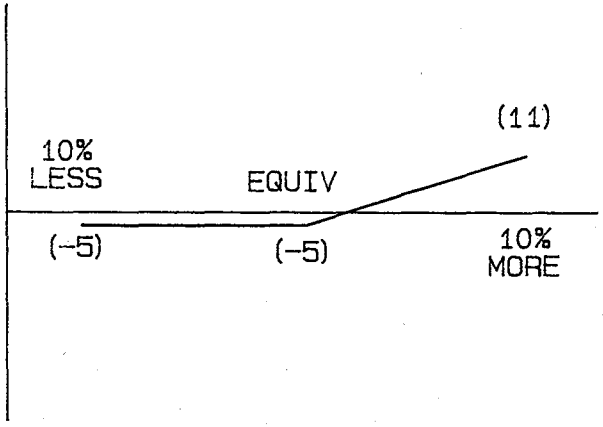
Attribute	Importance
Rental Paid	0.091
Time Rent Paid	0.545
Percent of Profit	0.182
Maintenance	0.182
Grazing or Not	0.091

From Figure 2a it seems that the least preferred time payment option (which is the most important aspect) for this group is the lump sum option, while the most popular is the annual payment. Clearly these respondents hope to use the scheme to provide a steady income for their farms and would gain considerable utility from such an offer.

The trade offs these respondents are willing to make in terms of rentals are also shown in Figure 2a. This group wishes a premium for rental and is indifferently unhappy about either of the other two rental options. Consequently, the Forests Department does not have to consider the middle ground for this group. That is, an option which provided annual payments at 10% less than grazing value might be viable.

