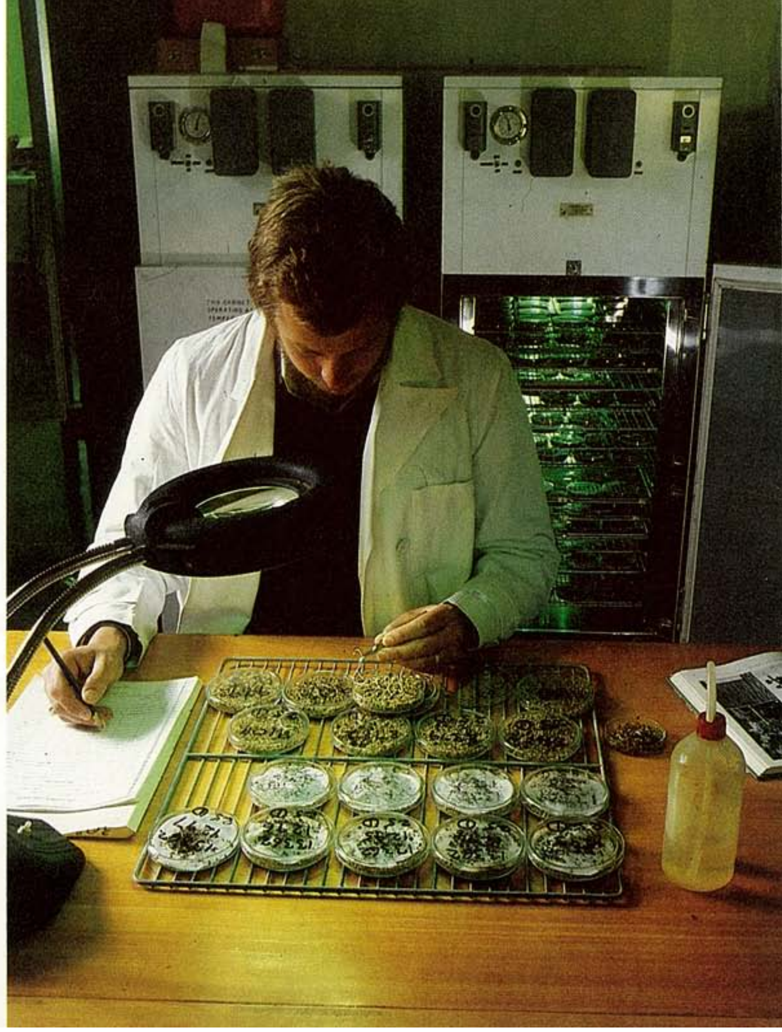
Australian trees make a greener globe

As you read this article, hundreds of hectares of the world's forests are being cut down. In Asia and the Pacific alone, deforestation continues at the alarming rate of 5000 ha a day, according to a joint study by the United Nations Environment Program (UNEP) and the Food and Agriculture Organization (FAO). Most of this forest is cut down in clearing land for agriculture. Where the wood is harvested, some will be used as pulpwood, in other industries, or for sawn-wood products; much will serve a more vital function as fuel-wood for the Third World.

The FAO estimates that more than 1500 million people depend solely on wood for cooking and heating. Already, in some arid and semi-arid tropical areas, a dangerous imbalance between use and supply of fuel-wood exists.

Results of a survey, published in that Organization's journal *Unasylva*, show that, in tropical regions, about 10 ha of natural forest is removed for every hectare planted. Clearly, tree-planting must accelerate rapidly to meet the high and

Not shooting down possums, but bringing down tree branches.

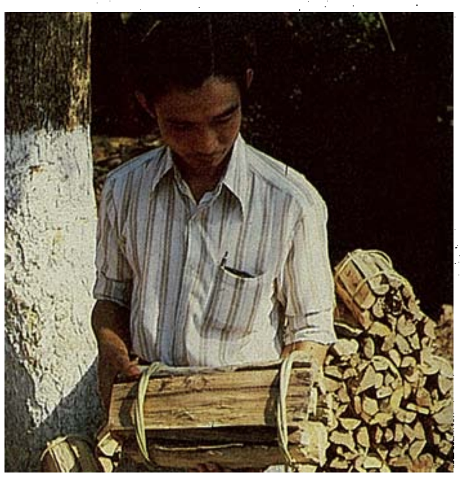


Assessing the germination rate of samples in the Seed Centre's laboratory.

increasing demand for wood. In the tropics, the FAO forecasts an annual planting rate of 1 100 000 ha of industrial plantations and 500 000 ha of non-industrial forests (for fuel-wood, domestic products, and protection) by 1985.

Its surveys indicate that the world urgently needs an extra 50 million ha of non-industrial plantations, mostly for fuel-wood. The equivalent plantation areas required to meet predicted fuel-wood deficits will total more than 100 million ha by the year 2000. China alone will plant 1–2 million ha annually to meet established targets for industrial and domestic wood, and in Brazil continuation of the annual planting rate of about 400 000 ha seems likely.

