

Kakadu Plum, Aboriginal Knowledge, Sustainability, Science¹

**ILC Project Brief Consultancy Agreement Contract No 4675
Final Draft**

Peter Botsman

20/6/2018

¹ Special thanks to B. Ross for ongoing support, knowledge, guidance, references and encouragement during the process of completing and

ILC Project Brief Consultancy Agreement Contract No 4675

Purpose: To write a report focused on ‘telling the story’ of Kakadu Plum. It will articulate how Indigenous communities across the Kimberley and Top End continue to draw on traditional knowledge to harvest important resources and build sustainable businesses through its harvest and processing.

The report will describe how Indigenous harvesters are working with Western science to understand the properties of the fruit and develop new uses for it.

The report will be used to educate markets regarding the significance of the fruit to contemporary communities and describe how the fruit may be utilised in their industries. It will also educate market on the importance of an Indigenous-controlled supply chain that maximises benefits to the knowledge holders and harvesters.

Target audience for your written report will be:

Potential commercial buyers of Kakadu Plum products in functional food and skincare and industries.

Potential philanthropic donors and social impact investors.

The broader public keen to know more about the fruit and its origins. Deliverables:

Provide a written report describing the significance of Kakadu Plum to contemporary Aboriginal communities. The report should include consideration of:

A short description of the geographic area where Kakadu Plum grows.

A short description of the cultural diversity across areas where Kakadu Plum grows. Also a description of the different species/varieties.

A detailed description of the traditional uses of Kakadu Plum including consideration of uses of different parts of the tree and also use as a food, medicine, fibre, tool etc.

A detailed description of the ongoing importance of the fruit to contemporary communities. This should include personal examples drawn-out in your interviews in Broome and Arnhemland

Links to spirituality, ‘Dreaming stories’ and Indigenous belief systems.

Describe different language names you encountered across the north.

Historical significance - stories of use by parents, grandparents etc.

Expression in art, language, song, design.

Ongoing use as a food and medicine by contemporary communities.

Any other pertinent issues that you believe will contribute to ‘telling the Cultural story of Kakadu Plum

2. Provide a written report that communicates, in layman’s terms, the ‘Western science’ story of the fruit. This should include:

A description of the key chemical compounds in the fruit (i.e. ascorbic acid, ellagic acid etc.)

A description of what those chemical compounds can do- i.e. stop food oxidation, fight microbial and bacterial infection, provide nutritional supplements etc. Where possible, link these 'new Western uses' back to the knowledge held by Indigenous communities.

A description of what new ways the fruit is being used:

As a food preservative for example as such by Karen Sheldon catering

As a seafood preservative by the prawn industry

as a niche dietary supplement

as a niche food for example as such used by Kimberley Wild Gubinge


as a skin/beauty cosmetic product by Jurlique

any other contemporary commercial uses

Do not include any cultural information that may be deemed secret/sacred or not for public consumption.

Contents

<i>Keypoints</i>	6
<i>Part One: Overview/ Break Out Report</i>	
<i>Ancient Future</i>	
<i>The “Kakadu plum” Story</i>	
<i>Food and Knowledge for the Twenty First Century</i>	10
What Kakadu Plum means for Aboriginal communities: Harvest, Social and Cultural Significance, Ceremony	11
The Modern Recognition of “Kakadu Plum”	14
Native Fruit Industry Development, Profitability and the Sustainability of Aboriginal economies	16
Kakadu Plum: A Food from an Ancient Culture for the Future	25
<i>Part Two: Research and Ongoing Questions for the Future</i>	27
Health, Food and Life: Aboriginal Knowledge & Wisdom	27
Aboriginal Agriculture	27
Gubinge: Why Were Broome and the Kimberley First Movers?	28
Seasonal Life	29
The Modern World Catches Up and Recognises Aboriginal Concepts of Health and Agriculture	29
Contemporary Sustainability	30
Hubs, Spokes and Cooperatives	31
Contemporary Scientific Findings: Recognising and Extending Traditional Knowledge Systems	32
Sacred Food: How Modern Consumers Can Support Aboriginal Provenance, Culture and Sustainable Development	40
<i>Towards a Sacred Food Network:</i>	
<i>Kakadu Plum Gubinge (Broome), Marnybi (Wadeye), Murunga (East & Central Arnhem) ṇṇṇka-bakarra (North East Arnhem)</i>	42
<i>Acknowledgements</i>	46
<i>Abbreviations</i>	47
<i>Background, Intelligence & Methodology</i>	48
<i>Bibliography</i>	50
Ethno-biological, Historical and General Sources	50
Contemporary Scientific Literature	58
<i>Appendix One. Interviews concerning Bush Fruit and Aboriginal Horticulture by Peter Botsman</i>	61
<i>Appendix Two First fruit for Bidyadanga</i>	62
<i>Appendix Three ABC Lateline Transcript</i>	63
<i>Appendix Four Draft Yolngu Dictionary of Bush Fruit</i>	67



<i>Appendix Five John Wolseley & Mulkun Wirrpanda Interview Mulka Project Midawarr/Harvest</i>	72
<i>Appendix Six Bush Plum Dreaming - David Wroth, Japingka Gallery, 2015</i>	73
<i>Appendix Seven Bush Plum Ahakeye, Utopia Lane Art Gallery</i>	74
<i>Appendix Eight The Broome Model From the Grass Roots Up</i>	75

Keypoints

- Kakadu plum (*Terminalia ferdinandiana*) which is known as gubinge, madoorr, madoorroo (Bardi), garbiny (Yawuru), kabinyn (Nyul Nyul), marnybi (Wadeye), nghul nghul, manhmohpan, murunga (East, Central, North East Arnhem) ṇṇaṇ'ka-bakarra (North East Arnhem) and colloquially "billy goat plum", has come, correctly, to be labelled, as a 'super food' but it is much more than that. Of all Australian native fruits the chemistry of the fruit and plant has multi-various therapeutic and bio-active applications for world food, medical, bio-security, beauty, health and manufacturing industries. For the many Northern Aboriginal worlds this borum (bush fruit) symbolizes a strength, vitality and healthfulness of an ancient world that for the first time, the modern world, has come to recognise and seeks in great quantities.
- The natural growing area of the kakadu plum is far more extensive than official recordings indicate. Most official recordings by Commonwealth, State and Territory herbalists and horticultural scientists are recorded around the central population area of the Northern Territory. However, the tree has been successfully cultivated as far south as Carnarvon in Western Australia and is growing in a great many, previously un-recognised bush orchards that are tended by traditional Aboriginal land stewardship practices particularly in remote areas above the tropic of Capricorn in Western Australia, the Northern Territory and Queensland. The lessons of Aboriginal land stewardship practices for modern horticulture as well as land management are only now beginning to be understood.
- Aboriginal people have known of all of the scientifically verified characteristics and health giving qualities of the kakadu plum for millennia.
- One of the blockages in communications about native fruit between Aboriginal Australian and non-Aboriginal Australia has occurred because "Western" epistemology and ontology is often at odds with Aboriginal knowledge and belief systems. Health and the role of a fruit like kakadu plum for many Aboriginal communities cannot be disconnected from land stewardship, seasons and keeping a balance between all of the material and spiritual dimensions of the world.
- In Australian history non-Aboriginal Australians have often exploited the most obvious natural resources of the land and sea without acknowledging the prior ownership, knowledge and stewardship of Australian Aboriginal communities. This has not only been unjust, as many historians and public figures such as Dame Mary Gilmore have acknowledged over time, it has led to ignorance and an inability to truly benefit from living on the Australian continent. Precious natural jewels such as kakadu plum have been neglected and not recognised.
- The people of Broome with their cross-cultural understanding of food and medicine have had an early post-colonial Australian appreciation of the properties of kakadu plum/gubinge from the first part of the twentieth century. The Chinese, Japanese, Malay, Pacific Island diaspora which, came to work in the pearling industry, and lived in close connection with the Bard, Nyul Nyul, Goolarabalooi and Yawuru communities in Broome used kakadu plum/gubinge as medicine, food and as a herbal tonic. This close collaboration is something to be celebrated and acknowledged because it paved the way for other communities in Western Australia, the Northern Territory and the world to follow their lead.
- The harvesting of Kakadu plum in December-January and April-June across the North of Australia has always been part of the hunting and gathering activities of Aboriginal people. Because of its many nutritional and medicinal qualities, the harvesting of kakadu plum could be one of the most important modern day activities for Aboriginal sustainability in the north. It links traditional land stewardship and the well-being that comes from walking and surveying the lands with the potential for a steady form of income which even at present levels is very useful.
- For the success of the kakadu plum industry and its capacity to meet world demand from within Australia, a set of cooperatives with Aboriginal supply chains to homelands and remote bush orchards need to be established in the first instance in Broome, Wadeye, Darwin and Yirrkala. At the centre of each cooperative and supply chain should be an Aboriginal owned and managed processing plant and distribution company.
- All harvesters of native fruits should be registered and certified by the appropriate and recognised Aboriginal land holders and stewards.
- All Aboriginal harvesters of native fruit should be able to earn income from their traditional activities tax free and without any penalty from existing Centrelink or welfare payments. This needs to be seen as a way for Aboriginal people to move beyond government payments towards a more independent and



