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NOTES ON GNANGARA PINE NURSERY

BY A. ROBERTSON 24/5/74

GENERAL

The nursery comprises of an area 35 ac. (14.2 ha) in size total area of beds currently in use 25 ac (10.1 ha) beds are worked on a three year rotation. Two species are grown P.pinaster and P.radiata, at present covering approximately 3.3 ha.

Pine planting stock for the plantation establishment programme is raised as one year old open rooted seedlings. No seedlings are retained for two years as these are considered too large for planting after one year old.

PINE SEED SUPPLIES.

Seed sown at present is local orchard stock, this seed is stored at the seed store Como.

The Storeman must be contacted two weeks before the expected commencement of sowing so that seed can be dried and treated with a fungicide and tested for germination. Each seed lot is allocated a serial number to provide a reference as to seed source etc.,

A label giving the serial number and germination result will accompany the seed on delivery, care must be taken to maintain a record of the serial number in the nursery.

NURSERY PRACTICE.

All operations in the nursery are mechanised as far as possible so the nursery is designed for as long a run as possible in each bed for economical use of machinery.

The beds are therefore long and narrow, of a width that can be stradled by the tractor wheels.

SEED BED PREPARATION.

Preparation for seeding commences the first week in August.

Technique for the preparation of nursery beds for sowing is a gradual process with rotary hoeing at a depth of 9" (230 mm), harrowing and final levelling.

Suitable weather conditions are essential in the final stages of preparation, i.e., the soil must be in a moist condition and worked to a fine tilth and this operation must be timed to allow the final preparation and seeding to be carried out in continuous fine weather.

Generally at this time of year the weather improves with lengthy spells of fine weather and advantage must be taken to start at the appropriate time.

If there is any delay before seeding can commence, and the beds have been prepared for seeding, seed beds should

be harrowed lightly to a depth of 3" - 4" and levelled again before seeding, this serves two purposes it brings the top soil to a fine tilth and disturbs any germination of weeds.

Sterilization of the soil can be benificial in circumstances where fungal problems occur.

Sterilization is an expensive and dangerous operation.

Formaldehyde is the type used and this omits a strong poisonous gas which must not be inhaled.

If any sterilization is required it must be completed at least six weeks in advance of seeding.

There has not been any major outbreak of any disease for many years and there has not been any need for this operation.

SOWING THE SEED.

Sowing should be commenced in the second week of August (weather permitting) as fine weather is essential and the operation must therefore be well organised so that the whole operation can be carried out quickly when conditions are favourable.

The seed should also be sown as soon after cultivation as possible, not more than two days should have elapsed otherwise the pre-emergent spraying will have no effect on any weeds that will have germinated since cultivation.

The seed is sown with a tractor mounted machine consisting of six Stanhay seeders each 9" (230 mm) apart and a six row bed is sown at the one time.

This machine allows precise control of the sowing rate and the depth of sowing, the seed boxes must be carefully adjusted by trials before sowing proceeds.

Belt hole size should be selected for use on seed size, i.e., large hole for large seed medium size hole for small P.pinaster and P.radiata seeds. The drive belts on the side of the seeder can be adjusted to three different speeds and the tractor speed is varied between 1 and 1.5 m.p.h., i.e., at faster tractor speed less seeds are sown and slower tractor speed more seeds are sown by the seed boxes.

The sowing rate should be such as to produce 8 - 10 good plants per foot (26 - 32 metre) care must be taken to work out the germination percentage which is provided by seed store, belt size and or hole size and tractor speed should be adjusted for each seed lot sown.

It is most important that the actual seed flow is carefully watched during sowing this means that the O.I.C. nursery must walk behind the seeder during sowing to ensure that no blockages occur or belts come off and that the mechanism is functioning properly, as this is the most important operation in the nursery it must not be delegated to someone else.

Care must be taken to ensure that the seed is sown at the correct depth, the seeds should be covered by no more and no less than one quarter inch (6 mm) of soil.

WEED CONTROL

Control of weeds in this nursery is now achieved mainly by the use of chemical weedicides.

Good techniques have been developed, the essence of control is in timing, i.e., by dealing with the problem as soon as or even before it becomes apparent.

The weedicides used fall into two main groups, i.e., pre-emergent and post-emergent weedicides.

PRE-EMERGENT WEEDICIDE

Dacthal is a very efficient pre-emergent weedicide, it is most effective against couch, crab grass and other soft annual weeds and it is harmless to the pine crop.

Dacthal is applied as a fine spray immediately after sowing at the rate of 12 lbs in 100 gals water (per ac.). To ensure proper application the Dacthal should be thoroughly mixed in a seperate container then poured through the wire gauze into the partly filled tank of water then again thoroughly mixed before filling with water, 1 pint of plus 50 surfactant is added to the 100 gals.