As the FAO suggests, the Third World must consider not only whether people will find enough food but also whether they will have enough fuel to cook it. For example, in some African countries, it takes villagers up to 7 hours to collect 30 kg of firewood. In Burma, a handful of firewood costs about half a day's wage. In Benin, a full day's wage buys fuel for 3 days' cooking. Where wood is so scarce that cooking becomes a luxury, people are changing their diet, eating less-nutritious and raw foods, and eating less often. Unsterilized food and cooking utensils and unboiled water lead to further health problems.



This bundle of firewood cost a Burmese labourer half a day's wage.

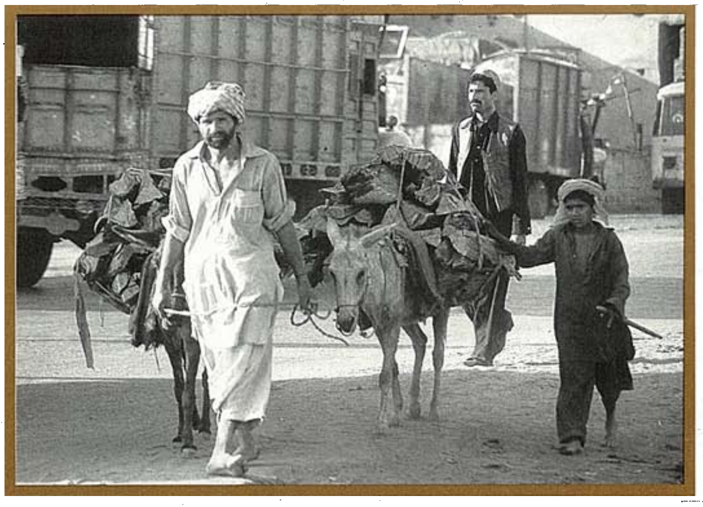
This 32-month-old plantation in Brazil was cloned from stem cuttings of fast-growing eucalypts.

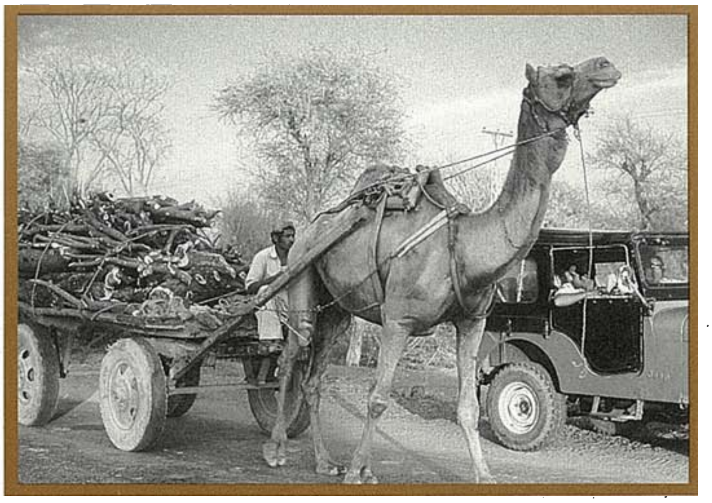
Help from Australia

The solution to the 'poor man's energy crisis' is intelligent reforestation that will provide a ready and sustainable supply of fuel-wood. Australian trees, mainly eucalypts, acacias, and casuarinas, are already providing timber and fuel in many countries on most continents. The species in demand grow quickly, tolerate fire, and thrive in infertile soils where other forest trees will not grow.

Many plantations in tropical and arid parts of the globe began with seed studies and collections carried out at the Tree Seed Centre of the CSIRO Division of Forest Research in Canberra.

Mr John Doran, Mr Stephen Midgley, and the small complement of Seed Centre staff maintain some 302 files on 170 countries that have made inquiries and requests for tree seed, many of them on a continuing basis. The FAO and the Australian Development Assistance Bureau (ADAB) have recognized the importance of the Seed Centre's work in global reforestation and contribute financially to its operation. The CSIRO Centre





for International Research Cooperation (CIRC) and the Australian Centre for International Agricultural Research (ACIAR) further assist the Centre's activities.

Under an agreement with ADAB, the Seed Centre sends Australian tree seeds free of charge to countries of Oceania, south-east Asia, the Indian subcontinent, and some African nations.

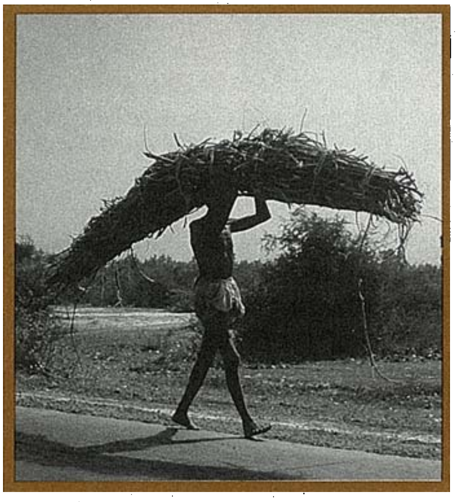
The Centre was established in 1961 when the FAO requested the Australian government to supply eucalypt seed of certified species and geographic origin for research in countries overseas. Other tree species have been included in its collections since 1966; and recently the International Board of Plant Genetic Resources (IBPGR) and UNEP, through FAO, began supporting seed collection of tree species for conservation purposes, with some emphasis on species suitable for agroforestry — the practice of complementing cropping or grazing with tree planting.

