Clovers

NOTES ON ARBORETUM ESTABLISHMENT IN THE WHEATBELT

(and deductions drawn from results)

PREAMBLE

Tree establishment in the drier agricultural areas has lagged a long way behind Agricultural development.

The necessity to clear land in the process of developing it for agriculture led to a distinct antipathy towards trees and even to the present day this has been by no means fully dispelled. Agricultural officers, in their concentration on the production of agricultural crops, have often tended to discount the part that can be played by trees in the improvement of living conditions for both humans and stock in these areas.

However in recent years later generations of farmers have begun to appreciate the potential of well designed tree establishment for farm improvement on areas where trees had previously been destroyed, but the main demand for trees appears to have arisen as a result of the widespread settlement of scrub plain where trees did not occur naturally. The Esperance plains and the sandplains to the west of the Midland Railway have been prominent in this connection. This trend is reflected in the rapid increase in demand for those trees adapted to light lands as compared with trees suited to the heavier 'forest' soils.

HISTORICAL

Until the close of World War 2 tree establishment in the wheatbelt had received little encouragement from any official source. In fact, the only species distributed by our nurseries and considered suitable for that region were the sugar gum, pepper tree and kurrajong. The Forester in charge at Hamel nursery (W. A. Ross) had recognised the lack of suitable trees and had made trials in the raising of some of the inland species. The Hamel climate was not conducive to their

satisfactory development in the nursery and the results were not encouraging.

In 1946 the D.F.O. at Kalgoorlie (G.E.Brockway) commenced a series of trials with a range of inland species. By 1948 excellent planting stock was being produced and this was distributed locally to the Kalgoorlie Council and local residents.

In 1948 a request from the Geraldton Zone Development Committee, through the Director of Industrial Development (file 441/48) eventually resulted in the establishment (starting in 1949) of arboreta in six localities in the Northern wheat belt. These were on -

1. W. J. Warr's property near Yuna (2 plots)
2. J. Heitman's property near Morawa.
3. E. Birch's property near Wogundy (between Mullewa and Mingenew)
4. Reserved land near Mingenew.
5. D. Beaton's property west of Northampton.
6. Scott & Elliotts property west of Watheroo.

Plots 1, 2 and 3 were well cared for and results achieved have served as a valuable guide for subsequent work and I would like to pay tribute to Messrs Warr, Heitman and Birch for their valuable contribution to this work.

Plot No.4 was badly retarded by scrub growth which resulted from inadequate initial cultivation and our inability to make satisfactory local arrangements for maintenance cultivation. However, belated maintenance when plant became available during the last three years has freed the surviving trees and they are showing a favourable response to the reduced competition supplemented by some fertilizer application.

Plot No.5 was a complete failure. An examination of it in 1950 failed to disclose any living trees and the

assumption is that they were allowed to dry out before planting. This could not be confirmed as the farm had by then changed ownership and the original owner could not be contacted. This plot was abandoned.

Plot No.6 was on sandplain country and like Plot 4 was over run by scrub. Access was difficult. With the subsequent development of plots at Badgingarra and Eneabba this plot became superfluous and no attempt was made to rehabilitate it.

Planting carried out at Cunderdin on the Community Recreation area in 1949 has also shown satisfactory subsequent development.

The early plots were cultivated and planted by the farmers who also provided the land. The trees and in some cases fencing material were supplied by the Forests Department. Our fuller participation was restricted by lack of personnel and equipment in the agricultural areas.

During the period 1949-53 inclusive a total of sixteen arboreta were started. Of these, four failed through our inability to provide adequate maintenance. The balance met with varying degrees of success and have provided valuable data.

Arboretum establishment lapsed during the period 1954 to 1958 but in 1959 with the directing of Senior Forester Thomson to the work there was a revival which has continued at a satisfactory tempo to the present time. On Mr. Thomson's resignation in 1963 the work was taken over by S/F Clover.

