SUMMARY OF '95 OIL MALLEE PLANTINGS
CANNA - MORAWA CELL
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Outline : The oil mallees that were planted in 1995 in the Canna - Morawa cell were inspected, counted for a survival percentage and a series of readings taken with the em38 conductivity meter. The purpose was to see if there was any correlation between soil conductivity and plant survival so that future plantings could be directed to the better soil conditions. In all, 43 farms were visited from mid December till early June 96. There did not appear to be any significant variation in em38 readings with the changing seasons therefore timing is probably not critical in determining site suitability using the em38. Visual appraisal must also be included with em38 readings to determine site suitability.

In the early stages, counts for survival and em38 readings were done randomly but this caused problems in trying to develop useable information at the spreadsheet level. Later readings were more coordinated so that there was a em38 reading that corresponded to the plant survival count. There also needs to be developed a dedicated data base so that meaningful information can be extracted.

Two readings were taken with the em38 - one in the vertical position and one in the horizontal position. The vertical position tends to measure conductivity at depth up to 1.5m and the horizontal reading relates to more of a surface measurement up to .75m. In most cases, the V reading is higher than the H reading. This would indicate in normal situations that the soil is more saline at depth. Therefore, if the land system has rising groundwater the surface will become more saline over time. If H is greater than V, this indicates that the surface is more saline than at depth. This occurs when there is more intensive capillary action, maybe due to dykes or hardpans, that leaves more salt on the surface. This occurred several times especially where iceplant is dominating the surface on upper slopes. The conclusion is that iceplant is not a good indicator of saline conditions but rather an indicator of capillary action.

Results : As recording proceeded, it became obvious that there are a range of factors that effected plant survival and, in many cases, it has become very difficult to pinpoint a single cause of failure where this has occurred. Some cases are obvious but these are few and far between.

Some of the variables include -

weed competition - for moisture
- allopathic reactions (rye grass, capeweed, iceplant)

time of planting - early season, late season
- time since last rain, time till next rain following planting

planting techniques - ripping, degree of compaction
- hand planting - operator error
- machine planting - depth of seedling placement

chemical applied - rate and type of chemical
- time to planting if using pre-emergent chemicals
- amount of rain between application and planting

species - some species have reacted differently to soil type and chemicals but has been difficult to quantify

rabbits - devastating on part of one site, effected some others
kangaroos - effected one site
seedling quality - not considered to be a problem in the first year but some mortalities noted in two year old trees (+/- 5%) in two sites
soil type - influences overall survival
- best survival in sandy loams - light york gum soils
soil salinity - some marked cases where survival goes down when salt goes up
- opposite reaction - survival goes up when salt goes up
- in general terms, difficult to determine cut off level

Survival per soil type : Soils and sites were lumped into three catagories -
- broad valley floors with heavier red loams, sometimes over calcrete / silcrete
- broad valley floors with lighter soils, light york gum soils
- contours and upland with yellow, pink, sometimes gravelly sandy loams

	number	survival %	em38av V
valley floor heavier loam	17	74	96
valley floor, lighter loam	6	82	75
contours and upland	11	72	54
mixed sites not included	10		

(note : em38av V = the average em38 reading in the vertical position over all sites)

Planting comparisons

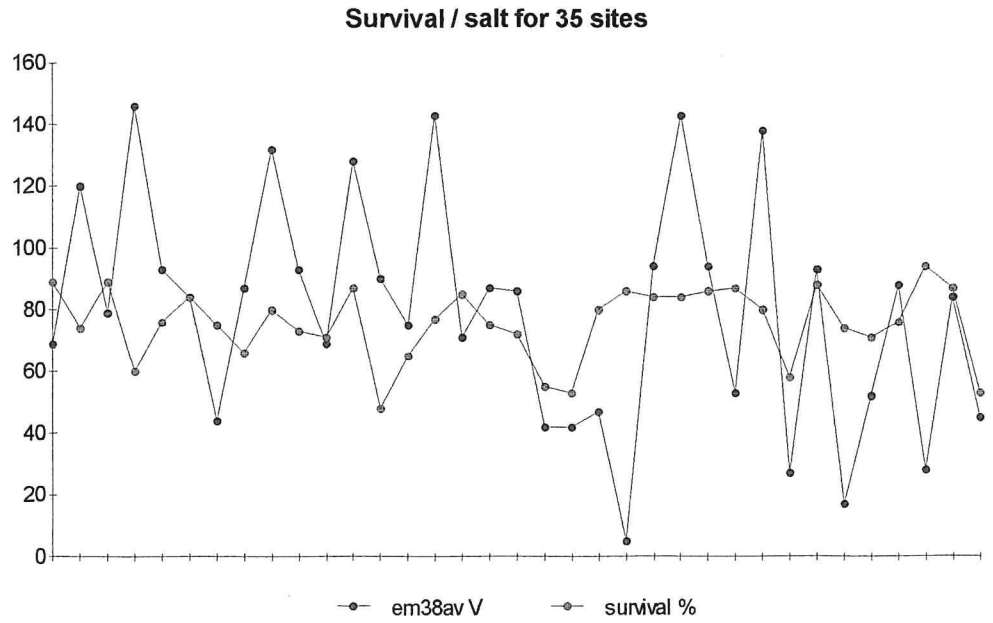
Hand planting over 26 sites gave an average of 75% survival
Machine planting over 9 sites gave an average of 76% survival

This is not a true indication as the hand planting tended to be in more difficult sites eg. only one machine site had a em38 reading of more than 100. The handplanted sites had six sites in excess of 100.