Both ADAB and ACIAR have sponsored advisory visits by Mr Doran and Mr Midgley, and Mr John Boland and Dr John Turnbull (also from the Division of Forest Research), to countries included in their aid program. This year, Mr Midgley visited eastern Africa to assess the use and potential of Australian species of forest trees there.

The two assistance agencies have also subsidized publications written by Seed Centre staff. Their latest book, 'More Australian Trees for Farms and Fuelwood' will provide valuable information to countries facing fuel-wood shortages.

More than 1500 million people depend on wood for cooking and heating.

Three ways of carting firewood in India and Pakistan.



It will list 100 woody species that have potential for use in developing countries with a warm climate. This year they have also produced a publication on acacias and one on casuarinas.

Provenance trials

Finding the right tree is an obvious but sometimes underrated preliminary step in any plantation program. The choice of seed depends on knowledge of genetic variation within and between species and on the environment in which it is to be planted. Genetic constitution of seed can have a major effect on tree growth and yield and, within a species, this may vary with the locality (provenance) of its source. Provenance trials carried out in conjunction with the Seed Centre have demonstrated that simply matching the seed source to planting locality and to the planned use of the trees can result in large gains in productivity.

For example, provenance trials using the river red gum (*Eucalyptus camaldulensis*) began soon after the Seed Centre was set up. Scientists planted trial plantations — using seeds from different localities covering much of the tree's natural range — on 32 sites in 14 Mediterranean and tropical countries. The differences in productivity between plantations were impressive.

In Nigeria, seed from tropical localities in Australia (Petford provenance, near the Atherton Tablelands) developed into plantations with 300% more productivity than plantings of southern, winter-rainfall provenances. In Israel, trees from the 'best' provenance from Lake Albacutya in Victoria had eight times the productivity of those of the poorest provenance tested. The latest reports of these trials indicate that the relative productivity has increased even more as the stands mature. In Brazil, the identification of well-adapted populations of eucalypts has led to an immediate improvement of 30–100%.

Every 2 years, the Centre reviews its seed collection program, taking into account advice from the FAO Panel of Experts on Forest Gene Resources. The panel has given priority to the exploration, collection, and conservation of a few select acacias and eucalypts. The biology, distribution, and natural variation of these species are not fully known and further studies, to be carried out as part of the Division's Genetic Resources and Breeding Strategy program, will be necessary to ensure the success of collection and evaluation programs. More work also needs to be done on differences in taxonomy and genetic make-up within each species, followed by systematic sampling throughout the species range, then provenance field trials over a range of potential planting sites.

Eucalypt plantations cover more than 6 million ha of the earth's surface.

Acacias and eucalypts are taxonomically complex and have large geographical ranges. Botanists already recognize a total of more than 1000 species of these two genera in Australia, but are still describing new ones and revising the classification of others.

Collecting and sending out seed

The Seed Centre collects seed for research, so its methods are designed to sample a modest number of trees and leave them intact. Whereas commercial suppliers have to follow logging operations or fell trees in order to get large amounts of seed, the teams from the Centre use high-powered rifles or flexible saws and ropes to bring down seed-laden boughs from sampled trees. The fruits are dried in the field and the seed extracted and taken to the Centre's laboratory for further cleaning and testing.

Most seed-collecting trips have been fruitful and have involved weeks or months of travel over thousands of kilometres, including the deserts of central and Western Australia and swamps in the Northern Territory. Sometimes the trips are a gamble. Nobody knows the seeding cycles of many of the target species and, as a further snag, seeds are often attacked by insects or eaten by birds before the team reaches them. A trip costing thousands of dollars and involving weeks of strenuous field work may produce only a few kilos of seed.

Once the seed reaches the laboratory, samples are tested for germination capacity and the rest is stored. Information about the collection site, the parent tree, the time of collection, and total weight of seed available is stored on computer. The Centre's current inventory covers seed from 700 different Australian tree species.

Last year, the Centre sent approximately 4000 seed lots weighing about 300 kg altogether to 83 countries. More than three-quarters of the output goes overseas, while the remainder is sent to universities, forestry and agricultural institutes, and mining companies for research within Australia. A single seed lot of eucalypt seeds can vary from grams to kilograms, with a kilogram frequently containing more than 500 000 seeds.

The Seed Centre encourages countries to produce their own seed from plantations established using imported seed and to send their own collection missions to Australia for species and provenance experiments. Mr Doran and Mr Midgley have collaborated with visiting teams from France, India, Zimbabwe, and Brazil. In return for assistance with equipment, laboratory facilities, and personnel, the Centre receives a proportion of all seed lots (usually 20%), which it will eventually distribute elsewhere.