The provision of a special Treasury Grant of £5000 per annum granted in 1963 for a period of three years has enabled the arboreta to be satisfactorily maintained and the

whole project has taken on a more dynamic character. Arboreta now have a well cared for appearance and it should be possible for us to more satisfactorily assess the true potentialities of the various species. It will be necessary for the Department to seek an extension of the grant for this work for a further three years as from July 1st, 1966. An increase to £7000 per annum should be sought to compensate for the inflationary trend and for the added maintenance necessitated by the increased number of arboreta and the increased range of their distribution.

Weaknesses in co-operative tree establishment arrangements.

A number of weaknesses soon became apparent in this arrangement, viz:

1. No matter how willing a farmer was to co-operate, his regular farming operations had to take priority and the plots often either failed to receive the attention needed at the time it was needed, or did not receive it at all. Thus plants could arrive and be held until planting became convenient - by which time they could have dried out, or late winter cultivation of plots could be delayed until too late for it to be effective. With such uncertainty regarding handling it was impossible to draw valid conclusions from the results obtained.

2. The failure to recognise species resulted in many trees being mixed in the wrong groups initially, with further complications being introduced in refilling operations.

3. Enthusiasm tended to lag after the initial burst while ownership could change at any time. Fortunately, in several cases the new owners have proved quite willing to continue co-operation.

Purpose of Arboreta.

The function of these arboreta was envisaged as essentially twofold; viz.

A. To provide ourselves with practical data with respect to -

i. Suitable species for various sites and purposes.

ii. Spacing and layout necessary for semi arid conditions.

iii. Cultural requirements for establishment and subsequent development.

iv. Protection measures necessary against a range of harmful agencies.

B. To serve as demonstration plots for the benefit of tree planters in their respective localities.

Development of Establishment techniques.

The extent to which these investigations have caused us to modify our ideas on tree establishment in the drier areas demonstrates how necessary they have been; e.g.

1. The necessity to completely eliminate scrub to ensure successful establishment on the lighter lands while being suspected was by no means fully realised.
2. Initially a spacing of 15' x 15' was thought to be suitable for tree establishment in plantation formation but this was found to be completely inadequate. In light lands moisture stresses, in many cases fatal, were set up within about five years with spacing at this level.
3. A number of species originally expected to prove useful were, in tirals, found to be unsuccessful and others which had been little thought of succeeded. In the first category we could place Euc. stricklandi, Euc. Le Souefei, Euc. campaspe, etc. and in the latter Euc. camaldulensis, Euc.

platypus var heterophylla and Pinus brutia.

4. Losses during the first year through termite attack dispelled the idea that such attacks were secondary and did not occur with healthy plants. The introduction of dieldrin powder enabled preventive measures to be taken. Application of 2% dieldrin powder to the planting hole and soil round the roots of plants at time of planting has proved effective.
5. Losses of young trees by cockatoo depredation not previously anticipated led to investigation into means of protection. This led to the use of wire guards in certain districts.
6. Tree damage by stem borers has proved a serious problem which has by no means been satisfactorily solved as yet. However, it emphasised the necessity to exclude the less vigorous Eucalypt species and to provide trees with conditions which would enable them to maintain healthy growth. This problem warrants intensive entomological investigation.
7. The follow up of tree development in the field directed our attention to defects in nursery stock - particularly in respect of coiled roots, etc. This led to changes in pot design, the recommendation of root treatment at planting time and to the wider use of tray stock.

Determination of Range of Species.

The wheat belt is in broad terms one ecological unit but while there are no sudden physiographical or climatic variations certain gradual transitions are noticeable. These take the form of a lengthening of the wet season and a slight mean temperature drop as one proceeds from the North to the South. There is also a gradual falling off in rainfall as one travels from West to East.

These changes are reflected in the behaviour of several but by no means all species; e.g. River gum (Euc. camaldulensis) and Athel tree (Tamarix aphylla) both of which thrive in the Northern wheat belt but do not achieve any great

measure of success in the southern areas.