Salinity : A graph follows that looks at salinity and survival on 35 sites.

Em38 readings were taken consistently over all sites although, early in the process, the em38 reading was not matched to a corresponding survival count. Some of these have been excluded from the graph as the figures would be quite meaningless. Also excluded are some sites that were too diverse in soil types which would result in an bias one way or another. The remaining 35 sites are reasonably consistent in soil type and position in the landscape. Included in the graph are the other variables that have influenced survival such as rabbits, weeds, planting techniques, chemicals and time of planting. It is difficult to extract specific influences as, in many cases, there are a combination of influences as well as the subjectivety in determining the influence. That is, to explain why some sites or sub-sites have failed, one operates on a "feeling" that such a variable is the cause, especially for aspects as planter error, sometimes chemical and species effects.

The following graph looks at the average survival over the whole site with the average em38 readings in the vertical position.



Each dot represents a specific farm with one line of survival percentage and the corresponding average salt reading. It can be seen that in a few cases, survival has dropped as salt levels rose but there are a similar number of cases where the survival has dropped when the salt level has also dropped. I find this very inconclusive.

When one looks at the low survival points, only one has a high salt reading. The cause of the low survival in the other cases are due to a combination of rabbits, 'roos, poor ripping, dry planting, sheep and poor machine planting.

The em38 is a useful tool for determining the conductivity, hence salinity, of the soil. It also suggests that, in the majority of cases, salt levels at 1.5m are higher than the surface. This may mean that, on those sites, they will all be subject to increasing surface salinity due to the rising water table. This may mean that there will be increasing stress on the young seedlings in the early years that will be detrimental if a harvesting stress is added. In other words, oil mallees may not be harvestable on certain sites where the sub-surface salinity is at a specific level. In the short term, it is difficult to say at what level planting should stop. One gets the feeling that perhaps 120 mS/m may be the practical limit for oil mallees. This would mean that, in the 95 plantings, there would be six sites rejected but, in four of the sites, survival has been above the average of 74%.

Summary : In general terms, it is not possible to draw definitive results from this exercise with regard to determining salt levels suitable for planting. Rather, it has shown that there are a range of actions that farmers can take to improve the overall survival of their oil mallees.These should be promoted by whatever means possible to get the message though so that farmers become more responsible for the success of the oil mallee project. From observations made in this exercise, the following comments are made to improve the planting survival -

Rabbits, 'roos and sheep : All grazing animals must be removed from any oil mallee planting. Rabbits are the biggest problem and maybe the calicivirus will stop a lot of the problem. However, it will still be wise for farmers to make sure that all burrows are ripped and every effort made to eradicate the rabbit from tree sites.

Sheep have caused major damage on three sites and there is really no excuse for this to happen. Oil mallee sites should be fenced off if sheep are on farm.

Weeds : Weeds are a continuing problem at establishment. Glyphosate is rarely adequate on it's own. Follow up srays of selective herbicides will have to be used. Simazine can be used as a preplant herbicide but it generally needs at least 25mm of rain to fix it before tree planting can be done. Also, simazine is more mobile in the lighter soils which can cause problems.

Scalping, by using a tree planter, is a very good method of weed control but may not be suitable for saline sites (if these are still targeted as planting sites.) It may also be beneficial to put the seedlings deeper so that the mallee root can be buried by backblading the banks left by the treeplanter around the plants.

Fallowing has not been looked at but may be beneficial when planting sites that have a high weed burden.

Hand planting : Within some sites, there are "unexplainable" misses that can only be explained by planter error. This may be caused by the operator not firming the seedling in at planting or by the operator being too casual with the depth of the hand planter. Farmers must make sure that the operators of hand-planting equipment know how to use the gear properly.

In the event of contractors being used for planting, farmers need to monitor the planters to ensure the best job achievable is being done.

Ripping : Ripping done at the height of summer can be difficult to compact again to eliminate air pockets because of the lumpy nature of the soil, especially in the heavier red loams. Care must be taken to ensure air pockets are eliminated. Lighter soils appear to be easier to prepare.

Salinity : Avoid planting in saline valley floors where combined stresses of salt and harvesting may be detrimental to the plant. Definitely don't plant in valley floors that have iceplant as the dominant species. The best long term planting site will be upslope from the salt, on contours and below absorption banks. This will ensure the mallees have the freshest water for growth which should result in the highest yields. If dollar returns are important to the farmer, he will pick the sites that will give the potential for the highest yields.

It may be possible to plant trees in the saline valley floors and it is recommended to attempt to do so but use trees that will not be cut down again. They need to be able to grow with the minimum of stress. Remember, the valley floor salinity is a symptom, not a cause and one should never treat symptoms without treating the cause. Ask any doctor.

Species selection : Different species react differently in similar soil types. CALM is not sure yet which is the best species for each soil type and climatic zone and calculated guesses are made. By and large, *Eucalyptus horistes* should be a dominant species in the Canna - Morawa area because it is a local species. It is also one of the better yielding species. *E. loxophleba subspecies lissophloia* is impressive in the field but not much is known about it's potential yield or handling ability. Being a vigorous grower, it may cause some harvesting problems. If the soil type doesn't grow York Gum, I would be hesitant to try lissophloia.

Seedling Quality : It can be difficult to grow large volumes of quality seedlings but the farmer should demand the best possible. In the event of seedlings becoming root bound or having upturned roots, the grower should remove any wayward roots at planting time. The effect of poor root structure does not show up until the second or third year.