In 1973, a collection mission from France's Centre Technique Forestier Tropical spent a year sampling seed from the tropical regions of Australia for use in research programs in Africa and South America. The 1500 seed lots gathered covered a wide range of species, and their donation has assisted planting programs in many tropical countries.

In a similar project begun in 1982, the Zimbabwe Forest Service, supported by ADAB funds, collected tree seed in Australia: two collecting teams sampled the seed of four *Eucalyptus* species over a range of provenances. That country, surprisingly, is the biggest exporter of eucalypt seed to South America, and expects to use this project to increase the productivity of its existing plantations.

One of the Zimbabwean collecting team, Mr Titus Mangezi, explained that eucalypts from an unknown provenance in Australia, introduced via South Africa earlier this century, have now grown into established stands in Zimbabwe. In the present trials team members seek to identify the original provenance of these trees and evaluate other species and provenances, so that they can determine the best-adapted and most productive trees for use in both the arid south and the wetter, eastern industrial areas.

Eucalypts abroad

Eucalypt plantations now cover more than 6 million ha of the earth's surface. Outside Australia, they are relatively pest-free and are capable of high growth rates in infertile soils and with fluctuating moisture supply. Their deep rooting system allows them to tap a large soil volume for water and nutrients. In addition, they shed their branches naturally, leaving a clean trunk.

Perhaps their most prized quality is their ability to coppice — that is, to produce new shoots from the harvested stumps. In this way, eucalypts can yield a continuing supply of poles and fuel-wood at low cost and with minimum expertise. Species that coppice well include rose gum (*E. grandis*), Sydney blue gum (*E. saligna*), Tasmanian blue gum (*E. globulus*), river red gum, forest red gum (*E. tereticornis*), Timor mountain gum (*E. urophylla*), and swamp mahogany (*E. robusta*).

Throughout the world, most eucalypt plantations are managed as coppice crops, with about 85% providing pulpwood for paper industries, fuel-wood, and charcoal, and the remaining 15% being used for sawn timber products. In India, some crops have been coppiced successfully at 10-year intervals for nearly 100 years. (The 'Mysore' gum, so prevalent that it is regarded as a native tree in India, originated

A stand of eucalypts in the Negev Desert, Israel.

A Burmese street lined with Australian river red gums.

from an early introduction of forest red gum from Australia.)

Brazil provides the most successful chapter of the eucalypt's global travel story. The country currently has 2 million ha of eucalypt plantations (mainly rose gum), much of which forms the basis of its lucrative pulp and paper industry. In the iron- and steel-producing areas of central Brazil, where all accessible natural forest has long since been cut, eucalypt plantations supply industrial charcoal for kilns.

In a recent development, the Brazilian government responded to a hydrocarbon-fuel crisis by subsidizing large industrial companies to use charcoal and wood fuel as alternative energy sources. A huge petrochemical complex in Bahia State has begun establishing 75 000 ha of eucalypts for this purpose. Eucalypts are also being used for fuel ethanol production: each hectare of trees yields about 3000 litres annually.

Eucalypts loom large in that country's economy. This year, a Brazilian delegation representing some 18 companies and agencies — including the government's scientific research organization EMBRAPA (Empresa Brazileira de Pesquisa Agropecuaria) — visited the Seed Centre and is sponsoring a year-long collection mission in Australia for new species and provenances.

The Tasmanian blue gum has not quite climbed every mountain, but it can be found on slopes in Ethiopia, southern India, and along the Andes in Peru. The capital of Ethiopia, Addis Ababa, was established around coppice crops of the species. A report by the American National Academy of Sciences has deduced that the city could not exist without this vital supply of fuel-wood and building poles. One of the smallest seed lots to leave the Tree Seed Centre was requested by an Australian priest working in Peru, who planned to use the trees for erosion control and as fuel-wood for local villages.

A weed, in the right place, can be very good indeed.

Eucalypts may be propagated vegetatively, by stem cuttings, or by tissue-culture techniques. These methods are useful for rapid multiplication of well-adapted individual trees; no recombination of genetic material is involved here, as it is in tree breeding. Some of the fuel crops of eucalypts in Brazil are clonal plantations that originated in stem cuttings from fast-growing individual rose gum trees.

Cloning is also used for propagating trees of hybrid derivation where hybrids are better adapted to local conditions than either of the parent trees. In Australia, CSIRO and Alcoa are jointly developing a commercial technique of vegetative propagation by tissue culture (micropropagation) to produce plantations of salt-tolerant river red gum.