The factors which exert the greatest influence however are those associated with the soil - its fertility, composition, texture, depth, drainage and salinity. Each of these can have a bearing on choice of species. (Unfortunately persons seeking advice on tree planting in a specific district often omit all reference to soil conditions).

General rules to observe in species and site selection and planting layout and protection.

1. Species which occur naturally on the heavier richer loams of the wheatbelt or goldfields are unsuitable for light land planting.
2. Some, although by no means all, light land species on the other hand will thrive in the medium to heavy loams.
3. Species which occur on the more arid rocky hills on the goldfields thrive when grown in the heavier loams, provided drainage is good. This suggests that their exclusion from such soils under natural conditions could be due to competition from other species.
4. All Eucalypt species are subject to attack by Cossid moth larvae (bark eating stem borers). The severity of the attack varies roughly in inverse ratio to the vigor of the trees. Unthrifty trees when attacked do not fully recover and frequently succumb. This in effect means that with Eucalypts there is no place for any but the most vigorous species. While attacks by cossids can be expected almost anywhere the intensity of the attack increases where trees are planted in the vicinity of fragments of the original Eucalypt forest which serve as a source of infection.
5. There are strong indications that trees endemic to the actual locality where planting is to take place will give less favourable results than species from other localities. This appears to be associated with the presence of the species' natural parasites which in the changed environment

due to clearing have got out of balance with their predators. Common examples of this are the tuart in the Metropolitan area, the flooded gum in the South West and the wandoo in the Western wheatbelt.

6. Tree growth is usually successful on land which naturally carried forest, although actual establishment losses are frequently higher on heavy land than on the lighter sand plain soils.

7. Mallee soils which are in most cases light loams overlying an impervious subsoil at comparatively shallow depth are generally suspect, and apparent early success can be misleading. Possibly the use of explosive to facilitate root and moisture penetration could assist, and investigations would appear worthwhile in this connection.

8. Success on sandplain soils can be generally related to soil depth. Thus some of the yellow sands are well suited for tree growth; e.g. Warr's light land arboretum established on deep sand (12 ft) has supported a range of species for sixteen years in which time some of the trees have attained heights of over forty feet.

Shallow sandplain soils have on occasions resulted in failure within a couple of years.

9. In areas where salt encroachment is taking place as a result of a rising water table it is useless to plant trees in the actual saline area - in fact they should be planted well back from it. It has to be recognised that salt spread is a symptom of a soil disorder resulting from widespread clearing and while planting a belt of trees in the vicinity is desirable for aesthetic and shade purposes, it is unlikely to exert any great influence on the actual disorder.

10. On light lands, at least, there is a definite response to fertilizer application. At present initial applications are confined to superphosphate (with or without trace elements). It is believed from trials with Jarrah that

the early application of nitrogenous fertilizer may lead to an unbalance in the shoot root ratio. However, applications of a wider range of nutrients might be considered after the first year or two. Where fertilizer is applied near a young tree which has been planted in grass land, accelerated grass growth near the tree may cause water stress if not attended to in time.

11. There are indications that tree establishment and growth is better on areas that have been under crop than on new land. This could be due to residual fertilizer or to a more mellow soil due to the absence of raw plant material such as scrub residue. Possibly both factors contribute.

12. Wide spacing is necessary to avoid excessive late summer moisture stress - particularly on light lands. Trees under such stress are subject to attack by Cerambycid beetles (Longicorns). Attacks by the larvae of these beetles take the form of tunnelling in the cambial zone which can result in the actual ringbarking of part or the whole of the tree attacked and recovery is then impossible.

Planting in large blocks is inadvisable and shade groups should consist of a small number of trees only, all of which should have undisputed root access to surrounding cultivated land.

Shelter belts should consist of not more than two rows of trees each with root access to adjacent cleared or cultivated land.

13. Scrub and grass competition must be completely eliminated prior to planting and its re-establishment prevented by late winter cultivation for at least two years after trees are planted.