Njñ'ka-bakarra, Wild Bush Orchard, North East Arnhem Land
Batumbil Burarrwanga

happier way of living.

- Federal and State governments need to recognise that the kakadu plum industry could be a very substantial rural industry that deserves as much as financial support for establishment, marketing and research and development as any other natural resources industry. The added benefit of the kakadu plum industry is that it is natural, sustainable and is an area where Aboriginal skills and knowledge are highly important.
- The kakadu plum industry could grow to become a \$100 million a year industry in the space of years and the limits to growth lie only with our own national skills, capacity and vision.
- The science of the native fruits and kakadu plum was retarded by the blindness of 19th century Australian botanists to Aboriginal knowledge systems.
- From the 1980s ethnobiology particularly in Australian museums has helped scientists understand the significance of Australian native fruits and to bridge the knowledge gap between Aboriginal Australians and the non-Aboriginal community. The scientific appreciation of Australian native fruits is a relatively recent phenomena and research and development is arguably in its infancy.
- Kakadu Plum first came to international medico-scientific attention in 1982 with the publication by Brand et al of an article in Lancet that found ascorbic acid contents of 3150, 2850 and 2300mg per 100g in edible fruit.
- The majority of scientific research articles about the kakadu plum have been published in the past eight years. As each publication appears the field of scientific inquiry about kakadu plum widens.
- Following Brand et al, studies of native Australian fruits have increased dramatically, in all studies Kakadu Plum has been found to have the highest levels of ascorbic acid and anti-oxidants of any known food.
- The food safety and processing characteristics have been studied and the principal finding is that kakadu plum can be stored at below 5 degrees for up to four years with little diminishment of its nutritional qualities. Leading from this kakadu plum has the capacity to extend the shelf life of many different foods, most notably sea food.
- Following Monty and Cock in 2012 the anti-bacterial qualities of kakadu plum are now starting to be intensively investigated. Kakadu plum has been shown to be a natural inhibitor of gastro-intestinal diseases
- Tan and Konczak have established that Kakadu Plum is also the most effective of Australian native fruits so far tested as an anti-cancer agent. Apoptosis is one of the most critical forms of defense against cancer, and the induction of apoptosis by dietary polyphenols represents significant potential for cancer preventive activity.
- Cock and Moriarty in 2011 noted kakadu plum is a natural anti-bacterial and anti-inflammatory substance. Following this, kakadu plum's relevance for the relief and prevention of auto-immune diseases began to be investigated. The study of the effect of kakadu plum as a preventive, remedial substance in relations to auto-immune diseases such as Rheumatoid arthritis, Systemic lupus erythematosus (lupus), Inflammatory bowel disease (IBD), Multiple sclerosis (MS), diabetes mellitus, Guillain-Barre syndrome, Chronic inflammatory demyelinating polyneuropathy, Psoriasis, Graves' disease, Hashimoto's thyroiditis, Myasthenia gravis, Vasculitis are under way with some promising results particularly in relation to rheumatoid arthritis.
- Kakadu Plum and several other Australian native fruits have been found to be a plentiful source of ellagic acid which has antiproliferative and antioxidant properties. The antiproliferative properties of ellagic acid may be due to its ability to directly inhibit the DNA binding of certain carcinogens, including nitrosamines and polycyclic aromatic hydrocarbons. As with other polyphenol antioxidants, ellagic acid has a chemoprotective effect in cellular models by reducing oxidative stress. The research into the characteristics of ellagic acid in kakadu plum continues.
- The science of the kakadu plum is clearly only just beginning. There is much more research to be done, and much to be understood about Australian native foods. So far the relevance of kakadu plum for the health of individuals, for medicine, for the hygiene industry, for the food industry and for public health knows no bounds.
- The Aboriginal provenance of kakadu plum needs to be protected by a "sacred food" consumer campaign complementary with an ongoing "Made in Australia" awareness campaign.

- A “sacred food” label would signal that native food
 - is uniquely of the Australian land, i
 - is produced from Aboriginal knowledge and the experience of living in the Australian landscape with continuous knowledge that goes back 60,000 years.
 - does not necessarily grow best in Western agricultural systems but in the wild orchards and groves of the bush with no conventional cultivation,
 - is produced on plantations that are on Aboriginal land, managed by Aboriginal organisations and informed by Aboriginal knowledge systems,
 - is harvested by Aboriginal people.
 - is processed and sold in ways that ensure Aboriginal communities produce an income and thus are sustainable within and alongside the mainstream economy and ensures
 - =that Aboriginal people have a real competitive advantage in caring for the fragile ecology of the Australian landscape that has been so misunderstood and abused by mainstream agricultural systems and land development systems.