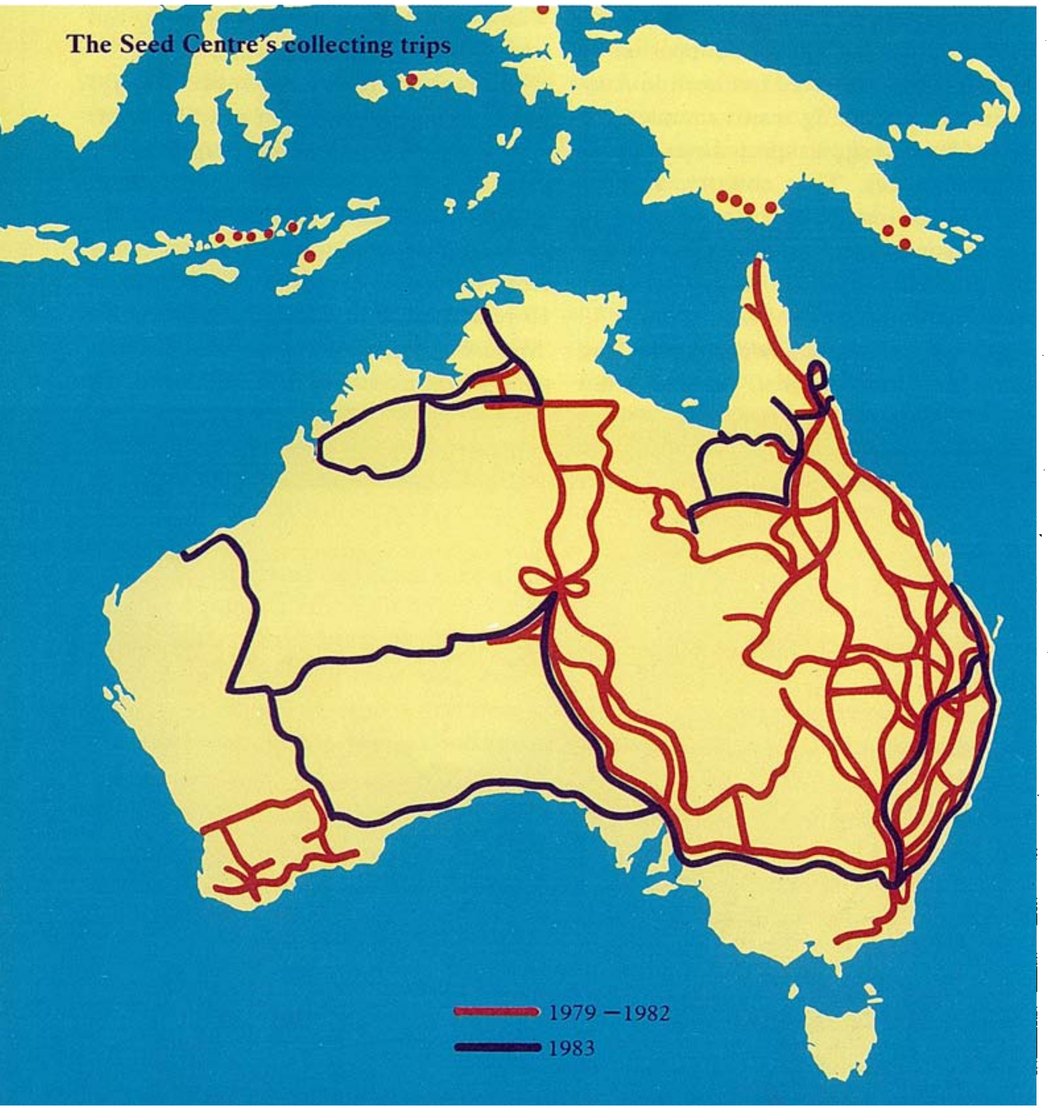
Acacias

In 1969, the FAO Panel of Experts on Forest Gene Resources recommended that the Centre also collect seed of non-eucalypt genera, particularly *Acacia*, *Araucaria*, and *Casuarina*, for provenance research. *Acacia* spp., or wattles, range over an even greater area of Australia than eucalypts and extend into the sub-arid inland areas where species such as mulga (*A. aneura*) provide fodder, shade, and shelter for stock as well as rough timber and fuel. They are recognized as the world's toughest and most useful trees for semi-arid and arid regions.

Acacias are important pioneers in reforestation. They fix nitrogen and adapt easily to poor sites, preparing the ground for other species. Their ability to survive long periods of drought makes them the 'camel of the plant kingdom'. In the Middle East and Africa, especially the arid areas on the edge of the Sahara that must withstand a lot of gazing pressure, they are providing stability to the soil, fuel-wood, and fodder for stock.

Their dense wood burns efficiently, they yield sturdy timber for simple construction, and many provide high-protein fodder. Some even have seeds that can be roasted and eaten like peas when green; and the world's supply of gum arabic comes from African acacias. In South Africa, an extensive tannin industry has developed around the species *A. mearnsii* and has led to the establishment of the country's own Wattle Research Institute.

Seed from a single *A. mangium* tree near Mission Beach, Qld, formed the source of the extensive acacia plantations of Sabah, Malaysia. When it was first introduced in 1967, this species was intended to provide firebreaks for plantations of caribbean pines but it proved to be more successful than the pine, growing rapidly to heights of 30 m (98 ft).



The map shows the routes taken during the Seed Centre's main collecting missions in Australia over the period 1979–83.

These kilns in Brazil produce charcoal from eucalypts for use in steel mills.

Triffid-like eucalypt trees in India. They have been stripped for oil.

Grevilleas shade a tea plantation in India.