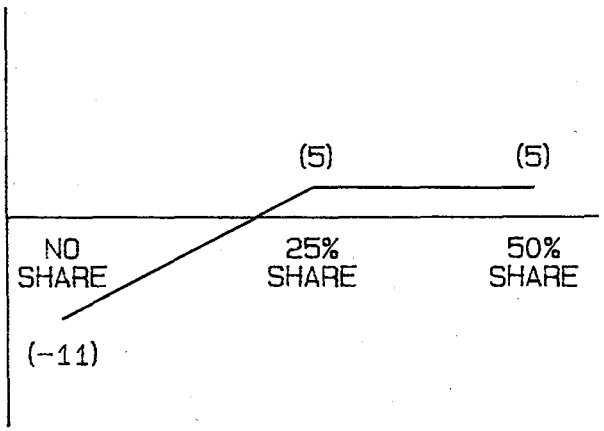


TIME OF PAYMENT

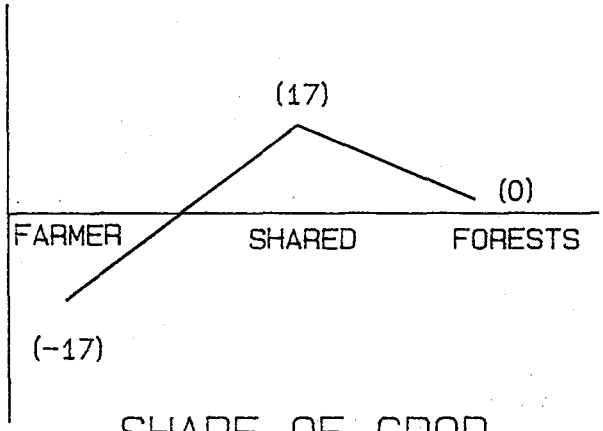


RENTAL PAYMENTS

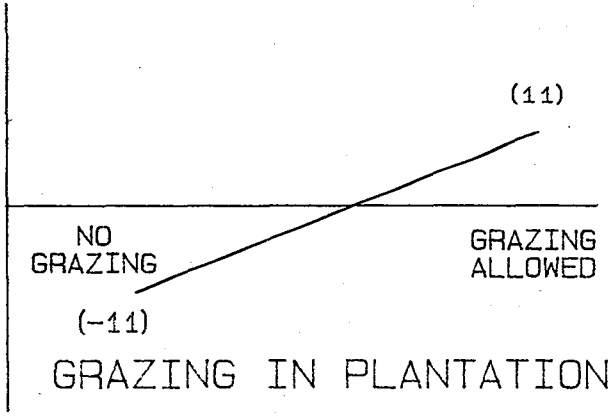
FIGURE 2a: TRADE OFFS FOR GROUP 2



SHARE OF PROFITS



SHARE OF CROP MAINTENANCE



GRAZING IN PLANTATION

FIGURE 2b: TRADE OFFS FOR GROUP 2 (CONTINUED)

Trade offs for share of profit are shown in Figure 2b and they suggest that this group is indifferent between a 25% profit share and a 50% profit share. However, this should probably be taken cautiously, perhaps reflecting respondents' concerns about the likelihood of being offered such a share. The result does suggest, however, that the Forest Department may not need to maximise profit share to this group if it can offer annual lease payments.

The grazing trade offs estimated for this group are also shown in Figure 2b and it can be seen that this group prefer a shared arrangement, are less happy with the Forests Department having overall responsibility but are least happy with having to take overall responsibility themselves. Clearly a shared arrangement would attract more of this type of farmer than either of the other possible arrangements.

The grazing trade offs are identical to those outlined for the earlier group. That is, the farmers wish to graze in the plantation. The preferred options for this group are options 16 and 6.

GROUP 3 (8% OF RESPONDENTS)

The fit to the model was not as good for this group as the Kendall's Tau was only 0.59 and this should be kept in mind. However, the major reason for the drop in the fit statistic was that there were many ties in preferences, rather than strict violations to the model. Consequently it seems worthwhile to consider this group further. The relative importance attached to the five attributes in this case can be seen in Table 13.

Table 13: Attribute Importance (Group 3)

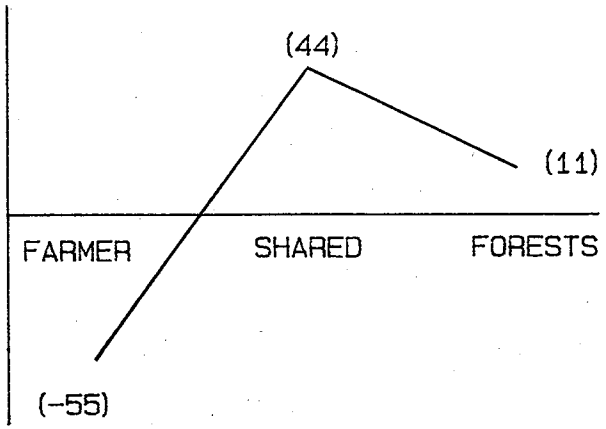
Attribute	Importance
Rental Paid	0.167
Time Rent Paid	0.167
Percent of Profit	0.167
Maintenance	0.500
Grazing or Not	0.000

From Table 13 it is clear that this group is most concerned about the crop maintenance contract and not at all concerned about whether or not grazing is allowed. Rental, share of profit and the timing of payment are equally, but less, important.

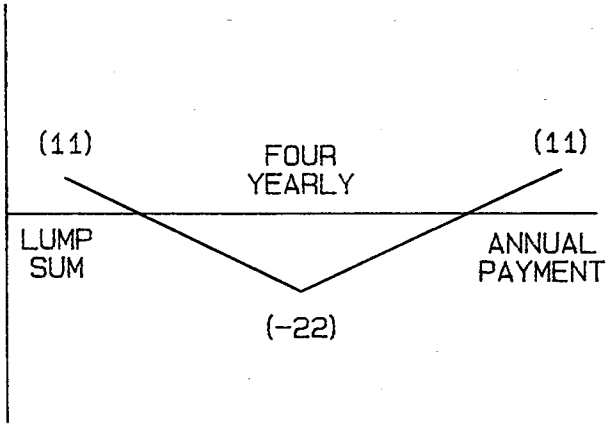
The trade offs implied for this group are shown in Figure 3 and from this figure it is clear that this group does not wish to have total responsibility for crop maintenance but, like the previous group, would prefer to share in such maintenance. Options which allowed such sharing would be much more likely to be accepted.

