



Site Preparation and Maintenance

Site preparation

The preparation of the planting site is an important first step as we are most often using pre-cleared sites including decommissioned dairy or crop farms; sites no longer used for the purpose for which the land was cleared. We can use a range of soil types for these plantings; not necessarily in areas of former rainforest.

Site inspections are necessary to determine the range of species to be used for particular locations. As mentioned previously, all plantings must consist of 4 to 6 different species. Rainfall from around 1000 mL is desirable but lower or higher rainfall can produce excellent results provided a suitable species mix is selected. As most of our rainforest plants are frost-soft to some degree it is important that we know whether the particular site is prone to frost in order to select and plant the correct range of species.

When the site is originally inspected the outside measurements are taken to enable a planting plan to be drawn up. The plan shows the design of the planting with a compatible mix of species. This plan is also used to provide correct numbers of each species needed for the plantation. Our plantings are spaced on a 3 m x 3 m square grid. This enables ease of weed control management, which can be achieved by the use of a specially designed spray unit which can be attached to any small tractor or quad.

The best sites for plantings are those with an original cover of grass. If grass is not present originally, it may be necessary to plant a cover crop usually a non-weedy exotic grass or legume to promote growth of surface organic matter which, upon herbiciding, provides a dead grass and stubble cover. When there are re-growth trees such as acacias or eucalyptus within the site they should be taken out by cutting off low and poisoning the stumps to prevent suckering. We advocate minimal disturbance of the site; we should never remove any existing trees with a dozer; doing so causes disturbance to the natural soil structure.

The total planting area must be slashed low and left for the stubble to shoot which takes about 2 to 3 weeks. There are therefore 2 herbiciding operations with boom sprays of the entire area prior to planting, at intervals of 2-3 weeks. If blady grass or bracken is a component of the weed population, a third boom spray is desirable.

The planting can usually take place about a week after the second or final boom spray.

Planting and maintaining tube stock in the field

We use a very successful planting hole siting methodology. This methodology, originally designed for large banana plantations, has been adapted for use in our timber plantations. We need to plant when there is sufficient sub-soil moisture. The herbiciding operations pre-planting should maintain soil moisture as evaporation and transpiration of moisture from the soil surface is inhibited. The planting date needs to be flexible and responsive to local soil moisture conditions; particularly in a drought/El Nino scenario. After all, after planting, there is very minimal supplementary irrigation in our Forest Farming System .

In most of our plantings the planting hole is dug by an especially designed hole digger which is fast and efficient by using the sighting method. It is operated by one person and can dig up to 1000 holes a day. It is especially designed to break up the soil even on compacted sites. This makes planting easy. Plants are placed by an experienced person as designed in the planting plan. All planting is carried out by experienced staff. Other labour if supplied by the owner will be employed in fertilising watering or placing tree guards. This will reduce costs to the grower. The especially designed long blade mattock is now only used for small plantings or rainforest regeneration.

The planting holes should be 3 times as wide as the tube, but only slightly deeper. The planting holes should be finished with a saucer shape, so that the soil adjacent to the plant is about 5cm below the surrounding area. Slow release fertiliser is applied only once in our system at the planting time on the surface 35-40 cm away from the plant on the uphill side of the tree if possible. We should not be tempted to place fertiliser in the same hole as the

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Total Weed Control and Pruning Technology

tree or the centres of the planted tree rows; doing so would create a dependency for added fertilisers. The healthiest plants in the field are those with root systems trained to extract nutrients from the soil's nutrient cycling processes.

Total weed Control

Total weed control management must be in place from the early stages of plantation. It is important that weeds not be allowed within the plantation as they are in direct competition to the root spread of the young trees. The faster growing species will have their root systems intermeshing across the rows under the dead grass and stubble within the first six months.