What gave *A. mangium* its edge over *Pinus caribaea*? Apart from its fast growth, it coppices vigorously, produces early heavy seed crops, and yields timber suitable for a wide range of products including pulp and building materials. Most importantly, it can compete with the notorious *Imperata* grass, which has rendered hundreds of thousands of hectares in the tropics useless. Once-sterile areas of the Philippines, Indonesia, Malaysia, Laos, and Vietnam are now being 'opened up' by *A. mangium*, whose shade prevents the grass from regenerating.

An ADAB-sponsored visit to Sabah in 1981 convinced Dr Turnbull of the need for further collection and testing of seeds from a variety of sources before too large an area of plantation of this species is established from the present extremely limited genetic base. Nevertheless, *A. mangium* has earned a reputation as a colonizer that has brought a flood of requests for seed from places like Costa Rica, the Congo, and the Philippines, with a high rainfall and short, dry winters. Co-operation between CSIRO, FAO, and individual research organizations will result in *A. mangium* provenance trials being established in 21 countries on 77 sites in 1983/84.

The demand for information about *A. mangium* has led to the publication of a book on the species by the United States National Academy of Sciences. And the Tree Seed Centre is carrying out further seed-collecting missions in Australia's tropical regions. From 1980 to 1982 the CSIRO Division of Forest Research, the Papua New Guinean Office of Forests, and the Indonesian Directorate of Forestry, in joint missions, collected seed from provenances throughout the species' range.

Sometimes, the acacia's success in colonizing transgresses the narrow line separating high adaptability from weediness. Then, like all weeds, it becomes a nuisance. Certain species are prohibited imports in South Africa.

Weediness is also a problem associated with the introduction of other hardy trees such as casuarinas, melaleucas, and hakeas. Chemical warfare has been declared on casuarinas running rampant in the Florida Everglades, and South Africa is initiating research into insect control of introduced trees.

Other non-eucalypts

If a weed is 'a good species in the wrong place', when it is in the right place it can be very good indeed. Casuarinas, or she-oaks, make excellent agroforestry trees. They are used as fuel-wood and for their abilities to bind sand and to withstand saline subsoil and strong winds. Like acacias, they fix nitrogen and adapt well to poor sites.

As fuel, they burn extremely well, reducing to a fine white ash and producing a lot of heat in the process. Their pine-needle-type leaves are the basis of their wind resistance and this, coupled with their salt tolerance, makes them successful colonizers of desert and coastal sand dune areas.

The casuarina's value in forming 'shelter belts' is epitomized by China's other great wall — the 3000 km of casuarinas that protect coastal villages of southern China from the battering winds and waves of the South China Sea. According to Dr Turnbull, before the planting of these trees, centuries of exploitation of local forests had resulted in soil erosion, frequent flooding, and the formation of shifting dunes — a no-man's land.

In 1954, the first seeds of more than 1 million ha of casuarina plantations were sown into the dunescape. Almost 30 years later, life for the people living in the shadow of the shelter belt has changed completely.

In one commune alone, rice production has increased from 1100 to 7100 kg per hectare per year. Wind force has been reduced, the dunes are stabilized, the sand-covered arable land has been rehabilitated, fuel and other timber is available, and a cash income flows from brick-making and fuel-wood sales (15 000 tonnes of fuel are produced annually). An unexpected consequence of the project has been the virtual disappearance of the once-common eye disorders associated with the blowing sand.

Casuarinas have proved themselves in many other parts of the world. They are widely planted in Argentina, and the Seed Centre is receiving requests for supplies

They call it *Eucalyptus proliferatus*

'Galloping globe-trotting gums' they may be, but most species of the large genus *Eucalyptus* originated in Australia. A few species are native to Papua New Guinea, to the islands of eastern Indonesia, and to Mundaroo in the Philippines. First described by the French botanist L'Héritier in 1788, the genus contains more than 500 species, with more waiting to be discovered. The eight 'subgenera' within it contain species capable of hybridizing with one another but not with species from another subgenus. In fact, one of its distinguishing characteristics is that many of its members can form natural hybrids with closely related species.

Between the latitudes 45°N and 45°S, eucalypts thrive as exotics in more than 60 countries. They make up about 40% of all current plantings in the tropics. In Australia, their natural range includes the wet tropics of northern Queensland, the arid interior of Western Australia, and the cold mountainous regions of the south-east, and they are planted in corresponding environments in other countries. Tasmanian blue gum, flooded or rose gum, and river red gum are the most widespread. In places like Spain, Portugal, Algeria, India, and California, local people often believe them to be native trees.

The eucalypt's ability to grow quickly and coppice are the main reasons for its popularity as a plantation crop. In the right conditions, trees will grow 4–5 metres a year and can be harvested in 6–7 years.

In Australia, we have been depending on 'wild' populations of eucalypts for timber and pulpwood, but in future we will have an increasing need to grow plantations, and hence an opportunity to use genetically improved varieties. Scientists in the Genetic Resources and Breeding Strategy group at the Division of Forest Research are studying the genetic variation, breeding systems, and flowering biology of commercially important species so that they can develop efficient breeding programs.