Before spraying is commenced the pump should be run for several minutes to agitate the contents in the tank.

Pre-emergent weedicides form a film or barrier on the surface of the soil which inhibits the germination of the weeds. It is therefore important that a fine tilth be established prior to treatment and that not more than 48 hours has elapsed since cultivation. It is very much preferable that final cultivation, levelling, sowing, and application of Dacthal applied on the same day. The barrier will be broken by disturbance of the surface after treatment so care must be taken to avoid subsequent working or disturbing the top surface of the beds for as long as possible.

POST EMERGENT WEEDICIDE

B.P. Pine Spraying Oil is an effective selective post emergent weedicide against crab grass, cape weed and other soft annual weeds.

B.P.P.S.O. is ordered from B.P. Australia in multiples of 220 gals, generally 440 gals is the minimum and 880 gals the maximum when ordering.

The aromatic content is the critical factor and the specified aromatic content for this nursery is 28% and should always be stated when ordering supplies.

B.P.P.S.O. is applied as a fine spray in fine weather at the rate of 70 gals per acre (785 litres per hectare) for P.pinaster, the optimum tempreture range for spraying is 70° - 80°F (21° - 27°C) generally arround midday when there is not any moisture on the seedlings and a few hours of sunshine to cause the evaporation of the B.P.P.S.O. Spraying should be postponed during periods of strong winds.

The rate of application to be sprayed on P.radiata should be slightly less per acre (hectare) as this species of pine is much softer and are prone to needle burn at 70 gals per acre (785 litres per ha) this problem is overcome by increasing the speed of the tractor while spraying by 0.4 m.p.h.. The spray at this rate has an acceptable effect on most weeds if completed at the appropriate time and any longer weeds not killed can be hand weeded.

The spray at this concentration is only effective on

very young weeds. Crab grass and cape weed should be sprayed while still in the cothydan stage.

Prior to the germination of the pine seed a close full inspection must be made of the seed beds to ensure that there is not any large germination of weeds, although seed beds have been treated with Dacthal, sometimes due to weather and other conditions there is an early germination of weeds and consideration has to be given to spraying with B.P.P.S.O. If any spraying has to be done a decision must be made before the pine seed germinates, as most weeds can mature in a very short time and completely choke the small seedlings.

It must also be borne in mind that the young seedlings must be about six weeks old before they are strong enough to be sprayed with any mineral oil as serious damage can occur at this stage. i.e., If spraying in cold conditions the oil does not evaporate and this causes the stem to rot and the seedling dies.

If spraying in hot conditions the tips of the needles are too soft and do not contain enough wax so the needles burn up and wilt. This will cause the growth to check as new needles have to grow from the stem.

HAND WEEDING

Hand Weeding is necessary on some occasions to combat some of the more persistent weeds. Generally this can be done by the personnel who are engaged in the irrigation as some time can be spent on hand weeding between moving pipes. Generally this is sufficient to maintain the beds free of weeds.

Fallow beds should be kept free of weeds, this can be done by hand or by a light cultivation with the tandem discs.

The nursery perimiter and drains should also be kept weed free. This can be done by spraying with Vorox 5 lbs and one pint plus 50 in 100 gals water per acre. Some drains might require spraying in autumn adjacent to beds that will be cropped in spring the remainder will be sprayed in August after seeding is completed.

MAINTENANCE OF SOIL FERTILITY

Continuous cropping of nursery beds leads to depletion of the humus fraction and a general deterioration of the soil structure. These signs are evident in the older nursery beds which have been cropped without any replacement of humus. On inspection of these beds it would seem that there is a high humus content but on growing a pine seedling crop on this type of bed a very uneven crop is produced. This is due to the close grained and hard structure of this soil. Generally any extra water and fertilizer which is added to boost the growth, has a very slow response.

This problem can be overcome by rotational cropping with green crops alternating with a pine crop on a three year rotation.

At present seed oats at 40 lbs per acre (50 kg. ha) and N.Z. lupins at 60 lbs per acre (75 kg. ha.) are grown and ploughed in while still green and when the lupins are at the full flower stage.

Seed oats and N.Z. lupins are broadcast in the fertilizer hopper mounted on the rear of the tractor.

The seeds are sown separately.

Care must be taken to adjust the hopper outlet so that the proper amount is being applied to each bed.

Seeds should be made into lots for each bed and broadcast separately to ensure even distribution.

This method has proven to give excellent results on the subsequent pine crop.

Another method is to add Cladium peat which can be obtained from various local deposits but this method can import new problems as all the local swamps within the plantation area contain large infestations of weeds which have been seeding for years if care is not taken in the selection of clean peat swamps many years of unnecessary weeding on nursery beds can occur.