The trade offs suggested for rental and share of profits were identical to the previous group. That is, these respondents would prefer a rental premium but are indifferent between the lower two rental levels and they would prefer a share of profits but are indifferent between a 25% and 50% share.

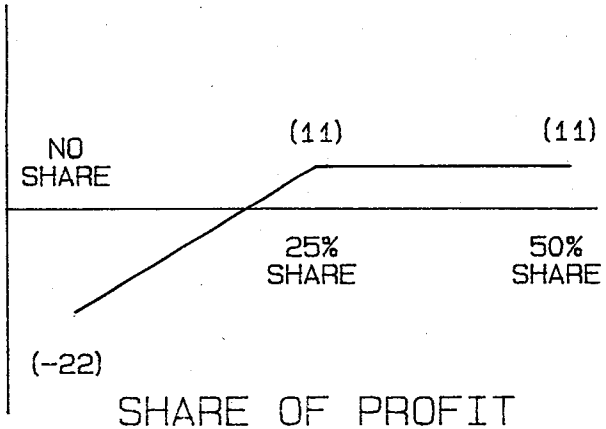
The implied trade offs for timing of rental payments are also shown in Figure 3. This group is indifferent between a lump sum and annual payments but does not wish to become involved with four yearly options. The option chosen by the Forests Department can be made on the basis of cash flow considerations when designing a package for this group. The hypothetical packages preferred by this group are packages 4 and 6.



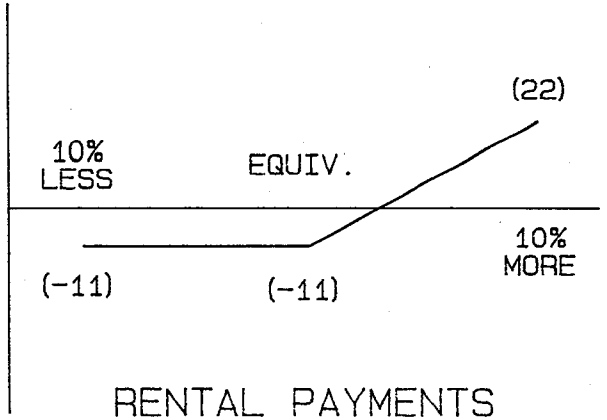
SHARE OF CROP MAINTENANCE



TIME OF PAYMENT



SHARE OF PROFIT



RENTAL PAYMENTS

FIGURE 3: TRADE OFFS FOR GROUP 3

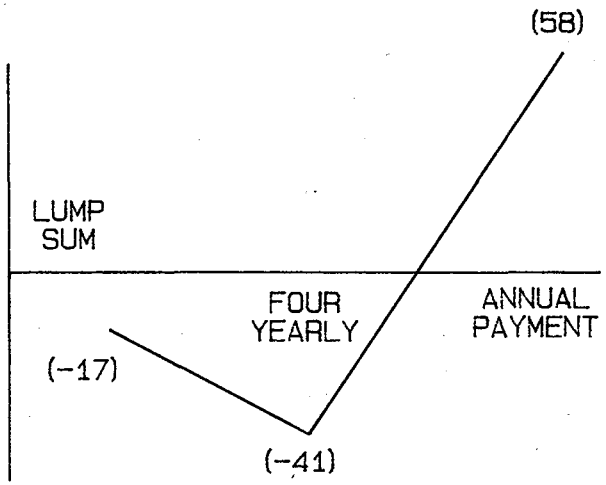
GROUP 4 (6% OF RESPONDENTS)

The model fitted reasonably well in this case with a Kendall's Tau of 0.63, again suggesting that the additive model provides a reasonable representation of the group's preferences. The relative importance of the five attributes are shown in Table 14.

