





AUSTRALIA'S Golden Future



Australia has more than 950 species of *Acacia*, offering a vast and largely untapped resource with substantial scope for economic, environmental and social uses. The largest genus of woody plants in the country, acacias occupy most habitats from the tropical north to the subalpine and temperate regions of the south, and are the dominant feature of many Australian desert landscapes.

By Bruce Maslin

More than half of Australia's *Acacia* flora is found in Western Australia, with the semi-arid Wheatbelt region being the most species-rich area. This region is currently experiencing serious environmental and economic problems caused, primarily, by increasing salinity due to excess groundwater accumulation. One of the strategies for addressing this problem, as identified in the State government's recently released Western Australian Salinity Action Plan, is the planting of an additional three million hectares of trees and shrubs within salt-affected regions.

Acacia offers great scope for revegetation of degraded and marginal farmlands in southern Australia, especially in the wheatbelt regions of south-western and south-eastern Australia and in the Murray-Darling Basin. *Acacia* is a significant natural component of this ancient landscape, renowned for its high biodiversity. *Acacia* species can be planted to stabilise soil and control salinity. The species can also be incorporated into mixed revegetation programs, and the establishment of conservation corridors, visual screens, windbreaks and shelterbelts. Acacias also fix atmospheric nitrogen in the soil, thereby raising its nutrient levels.

Soil salinisation in the Wheatbelt is perhaps the most urgent environmental challenge facing the WA community, and acacias are well placed to contribute



solutions to this problem. The selection of suitable species for strategic planting can lead to some control of rising water tables (the prime cause of increasing salinity). Benefits can also be derived by using species that have the potential for producing commercial products such as timber, wood fibre or seed for human consumption (see below). With appropriate species selection, land owners in the Wheatbelt can meet the dual goals of increased on-farm income and improvement of degraded lands.

HUMAN FOOD

Acacia seed as a source of human food has been a subject of increasing interest and research in recent years.

Studies have shown that the overall nutritional status of certain Australian arid-zone *Acacia* seeds is typically high in protein, fat and carbohydrate. In fact, some species are poised to become an important new human food in semi-arid regions of sub-Saharan Africa. Here, arid region Australian species such as *Acacia cowleana*, *A. thomsonii*, *A. tumida* and, in particular, *A. colei*, are showing great promise. These were introduced originally for multi-purpose uses, especially for fuel wood and windbreaks. Research has revealed that these species are easily established, excellent survivors and produce heavy seed crops within two years of planting. Furthermore, their seeds contain low levels, if any, of toxic or anti-nutritional compounds and are easily collected, stored and processed using local technologies. In Maradi, Niger, the seed of *A. colei* is ground into flour and included in traditional recipes to make a range of palatable foods.

Within Australia, wattle seed is presently used in small amounts in the developing bushfood industry, and is collected primarily from the wild. Flour from *Acacia* seed is said to impart a "nutty flavour to damper and bread, savoury sauces, curries, porridge and ice-cream and the seed can be used as a coffee substitute". *Acacia victoriae*, a widespread arid-zone plant, is the most commonly used species at present. Research being undertaken jointly by CALM and the CSIRO's Australian Tree Seed Centre is exploring other possible species that might be suitable for commercial planting in the semi-arid areas of southern Australia, including the Wheatbelt region of Western Australia. This study reveals that a large number of the most promising species



Previous page

Main: Golden Wattle. An extensively used south-western WA species.

Inset: The minniritchi *Acacia cyperophylla* var. *cyperophylla*, is an attractive species with scope for ornamental plantings, particularly in dry inland areas.

Above: *Acacia nyssophylla*. The prickly, densely entangled branches offer excellent protection for small animals.

Left: Northern Wheatbelt farmland in Western Australia, showing a creek becoming saline after clearing.

Photo – Jiri Lochman

are restricted to Western Australia. While the current domestic market for *Acacia* seed is worth less than \$1 million per annum, it is expected to grow over the next few years, especially as the recently created Australian Native Bushfood Industry Committee identified *Acacia* as a core group for future development. At present, the viability of an export market for *Acacia* seed, although a possibility, is still highly speculative.

