

The Macadamia Story – an Overview



Harvesting nuts from wild Macadamia trees in the Gold Coast hinterland that were left when the property was originally cleared in the 19th century.



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Introduction

You may be interested in learning more about the Macadamia and why it is so important to conserve them in their native habitat. This booklet has been written to provide an overview of Macadamias, their history, use by humans, the threats they face to their survival and what we need to do to ensure their conservation for future generations. It is hoped that the information we provide will give you a greater depth of understanding of Macadamias and their rainforest habitat.

The Macadamia is native only to our region of Australia and is our only native plant to have become an internationally known and grown food at a large scale. Sometimes called 'Australia's Gift to the World' Macadamias are very much part of our heritage and history, however the remaining trees in the wild are slowly being lost and are very much under threat.

Back in the mists of history as Australia was separating from the mega-continent of Gondwana, a flowering plant evolved which was part of the Proteaceae Family. Pollen is extremely long lived and fossilised pollen of a plant that we recognise as an ancestor of Macadamia has been found in central Queensland and dated to

about 50 million years. At that time much of eastern Australia was covered in rainforest and Macadamias existed up much of its east coast. Massive climate changes resulted in the rain forest retreating and Macadamias came close to extinction. Isolation and other pressures resulted in Macadamias separating into the four species we recognise today. Probably since the end of the last ice age 10,000 years ago, Macadamias have only existed in isolated pockets in or at the fringe of rainforests, generally near the first inland ranges from the Pacific Ocean. They are recorded from current day Lismore in the Northern Rivers to Mt Bauple north of Gympie, with the endangered *Macadamia jansonii* only found in one location 300 km further north. Macadamias have a limited capacity for dispersal in the wild and their ability to expand their habitat is restricted.

Aboriginal people and Macadamia

Aboriginal people came to Australia and to Macadamia country possibly 40,000 years ago and they lived as hunter gatherers. There is no doubt that Macadamias were a treasured but minor food for them which they have known and understood for perhaps a thousand generations. Within the rainforest, absence of light and competition mean that Macadamia trees do not

produce many flowers or fruit and it was mainly the trees at the fringes of the rainforest that were regularly cropped by them. Insect pests caused many flower, nutlets or nuts to be lost and native animals, particularly rats, ate them from the ground.



Aboriginal woman
cracking Macadamia nuts

The Aborigines would have known almost all of these trees and it was mainly the women who searched for, collected the nuts and prepared them. They may have burnt around some trees to reduce competition and make the nuts easier to collect. They removed the husk and cracked the nuts between rocks.

They sometimes used a very efficient cracker using a rock with a depression in it to hold the nut placing a flat rock over the nut and striking the rock with a rock hammer. Some of the Aboriginal names for the nut were Kendal [more correctly something like gyndnl] Goomburra and Boomberra.

They presumably roasted the nut in the ash of their fires and carried them as a non-perishable food source and

as a trading commodity with other Aboriginal groups. They showed the tree and nuts to the explorers and botanists. In early contact with European settlers Macadamias were a major item of trade in exchange for tobacco, tommy axes and rum.

European settlers and taxonomy

Alan Cunningham may have been the first explorer/botanist to record Macadamias near current day Beenleigh. He called them a Moreton Bay Chestnut, however the nut specimen he took cannot be located at Kew Gardens in London, so it is uncertain if it was the black bean or a Macadamia. In 1843 Ludwig Leichhardt collected *Macadamia ternifolia*, known as the Maroochy or Gympie Nut, which is not edible. This specimen is held in the Melbourne Botanic Gardens. Historians got Leichhardt's reports wrong, named the plant Jindilee and believed it was collected near Mt Bauple, whereas it came from near Maleny more than 100km to the south. In 1857 Baron Ferdinand von Mueller, one of Australia's greatest botanists, with Walter Hill the Superintendent of the Brisbane Botanic Gardens, collected nut specimens and in 1858 described and named them Macadamia.

Again it was the bitter inedible species and the delicate flavour and texture we appreciate today was not realised. The plant was named after John Macadam, the Secretary of the Victorian Philosophical Institute. Macadam was an amazing man, a Doctor of Medicine, a forensic scientist, a Member of Parliament, Post Master General and one of the founders of Australian Rules, however it is unlikely he ever tasted a Macadamia nut.