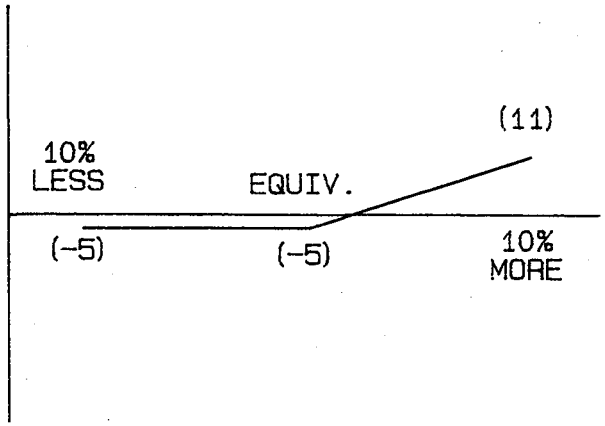
Table 14: Attribute Importance (Group 4)

Attribute	Importance
Rental Paid	0.100
Time Rent Paid	0.400
Percent of Profit	0.100
Maintenance	0.200
Grazing or Not	0.200

In this case the timing of rental payment is the most important attribute, followed by share of crop maintenance and grazing rights. Rental and share of profit are less important. Trade offs for this group are shown in Figures 4a and 4b.

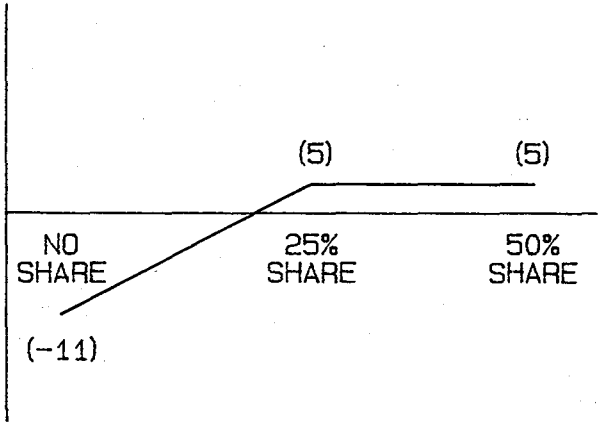


TIME OF PAYMENT

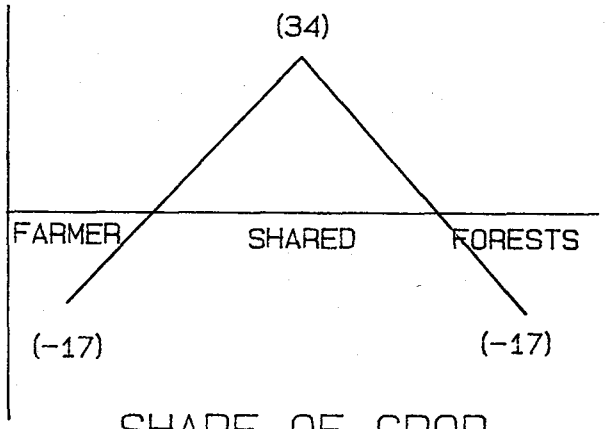


RENTAL PAYMENTS

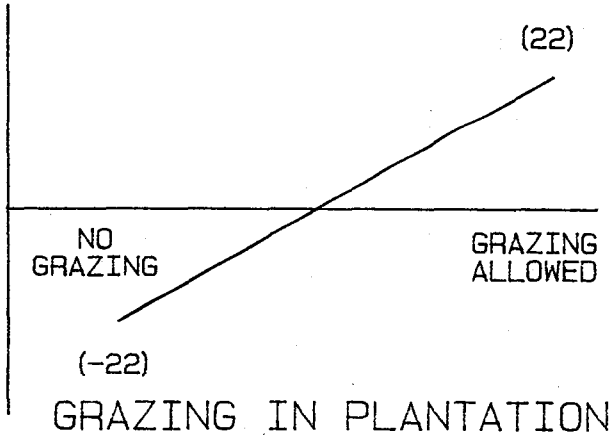
FIGURE 4a: TRADE OFFS FOR GROUP 4



SHARE OF PROFITS



SHARE OF CROP
MAINTENANCE



GRAZING IN PLANTATION

FIGURE 4b: TRADE OFFS FOR GROUP 4 (CONTINUED)