In one of these studies Dr Rod Griffin examined the growth rates and frost-hardiness of 49 mountain ash (*Eucalyptus regnans*) provenances in trials in Victoria and Tasmania. Mountain ash is the second-tallest forest tree species in the world — after the Californian redwood — and is used for sawn-timber products and pulpwood. In addition to regeneration of natural stands, several hundred hectares of this species are now planted each year in south-eastern Australia.

Dr Griffin's experiments showed that trees grown from seeds collected at high altitudes in Victoria grew more slowly than those seedlings from lower elevations in that State's Strzelecki Ranges and Central Highlands. The most frost-hardy provenances were high-elevation sites in the latter regions and inland locations in Tasmania.

Among his most significant findings, he identified the provenances that produced trees with above-average performance for both growth and frost-hardiness. These trees, from a site in south-central Tasmania, will be used as a base population for breeding improved stock.

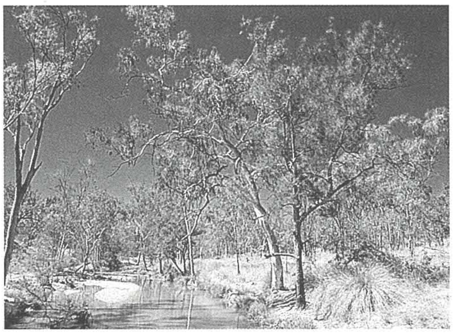
Forestry is following in the footsteps of agriculture; man is now selectively breeding and domesticating wild tree populations using techniques similar to those employed with crop and pasture plants. One of these techniques, selective breeding, was the basis of Dr Griffin's mountain ash experiments. Others include vegetative propagation to multiply selected individuals, production of new strains by controlled crosses within species, and hybridization between species.

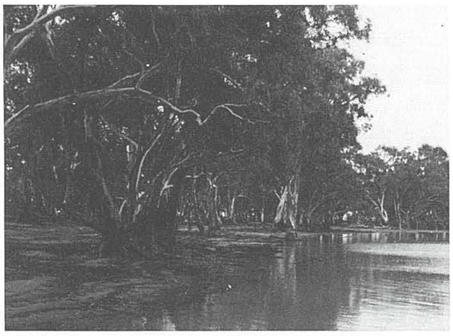
Among their breeding problems, eucalypts have longer generation times than maize or wheat and it is difficult to control cross-pollination to produce large quantities of hybrid seed. Hybridization usually produces a spectrum of types ranging from one parent to the other, and the breeder cannot predict or control the number of individuals of any one type in the offspring.

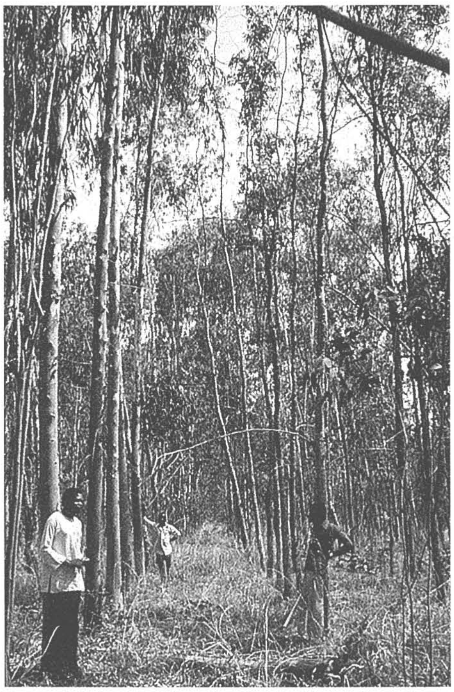
The conventional way of capitalizing on the benefits of tree breeding programs is to establish seed-producing orchards of selected trees. However, interspecific hybrids cannot be propagated in this way; cloning such individuals has provided a solution in the Congo. This method of reproduction has also been adopted in

from other South American countries. In Africa, the trees have been used to stabilize the edges of canals in Egypt for many years, and their combined agroforestry and fuel-wood applications make them excellent for projects in areas like Senegal and Zimbabwe. They are so highly prized in some parts of India that trees from seed sown at the birth of a baby girl provide a dowry for her marriage later in life.

Melaleuca and grevillea seeds are being collected for use in trials in countries requesting new fuel-wood species. *Grevillea robusta* is used as a shade crop tree for tea and coffee plantations and is a common







In a provenance trial in Nigeria, river red gum seeds from the Petford region (top) near the Atherton Tablelands, Qld, were sown next to seeds from Lake Albacutya in Victoria. The picture on the right illustrates the higher productivity of the tropical seedlings (left).