Initial elimination is best attained by deep ploughing in early winter followed by a period of fallow and a second ploughing ten or twelve months later and shortly before planting. This eliminates the scrub or grass and permits the build up of a soil moisture reserve. Subsequent

winter cultivation conserves moisture and discourages shallow rooting by the trees, and hinders re-establishment of grass or scrub.

Soil moisture determination over a period of six years have demonstrated that -

a) Native sandplain scrub cover reduces the soil moisture level below normal wilting point by mid summer. (See graphs 1 & 2).

b) Pasture crops make a severe drain on soil moisture to a depth of 2 ft. (See graphs 3 & 4).

c) Tree crops when established draw water uniformly to a depth of at least four feet and in a dry season may prevent the complete recharge of the soil moisture during the winter season (See graphs 3 & 4). Such failure to recharge can in a succession of dry seasons have disastrous results if trees are in intense competition.

14. It was found that a proportion of the trees in the arboreta blew over after three or more years. This was invariably traced to a coiled root condition in the original planting stock. Investigations were made into ways of correcting this. Unglazed earthenware pots as currently used, although of suitable shape for nursery plant production in that they provide ample surface space for the satisfactory development of the aerial portion of the plants, are conducive to the development of coiled roots. This is I suspect due to the concentration of nutrients in the porous material of the pots through the evaporation at the outer surface of the water from the percolating soil nutrient solution. Some reduction in the incidence of this trouble was obtained by -

a) Cutting off the coil of roots which invariably developed at the bottom of the standard pot then in use.

b) Introducing the bottomless flower pot which actually represents a compromise between the tube and the standard pot. With these, periodic movement of pots in the nursery removed any basal root coils.

c) The making of two vertical cuts about half an inch deep down the soil cone on opposite sides of the plant.

However, the more reliable means of avoiding root coiling are -

a) To use tray stock rather than potted stock. While some of the more difficult species will not stand this treatment, the more vigorous popular species (e.g. river gum, sugar gum, flat topped yate, etc) will. The number of these species being raised in this manner is being progressively increased.

b) To wash soil from the roots of the plants and spread the roots in the planting hole. While this method proved successful in our own trials it necessitates a degree of skill not possessed by many amateur tree planters and I would therefore hesitate to recommend it for general application.

c) In the case of the Athel Tree (Tamarix aphylla), the setting of cuttings in the positions where the trees are to remain rather than the use of container grown stock. We have advised this procedure for a number of years.

15. Protection - Damage to trees may come from a number of sources, particularly -

a) Domestic animals.
b) Vermin (Rabbits and cockatoos).
c) Human activities.
d) Wind action.
e) Fire.

Dealing with these in order . . . .

a) Domestic animals if allowed access to small trees may trample them, de-bark them, browse them or horn them. It is necessary therefore to provide protective fencing for a number of years to ensure their exclusion.

As the trees assume sufficient size to have most of their crown out of the reach of stock the latter may be

allowed access. Sheep will trim foliage as high as they can reach but cattle may break down some of the multiple stemmed slower growing species. However, at this stage it becomes necessary to watch developments as in the absence of roughage cattle and horses sometimes chew the bark off the trunks, while rams will on occasions remove bark either by horning or chewing. When this occurs protection of the trunk by strong guards becomes necessary.

b) Vermin. Even when the surrounding fence is of rabbit proof construction damage to it or the leaving open of a gate may allow vermin access and for this reason in areas where rabbits are prevalent we have used tubular guards of 42" rabbit netting about 10" or 12" in diameter around the trees. These are fixed to a 2" x 1" stake and the base is let into the ground a couple of inches.