The implied trade offs for the timing levels suggest that this group also wishes for annual payments but, unlike some of the other groups, is very adverse to either a lump sum or to four yearly payments, although the latter option is the least preferred.

The implied trade offs for share of crop maintenance are shown in Figure 4b and suggest that this group of farmers want to be involved in the maintenance of the crop but are equally adverse to either having overall responsibility or allowing the Forests Department overall responsibility.

Like previous groups, this group:

(1) would prefer a rental premium but is indifferent between the lower two rental levels,

(2) would prefer a share of profits but is indifferent between a 25% and 50% share, and

(3) would prefer grazing in the pine plantation.

A further analysis of respondents who were interested in receiving information about pine afforestation was also carried out to assess the importance they attached to the various attributes and their preferred attribute levels. Conjoint analysis could not be used in this case as there were too few respondents of this kind in each of the four groups. The results obtained are shown in Appendix D.

CONCLUSIONS

The study results strongly suggest that there is wide spread opposition to pine afforestation in Manjimup and surrounding areas and that there are a number of reasons for this opposition. Firstly, it seems that farmers prefer hard woods over pine for aesthetic and ecological reasons. While most farmers agree that they may make money from pine, they believe that they can make more from the land if it is used for grazing. It is apparent that information about the relative economics of pine and grazing have either been not passed on effectively or that the results are simply not believed. Qualitative information from the two field workers suggests that it is the latter rather than the former reason which is more important. However, it is also true that a more intensive educational programme, perhaps requiring a demonstration plot, could alter this situation.

Many respondents fear an oversupply of pine from the East and from New Zealand. The Forests Department must allay such fears if they are to obtain farmers' support, suggesting the need for firm forward contracts to farmers, even though this may reduce the scheme's profitability to the Department.

It is also apparent that "successful" farmers are less willing to participate in pine afforestation schemes and that farmers are really only willing to provide marginal land or to exchange land for portions of their property which they are not presently allowed to clear. From the farmers' point of view, using this type of land is seen to be a desirable, low risk strategy as it is unlikely to interfere with current farm activities and offers an additional, rather than an alternative, income source. It may well be that the Forests Department will have to accept such land, with reduced profitability if necessary, if it is to obtain farmers' support. If the Department is not willing to take such a course then it is clear that they will have to pay a premium for land which farmers view as better used for grazing, either in the form of rental or in the percentage of profit returned to the farmer.

Farmers who are interested in participating in pine afforestation also wish to graze in the plantation. Any scheme must allow this privilege if it is to obtain farmers' support and the economics of pine afforestation must take this into account.

The study has shown a major group of farmers who wish to "participate" in the scheme by taking a share of profit, being involved in maintenance and grazing in the plantation. There is another group, mainly absentee

owners, who do not wish to "participate" but rather wish to give control of the property to the Forests Department. Consequently, it seems desirable for the Department to offer two quite distinct packages for these groups, with the final packages being determined by the resources available to the Department. The next stage in the process is to determine these packages and inform farmers of what is being offered and the long term implications to them of such an arrangement. Such a step is essential at this point as farmers are requesting exact information before they are willing to commit themselves.

Farmers should be invited to submit the land they are willing to lease under the package and the exact conditions under which they would offer other land. The Department can then determine whether or not there is sufficient appropriate land for the scheme to be economic. If there is sufficient land then offers can be accepted. If there is insufficient land the Department can examine the other land offered and the conditions under which it could be acquired and decisions can be made as to which land, if any, will be accepted.