There are indications that seeds from some semi-arid acacias may find a niche market as a human food. However, considerable research, including market research and development, is needed if these species are to be developed as widely planted commercial crops for human consumption. Of particular relevance is the need for biochemical analyses to ensure seeds do not contain toxic or anti-nutritional compounds, and research demonstrating that the species will not become environmental weeds. There is also a need for better information on the biological, nutritional and silvicultural characteristics of the most promising species.

TRADITIONAL KNOWLEDGE

It is important to acknowledge that much of what we know concerning the suitability of *Acacia* as a human food is based on Australian Aboriginal uses. About 50 arid-zone species of *Acacia* are known to have been a seasonal component of traditional Aboriginal diets. The common method of preparation was to roast the mature seeds, grind them into flour with a little water and cook the resultant paste as a damper. Cooking denatures certain toxic compounds known to occur in some raw seed. In a few cases the green seeds and



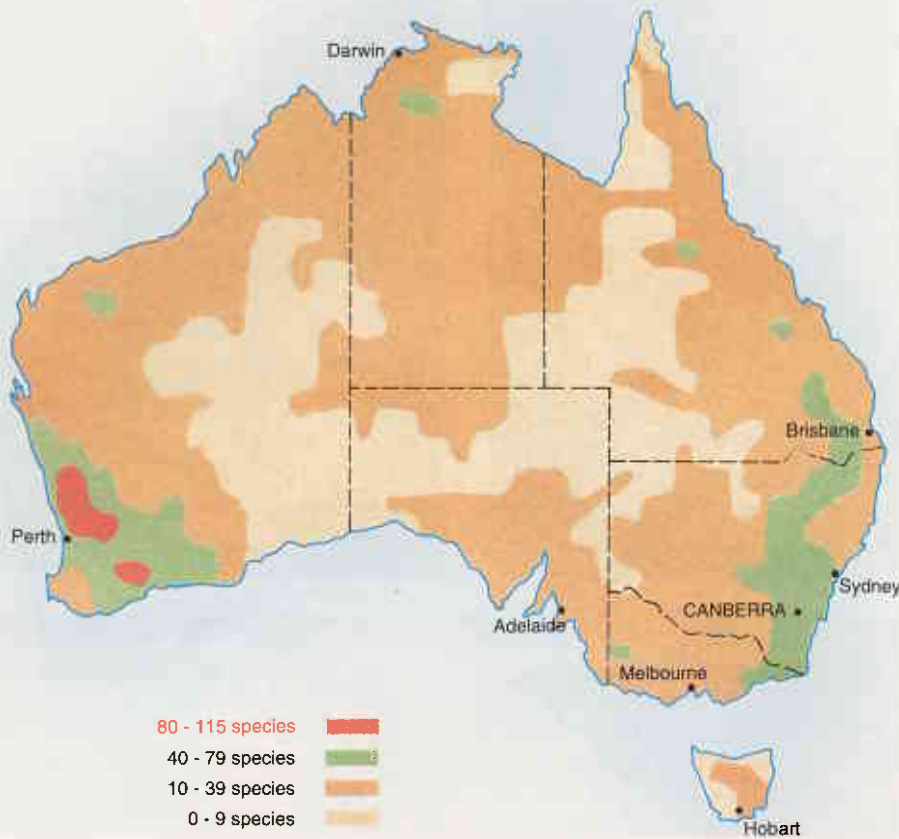
Top left: Kalkardi (*Acacia elacantha*) and its close relatives produce large quantities of highly nutritious seeds.

Top right: *Acacia coriacea* subsp. *pendens* is confined to the Pilbara region. The seeds were once consumed by traditional Aboriginal people.

Centre right: Women from the Utopia community (NT) use traditional method to grind *Acacia* seed.

Right: Vanilla-scented wattle (*Acacia redolens*), confined to the south-west of WA.

Photo - Penny Hussey



NUMBERS OF SPECIES OF ACACIA RECORDED FOR STATES AND TERRITORIES OF AUSTRALIA.