Back in Brisbane Walter Hill collected more Macadamias in 1858 which were larger than those which he and von Mueller had collected. Hill erroneously believed the hard shell had to be removed to allow them to germinate and be planted. He gave the job to a young assistant and told him not to taste them as they were very bitter and probably poisonous. To his concern he found the lad eating them and proclaiming them delicious. After several days with the lad remaining healthy, Hill tasted them and became the second Caucasian known to be captivated by them. He became the first Macadamia enthusiast and promoter. He germinated seedlings, widely gave them as gifts and distributed plants around the world in exchange for plants that could be trialled for commercial use in the new State of Queensland. In 1858 he planted the first cultivated Macadamia in the Brisbane City Botanic Gardens which is large and healthy to this day.

The 19th century was an era of botanic discovery and exchange of plants around the world. Botanists classified plants largely on their morphology and fruit. The genus *Macadamia* is part of the Proteaceae Family, which contains many well known and loved Australian plant species of *Banksia*, *Grevillia* and *Persoonia*. Numerous newly discovered rainforest species were recorded and named as belonging to the *Macadamia* genus from Northern New South Wales, SE Queensland, North Queensland, and some Pacific Islands and in the Celebes. However almost all of the so called “Macadamias” were reclassified into other genera over the years and today just four species of *Macadamia* are recognised. For almost 100 years botanists struggled with distinguishing between the species and both the commercial *M. integrifolia* and the smaller bitter *M. ternifolia* were described as variants of *M. ternifolia*. It was only in 1954 that the then three and now four species of *Macadamia* were separately and soundly described. If you read older papers on Macadamias you may see the commercial *Macadamia* described as *ternifolia*.

The four species are:-

Macadamia tetraphylla where tetra is Greek for four and phylla leaf and which refers to the usual number of leaves to each node. This species grows in rainforest in remnants in Northern NSW from south and east of Lismore to about Mt. Tamborine in SE Queensland. Apart from four leaves to each node the leaves have more spines, the new leaf flush is red/brown, flowers are generally pink and the nuts are rough shelled. Common names are the Bush Nut or Rough Shelled Macadamia. The kernel is slightly sweeter than *M. integrifolia*. This species is only commercially planted to a small extent in Australia although hybrids between it and *M. integrifolia* are common. It is widely planted in Kenya and California.

Macadamia integrifolia where integ means entire and folia leaves. This species grows in and adjacent to rainforest from just north of the NSW Queensland border to Mt Bauple north of Gympie. It has three leaves to each node, leaves are not as serrated as tetraphylla, new flush is green, flowers are cream and the shells are smooth. Common names are the Smooth Shelled Macadamia, the Queensland Nut and the Bauple Nut. It is the main commercial species and is

now being cultivated in subtropical environments throughout the world.

Macadamia ternifolia where terni means three and folia leaves. It grows from north of Brisbane to Gympie. It is a slower growing and usually a smaller tree than the commercial species. Nuts are small and the kernel is intensely bitter but not poisonous as is often stated. Common names are Maroochy or Gympie Nut. Because it is not edible as such it has received little study but there is evidence that it could have breeding potential and be used in adding desirable genetic characteristics in the future.

Macadamia janseni was named after its discoverer Ray Jansen in 1991. It is as rare as the Wollomi Pine with only 60 trees being found all in one small rainforest gully in a National Park between Gin Gin and Miriamvale. It is slow growing with a small slightly bitter kernel. A bushfire could result in the total population being lost. Its common name is Bulburin Nut. It also has breeding potential and possibly could be a tool in developing cultivars able to tolerate global warming.



Macadamia integrifolia



Macadamia tetraphylla



Macadamia ternifolia



Macadamia janseni

Domestication

From the 1860's Macadamias were planted in gardens and as an interesting farm tree. As rainforest was cleared, Macadamias were often spared to provide nuts and for shade. However, their commercial potential was limited by an inability to control insect pests and lack of horticultural knowledge.

A 'grove' of Macadamias was progressively planted alongside the Noosa River from the 1870's and some of these trees still thrive. An orchard of about 150 tetraphylla seedlings were planted at Rous Mill near Lismore between 1878 and 1888. By 1900 there were at least five small orchards in NSW and one in Queensland. Macadamias were regarded as a very special food and held in high esteem as our own true nut. Its delicate distinctive flavour and crunchy texture distinguished it from other tree nuts.

