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You can climb a tree but you can't look up its genes!

Mount Gambier based Australasian tree breeding cooperative, the Southern Tree Breeding Association has formed a partnership with scientific research institutions to develop state of the art tree breeding technologies for use on plantations.

Principal geneticist for the Southern Tree Breeding Association (STBA), Dr Tony McRae, says the TREEPLAN™ project aims to transfer advanced animal breeding technologies to tree improvement programs.

Although the theories have been around for a while, it is only recently that computers have become powerful enough to adopt these technologies. The animal breeders have developed national recording and breeding programs for livestock.

The project will allow the STBA to develop breeding values for more than half a million trees included in its breeding programs for the plantation species of Radiata pine and Tasmanian Blue Gum. The cooperative breeds and tests individual trees in experiments planted in the Green Triangle region and Adelaide Hills in SA, Victoria, ACT, Tasmania, Western Australia and New Zealand.

The project will help identify elite trees for use as parents in the breeding programs. Usually about 300 parent trees are maintained in the breeding population at any one time for each species.

The STBA uses traditional breeding methods in its softwood and Eucalypt programs. Dr McRae says there is nothing fancy about breeding trees. It's a matter of taking pollen from a good male parent tree and crossing it with the flower of a good female parent. The seed or progeny from about 500 crosses are then planted as family units in progeny tests spread around Australia. As the progeny grow they are assessed for growth rate, tree form, disease resistances and wood properties. It's then just a matter of picking the best performing trees for use as parents in the next generation. If only it were that simple.

Unfortunately, you can't look up a tree's genes. The growth of a tree is determined both by its genetic make up and partly by the environmental conditions under which it has grown. But we need to know how good the genes are for breeding and not necessarily whether the tree looks good. The hard part is to separate out the effects due to the genes and the component due to differences in growing conditions. It's a bit like the 100m sprint at the Olympics. If one athlete gets a 10m start, he might win the race, but he might not be the fastest runner if he only wins by 5 m. If a tree gets a little more rain or slightly better patch of dirt, then it has an unfair advantage relative to other trees. Making adjustments can get highly subjective.

It is hard to compare the properties of a tree grown in Western Australia with one that is grown in the Green Triangle. This is where TREEPLAN™ software will come in handy. The software takes account of the genetic relationships among relatives (grandparents, parents, brothers, sisters and cousins) to put the trees that are grown in different states and thousands of km apart on a level playing field. It sounds simple enough, but the statistics and computing programs making up the software are quite complex. This is why the STBA is calling on its research partner, the Animal Genetics and Breeding Unit from the University of New England Armidale, NSW to supply the scientific expertise to deliver an analytical system suitable for a national tree improvement cooperative like that of the STBA. Scientists from the Cooperative Research Centre for Sustainable Production Forestry (Hobart), the Centre for Forest Tree Technology (Melbourne) and CSIRO Forests and Forest Products (Mount Gambier and Canberra), will also contribute vital expertise in statistical genetics and silviculture to the project.

How good will the product be? Dr McRae says TREEPLAN™ will be a world first for trees. There are several products in the market that can do bits and pieces, but none have the capability to handle the number of trees handled by the STBA. Dr McRae says TREEPLAN™ is being developed to improve the genetic quality of plantation trees planted in Southern Australia and New Zealand by the cooperatives members.

However, Dr McRae also thinks the STBA could establish an international market for this type of software in other tree improvement programs.

More plantation timber of better quality with less wastage can be grown on the same area from genetically improved trees. Improving the genetic quality of plantation trees by using natural cross-pollination methods is friendly to the environment and it reduces the need to harvest timber products from native forests in Australia and overseas. It's a win win situation for the community and the timber industry.

In the long run, the benefits of TREEPLAN™ through tree improvement will mean hundreds of millions of dollars extra revenue per year for the economy from the plantation estate.

The Southern Tree Breeding Association was established in Mount Gambier in 1983 with the support of the predecessors of local timber companies of Green Triangle Forest Products, Auspine, Forestry SA and CSIRO. The breeding cooperative has now expanded to include 19 companies and three research organisations spread throughout Australia and New Zealand.

Dr Tony McRae