State	Number of species
Western Australia	560
Queensland	262
New South Wales	219
Northern Territory	168
South Australia	118
Victoria	99
Aust. Capital Territory	22
Tasmania	19



Pods were eaten raw, sometimes as a sort of snack food, as in the case of *A. craspedocarpa*. There are mutual benefits to be obtained from the continued involvement of Aborigines in the developing 'bush tucker' industry. Aboriginal communities are important suppliers of *Acacia* seeds and are participating in field trials aimed at assessing the most promising arid-zone acacias for human food.

STRENGTH IN DIVERSITY

Acacia species have many characteristics that make them well suited to multipurpose uses. In general, they are easy to germinate and propagate, have good survival rates and exhibit early rapid growth. However, it is the great diversity in growth form, ecological tolerances and biological characteristics that impart to *Acacia* a wide range of possibilities for conservation and economic uses (see Box). Some eastern Australian species such as northern black wattle (*A. auriculiformis*), brown salwood (*A. mangium*) and blackwood (*A. melanoxylon*) are tall forest trees that may reach 35 metres or more in height. These plants are important in the Australian and/or Asian regions as sources of plantation-grown sawn timber and pulpwood. Western Australia has no native tree species suitable for these purposes, but some of its tall shrub and small tree species may assume importance as the community's attention moves towards wood-composite products to complement solid wood products.

Intermediate-sized plants such as jam (*A. acuminata*) and manna wattle (*A. microbotrya*) are currently being

Top left: Map shows areas of species-richness for *Acacia*. The richest areas are the WA Wheatbelt and the Great Divide in eastern Australia, while secondary centres occur on the rocky tablelands of northern and central Australia.

Above left: Western myall (*Acacia papyrocarpa*) is suitable for the manufacture of ornamental pieces and musical instrument parts (see *LANDSCOPE* Spring 1995).

Left: Mulga (*Acacia aneura*) with pink velleia (*Velleia rosea*) ground cover. Mulga is palatable, abundant and widespread in arid regions.

used successfully in a revegetation program in the northern Wheatbelt. Others such as the densely foliated Kimberly's wattle (*A. anthochaera*) and Prain's wattle (*A. prainii*) make excellent windbreaks. In rangeland areas, species such as mulga (*A. aneura*) are important in minesite rehabilitation programs. *A. pulviniformis* and *A. erinacea*, which are commonly low, ground-hugging plants only a few centimetres high, may well have potential for rockery plantings. Plant forms can have important implications to conservation. For example, kurara (*A. tetragonophylla*) and *A. mackeyana* have prickly foliage and a dense or entangled branching system, offering excellent protection from foxes and feral cats for native birds and small marsupials.

The ability of *Acacia* species to grow on a great variety of soil types makes them particularly attractive for incorporation into revegetation programs, with some species, such as *A. ampliceps* and *A. inceana* subsp. *conformis*, being highly salt tolerant.

UNLOCKING THE SECRETS

The key to effective conservation and sustainable use of *Acacia* is understanding the genus' biology, ecology, silviculture and taxonomy. It is also important to develop appropriate systems that enable this information to be assessed and communicated so that the value of the various species is fully realised. Scientific programs within CALM and other agencies are aiming to do just this. CALM's computer-based information system called 'Wattle', currently under construction, is one example. Wattle can be thought of as an electronic encyclopaedia that will elegantly deliver information essential for effective conservation and landcare programs and facilitate sustainable, multipurpose use of *Acacia*. Applying this new technology to specific landcare situations in the northern Wheatbelt of WA will occur in 1997. Wattle provides a powerful multi-access key enabling species to be quickly and accurately identified, and grouped according to the user's needs. For example, one can list all multi-stemmed species suitable for revegetating sub-saline sites as well as providing effective wind breaks. This sort of power, functionality and utility has not

USES FOR AUSTRALIAN ACACIAS

(Apart from the environmental and human food uses outlined in the main text, the following list includes uses both within Australia and abroad; only selected representative species are given for each use.)