Macadamia nuts or plants were sent overseas and several small lots were sent to Hawaii from the late 1870's for reforestation and botanic garden displays. In 1893 Captain Jordan collected nuts from two trees at Pimpama on the Gold Coast hinterland which were planted in a large garden in Honolulu. The nuts from these trees were used to establish the first Hawaiian orchard and subsequently for grafting as commercial

cultivars. One of the original trees at Pimpama still exists and is known as the Jordan Tree, or 'The Mother of all Macadamias'. The Macadamia nut industry is now seeking to verify if some of the early Hawaiian commercial cultivars were derived from this tree.

Most of the early trees and small orchards were based on collecting nuts from wild trees and seeking those with good crops and thin shells. Macadamias in the wild are very diverse in all of their characteristics and typically have thick shells which are undesirable for commercial purposes. Botanists, seed merchants and interested people searched through the rainforest seeking wild trees with suitable characteristics for commercial planting and these as well as nuts from single domesticated trees were sold both in Australia and overseas. However the few nuts produced by wild trees was a major constraint to selection of superior types.

Unfortunately for Australia we tended to talk about these wonderful nuts but did little to address what was needed to grow and process them as a commercial crop. Little was known of their requirements and native insect pests caused most of the crop to be lost. It was the Hawaiians who commercialised the industry through research and trials on all aspect of their culture,

processing and quality. They mastered the art of grafting so being able to successfully propagate a tree with desired known characteristics. These varieties, developed in Hawaii, became the base plantings of the Australian and global industries from the 1960's but were derived from a very limited collection of the total genetic diversity present in wild *Macadamia* species.

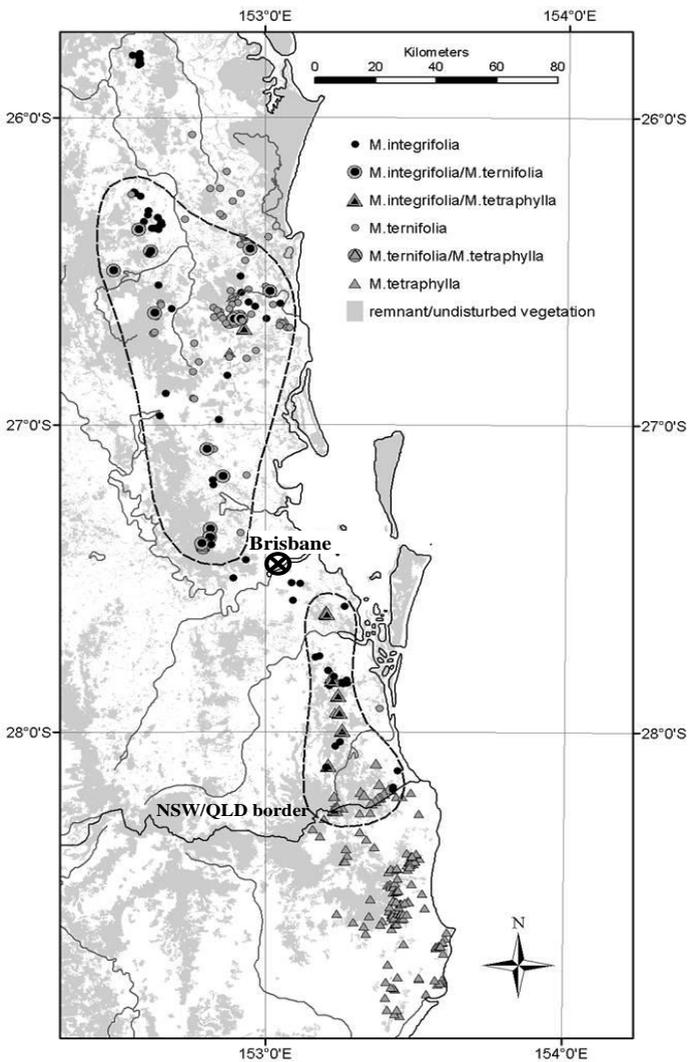
Largely due to limited resources, Australia did not realise or use the genetic potential waiting in our rainforests, however there were exceptions. Once grafting was mastered in Australia, enthusiasts took cuttings from productive wild or backyard domesticated trees, grafted them and they were planted out and assessed as commercial cultivars. One was the Daddow variety which was planted in a large display garden in Maryborough in the 1880's possibly from nuts collected at Mt Bauple. The thin shells, good kernel quality and hardy tree characteristics were recognised by a local enthusiast and now Daddow is one of the better commercial varieties. Hawaiian botanists made several trips to Australia to seek elite wild and planted seedling trees to develop better performing varieties.