The fertilizer regime developed for Gnangara nursery is an initial top dressing of 2 cwts per acre (125 kg. ha) of nutrifert to all growing crops broadcast immediately after seed is sown. This amount is generally sufficient to maintain good growth. Some areas of seedlings sometimes show signs of nitrogen deficiency, i.e., yellow colour and stunted growth, these areas should receive subsequent light applications of urea at one half cwt per acre (62.5 kg. ha). This fertilizer should be watered in the same day.

MAINTENANCE OF CROP.

Young seedlings are delicate and easily damaged by any one of a number of agencies.

The most critical period is during the first few weeks following germination (which takes approximately 21 days under normal conditions). As weeds disease and even bad weather can cause serious losses, an almost constant watch must be kept on the young seedlings by making a physical check each day.

Seed beds should be inspected every working day if possible and close inspection made of beds at this stage. Prompt action should be taken to guard against the various hazards.

A close vigilance should be kept for at least 12 - 14 weeks from date of sowing when seedlings should be starting to make good growth.

FUNGAL DISEASES.

The pine seed is always dusted with Ceresan prior to delivery as a precautionary measure, this does not provide complete protection from disease.

Some areas, particularly on the hard beds where water lies after rain, small areas of damp off can occur, if no more than a few seedlings are affected no action is taken.

Only one bed, No. 10 has an area which has given cause for concern in the past and it was sprayed with Captan which halted the spread of deaths, the pathogen had caused the death of many seedlings in an area ½ acre (0.2 hectare) in size.

This area will be marked on the nursery plan so that a special watch can be made when seedlings are growing on it and prompt action taken to combat any problems as soon as they become evident.

Captan is not held in stock at the nursery as it deteriorates if stored for long periods and not used.

Supplies can be obtained at once by contacting stores branch Como should the need arise.

INSECTS, BIRDS AND PESTS.

A variety of insects and other pests may cause damage to the nursery.

Caterpillars are evident in some years during September-October. They generally occur where there is a covering of weeds or any other vegetation where they hide during the day.

Black beetles are evident in small numbers particularly near cover and no serious damage has occured in this nursery from both insects in recent years, hence the need for good housekeeping in keeping the nursery seed and fallow beds, drains and surroundings areas clean and free of weeds etc.,

Green parrots occasionally steal newly sown seed particularly if seed is exposed or carelessly spilled while filling seed hoppers and also when pine seed is germinating on hard beds as the germination causes the surface to crack and expose the other seeds which are in the process of germination.

If damage is serious appropriate action should be taken to reduce the number of birds.

Rabbits can be a problem as generally they are not evident in the nursery because they move in at night and only eat the newly germinating seed down to ground level.

P.radiata is particularly susceptible at this stage, as the nursery is not fenced a close inspection of the surrounding perimiters must be made for rabbits about the time of sowing so action can be effective before germination.

WATERING

Watering should be commenced as soon as the nursery beds start to dry out and no more rain is expected.

To maintain good growth on no account should the beds be allowed to become dry, once started, watering should continue on a once weekly basis throughout the summer season provided no rain is received.

While moving pipes care must be taken to ensure that the watering overlaps each move particularly on each end. When there is a wind change, if some areas are poorly watered they may suffer from drought and become retarded.

In late autumn certain areas may appear to be small and watering should continue until sufficient rain is received to maintain the moisture content and retain growth to these poorer seedlings.

LIFTING, BAGGING AND DISTRIBUTION:

Lifting and bagging at Gnangara nursery is not a highly mechanised operation.

The only machinery required is a Massey Ferguson 165 tractor with an undercutter mounted on the three point linkage. This attachment undercutts the seedling tap roots at a predetermined depth generally 7" (180 mm). While the cutter cuts the tap root it slighdy lifts and loosens the seedlings in the bed to facilitate lifting.

Seedlings are pulled from the ground (lifted) by hand. The seedlings are packed immediately in wet jute bags which are hung from an outrigger positioned on the site of the tractor at a slight angle across the bed being lifted.

The tractor travels at as slow a speed as possible, the personnel lifting can generally lift and pack the seedlings at the same speed as the tractor is travelling.

Care must be taken to handle and pack the seedlings properly, i.e., the needles are not to be stripped off, or the stems bruised by rough pulling, also the roots should be well shaken (particularly in wet weather) to discard excess soil.

The bags are made from second hand wheat or corn sacks cut down one side.

Prior to use the bags must be thoroughly soaked in water, containers are kept at the nursery for soaking the bags before use, they should be kept wet throughout the entire time that they contain seedlings.

It is the O.I.C. nursery responsibility to ensure that once seedlings are packed they are maintained in a moist condition until they arrive at their destination. Truck drivers must be instructed in the proper care of seedlings under their control during transportation to the planting sites. O.I.C. planting must advise O.I.C. nursery if plants are delivered in an unsatisfactory condition.