Part One: Overview/ Break Out Report

Ancient Future

The “Kakadu Plum” Story

Food and Knowledge for the Twenty First Century

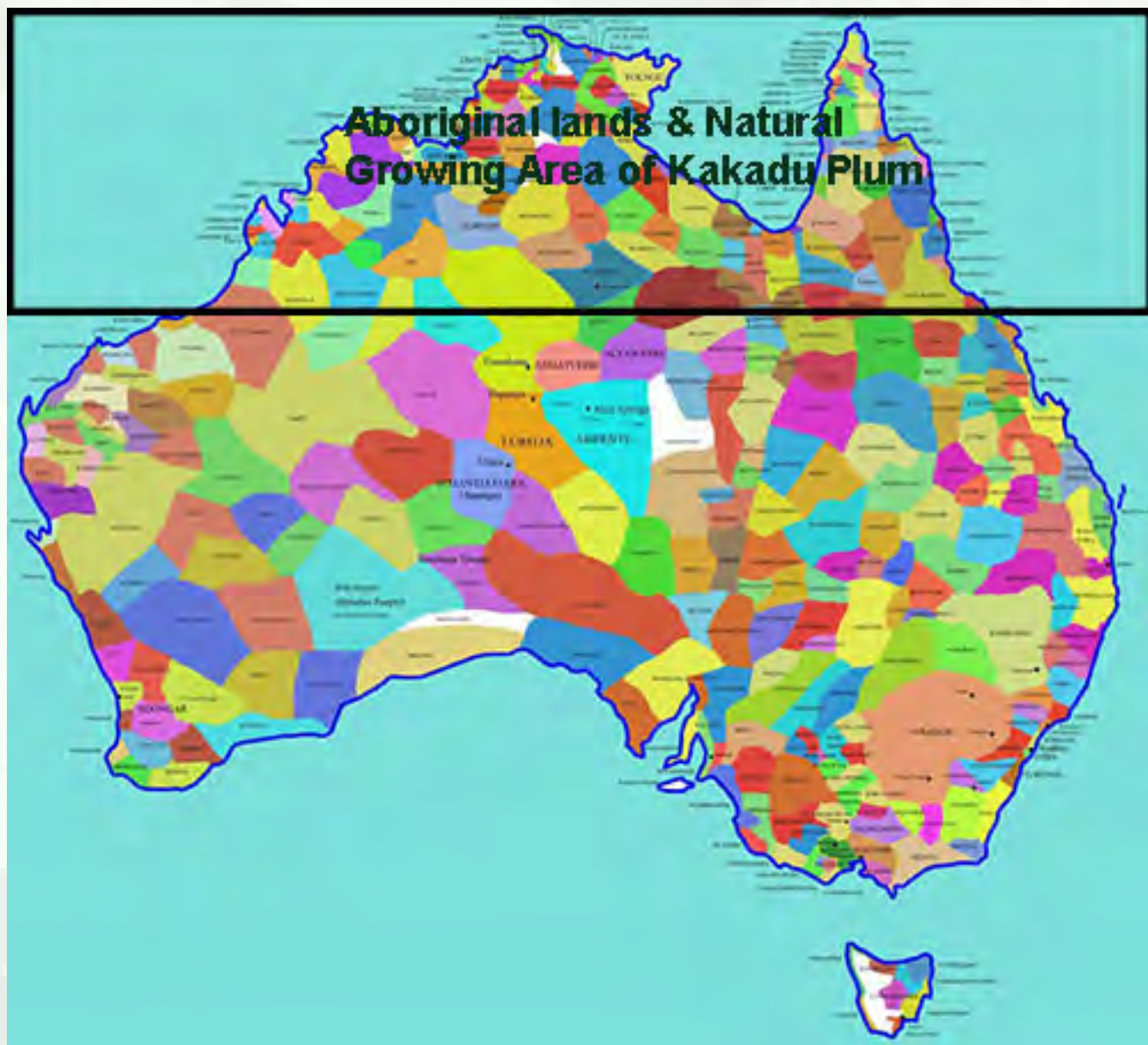
Kakadu plum (*Terminalia ferdinandiana*) which is known as gubinge, madoorr, madoor-roo (Bardi), garbiny (Yawuru), kabinyn (Nyul Nyul), marnybi (Wadeye), nghul nghul, manhmoohan, murunga (East, Central, North East Arnhem) njän'ka-bakarra (North East Arnhem) and colloquially “billy goat plum”, has come, correctly, to be labelled, as a ‘super food’ but it is much more than that.² Of all Australian native fruits the chemistry of the kakadu fruit and tree has multi-various therapeutic and bio-active applications for world food, medical, bio-security, beauty, health and manufacturing industries. For the many Northern Aboriginal worlds this borum (bush fruit) symbolizes a strength, vitality and healthfulness of an ancient world that for the first time, the modern world, has come to recognise and seeks in great quantities. For Aboriginal communities everything is part of “family”, every insect and every grain of sand, all have their place and function in a healthy world. The hope generated by understanding kakadu plum and native fruit from an Aboriginal perspective is that contemporary non-Aboriginal communities might also recognise that the Aboriginal ancient philosophy, diet and way of life is important for world sustainability and health. Traditional Aboriginal life, knowledge systems and practical ways of living survive in the 21st century but there is much to do to ensure they thrive, grow and are respected and replicated in modern life. The hope and possibility of the kakadu plum is that there can be a new synthesis of the ancient and the scientific. In this way the kakadu plum heralds an ‘ancient future’ that improves personal health and the health of the world.

To see the kakadu plum in the wild involves tuning the eyes. Aboriginal people travelling along bush tracks in a fast moving motor vehicle can spot fruit ready to be harvested from hundreds of metres away. But for most people the tree and the fruit are invisible, part of the montage of the bush. Botanists describe the kakadu plum as follows: “This tree has a smooth grey bark, large ovate green-grey leaves and fleshy drupes, becoming soft when ripe”. The kakadu plant grows as a small to moderate sized tree between 4 – 10 m high. The tree has a rough, creamy grey bark which is flaky and finely tessellated. The leaves are spirally arranged and dense towards the ends of the branchlets. The fruit is yellow to green and beaked, containing a single seed.³

The term “kakadu plum” is a misnomer in one sense. Most of the official botanical records of the plant occur around the Mirrar homelands and the world heritage listed Kakadu National Park, however the tree grows prolifically across the North of Australia above the Trop-

2 See Cock, I. (2012). Kakadu Plum – An Emerging Super-food. *Bushfoods Bulletin*, Winter, 3–4. The term “super food” is subject to an intense debate within the food industry. For example, see on one end of the spectrum of debate Jayson Lusk, 2016, *Unnaturally delicious: how science and technology are serving up super foods to save the world* St. Martin's Press, 246 p. and on the other the best-selling Anthony William, *Life Changing Foods*, Hay House Press, 2016. This paper suggests that Australian native foods tick boxes on each end of the debate. They are nutritionally extraordinary with widespread industrial and pharmaceutical uses validated by food science but are also part of a new consumer-led way of seeing fruit, plants and the environment as inter-connected with the health of all life forms. This is very much an Australian Aboriginal concept in which even mosquitoes and midges are part of “family”.

3 *Indigenous Kimberley Trees in Broome*, Compiled and Edited by Tom Harley and Elizabeth Lovegrove for Kimberley Environmental Horticulture, 2012, p. 43



ic of Capricorn. There is some evidence that the tree will grow as far south as Carnarvon on the west coast and Brisbane on the east coast of Australia.⁴ For Aboriginal people living in regional towns, kakadu plum is, along with mango trees, a tree to be planted close to the house and closely watched and harvested at the right times of the year.

What Kakadu Plum means for Aboriginal communities: Harvest, Social and Cultural Significance, Ceremony

Though it is named “kakadu” plum, after the Mirrar people’s home country in which it has been most recorded by botanists, Kakadu plum is a traditional food of all of the Northern Aboriginal peoples of Australia who live above the Tropic of Capricornia. Kakadu plum has many traditional names and these are an important means of identifying the origins of each crop and they are also very special and unique to each Aboriginal community. The drupes (stone fruits) can be seen resplendently forming and ripening on the trees from September to June. The tree often produces a first crop of fruit in December and a second crop of fruit in May/June in many parts of North Western Australia, the Northern Territory and North Queensland.

As each day goes by scientists seem to make some extra-ordinary ‘discovery’ about the properties of Kakadu plum, but important as the scientific work is, the traditional peoples of Australia have always known about the life-giving properties of this bush food and even more significantly its role in our health and the health of the land. It was used as a source of vitality and energy on long walks.⁵ It was known as a headache cure. It was used as an anti-septic. It was used as an anti-inflammatory agent for swollen joints or bones⁶. It was used as a food additive⁷. A preparation from the inner bark was used to treat sores, boils, back-ache, ringworm, leprosy sores, wounds, scrapes, ulcers, scabies, bites.⁸ It was known to be a food preservative⁹.

Most importantly the gathering of the food was part of an ancient practice involving the stewardship and agricultural development of lands which have not been well understood by European based farming experts or modern industrialised agricultural and horticultural experts. Often it is assumed that Australian native vegetation should be bulldozed and transformed into gardens and plantations, when in fact the bush itself is a pharmacopia, garden and farm in its own right. The relevance of this realization for mining re-vegetation projects in Northern Australia and new forms of income and sustainability for Aboriginal peoples is profound.