The survey has shown that the Forests Department has a major job on its hands in persuading farmers to participate in pine afforestation but it is also apparent

that many farmers would be willing to participate in a minor way with marginal land. Whether that will prove to be sufficient for the Department's purposes is a question which can now only be answered by offering concrete packages under which land can be obtained.

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APPENDIX A

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Our ref: 6.01.022

July 1984

Dear Sir

About this questionnaire

This questionnaire is being given to you because the Forests Department of Western Australia is considering an afforestation programme in this area. The Department needs your opinions about such a development because if you like the idea of the project and decide to participate in it, several options will be offered to you for your consideration. These alternative options have yet to be determined and will largely be a result of your ideas about how such a programme would best suit you.

Primarily, the Department is interested in a scheme which, with your approval, would involve the development of some of your land as pine plantations. To do this, we need your opinions on such things as payment to you for undertaking pine afforestation, your role in managing such a plantation and your ideas concerning agro forestry within the plantation. We are also interested in your ideas about the overall suitability of pine afforestation and the role you see the Forests Department might have in such a project.

Please help us to understand your opinions on these issues by taking a few minutes with the research representative to fill out this questionnaire. Your personal identity is not required for the purpose of this study and all of the information you provide will remain strictly confidential. However, we need your support in this research because your opinions are essential to the decision to initiate such a programme.

I thank you in advance for your support,

Yours sincerely

Dr Roger Smith
Acting Director

Encl

QUESTIONNAIRE

1. (a) If there was to be an afforestation programme planting trees for timber production in your area, would you prefer to see soft woods (pine) or hard woods (eg, karri or bluegum) as the primary crop? Please tick the appropriate box.

[ ] Softwoods [ ] Hardwoods

(b) Please give a brief explanation for your choice

.....

.....

.....

2. Assuming that pine was to be the crop involved in the afforestation programme, how interested would you be in the following arrangements concerning your land? Please tick the appropriate box to indicate your degree of interest in each of the arrangements listed below.

	Extremely interested	Somewhat interested	Not at all interested
Selling some of your land to the Forests Department to afforest independently. A buy back option would be made available when the crop matures	[]	[]	[]
Putting in a pine crop yourself on some of your land **with no** assistance from the Forests Department	[]	[]	[]
Putting in a pine crop yourself on some of your land **with some** assistance from the Forests Department	[]	[]	[]
Leasing some of your land to the Forests Department in return for a payment from the Forests Department which you consider acceptable	[]	[]	[]

3. (a) In this research project the Forests Department is interested in your attitudes to leasing land from you so the following questions assume a lease arrangement. There are a number of ways this could be done and following is a set of 16 alternative offers which we would like you to consider. Please rank them from your **most preferred** to your **least preferred** alternative by placing the cards the interviewer will give you into that order. Remember, your response in no way obligates you and your identity will remain strictly confidential to the independent research team carrying out the study.

Interviewer Use Only

Alternative A	[ ]
Alternative B	[ ]
Alternative C	[ ]
Alternative D	[ ]
Alternative E	[ ]
Alternative F	[ ]
Alternative G	[ ]
Alternative H	[ ]
Alternative I	[ ]
Alternative J	[ ]
Alternative K	[ ]
Alternative L	[ ]
Alternative M	[ ]
Alternative N	[ ]
Alternative O	[ ]
Alternative P	[ ]

(b) How important are these factors in your consideration of an afforestation programme? Please tick the appropriate box.

		Extremely Important	Somewhat Important	Not at all Important
(i)	Annual rental received	[ ]	[ ]	[ ]
(ii)	Timing of rental payments	[ ]	[ ]	[ ]
(iii)	Share of profit from crop	[ ]	[ ]	[ ]
(iv)	Responsibility for crop maintenance	[ ]	[ ]	[ ]
(v)	Allowance of grazing in pine plantation	[ ]	[ ]	[ ]

(c) For each of the factors given below, which alternative would you prefer?