All dead grass and stubble must be retained as an important ground cover. This enables the shallow nutrient gathering root system of the trees to spread out under this ground cover. The faster growing trees will have the root system intermeshing across the rows when the correct weed control management is in place. The tree root system is so shallow that any weeds are in direct competition with the trees. When dead grass stubble is retained the chance of erosion is small.

It should be remembered that 90% of the weed population in timber plantations comprises introduced species with high nutrient and moisture requirement, relative to native plants. There should be no tolerance for weeds in timber plantations; native timber trees cannot coexist with exotic weeds.

One of the greatest mistakes still being made in other timber plantation systems is where weeds are controlled only along the tree rows and the centres mowed. This practice is detrimental to the structure of the root systems of these trees, causing poor growth rates and poor root form. These slashed centres between tree rows act as root barriers which deflect the roots back to the cleared area, thus limited root spread and exploration for nutrients.

The dead grass and stubble cover provides natural organic mulch, which not only inhibits weeds but also prevents soil erosion. An added advantage of this natural organic mulch the direct result of pre-planting herbiciding operations is that its decomposition in situ promotes populations of soil fauna to build up; particularly earth worms. Earthworm populations enhance native soil's physical condition and chemical fertility.

Weed control timing is governed by the species of weed existing but every effort must be made to prevent weeds from seeding. It can be stated that total weed control for the first two years is essential. For the first two years weeds control the trees but after three years the trees control the weeds. For the herbiciding operations care needs to be taken to avoid spray drift onto the stems and foliage of the growing timber trees. The tree guard effectively protects young trees from this threat. We now use especially designed tree guards with bio-degradable mulch mats which are placed around the trees. The tree guards are placed over the mats which prevent seedling weeds immediately around the tree. The guards stay on the trees for about six months which allows for three weed control runs. The guards are efficient protectors of trees from spray drift, animal predation and creates a micro climate which promotes rapid early tree growth. Our latest model is very user friendly and long lasting and can be used many times or sold secondhand. We recommend leaving the guards on the trees until the trees are at least one metre above the guard. They can then be easily removed by pulling out the pegs then flattened out and stored for further use. Ideal planting times are from March to October. Avoid planting in the heat of summer as extreme heat can cause tree losses.

Pruning Technology

Over the past 10 years, we have developed a pruning technology for our timber plantations very different to that used for eucalyptus or conifers. It is essential to recognise that every cabinet timber tree species has a specific methodology for pruning to achieve optimum timber yields. Pruning technology is of great importance to the future health of the plantation. While under-pruning causes poor trunk form, over pruning causes poor growth rates. There is a direct relationship between leaf mass, trunk thickness, and plant health. Four fifths of leaf mass must remain after pruning.

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Pruning Technology and Pest Management

For the first three months of first metre of growth, for all trees, only form pruning is needed. After that time, we need to be aware of the various methods that need to be employed for each species in a timber plantation.

We have developed a special methodology for pruning white cedar (*Melia azedarach*). After the trees reach over a metre in height, side shoots are thrown above every leaf. Because the leaves of this species are very large and provide enough photosynthesis for the plants, these side shoots must be removed as soon as they appear, and must not be allowed to form branches. Care must be taken when pruning not to damage the leaf system.

Pest management

There are a number of features characteristic to our 'Forest Farming System' that mitigate against major pest infestations becoming established in our timber plantations: there is a biodiverse planting mixture, habitats for insectivorous birds, linkages to adjacent native bushlands are conserved and enhanced, and tree health and vigor are maintained.

There is very little in terms of insect pests with any of the timber species apart from the cedars. Red cedar trees (*Toona ciliata*) for example are badly infected with tip moth in all of our coastal regions. White cedar (*Melia azedarach*) has an insect problem caused by caterpillar which causes considerable damage to the foliage. This pest can be controlled on young trees by regular monitoring, and the use of environmentally friendly insecticides when needed. Should the insects remain on the tree until the caterpillars are approximately half grown, they migrate to the base of the tree and remain there in a cluster during the day and only feed at night. At this stage a stronger insecticide must be used.