Terminalia Ferdinandiana is unique within the Aboriginal world itself. In North East Arnhem land, where the language and culture of the Yolngu people remains strong, almost every known plant, tree, shrub and bush fruit belongs to one of two moieties and as such has a place within the ceremonial cycles of life, death, traditional law and the celebration of the creative beings who made the world. The cycad cycad arnhemica, and its nuts, malajanba,

⁴ Personal Communication, Broome, 2018

⁵ See Batumbil Burarrwanga, “Don’t Forget Your Dilly Bag”, op cit.

⁶ ibid

⁷ ibid

⁸ Ibid and see T.K. Lim, “Terminalia Ferdinandiana” in *Edible Medicinal and Non-Medicinal Plants: Volume 2, Fruits*, p. 158-160

⁹ Ibid.



Peter Gurruwiwi singing and hunting for n̄än'ka-bakarra at his Galpu clan homeland Gi'kal in North East Arnhem Land, copyright Batumbil Burarrwanga

for example, belongs to the yirritja moiety and has a very important role in ceremony. The sacred identity of plants and their representation maḡayin/miny'tji is carefully protected and managed. Representation and painting itself is undergoing a steady evolution, where once painting was reserved for men and for ceremonial body paint, now painting is open to women and designs are becoming modified for public display. The painter Mulkuṇ Wirrpanda talks of trying to find ways to represent plants and fruit in ways that show their secular and not sacred meaning¹⁰. When a plant or fruit is so powerfully represented through sacred designs in ceremony, there are sometimes related songlines and ceremonies across the Aboriginal lands and communities of the North.

Traversing sacred representation is not an issue for *terminalia ferdiniana* within the Yolngu world at least. The unique aspect of *terminalia ferdiniana* or murunga (East, Central, North East Arnhem) ṇḁn'ka-bakarra (North East Arnhem) is that uniquely it seems to exist outside the famed gurrutu (kinship) system which links all lands and peoples. It does not belong to a moiety but has a dimension of being something like a public good that belongs to all. There is an interesting long-term research project on this phenomena in itself. What does it mean? Are there other entities that have a similar status? Is it because the memory of its ceremonial status has passed? Work needs to be done with elders across the north to compare traditional knowledge about the fruit and its role in life.

What is confirmed from Broome to Yirrkala and across Cape York Peninsula is that *terminalia ferdiniana* was known to be a source of health, strength and life and had the status of a seasonal food that brought vitality and was a fruit that rewarded the active stewardship of lands and hunters who diligently sought food for their families. Certainly kakadu plum is associated with the endurance, physicality and good health that came with the traditional Aboriginal way of life.

As a 'public', 'secular' fruit *terminalia ferdiniana* is of enormous significance because the recognition of its qualities potentially opens up the bush and the lost arts of Indigenous peoples for a strong contemporary cultural and economic value. It is potentially the most important practical symbol of an important reconciliation between traditional and modern life and the revitalization of Aboriginal communities. Will Stubbs has recently noted: "Whenever a person is lost in the bush for even a couple of hours we get a national news update until they are recovered. If they survive a few days and emerge alive, it is enough to make them a national hero on TV and the object of awe and celebration. How does this sit with the lack of regard for the Indigenous history of prosperous survival here? Can anyone truly claim to own land that they cannot live on without external help?" Stubbs goes on to describe the fragility of Indigenous knowledge even among the strongest Aboriginal communities.. "...Despite a strong ceremonial culture and one of the most active contemporary resistances, the Yolngu people of north-east Arnhem land are not immune to the decay. .. There are many plants that were known to elders even a generation ago that are not known to a significant proportion of young Yolngu people and many plants 'may never have been gathered even by middle aged Yolngu people. As Stubbs suggests "The loss of this ancient monument is more than simply esoteric angst at the destruction of the legacy of history; it

¹⁰ Midawarr/Harvest: The Art of Mulkuṇ Wirrpanda and John Wolseley, 2017, p. 18



Dampier Peninsula Gubinge <http://kimberleywildgubinge.com.au/>
Dampier Peninsula
© Kimberley Wild Gubinge

is the loss of the key to our contemporary and future survival on the continent”.¹¹

Because of its nutritional and economic value, *terminalia ferdiniana* can help contemporary Aboriginal communities earn a livelihood as well as revitalizing hunting and gathering traditions. In this respect *terminalia ferdiniana* is not just another commodity to be consumed it leads us to new understanding of the bush and life itself.

Aboriginal communities have always cultivated bush orchards where the fruit is with no conventional farming techniques necessary to maintain the health of the plant and the fruit. All parts of the plant are used for many different purposes and the annual season of kakadu plum was part of a larger dimension of a healthy life. The concept of healthy, seasonal produce consumed within a life of land stewardship is an important dimension of understanding the true qualities of bush foods and their production and harvesting. IF the fruit is simply understood as a substance with beneficial properties that can be mined, then its true healthy qualities will be lost by mainstream society. Kakadu Plum is part of a greater biological and human ecology that is the provenance of the Aboriginal peoples of Northern Australia. It is perhaps ironical today that when conventional mainstream monetary income fails, as it frequently does in remote Australia, kakadu plum is the kind of survival food that Aboriginal people turn to for sustenance¹².

The Modern Recognition of “Kakadu Plum”

Kakadu Plum first gained world-wide scientific recognition in 1982¹³ as a fruit with the highest recorded levels of natural Vitamin C, measuring up to 50 times the Vitamin C content in oranges¹⁴. Following this finding, it was quickly confirmed that the fruit has 5.19 times the antioxidant levels of blueberries. It contains a strong fat-soluble antioxidant, Vitamin E. It is a rich source of lutein, “the eye vitamin”, known to prevent eye diseases including age-related macular degeneration (AMD), cataracts, and retinitis pigmentosa. Lutein is also coming to be regarded as preventive for colon cancer, breast cancer, type 2 diabetes, and heart disease. Kakadu Plum has a high potassium:sodium (K:Na) ratio which may assist to develop foods to reduce hypertension. Kakadu Plum exhibited six times the oxygen radical absorbance capacity, that of a blueberry, which may provide protection from oxidative stress.¹⁵ After the discovery of the kakadu plum’s extraordinary anti-oxidant and vitamin C composition, there has been world-wide interest in the molecular characteristics of the fruit. Clusters of promising research findings indicate that kakadu plum products and uses will only grow in number and the demand for the fruit can only rise:

- Germoplasm/Genomic Patenting and Genetic Engineering: From 1982-2011 there

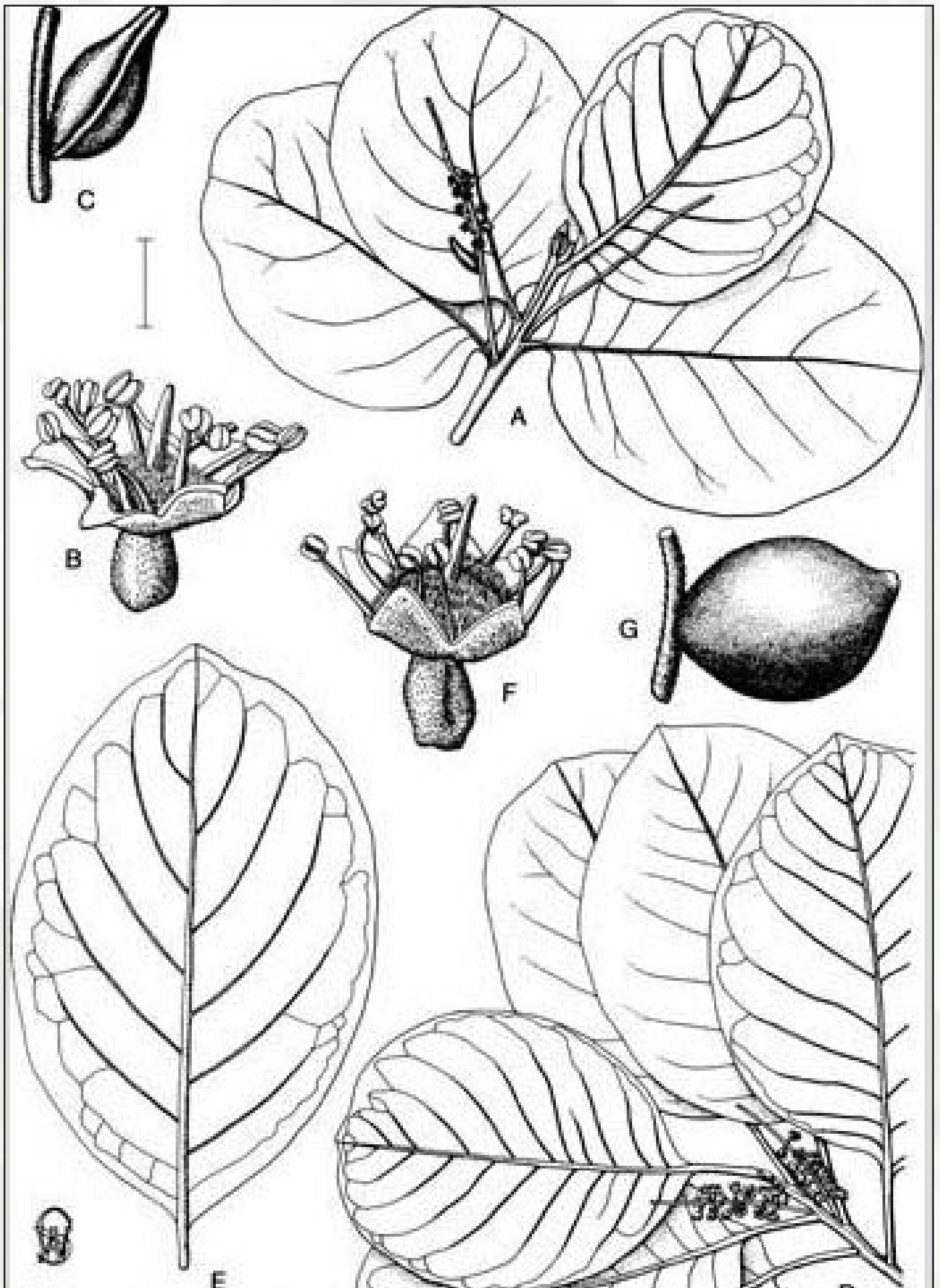
¹¹ Ibid., pp. 12-13

¹² The Aboriginal story of kakadu plum has a resonance with many health and nutritional narratives. The Jurlique skin/beauty cosmetic range notes that “The Kakadu Plum must be harvested from the wild in some of the most inaccessible areas of north-western Australia. Because of this, the fruits tend to be handpicked by Aboriginal Australians who care for the land, and draw on generations of traditional knowledge when it comes to finding and utilising this unique fruit. ..Today, we draw on all the powers of this Australian superfruit in our Purely White range, so we can deliver the most efficacious skin-brightening results. <http://www.jurlique.com.au/blog/2015/02/27/meet-the-kakadu-plum-australias-unique-skin-care-superfruit/>

¹³ Brand JC, Cherikoff V, Lee A, Truswell AS (1982) An outstanding food source of vitamin C. *Lancet* 2:873

¹⁴ Perzada et.al, 1990

¹⁵ Konczak, I., Zabaraz, D., Dunstan, M., Aguas, P., Roulfe, R., Pavan, A., (2009) Health Benefits of Australian Native Foods, RIRDC Pub. No. 09/133. Research: McDonald, J. K., Caffin, N. A., Sommano, S., Cicksedge, R., (2006) the effect of post harvest handling on selected native food plants, RIRDC Pub. No 06/021. Konczak, I., Zabaraz, D., Dunstan, M., Aguas, P., Roulfe, R., Pavan, A., (2009) Health Benefits of Australian Native Foods, RIRDC Pub. No. 09/133.



Terminalia Ferdinandiana, As drawn by W.A Smith
Queensland Herbarium

were successive international attempts to patent the genomic and molecular structure of kakadu plum particularly for beauty and nutraceutical products. These were challenged by Australian Aboriginal communities and this remains a contested domain of intellectual property and native title rights. Nevertheless the genomic characteristics of kakadu plum remain a domain of high research interest. This is an area of interest in relation to royalty payments but also moral and ethical use of the genetic qualities of the kakadu plum.

- **High Nutritional Value:** Following the revelations of Brand et al¹⁶ there have been many studies of the high vitamin c and anti-oxidant levels of kakadu plum. Because of its high concentration levels of vitamin c, kakadu plum can boost the nutritional value of cereals, drinks and general foods without adding significant weight or volume making it an ideal food additive. This also makes kakadu plum a highly desirable natural ingredient of nutraceutical products in the beauty and skin care industry.
- **Anti-bacterial and anti-inflammatory qualities:** Cock and Moriarty in 2011¹⁷ investigated Kakadu plum as a natural anti-bacterial and anti-inflammatory substance in relation to auto-immune diseases such as rheumatoid arthritis, Systemic lupus erythematosus (lupus), Inflammatory bowel disease (IBD), Multiple sclerosis (MS), diabetes mellitus, Guillain-Barre syndrome, Chronic inflammatory demyelinating polyneuropathy, Psoriasis, Graves' disease, Hashimoto's thyroiditis, Myasthenia gravis, Vasculitis.¹⁸ Even without clinical trials there may be advantages for patients of these diseases to take kakadu plum as a food additive as the Vitamin C and anti-oxidant properties of the fruit are also a benefit to general well being. This makes kakadu plum an automatically attractive food for health food stores and alternative medicine. In 2015 Sirdaata et al found that kakadu plum extract inhibited the growth of the bacterial triggers of rheumatoid arthritis.¹⁹
- **Gastro-intestinal health:** Monty and Cock proved in 2012 that Kakadu plum is a natural inhibitor of gastro-intestinal diseases. Giardia is one of the most common infections worldwide of water and food borne diseases. Giardiasis is a debilitating disease that can cause long term illnesses in children and is caused by gastrointestinal parasites of the genus Giardia. Kakadu plum is not only a treatment it is also a preventive agent giving it a potential world market in parts of the world where these infections are common.
- **Medical products:** In 2016 Wright et al have demonstrated that kakadu plum has an inhibitive effect on necrotic skin disease²⁰. Because of this and other qualities kakadu plum has strong potential as a medicinal cream and oral medicine.

16 Ibid, Brand et al, 1982

17 Cock, I. E. and S. Mohanty (2011). "Evaluation of the antibacterial activity and toxicity of Terminalia ferdinandia fruit extracts." *Pharmacognosy Journal* 3(20): 72-79.

18 Courtney, R., J. Sirdaarta, et al. (2015). "Tannin components and inhibitory activity of Kakadu plum leaf extracts against microbial triggers of autoimmune inflammatory diseases." *Pharmacognosy Journal* 7(1): 18-31.

19 Sirdaarta, J., B. Matthews, et al. (2015). "Kakadu plum fruit extracts inhibit growth of the bacterial triggers of rheumatoid arthritis: Identification of stilbene and tannin components." *Journal of Functional Foods* 17: 610-620.

20 Wright, M. H., J. Sirdaarta, et al. (2016). "Growth inhibitory activity of kakadu Plum extracts against the opportunistic pathogen *Clostridium perfringens*: New leads in the prevention and treatment of clostridial myonecrosis." *Pharmacognosy Journal* 8(2): 144-153.