(i)	Timing of Rental Payment	[ ] Annually [ ] Lump sum at beginning [ ] Every four years
(ii)	Responsibility for crop maintenance	[ ] Farmer's [ ] Forests Dept's [ ] Shared
(iii)	Grazing in Pine Plantation	[ ] Allowed [ ] Not allowed

4. (a) How interested are you in obtaining further information on -

		Extremely Interested	Somewhat Interested	Not at all Interested
(i)	A pine afforestation scheme?	[ ]	[ ]	[ ]
(ii)	A hard woods afforestation scheme?	[ ]	[ ]	[ ]

5. We would also like to know what your attitude is, in general, to a number of organisations in terms of how helpful you believe they are to you as a farmer. Please circle the appropriate number to give your opinion or tick the box if you have no opinion.

	Extremely Unhelpful	Somewhat Unhelpful	Neither Helpful Nor Unhelpful	Somewhat Helpful	Extremely Helpful	No Opinion
Forests Department	1	2	3	4	5	[ ]
Local Shire	1	2	3	4	5	[ ]
State Government	1	2	3	4	5	[ ]
State Department of Agriculture	1	2	3	4	5	[ ]
Public Works Dept	1	2	3	4	5	[ ]

6. Finally, some questions about your farm.

(a) How large is your farm? _____ hectares

(b) What percentage of your farm's land is still bush? _____ %

(c) What percentage ofyour cleared land can be used only for grazing? _____ %

(d) What percentage of your cleared land would you consider afforesting? _____%

(e) How successful do you feel your farm is?

[ ] Extremely successful

[ ] Quite successful

[ ] Not at all successful

(f) What are your farm's major sources of income and about what percentage of your farm's income do they provide

ACTIVITY	% of Farm's Income	Area devoted to activity (in hectares)
Grazing		
Cereal Crops (eg wheat, oats)		
Other crops (eg field peas, rape seed)		
Vegetables		
Fruit		

(g) What percentage of your total income does your farm provide? _____ %

Thank you for your co-operation.

SHAN-IIQ/cm
16/07/84

APPENDIX B

Responses to Question 2

Preference for Afforestation Scheme by Reason for Choice

Abbreviations Used in Appendix B:

SOIL	Pines have detrimental effect on soil.
AREA	Area believed to be a "hardwood area".
ECOLOGY	HW suit area ecologically.
AESTHETICS	HW suit area aesthetically.
FIRE	Pine presents an excessive fire risk.
TIMBER	HW represents better, more valuable timber.
O'SUPPLY	Pines believed to be in oversupply.
SHORTAGE	HW believed to be scarce in future.
MAINTENANCE	Pines believed to involve excessive maintenance.
DISEASE	Pines believed to be too susceptible to disease.
ECONOMICAL	Pines believed to be more economical than HW.
AGRIC USES	Agricultural uses preferred to timber production.
UNDERPAID	Timber production in general too underpaid.
NO PREFERENCE	No strong preference for either timber.
BALANCE	Balance planting - of HW and SW by soil type.
BOTH	Place for both HW and SW is perceived.

	HW	SW	NEITHER	BOTH	EITHER
1. Soil/Area	16	-	-	-	-
2. No future in pine	3	-	-	-	-
3. Fire/Soil/Area	13	-	-	-	-
4. Fire/O'Supply	1	-	-	-	-
5. Fire	11	-	-	-	-
6. O'Supply/Timber	4	-	-	-	-
7. Soil/Timber	4	-	-	-	-
8. Disease	2	-	-	-	-
9. Fire/Area	6	-	-	-	-
10. Area/Timber	15	-	-	-	-
11. Area/Shortage	15	-	-	-	-
12. Area/Aesthetics	38	-	-	-	-
13. Area/Ecology	14	-	-	-	-
14. Timber	24	-	-	-	-
15. Area/Maintenance	2	-	-	-	-
16. Agricultural Uses	1	-	11	-	-
17. Economical/Area	8	3	-	7	2
18. No preference	3	-	-	-	17
19. Balance	11	-	-	12	1
20. Fire/Maintenance /Economical	1	-	-	2	-
21. Economical	-	50	-	-	-
22. Area suited to pine	-	3	-	-	-
23. Pine better timber	-	4	-	-	-
24. Both	2	1	-	10	-
25. Easier to sell HW	2	-	-	-	-
26. Soil/O'Supply	2	-	-	-	-
27. Bad area for fire	-	-	1	-	-
28. Underpaid	-	-	2	-	-

Total number of respondents: 324.