WOOD PRODUCTS

Sawn timber. *Acacia auriculiformis*, *A. crassicarpa*, *A. mangium* (these tropical acacias are very important plantation species in Asia).

Furniture (solid wood and veneers). *Acacia aulacocarpa*, *A. melanoxylon* (the best known, high quality Australian timber species), *A. salicina*.

Pulp. *Acacia aulacocarpa*, *A. crassicarpa*, *A. mearnsii* and *A. mangium* (plantation grown for pulp production).

Reconstituted wood products. *Acacia mangium*, *A. mearnsii* (the potential of *Acacia* for this purpose has not yet been fully assessed).

Fuel wood & charcoal. *Acacia coleii*, *A. stenophylla* (many acacias are excellent for these purposes).

Posts and small poles. *Acacia acuminata*, *A. aneura*, *A. dealbata* (many species have hard, durable wood).

Tool handles. *Acacia falciformis*, *A. silvestris*.

Musical instruments. *Acacia papyrocarpa* (see LANDSCOPE, Spring 1995).

Craftwood/Turnery. *Acacia acuminata*, *A. aneura*, *A. implexa*, *A. papyrocarpa* (many acacias are excellent for these purposes).

BARK PRODUCTS

Tannin. *Acacia mearnsii*, *A. pycnantha* (used mainly in the production of leather products; Australia imports most of its tannin requirement, about \$6.5 million per annum).

Adhesives. *Acacia falciformis*, *A. mearnsii*, *A. parramattensis* (Wattle tannin adhesives can produce the highest quality bonding, used in reconstituted wood products).

Anticorrosive agent. *Acacia mearnsii* (recent UK technology shows some promise for future development).

GUMS

Gum arabic (from *A. senegal*) is an important food additive and industrial emulsifier; Australia imports approximately A\$1.5 million of gum arabic annually. The gums of certain Australian acacias have excellent properties but are not produced naturally in commercially viable quantities.

FODDER

Acacias generally have low fodder value but some species, especially *A. aneura*, are nevertheless important drought feed in arid rangeland areas. In some semi-arid regions *A. saligna* is used as a forage plant, despite its low digestibility.

USES BY ABORIGINAL PEOPLE

Apart from seed for food, Australian Aborigines used most of the other parts of *Acacia*. They used the leaves, twigs and bark mostly for medicinal purposes, while the wood was used for fuel, a variety of tools (spears, clubs, etc.) and artefacts. Its ash was mixed with the leaves and twigs of pituri (*Duboisia hopwoodii*) to make a chewing 'tobacco'. A variety of insect infestations was a food source, (witchetty grubs in the roots of *A. kempeana*, for example)

HORTICULTURE/FLORICULTURE

Having great variation in growth form, foliage, bark, flowers and pods, *Acacia* offers much scope for horticultural and floricultural uses. *Acacia baileyana*, *A. dealbata*, *A. podalyriifolia* are popular in Europe as cut flowers. *Acacia redolens* is used in median strip plantings in California and *A. auriculiformis* is widely used as a street tree in Asia.



MISCELLANEOUS

Pollen. *Acacia baileyana*, *A. dealbata*, *A. silvestris* (honey production).

Essential oils. *Acacia dealbata*, *A. farnesiana*.

Kimberly's wattle (*Acacia anthochaera*). Many Australian wattles have showy sprays of golden flowers, much sought after by the flora industry.

WHY WATTLE?

Following is an adaptation of an extract from the Agricultural Gazette of New South Wales, dated October 1898, *A Chat About Wattles* by J H Maiden:

The word wattle is one which we in Australia have peculiarly adopted as our own, and this is how it has come about. It dates from Anglo-Saxon times, and signifies twigs, saplings or flexible rods plaited or interwoven together. The word has survived (chiefly in provincial dialects), to modern days, and when the early settlers of this Colony found it convenient to construct the framework of the walls of their dwellings and other buildings of twigs and split saplings, the operation was called 'Wattling,' and the material used 'Wattle'. Near Sydney Cove there grew in abundance, overhanging the water-courses, a small tree with thin, flexible stems, which was frequently used for the purpose, and first called 'Wattle or 'Black Wattle'. It is known to botanists as *Callicoma* (from the Greek *kalos*, beautiful, and *koma*, hair, in allusion to the appearance of the heads of flowers) and has cream-coloured flowers, in globular heads. Subsequently, other plants, which we now call *Acacia*, were used for the purpose, and these are recognised as 'Wattles' in most parts of this continent, whether their stems and twigs are used for wattling or not, while the name, as applied to *Callicoma*, has almost fallen into disuse, except amongst a few old-fashioned people. The term wattle, however, is by no means universally applied to plants of the genus *Acacia*, particularly in the far western parts of Australia. Myall, boree, mulga, brigalow, cooba, dead-finish, gilgee, hickory, miljee, umbrella-bush, wait-a-while, and yarran, amongst others, are all members of the great wattle family.



***Acacia pulviniformis*.** One of Australia's smallest wattles, it has spiny branchlets and forms dense mats not above 20 cm tall. Suitable as a ground cover or in rockeries. Confined to the south-western Wheatbelt of WA.



been previously available for this important genus of Australian plants.

Although many Australian acacias are currently under trial, or are being used for a variety of purposes abroad, within this country the genus is relatively under-used. This article shows some of the ways, both actual and potential, that *Acacia* species can be incorporated into conservation strategies, landscape improvement programs and commercial activities. However, more research is required, with emphasis on the need to assemble and disseminate the crucial biological, ecological, silvicultural and genetic information that underpins conservation and agro-forestry work. Even though the *Flora of Australia* treatment of *Acacia* has been completed, there remains between 50 and 100 species undescribed (a majority of these 'new species' occur in

Western Australia). Weed research is also essential if wide-scale planting of *Acacia* is to occur.

The challenge now is to build on our excellent research base to produce outcomes relevant to current environmental and social needs. *Acacia*, the single largest group of woody plants in Australia, has much to offer in this regard.

Top: Golden wreath wattle (*Acacia saligna*), fast-growing and hardy, it is used for coastal dune stabilisation, salinity control, mine site rehabilitation, low windbreaks, stock fodder, firewood and ornamental pieces.

Centre: Weeping mulga (*Acacia paraneura*). This species was only recently formally distinguished from the highly variable mulga *Acacia aneura*.

Above: Prain's wattle (*Acacia prainii*).

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Photos by Bruce Maslin unless otherwise indicated.

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Aquatic bugs are helping scientists to determine the health of WA's waterways. See *Spineless Indicators* on page 49.



CALM's new Marine Conservation Branch gets in deep (page 10) to play its vital role in safeguarding the health of WA's unique marine environment.



Called 'Karlamilyi' by desert Aborigines, Rudall River National Park (page 28) is steeped in history and bristling with wildlife.



The economic, social and conservation potential of Acacia in WA, a story of a golden future on page 16.



Fancy a walk? Join us while we look at the environment, history and building of a new Bibbulmun Track. See page 36.

FEATURES

OCEANS OF WEALTH
CHRIS SIMPSON, NICK D'ADAMO AND CAROLYN THOMSON.....10

AUSTRALIA'S GOLDEN FUTURE
BRUCE MASLIN.....16

PARK FOR THE PEOPLE
CARIS BAILEY.....23

RUDALL RIVER NATIONAL PARK
DAVID GOUGH.....28

BUILDING A BETTER BIBBULMUN TRACK
JESSE BRAMPTON.....36

MOUND BUILDERS OF THE PILBARA
STUART ANSTEE, TONY START AND KEITH MORRIS.....42

SPINELESS INDICATORS
MIKE SMITH, WINSTON KAY, ADRIAN PINDER AND STUART HALSE.....49

REGULARS

IN PERSPECTIVE.....4

BUSH TELEGRAPH.....6

ENDANGERED THE NIGHT PARROT.....27

URBAN ANTICS.....54

COVER

The tiny pebble-mound mouse of the Pilbara (see story on page 42) is a tireless night-worker and the architect of many odd, red gravelly mounds, which look like miniature volcanoes among spinifex.

Illustration by Philippa Nikulinsky



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