Batumbil Burarrwanga, Wet Season 2017, discussing a njan'ka-bakarra tree (background) about 50 metres from her house, "Don't Forget to Fill Your Dilly Bag!" was what her elders told her as a child before embarking on a long and strenuous overland walk, Mata Mata North East Arnhem



Kakadu Plum/Gubinge Plantation, Bidyadanga, WA



Kakadu Plum/ḡäḡ'ka-bakarra Wild Bush Orchard, Mata Mata, North East Arnhem Land, copyright Batumbil Burarrwanga

- Food preservation: In 2012/13 research and trials began using kakadu plum as a natural food preservative. The shelf life of prawns increased from 2-4 days to up to 14 days. In 2014/15 \$22.5 million worth of prawns were treated with a Kakadu Plum extract formulation. In 2016 15 per cent of Queensland's prawn farming industry is using Kakadu Plum extract as a food preservative. The only other natural product that has qualities of food preservation is the Australian rainforest plum [*Davidsonia jerseyana*](#) or Davidson Plum but its food preservation capacity may be less than the kakadu plum and it less plentiful than kakadu plum.
- Australian cuisine, food and health: Several Indigenous caterers and chefs have made kakadu plum a hero native fruit i. Collaborations with food scientists have centred around retaining the bioactive properties of kakadu plum in processing, packaging and storing foods.²¹ Chefs such as Maggie Beer and Clayton Donovan have featured kakadu plum in ways that could make it a favorite ingredient in everything from deserts to bbqs.²² Maggie Beer has also featured gubinge/kakadu plum as a health food and alzheimers disease preventive compound.²³
- Cancer treatment: Apoptosis is an important mechanism in the treatment of cancer and diseases such as AIDS. Kakadu plum has been to shown to activate an apoptosis function in cancerous cells. This causes cancerous and diseased cells to die and creates a healthier environment for healthy cells to multiply.²⁴

Arising from these discoveries there are a host of potential industrial, health, medicinal and pharmaceutical uses of kakadu plum from being used as a natural anti-bacterial cleansing agent in hospitals to creating alternative anti-bacterial tooth paste to being used as a cosmetic and skin care product to food preservation and as the basis for anti-cancer drugs and auto-immune diseases treatment. If Australia is to capture the value of these potential products there must be a focused effort to invest in, develop and create the value chain of production from Aboriginal growers, plantations and bush orchards to modern science based innovations and products. Australia's overall investment in innovation is arguably too small and unless this changes the prospects of the value adding parts of the kakadu plum industry remaining in Australia are questionable. A kakadu plum industry body that can promote research and development as well as value added products is much needed.

Native Fruit Industry Development, Profitability and the Sustainability of Aboriginal economies

Strategically the development of a kakadu plum industry is of great importance for all Aboriginal Australians. More than 15 per cent of the Australian continent is under the control of Aboriginal people and organisations. Much of this land, from a Western agricultural perspective, is bush, range lands, marginal, over-grazed or degraded and would require significant financial investment to create traditional rural productive farms or enterprises. This is often beyond the capacity of Aboriginal family and title holders and also beyond the gov-

²¹ <https://www.business.gov.au/assistance/entrepreneurs-programme/innovation-connections/customer-stories/customer-story-karen-sheldon-catering>

²² See <https://www.maggibeerfoundation.org.au/blog/gubinge-bark>

²³ <https://www.sbs.com.au/food/article/2017/11/03/maggie-beer-wants-you-eat-your-way-better-brain-health>

²⁴ Tan, A. C., I. Konczak, et al. (2011). "Potential antioxidant, antiinflammatory, and proapoptotic anticancer activities of Kakadu plum and Illawarra plum polyphenolic fractions." *Nutrition and Cancer* 63(7): 1074-1084.

ernment and other organisations who are charged with assisting Aboriginal people to manage their lands. Frequently conventional agriculture is just not a good or feasible strategic consideration. Harvesting seasonal high value native fruits in this context is a game changer which has lessons for the Australian rural economy as a whole.

Contemporary science indicates that kakadu plum will be the basis of a profitable primary industry and a series of innovative products in the future. However, will the development of the Kakadu Plum and native fruit industry be based in Australia? and will it support the future sustainability of Aboriginal land enterprises and community economies? Much of the future potential for Australia depends on the support of Commonwealth, State and territory governments, Australia's private investment community and the nimbleness of existing Aboriginal public authorities, community enterprises and their ability to cooperate and support Aboriginal entrepreneurs and families. The future is promising if what Keynes calls the economic 'animal spirits' around kakadu plum development can be harnessed. The fact that kakadu plum trees grow in abundance across the north of Australia and no-where else in the world is a major advantage. The road map and check list of what must happen now varies depending on interest groups, however, one fundamental precept is that Aboriginal knowledge and land combined with mainstream expertise, capital and know-how is essential for a more profitable kakadu plum industry in Australia or elsewhere.²⁵ There is no question that Aboriginal people and knowledge must be at the centre of all future developments.

An Industry in its Infancy

The Kakadu Plum industry is in its infancy as a domestic and export industry. As has been noted by several business analysts: 'only a small number of commercial harvests have ever been undertaken, and only a handful of farms had attempted to respond to the ever-expanding global market for Kakadu Plums'.²⁶ The most successful Australian native fruit export is the macadamia nut and in 2017 46,000 metric tonnes of shelled nuts were produced and up to 70 per cent of the product was exported. This dwarfs the size of the kakadu plum industry in which 5 metric tonnes were produced in 2018 and all was consumed within the domestic market.

Nevertheless the pioneering work of T.H.E. Kakadu Plum Working Group, Palngun Wurnan-gat Aboriginal Corp, Gundjeihmi Aboriginal Corp, Mamabulanjin Aboriginal Corp, the Indigenous Land Corporation and their supporters and advisors including the Queensland Alliance for Agriculture and Food Innovation and the Kimberley Institute Inc. as well as several Aboriginal based entrepreneurs at Bidydanga, the Dampier Peninsula, Yirrkala and Cape York Peninsula have been seminal and show the potential of the industry to grow very strongly.

To be successful and prosperous the Australian kakadu plum industry must harness a diverse range of stakeholders from private investors to Aboriginal traditional owners to homelands communities to rangers groups to agriculturalists and farmers, scientists and food processors. Cooperation and good will is needed between Aboriginal communities and

25 Emerging Business Models for the Kakadu Plum Industry, PWC, 2017, p xi
26 Ibid., p. xi

non-Aboriginal partners, between government and private investors, between Aboriginal communities across the North, between large and small enterprises and between Australian and international partners.

The Role of Government: A Native fruits/Kakadu Plum Marketing Authority vs Stakeholder and Information Associations

Legislation to protect, develop and enable the kakadu plum industry must be enacted in the Commonwealth, WA, NT and Qld parliaments. This coordinated legislative effort should create a central marketing authority that develops and coordinate the efforts of kakadu plum growers in the States and Territories and obtain the best international and domestic prices for the fruit. It should also work with centres of research and development in Australian research institutions particularly in the food and biotechnology centres of Brisbane and Melbourne.

Federal, State and Territory government have played seminal developmental roles as buyers/sellers, direct investors, marketers, price regulators, global exporters, infrastructure providers, research and development agencies, forecasters and planners for every major Australian primary industry. Over the course of the 20th century many billions of dollars were invested by government in primary industry so that in turn in 2018 the combined grains, sugar, meat and other farm products industries contributes 3 per cent of Australia's GDP and fifty billion or 13 per cent of Australia's total export returns. Moreover Australia is almost fully self sufficient (93 per cent) in food and agriculture and one Australian farmer feeds on average 600 people worldwide each year, collectively the equivalent of 80 million people or three times the Australian population.