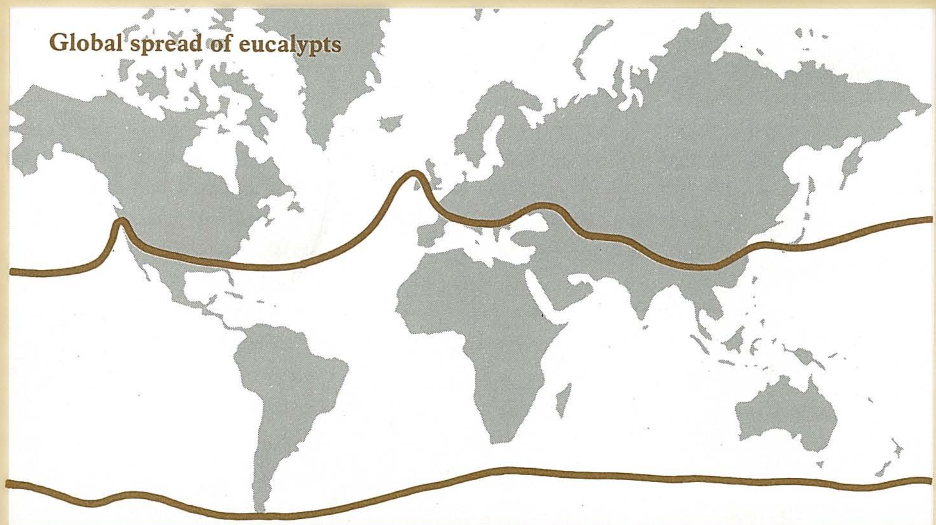
Brazil on a large scale to capture maximum benefits from selection within rose gum. Stem sections are treated with hormones that initiate root development, and the rooted cuttings eventually form plantations reaching heights of up to 20 m in 28 months.

In Australia, the CSIRO Division of Forest Research and the mining company Alcoa are jointly developing another method of vegetative propagation called micropropagation. It involves taking young buds from seedlings or coppice outgrowths and growing them in sterilized vials containing a special nutrient jelly. These young plants are then 'hardened' in a greenhouse for 2–3 weeks and finally planted out.

This method has several advantages over taking stem cuttings: it requires only a small amount of space, the multiplication rate of plants is doubled, and the use of sterilized containers means that pests and diseases are excluded. Using the micropropagation vials, 100 cloned plants occupy only 1 sq. m of laboratory space.

The micropropagation experiments began with studies on how to propagate salt-tolerant river red gum trees. Eventually such trees may be used to reclaim salinized agricultural land here and elsewhere. Israel has already begun trials using clonal material.

Vegetative propagation enables scientists to exploit hybrid vigour and to take full advantage of selection. Very large gains in wood volume — up to 100% increases over routine planting stock — have been observed in plantations of hybrid eucalypts in different countries; cold-tolerant hybrids have been vegetatively propagated in Florida, U.S.A., and France. A potential problem with such cloning is that plantations may become genetically uniform as trees with traits such as salt tolerance, straight trunks, etc., are selectively propagated.



The lines mark the limits to the zone in which eucalypts have been successfully cultivated.

Who knows which species will assume importance in the future? Where trees were once sought for their straight, clean boles or their wood quality, they now need to grow quickly, burn well, withstand saline or windy conditions, or perhaps be unpalatable to browsing stock. To provide breeding resources for the future, we need not genetic uniformity but genetic variability.

Gene 'banks' for long-term storage of seed or pollen offer the only means of conserving many agricultural crops, but for eucalypts *in situ* conservation of selected natural stands is still possible. However, as forests are cleared and used for agriculture or replanted with trees of unspecified provenance, this opportunity will be lost forever. Already 111 species of eucalypts have been classified as endangered in Australia, most of these having a restricted distribution.

As custodian of the internationally important genetic resource of the genus *Eucalyptus*, Australia has an obligation to ensure its conservation. An important aim of scientists at the Division of Forest Research is to obtain the knowledge necessary for prescribing effective ways of carrying out this responsibility.

sight in city streets in south-eastern Asia and India.

'Mere scattering of seeds . . .'

In a world clamouring for more fuel, 'high tech' solutions to the problem become the yardstick for development in the western industrialized world. Yet for a large proportion of humanity, fuel-wood is providing an answer to the energy crisis. Organizations providing aid to Third World countries are concentrating on offering integrated programs that include reforestation, efficient stove design, and small combustion and gasification systems. The Tree Seed Centre and similar units elsewhere provide the raw research material for these programs.

A century before the Centre began sending seeds from Australian trees to help revive the world's wasting acres, Baron Sir Ferdinand ('Bluegum') von Mueller wrote '. . . in Australian vegetation we probably possess the means of obliterating the rainless zones of the globe, to spread at last woods over deserts . . . How much lasting good could not be effected, then, by mere scattering of seeds of our drought-resisting acacias and eucalypts and casuarinas . . . Even the rugged escarpments of the desolate ranges of Tunis, Algiers and Morocco might become wooded: even the Sahara itself . . .' A hundred years later, his dream is, at least partly, realized.

Mary Lou Considine

More about the topic

Tree seed supply — a critical factor for the success of agroforestry projects. J.W. Turnbull. *Proceedings of a Workshop on International Cooperation in the Supply of Germplasm of Multipurpose Trees, Washington D.C., May–June 1983*, 1983.

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Better use of the gene resources of some Australian forest trees. J.W. Turnbull, D.G. Nikles, and A.G. Brown. *Paper to 11th Commonwealth Forestry Conference, Trinidad, 1980*.

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