Where cockatoos are likely to cause damage it is advisable to bend the top of the guard netting inwards to prevent their entry.

c) Human activities. Inadequate marking of planting sites has on several occasions led to the destruction of trees through the movement of agricultural machinery and vehicles. This has been of particularly high incidence where trials have been made on roadside strips. The erection of easily discernable pegs is advisable where young trees are not protected by fencing or guards.

d) Wind action. In exposed areas - and most wheatbelt planting sites are exposed - staking of trees is desirable to prevent young plants being blown over or developing a permanent lean. The erection of a wire vermin guard around them offers some support although an improvement has been achieved by surrounding the base of the guard with a strip of industrial cardboard.

e) Fire. The aerial portions of all inland species are extremely fire tender. The mallees send up fresh shoots from the woody rootstock but those possessing the tree

form seldom if ever recover. Complete fire protection of trees is therefore essential.

If the requisite initial steps taken to destroy scrub have been successful the problem is largely solved. However, the provision of protective ploughed lines is advisable.

Recording of Data.

It is necessary to assess the response of a wide range of tree and shrub species, of inherently diverse forms and growth habits, to the various sets of site conditions which the arboreta provide. Such quantitative data as height and girth increment, bole length, etc., are not valid bases for comparison between individuals of different species.

This type of data is necessary to enable us to assess a species' suitability for a particular purpose but the relative response of different species to site conditions must be assessed on a qualitative basis - their health and vigor.

Tables compiled from periodic field measurements and vigor assessments enable a quick appreciation to be made not only of a species behaviour on any given site but also of its potentialities for that site. Thus if it is observed that a proportion only of the individual test specimens of a species perform well, one could reasonably assume that that species has the capacity to grow on that site but that added site preparation would be necessary to enable it to do so consistently. (See pages 13-17, File 576/64).

Suitable species for Wheatbelt planting.

The Dryandra nursery distributes some 60,000 trees per annum and the distribution list covers over fifty species; in addition some species not listed are distributed in small numbers, usually to inquirers seeking a special tree for a specific purpose.

Of the trees distributed -

a) one third are of the one species, Euc. camaldulensis,

b) one third is made up of about one dozen of the more popular species,

c) the other third is made up of all of the other species.

The ten most popular are as follows -

	Species	No. distributed in 1965
1.	Euc. camaldulensis	20,000
2.	Euc. torquata	4,850
3.	Euc. cladocalyx (var nana)	3,400
4.	Euc. cladocalyx	3,300
5.	Euc. dundasi	1,860
6.	Euc. sargenti	1,450
7.	Euc. lehmanni	1,050
8.	Casuarina glauca	980
9.	Euc. gardneri	850
10.	Euc. stricklandii	620

Nos. 1, 2, 3, 4 and 9 are adaptable species suited not only to light soils but also quite fair subjects for medium to heavy loams - provided it is well drained.

The extreme popularity of Euc. camaldulensis is undoubtedly due to greater vigor and adaptability with regard to site. It has greater drought resistance than Euc. cladocalyx and has largely supplanted that species in the lower rainfall areas.

Nos. 5 and 10 are suited to the heavy soils only. After an examination of No. 10 in the various arboreta I feel that the wide demand is not altogether warranted. However, there are some very good specimens in a small reserve in the centre of Dalwallinu in a very good site where they have received very good attention. Many of the inquiries have consequently come from the Dalwallinu district but I doubt if a high percentage of success will be achieved with less

favourable treatment or on less fertile sites.

No.7 is a species not well suited to the wheatbelt and the number distributed represents portion of the Esperance plains demand which was mainly supplied from Hamel.

Nos. 6 and 8 are outstanding trees for saline areas although either of them will grow on better sites - on a range of soil types but preferring light to medium looms.

While arboretum trials indicate that the popularity of the listed species is not misplaced except perhaps in the case of No.10, they also show that a number of other species are deserving of greater recognition.

Brief notes on other possible species are as follows:

Euc. astringens: (Brown mallet) This tree is suited to the heavier rainfall areas of the Western and Southern Wheatbelt. However, it has performed quite well on deep sands in the drier areas - a particular instance being in Carr's light land arboretum near Yuna. It is not suitable for shallow soils where extreme moisture stress is likely to develop. It is preferable to use tray grown stock as like the other two mallets, it suffers badly if young plants have coiled root systems.