To be successful the kakadu plum and native fruits industry requires significant public support and investment. One of the institutional challenges for government and an important change in the national narrative is for Aboriginal lands, enterprises and knowledge to be seen to be as economically and strategically important as farming communities have been viewed in the past. The kakadu plum may be the modern product that finally allows Aboriginal people and organisations to be seen as fully fledged commercial partners and primary producers. This is to reinstate a little-known dimension of the Aboriginal people of Northern Australia as Australia's oldest exporters. Trepang which grows in the sea waters, close to the bush orchards of kakadu plum in North East Arnhem land was successfully traded with Macassan and then Chinese traders for up to 400 years before modern colonisation.

It is instructive to note that all Australian primary production is still heavily supported by publicly owned or supported marketing authorities. Historically statutory authorities had a monopoly and very tight control over the purchasing and exporting of all primary products including meat, wheat, wool, sugar, cotton. Although there has been a trend towards de-regulation in recent years, due to some profound mistakes by the management of the Wheat and Wool Boards, in the early development of primary industries marketing bodies are essential. This is because long term patient capital investment is needed alongside international and domestic marketing that is beyond the capacity of individual producers

and even significant investors. Many marketing authorities continue to play a very, hands on and important role in the development of primary industries. The rice marketing board formed in 1928 owns all Australian export rice. The rice becomes the property of the board and the board's function is to obtain the best possible return for growers. Domestic rice production and sales are also highly regulated by the board. The rice marketing board also financed the development of all of the processing and storage facilities that enabled the industry to grow strongly and obtain good returns over many decades.

Stakeholder and information associations, such as Australian Native Foods and Botanicals Limited (ANFAB) in its current form, are not enough to truly develop a primary industry. It is important to note here that the macadamia industry was not supported by a public marketing authority and although it is a native Australian fruit, now only 3.2 per cent of world kernel production currently takes place in Australia. South Africa, South America and China are increasing production to much higher levels than Australia. World supply effects the price of the Australian product and Australian macadamia producers are very vulnerable to over supply that can occur due to seasonal variations. Hopefully this will not occur for the kakadu plum industry at least, for the present, the majority of world supply can only come from northern Australia.

There is as all this suggests and urgent need to create a statutory kakadu plum/native fruit marketing authority or corporation whose first priority should be the development of the kakadu plum industry. In the first instance the marketing authority should purchase all kakadu plum tonnage for export and regulate the sales of domestic kakadu plum production with the goal of obtaining the best returns for individual producers. The native fruit marketing authority should also with the aid of the machinery of government, under-write and finance the creation of processing plants and storage facilities in five key centres of kakadu plum production, Broome, Wadeye, Darwin, Yirkalla and Weipa.

Realistic and evidence-based industry projections of the future revenue of the kakadu plum industry predict a 30 tonne annual crop yielding between 3 and 5 million dollars per annum within five years.²⁷ This is a modest estimate. But the most important factor in the development of the industry is centralized marketing and coordinated investment. With these elements in place the industry could potentially grow faster and have a strong international market place. A hybrid public and private investment strategy focusing on five main centres Broome, Wadeye, Darwin, Yirrkala and Weipa would be most desirable in the first instance. The Brisbane based bio-food centre of excellence focused around St Lucia and the University of Queensland is also critically important to the development of the industry.²⁸ In each centre there should be a central collection, processing and storage facility at minimum. In Broome, Yirrkala and Weipa the existing nursery and bush re-vegetation facilities need to be upgraded and expanded. There should be high valued adding processing capacity in Broome and Darwin and potentially the other centres as well. The size, scope and form of investment is open to debate, however, a sum of \$50 million over five years would give northern Australia a substantial advantage in making the kakadu plum industry a profitable domestic

²⁷ Ibid.

²⁸ <http://statedevelopment.qld.gov.au/industry-development/biofutures.html/>

and export industry. This is a modest outlay when compared to the public subsidy and investment in other primary industries by Commonwealth, State and Territory governments.

Aboriginal Enterprise and the Future Kakadu Plum Industry

Aboriginal homelands and other community enterprises invariably take the form of cooperative corporations and are registered and regulated through the Office of Indigenous Corporations. One of the priorities now is for Aboriginal corporations to run as cooperative profitable businesses that distribute their profits back to their members. This requires cultural change because in the past there have been limited possibilities of generating profitable income through business activities. There is less a need for bureaucratic adherence to rules and more of a focus on building long term businesses and partnerships with non-Aboriginal enterprises and investors. This is not something that can be achieved over night and it is often a tricky transition. In the case of kakadu plum encouraging the collection and storage of food that will be sold as a mass for profit is in itself very different from the usual community management role of Aboriginal corporations and also from the traditional hunting and gathering role where food was consumed as it was found. Even the North east Arnhem land 400 year old trade of trepang revolved centrally around bartering for goods and most of the processing and gathering was done by the visitors. Fabric, tobacco, steel was highly valued but the rupiah (coins) brought by the traders to pay for trepang may still be found buried in large mounds on remote beaches. As this suggests a new cooperative culture will be necessary for homelands organisations and the hunting and gathering groups who have the potential to harvest kakadu plum in great quantities. The evidence of particularly the Wadeye, Palngun Wurnangat Aboriginal Corporation and Kindrid Spirits partnership shows that with the right investment, support and revenue flowing to harvesters, a new productive culture can and will be achieved. Similarly long term homelands entrepreneurs and families such as Bruno Dann and family based enterprises such as Kimberley Wild Gubinge show that it is possible for strong relationships to develop between private retail outlets and to high end consumers directly.

Even in this early phase of the Kakadu Plum industry, and with a very limited capacity for collecting and processing the plum, Aboriginal individuals and families in Broome earned up to \$5000 in a fortnight in a good season. At Wadeye the Palngun Wurnangat Association aimed to create 200 seasonal 3-4 month jobs and to produce 110,000 dollars in additional income for the community. As this indicates the harvesting of kakadu plum can form an important supplement to Aboriginal income in regional towns, urban environments and remote homelands.

The income of registered Aboriginal wild harvesters of native foods, who are authorized by traditional owners and landholders, should be deemed tax free and should be neutral for the purposes of all Commonwealth welfare payments including especially unemployment, disability and pension payments. While “hobby or hobby farm income” *is not taxable* if it is sporadic and under \$18,000 per annum, such income has problematic complications for Commonwealth Centrelink allowances. For this reason this report strongly argues that the seasonal income from harvesting kakadu plum should be seen