The insects are only a problem until there is a clear trunk approximately 4 metres and then allowed to crown usually within the first growing season. Should the insects attack the leaves after this time the tree will shed its leaves, and after the insects have disappeared the tree will quickly regain its leaf structure which means no further insect control is necessary.

On studying the range of species to use in North Queensland we must take into account prevailing winds and choose a range of species most suitable to stand up to these conditions. To this end I have been able to select a range of species best suited to the wet tropics. These are silver quandong, Queensland Maple, Southern Silky Oak and khaya. They would be planted on a 3 x 3 metre square grid. The quandong would be used as a height promoter with every second row entirely of quandong then in the alternate rows the quandong every fifth tree with a mix of mainly maple and khaya. One or two other species could be added but the species listed will require less pruning as the row of quandong creates good trunk height in all other species. The full row of quandong can be taken out at about 8 years as a milling and thinning harvest. This then reduces the stem population to a required density and also means that there will be only one non-commercial thinning. There would be a non-commercial culling at three years to remove unviable trees. When good management practices are in place this culling will be no more than about 2% of total trees.

For North Queensland a range of species best suited for the prevailing conditions must be used. We have given careful consideration to choose species that have the potential for success in this area.

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| (1). Silver Quandong | (<i>Elaeocarpus grandis</i>) |
| (2). Queensland Maple | (<i>Flindersia brayleyana</i>) |
| (3). Khaya | (<i>Khaya senegalensis</i>) |
| (4). Southern Silky Oak | (<i>Grevillia robusta</i>) |

Although khaya is not a native it is important to have a coloured timber to make up a choice of furniture timbers to suit the domestic market as well as future export markets. Khaya is a fast growing and fast maturing tree and fits in well with the native species we are using. The addition of one exotic species will not upset to any great extent

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Pest Management and Rainforest Regeneration

the ecological balance of our native naturalistic planting system. Planting designs are based on a compatible mix of species with silver quandong as the main height promoter. The planting design is based on the successful methods used by the Mitchell System in South Queensland. Every second row is a full row of quandong. This is to promote the necessary height promotion of the slower growing species. Quandong matures rapidly and is designed to enable a thinning and milling at 8 to 9 years. Quandong is planted the fifth tree in every alternate row with the design mix of the other mentioned species which should consist of a dominance of khaya and maple. Plantings are now designed so that we only have one culling of unviable trees at three years and with the milling of quandong at 8 to nine years the stem density is then reduced to the required number per hectare. As plantings are designed on a 3 metre x 3 metre square grid system with approximately 1000 trees per hectare the thinning and milling effectively reduces the stem density, with very little wastage, to the desired stem number. Quandong milled at 8 years has been tested and the timber has been proven to be of high quality.

Rainforest Regeneration

Rainforest regeneration of tropical and sub-tropical species requires a different method. Firstly site preparation requires the elimination of all weeds, grasses and all unwanted tree species including exotics, eucalypts and acacias. Eucalypts are too highly competitive with native rainforest species, acacias because they have a relatively short life span compared to rainforest species and will die out early. When setting out a rainforest first a walking track must be marked throughout the planting so as to enable a corridor of 2 metres to be retained for future track access. Plantings should be in two stages with one year between each stage. A large range of species must be selected that will eventually form the canopy with at least two to three of each species used. These are randomly planted at 2 to 2½ metre spacings. One year later the shade tolerant shrubs, palms, ferns etc should be added to create the understory. Providing the weed control management has been strictly followed a full rainforest with canopy cover should result in 2 to three years.

Our latest innovation with especially designed tree guards greatly enhances growth rates by protecting trees from animal predation and weedicide spray drift during the early establishment of the rainforest. We strongly recommend the use of these durable trees guards which can be reused several times enhancing and simplifying the establishment of rainforest regeneration.