Euc. Brockwayi: An attractive tall tree under very good soil conditions. Not recommended for any but the best loam sites.

Euc. caesia: This is purely an ornamental flowering species and an extremely good one - particularly if the special strain from Chiddarcooping Rock (North of Westonia) is used. It prefers light soils and can be recommended for homestead gardens, etc.

Euc. ebbanoensis: A good mallee species of low height growth but of considerable drought resistance. It develops rather slowly. It is adaptable to a range of sites.

Euc. crucis: This is a species with attractive foliage but like Euc. caesia is purely an ornamental. It is suited for planting as a large garden subject and also prefers light soils.

Euc. flocktoniae: (Merrit) This is an attractive species with rather more drought resistance than most. It has survived on shallow mallee soils (light loams) where some of the more vigorous species have succumbed.

Euc. leucoxylon: This tree has not been widely planted to date but observations of it as a street tree in country towns indicate that it should be more widely used.

Euc. loxophleba: This species is not outstanding except on certain sites. It is moderately salt tolerant and will often survive on some of the shallower medium loams overlying rock or 'cement'. It does not do well on infertile soils.

Euc. occidentalis: This is a tree which has limited application. It has done extremely well at Yuna (13" rainfall) on deep sands but on the shallower soils where high moisture stresses occur it invariably succumbs, often after an extremely vigorous and promising start.

Euc. oleosa: (var robusta and var Kochie) Both of these mallee species are slow developers but have considerable drought resistance and can be recommended for the shallow mallee soils where high moisture stresses occur.

The mallee types naturally develop multiple stems and if they are required for shade purposes need pruning to keep them to one trunk.

Euc. platypus: This is quite a good small tree for the heavier soils although it appears better adapted to the Southern sections of the wheatbelt - down to about 15".

Euc. platypus var heterophylla: This is perhaps the most outstanding new species under test. It is extremely adaptable and shows considerable vigor on most soil types. It is generally free from pests. It has something of the habit of the Euc. lehmanni but is better suited to wheatbelt conditions. This tree tends to spread widely and for best results needs pruning to a centre stem to ensure satisfactory height and form.

Euc. redunca var elata (inland form): This tree has not lived up to earlier promise - it is fairly reliable for most sites but its rather dull coloured leaves and tendency to attack by borers when under moisture stress tell against it. A fairly good species but not outstanding.

Euc. salmonophloia: This tree is quite good for the better quality loams but its slow development in its early years detracts from its popularity and usefulness. The fact that it occurs naturally throughout most of the wheatbelt tends to deter people from planting it. The same applies to the next species - Euc. salubris.

Euc. salubris: A suitable tree for the heavy soils but it requires rich soil and should not be planted anywhere else. Well grown under suitable conditions as in Kalgoorlie, it is extremely attractive. (Euc. diptera and Euc. annulata are similar in appearance and requirements to Euc. salubris). They all have a tendency when widely spaced to develop multiple stems and need some trimming to overcome this.

Euc. spathulata: This fine leafed species is comparable with Euc. sargenti as a subject for saline conditions. It is, I understand, grown in Victoria as a shelter belt tree and could be more widely used here. There appears to be a good deal of variation in form and it would be as well to obtain seed from the country East of Katanning rather than further north.

Euc. woodwardi x Euc. torquata hybrid: Euc. woodwardi is generally disappointing owing to its invariably sparse crown. However it hybridises freely with Euc. torquata with unusual and often pleasing results. There is of course no uniformity in the hybrid progeny and blossoms may vary from yellow to pink, usually with a proportion of orange or dual toned orange and yellow.

In form the hybrids are usually more erect and taller than Euc. torquata and carry a better crown than Euc. woodwardii.

Acacia acuminata: This is quite a good small tree for the Western wheatbelt but being a native of that region is seldom much sought after. It prefers fertile sandy loams and stands a high degree of summer desiccation.