Small orchards were planted sometimes in conjunction with bananas, so that when the bananas died from disease, the *Macadamias* would provide an income. In

Australia up to 1970 the total crop never exceeded 70 tonnes of nut in shell per year and in Hawaii about 250 tonnes per year. It was largely US troops passing through Hawaii in World War Two who fostered widespread appreciation of the virtues of Macadamia nuts.

After the war, Hawaii used grafted trees of varieties selected from their seedlings and rapid expansion took place. Soon interest in this new crop transferred to Africa, Central and South America plus it reinvigorated the cottage Australian industry. The global commercial industry rapidly grew. In Australia CSR Limited, the sugar giant, invested several million dollars in research funding in the 1960's to commercialise our industry, which thrived and grew.

In 1974 the Australian Macadamia Society [AMS] was formed to represent the industry, to undertake research and to promote the nut. In the 1980's a statutory levy paid by growers and administered directly and partially matched by the Australian Government through Horticulture Australia Limited resulted in considerable funds for research and promotion.



Natural distribution of three main *Macadamia* species and natural hybrids. Dotted lines show the extent of hybrid zones (Hardner et al 2009).

The modern Macadamia nut industry

The Hawaiian Macadamia nut industry, which led the world until the 1980's, has slowly declined and Australia has taken its place, investing millions of dollars in research, development and promotion. Australia's production exceeded Hawaii from 1997 and is now in 2012, is double theirs. Macadamias continue to be widely planted in South Africa, Kenya, Malawi, China, Brazil, Guatemala, Costa Rica and other South American countries. Currently there are approximately six million commercial Macadamia trees planted in Australia, many still young and not yet producing nuts. Our production averages 40,000 tonnes of nut in shell a year and is expected to increase. Global production is approximately 120,000 tonnes of nut in shell per year. Macadamias are generally regarded as the global premium tree nut and this is reflected by them being priced at the top. Surprisingly Macadamias still comprise less than 2% of the world production of tree nuts.

The Australian industry from the 1960's realised it could not rely on varieties developed from limited genetics in Hawaii but must have ones suited to our differing growing environments. Enthusiasts trialled local selections, seedlings from good parent stock were

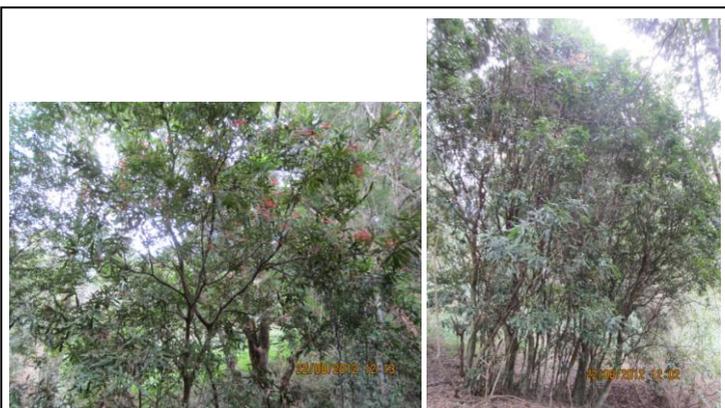
assessed and private breeders such as the Bell family from Beerwah developed mainly hybrids some of which were protected by Plant Variety Rights. Firstly the Queensland Department of Primary Industries undertook varietal improvement and then through CSIRO and now DEEDI a Plant Breeding, Improvement and Conservation project has been operating for 15 years at a cost of approximately \$400,000 a year. A range of elite cultivars have been identified and are currently undergoing field trial in different localities and will soon be released. Progressive advances through breeding of superior more productive cultivars are expected over time and both trial plot plantings and the trees in the wild will play a part. Only a portion of the available wild germ plasm has been used so far and the ongoing potential through utilising our genetic resources can only be guessed at.