Counting of seedlings is not practical except for small orders, generally a check is made of each species and stratum, by counting several bags at random.

These sample counts determine an average number of plants per bag.

The number of seedlings lifted per day is around 100,000.

The optimum labour requirement for the lifting operation is one tractor driver, 2 men for bagging and loading trucks, and six ladies for lifting and packing seedlings. Any less a number than this can affect production drastically.

NURSERY REPORT

At the end of the planting season a report is required on the operation of the nursery for the past year.

This report is set out in standard form and provides the analysis of number of seedlings raised and details of the distribution of seedlings and any other relevant information.

The O.I.C. ensures that a strict record is kept of all seedlings despatched locally, other divisions and private sales.

IN CONCLUSION.

These notes are made from practical experience and observations made over the last six years as O.I.C. nursery and will provide a guide line to future nurserymen.

Attached is a calendar and check list of nursery work to assist in programing the annual events as they may occur.

A. Robertson

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10.5.74.
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CALENDAR AND CHECK LIST OF NURSERY WORK

AUGUST

Prepare seed beds, cultivate, harrow and level.
Sow pine seed. Spray Dacthal on seed beds immediately pine seed is sown. Broadcast fertilizer at 2 cwt per acre (125 kg. ha) to seed beds as soon as all seed has been sown.
Clean up seeder and despatch to other Divisions.
Rotary hoe green crop when proper stage of growth is reached - may also be September.
Spray drains on nursery perimeter with Vorox.
Order B.P.P.S.O. for anticipated weed growth.
Keep close eye on germinating seeds.

SEPTEMBER

Inspect seed beds daily.
Inspect seed beds to ensure that no weeds have germinated before germination of pine seed.

OCTOBER

Inspection of seed beds daily.
Spray seedlings with B.P.P.S.O. if required not until seedlings are at least six weeks old.
Commence irrigation if weather conditions warrant.

NOVEMBER

Inspect seed beds daily.
Irrigation of seed beds ensure that beds are overlaped with water.

DECEMBER

Inspect seed beds daily.
Irrigation of seed beds, care must be taken to ensure that seedlings receive sufficient moisture prior to and during the holiday period.

JANUARY

Inspect seed beds at least every other day.
Irrigation of seed beds.
Check fallow beds to ensure that crab grass has not germinated, appropriate action should be taken to combat any weeds which might flower and seed on these beds.

Apply urea to any area which shows a deficiency in nitrogen, i.e., yellowish plants.
Order Seed oats, N.Z. lupins, corn sacks, Dacthal, Vorox, plus 50, fertilizer for green crop and any other requirements for coming season.

FEBRUARY

Inspect seed beds at least every other day.
Irrigation of seed beds.

MARCH

Inspect seed beds at least twice a week.
Irrigation of seed beds.
Apply urea to areas which show a nitrogen deficiency, i.e., yellowish or stunted growth or seedlings well below average for this time of year i.e., below 6" (12 mm) at the end of march.

APRIL

Inspect seed beds twice weekly.
Irrigation of seed beds as required by weather conditions.
Order B.P.P.S.O. for anticipated weed growth after first autumn rains.

APRIL (CONTD.)

Inspect Stanhay seeder and order new parts and belts as required.
Prepare beds for green crop.
Sow green crop after good rain and apply fertilizer as soon as sowing is complete.
Undercutt P.radiata if required.

MAY

Inspect seed beds more frequently for weeds particularly cape week.
Spray with B.P.P.S.O. as required.
Apply urea to any areas which might require a boost, continue irrigation to these areas if more than a week of dry weather has elapsed.
After mid may the average seedling height should be 8" (16 mm) and more in some cases.
Check that everything is in order for the lifting programme.
Tractor should have any repairs carried out and be serviced ready to start work.

JUNE

Check on availability of nursery labour.
Assemble cutter and out-rigger on tractor, prepare bags etc., for lifting.
Commence lifting, ensure that bagged seedlings are stored properly overnight and at weekends and that seedlings are kept moist at all times.
Check orders each morning and with other divisions regarding their requirements ensure that truck drivers picking up orders handle and stow seedlings carefully and if travelling long distances keep bags wet.

JULY

Continue lifting and bagging seedlings. When complete check to see that no more plants are required.
Tally up surplus seedlings left in beds this surplus can be ploughed in when it is certain that no more seedlings are required.
Nursery should then be cleaned up and all gear used can be stored away for next season.
All bags that were in use and still serviceable should be hung on fence to dry. Old and torn bags should be discarded.
Start preparing nursery report.
Check with seed store regarding new seasons seed for August sowing and approximate amount to be sown and program for same.