Acacia microbotrya: This is a fast growing small tree with a comparatively short life. It makes a quick show while some of the longer lived species are becoming established.

Acacia pycnantha:
" baileyana:
" podolyrifolia: These are all good ornamentals and although often grown in wheatbelt areas are usually in or near homestead gardens where they may receive extra water. They are not sufficiently drought resistant for general field planting there.

Callitris calcarata:
" glauca:
" propinqua: These callitris are drought resistant trees suited to the light to medium soils. However, their slow early development is a handicap and although they ultimately form quite good trees few farmers are prepared to wait for fifteen to twenty years for their trees to become effective. The above callitris appear more desirable than cupressus for wheatbelt planting. Cupressus arizonica has in all tests proved to be a very slow grower.

Callitris robusta: This tree appears to be a possibility for areas near the South and West coasts but is too unreliable for the lower rainfall areas of the central and Eastern wheatbelt.

Casuarina huegeliana: has shown phenomenal growth on poor light lands but recent observations of arboreta have shown it to be subject to a bark disorder. The bark of limbs puffs up and becomes transversely broken by deep cracks, causing death of the affected limbs. Specimens were submitted to the Biological section of the Department of Agriculture for examination following our arboretum examination last month. In view of this trouble it is doubtful if we should persist with this species.

Casuarina dielsiana: is a drought resistant species and

appears less subject to the above disorder than C.huegeliana and we may need to give it greater consideration in future.

Hakea laurina:
" multilineata: These are both ornamentals with little if any value for field planting. However they are quite good garden subjects for the drier areas.

Pinus canariensis: This has been grown at one or two arboreta but information is as yet inadequate. It requires deep light soil and responds to fertilizer.

Pinus brutia: has been the outstanding pine species to date - in fact as a windbreak tree it has proved itself exceedingly promising. On J. Heitman's arboretum near Morawa a two row belt of P. brutia spaced at 15 ft. intervals is now 30 ft. high (at age 16 years) and forms the most effective shelter belt I have seen in the wheatbelt.

For a number of years the trees were unimpressive although they survived while Pinus pinaster in an adjoining plot died. However, following a liberal fertilizer dressing three years ago they have developed exceedingly well.

I would expect P. halepensis to give similar results and it is proposed that stock from a number of seed provenances of this species received from Tunisia which have been sown in our nurseries this year should be tried out in various parts of the State.

Pinus pinea: is on trial in a number of the more recent light land arboreta but trees have not yet developed sufficiently for an assessment to be made of its potentialities.

Schinus molle: has not been tried in any arboreta but observations throughout the wheatbelt indicate that it is not suitable for field planting although it has the ability to send its roots far afield into gardens, etc., and it appears to be this rather than its actual drought resistance which has enabled it to become established in some goldfields towns.

Tamarix articulata (Syn T.APHYLLA): has a high degree of salt tolerance and is fairly drought resistant. It grows well on the heavier lands of the Northern wheatbelt but seldom if ever

on the lighter wheatbelt soils. However, it has grown quite well in coastal sands at Geraldton and North West towns and to a lesser extent nearer Perth. It is quite a useful tree, easily raised from cuttings.

Several of the mallees are worth considering as ornamentals but have little value for field planting. These include -

Euc. erythronema	-	Good for heavier loams.
Euc. Forrestiana	-	Medium soils.
Euc. Kruseana	-	Medium soils.
Euc. macrocarpa	-	Light to medium soils.
Euc. Preissiana	-	Light to medium soils.
Euc. stoatei	-	Light to medium soils.

When grown for ornamental purposes near homesteads, these should receive extra watering to ensure a less desiccated appearance and better foliage and blossoms.

8th December, 1965.
GEB.CA

Appendices are attached showing -

1. Map of wheat belt and arboreta established.

2. Graph showing moisture determinations over a period from 1959 - 1965.