Conservation of wild Macadamias

Up until the 1960's there was limited interest in wild Macadamia trees in the rain forest. It was an era, thankfully coming to an end, where our rain forests and land were seen as there to be exploited and conservation of our flora and fauna had a low value. In a sense the rainforest for the first one hundred or more years of European settlement was an obstacle to be

cleared as quickly as possible so that grazing or cropping could take place. Whilst botanists and others searched, recorded and valued our rainforests for their biodiversity, their gradual loss was not of much concern to the majority of Australians. As an example over 99% of the Big Scrub, about 80,000 hectares of rainforest stretching from Ballina to Lismore and north to Mullumbimby was cleared and it and its Macadamias were lost forever. Elsewhere, clearing, burning and residential development steadily increased as our population grew and it is estimated that at least 80% of the original habitat of the wild Macadamias has been lost.

The Australian Macadamia industry via the peak industry body, the Australian Macadamia Society (AMS) has accepted responsibility to take the lead in conservation of the wild trees. The first Macadamia conservation project occurred in 1988 when the AMS with government support, funded a project undertaken by the University of Queensland to survey and record wild Macadamia populations. This project created a lot of public interest and support, providing detailed knowledge of the threats the trees face and what was required to conserve them.



Wild *Macadamia tetraphyllas* Tyalgum Tweed Valley, NSW



Wild *Macadamia integrifolia* (LH) and *Macadamia ternifolia* (RH)
in Triunia NP Blackall Ranges, south east Queensland

A few years later another conservation project followed which took cuttings from the wild Macadamias in our data base of the then three species, propagated these and planted them out in three sites in order to retain at least a small proportion of the genetic diversity of wild Macadamia species.

It was soon realised that whilst governments and local environmental groups were active and passionate in conserving our environment, the wild Macadamias were being progressively lost. In 2004 a group of dedicated people and specialists with a wide range of skills and experience met and formed the Macadamia Conservation Committee under the auspices of the AMS. Their first task was to prepare a Recovery Plan which was approved by the NSW, QLD and Australian Governments in 2009.

To add permanent structure and allow donations for conservation to be tax deductible the Macadamia Conservation Trust was formed in 2007 and listed by the Australian Government as a registered Environmental Organisation. It has a Trust Deed stating its goals and operating procedures and the Australian Macadamia Society is the Trustee. Without the financial and moral support of the AMS little would have been achieved.

To implement the Recovery Plan a project titled ‘Wild about Macadamias’ commenced in 2010. It was funded by donations, significant financial support from regional Councils, the AMS and matching Government funds were received from Horticulture Australia Limited. Its aims are to implement the Recovery Plan by surveying known populations, to seek currently unrecorded populations, working with landowners to establish greater security for priority populations, provide landowners with resources, identifying gaps in knowledge and working with all interested parties.

The future

One of the main outcomes of the ‘Wild about Macadamias’ project will be a detailed assessment of the distribution and abundance of wild Macadamias in the current landscape. In part, this will be quite different from the pre European distribution, however many Macadamias still remain in areas of prime habitat that were too steep to be cleared.

The prioritisation of Macadamia populations in the current landscape will be based on numerous factors that together will give a rank of the relative importance of individual populations among the network of recorded sites for each species. Factors to be taken into

account in a prioritisation analysis include population size, reproductive potential, habitat patch size, condition and connectivity, tenure, and threats both current and future. This information will provide the basis for informing future conservation of Macadamia species including clear articulation of aims, methods and outcomes in applications to funding providers for material support. Due to the extent of past losses, conservation of all wild Macadamias are important, however a sound basis for allocation of conservation effort and resources must be clearly defined to be successful in grant applications.

Macadamias occupy a unique position in Australia's heritage, culture and economy. They are truly iconic plants that are under real threat from past habitat loss and fragmentation, weed invasion, development and climate change. We cannot stand idly by when we have the capacity to do something about it. The Australian Macadamia Society is leading the effort to conserve wild Macadamias in good faith as a demonstration of their corporate integrity and willingness to accept this responsibility. However the solution requires contributions from all sectors of society.

The role of land owners

Land owners who harbour wild Macadamias have a special place as the majority of recorded locations of wild Macadamias are located on private property.

A key objective of the 'Wild about Macadamias' project is to establish long term relationships with land owners to provide continuity, ongoing information on Macadamia conservation as it comes to hand, assistance in development of management plans and support in applications to funding bodies for grants for management and rehabilitation of habitats. Our ultimate aim is to obtain a secure permanent source of funding for conservation of Macadamia species to ensure their persistence in their native habitat.

The future for Macadamias and that of our rainforests with all of their diversity will, in part, depend on how successful we are in conserving our heritage. The wild trees need your help.