APPENDIX C

Pine Afforestation Packages included in the questionnaire

OPTION	Annual Rental to Farmer	Timing of Rental Payment to Farmer	Farmer's share of Profit of Pine Crop on its Maturity	Responsibility for Maintenance of Pine Crop	Grazing in Pine Plantation
A	Equivalent value of land for grazing	Annually	No share	Farmer's	Not allowed
B	Equivalent value of land for grazing	Lump sum at beginning of project	25%	Shared	Not allowed
C	Equivalent value of land for grazing	Every 4 years	50%	Forests Dept's	Allowed
D	Equivalent value of land for grazing	Lump sum at beginning of project	25%	Forests Dept's	Allowed
E	10% more than equivalent value of land for grazing	Lump sum at beginning of project	No share	Forests Dept's	Allowed
F	10% more than equivalent value of land for grazing	Annually	25%	Forests Dept's	Allowed
G	10% more than equivalent value of land for grazing	Lump sum at beginning of project	50%	Shared	Not allowed
H	10% more than equivalent value of land for grazing	Every 4 years	25%	Farmer's	Not allowed
I	10% less than equivalent value of land for grazing	Every 4 years	No share	Shared	Allowed
J	10% less than equivalent value of land for grazing	Lump sum at beginning of project	25%	Farmer's	Allowed
K	10% less than equivalent value of land for grazing	Annually	50%	Forests Dept's	Not allowed
L	10% less than equivalent value of land for grazing	Lump sum at beginning of project	25%	Forests Dept's	Not allowed
M	10% more than equivalent value of land for grazing	Lump sum at beginning of project	No share	Forests Dept's	Not allowed
N	10% more than equivalent value of land for grazing	Every 4 years	25%	Forests Dept's	Not allowed
O	10% more than equivalent value of land for grazing	Lump sum at beginning of project	50%	Farmer's	Allowed
P	10% more than equivalent value of land for grazing	Annually	25%	Shared	Allowed

APPENDIX D

Attribute Importance and Preferred Levels
(Interested Respondents)

ATTRIBUTE IMPORTANCE

Further analysis was undertaken to examine the importance attached to and the preferred levels ofthe various attributes by those respondents who were extremely interested in obtaining further information about pine afforestation schemes. Data to carry out this analysis was taken from sections 3(b) and 3(c) of the questionnaire and the results obtained are shown in tables D.1 and D.2. Table D.1 shows the responses to section 3(b).

Table D.1: Attribute Importance by Interest

	Annual Rental Received		
	Extremely Important (%)	Somewhat Important (%)	Not at all Important (%)
Extremely Interested in Scheme	79.4	14.7	5.9
Full Sample	68.7	24.0	7.3

Timing of Rental Payments

	Extremely Important (%)	Somewhat Important (%)	Not at all Important (%)
Extremely Interested in Scheme	38.2	50.0	11.8
Full Sample	48.0	38.4	13.6

Share of Profit from Crop

	Extremely Important (%)	Somewhat Important (%)	Not at all Important (%)
Extremely Interested in Scheme	38.2	44.1	17.6
Full Sample	53.1	34.5	12.4

Reponsibility for Crop Maintenance

	Extremely Important (%)	Somewhat Important (%)	Not at all Important (%)
Extremely Interested in Scheme	61.8	35.3	2.9
Full Sample	58.2	35.6	6.2