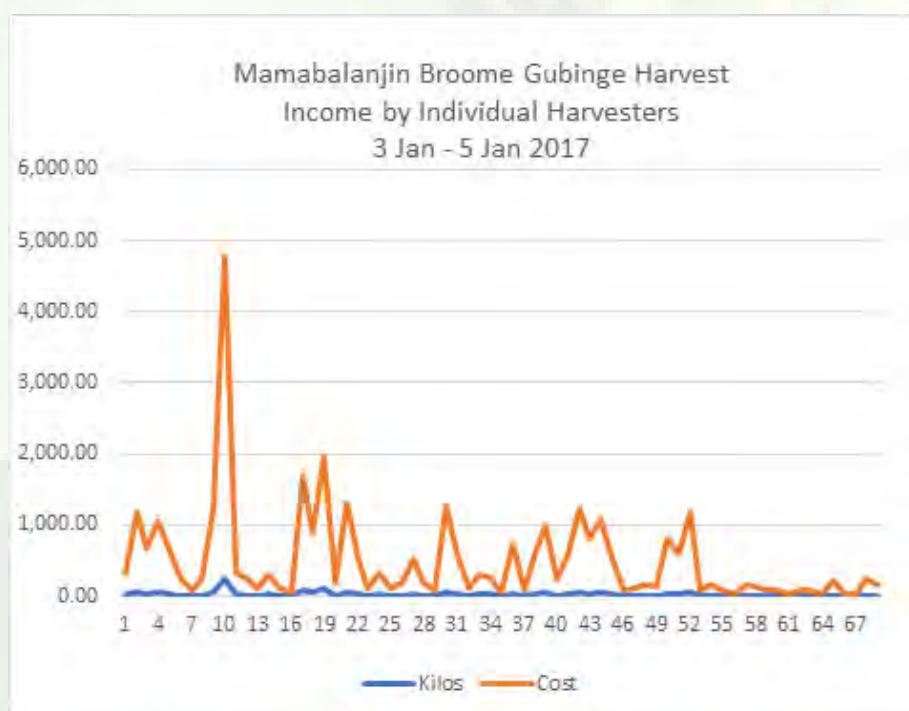
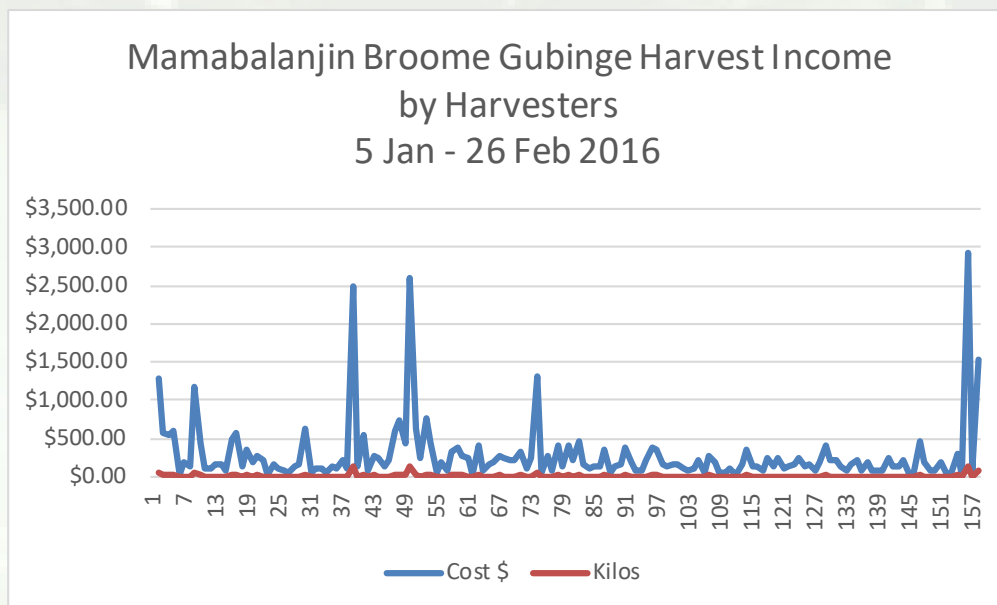
as symbolic of the traditional Aboriginal ownership of land and native foods and should belong to a special category of income that is untaxed and allowable as supplementary income that does not effect payments by Centrelink and all Commonwealth and State welfare agencies. The problem with seasonal income from the harvesting of kakadu plum as a hobby is that it comes within a short period. If an individual harvester or family earned over \$989.67-1149.84 in a fortnight then a Centrelink payment could be reduced to zero. This would discourage harvesters from fully participating in the annual harvest. In Broome one family was able to gather 255 kilograms of kakadu plum in a two week period earning \$5000. Evidence suggests that many Aboriginal harvesters in Broome collect only enough kakadu plum to be able to retain their allowances. We should be encouraging Aboriginal harvesters to collect the maximum wild harvest yield possible and to derive an appropriately income for that work which is an extension of traditional hunting and gathering with major health and psychological benefits. As the world's greatest social entrepreneur Dr. Muhammad Yunus argues "If we can turn unemployment into entrepreneurship, the amount of human creativity, talent and productivity we will unleash is almost beyond measuring". In the case of the kakadu plum and Aboriginal traditional knowledge this would be a truly righteous and rewarding outcome with benefits for Australia as a whole.

In a recent address in Sydney Professor Yunus the inspirational founder of the People's Bank of Bangladesh reflected on the lessons of bringing micro-finance to the United States. The irony he noted was that as soon as people start to get on their feet with a micro-loan their social benefits are cut off throwing the individual's self-employment strategy into chaos. Professor Yunus noted that government policy wants to create the perfect poverty trap from which no-one can possibly escape. Professor Yunus' sentiments match the last ten years of work of the ISX where so many small enterprises have not started because any form of self employment would jeopardise the stability of welfare or disability payments. The United States is also a very useful example of why a minimal welfare state is not the answer either, this creates a situation where people work many jobs and still struggle. Instead of seeing the first steps of self employment as something to encourage, the modern welfare society discourages these steps by stripping away an individuals social benefits.

If the kakadu plum industry is going to be a success, not only for Aboriginal Australia, but for the nation as a whole then public investment ie welfare dollars must be seen as a foundation stone for the future development of the industry. The potential income to registered Aboriginal harvesters that can come from the kakadu plum industry should supplement their existing forms of income from welfare or work and should be completely tax free for at least the next ten years. This will motivate Aboriginal people to really develop their bush orchards and to support their community mutual and cooperatives such as Mamabalanjin in Broome, Palngun Wurnagat in Wadeye and Gunddjejihmi in Darwin.

In Broome one Aboriginal family was able to gather 255 kilos of Gubinge and received over \$5000 in income in a two week period. Other individuals gathered small amounts in the range of 10 kilos and used the income to supplement their weekly shopping, to pay for

school books, uniforms for their children. The average income for the 157 harvesters in Broome in 2016 over that year's harvest period from 5 January to 26 February was \$281.30. In the 2017 harvest there was a smaller window of buying only 3 days and only 70 harvesters brought Gubinge for sale. In 2017 the average income for a harvester was \$483.70.



The importance of the Kakadu plum for the contemporary sustainability of remote Aboriginal homelands and regional and remote communities in Australia's North is unprecedented. The current harvest of Aboriginal sources kakadu plum is estimated to be between 5 to 10 tonnes per year.. The price for a kilo of un-processed fruit to an Aboriginal harvester where there is a community hub is \$20. The current price for processed fruit can be as high as \$85. Some estimates are that the price for a kilo of processed fruit could rise as high as \$760.²⁹ Other unsourced claims are that the demand from China alone could rise to 100 tonnes a

²⁹ Emerging Business Models, p.22

year³⁰. In their recent report for the Australian government PWC Indigenous Consulting argue that there is substantial scope for the industry to be price makers not price takers. PWC Indigenous Consulting also predict exponential growth in demand for the plum³¹. But this remains to be seen in the international market place given that Australia's north is for the time being the sole provider of Kakadu plum and its value added products.

Even within the current price range there are opportunities for Aboriginal individuals, communities, families and commercial businesses to create income, even using existing infrastructure and distribution systems. The potential revolutionary role of the Kakadu plum as a source of income for Aboriginal individuals has been demonstrated and proved by Mamabalanjin Aboriginal Corporation in Broome and the Palngun Wurnangat Aboriginal Corporation in Wadeye. With the support of philanthropists and government investment these organisations bought and sold over eight tonnes of Kakadu plum from individual harvesters in and around the town of Broome and from a remote Aboriginal community centre at Wadeye in 2016 and 2017. In the process \$160,000 in direct benefits was distributed to community harvesters in both communities and although it took time the wholesale organisations were able to make a profit on their purchases.

At first sight the individual income of Aboriginal harvesters seems small. However it should be observed that there is great potential demand for kakadu plum and it is readily storable for up to four years as a refrigerated product. There are few Australian agricultural products who have these characteristics and are as a form of wild harvest very economical to maintain and nurture. The other characteristic of the kakadu plum industry is that it encourages Aboriginal people to be on their own country and to walk and appreciate their lands. The benefits of health and well being for such a natural practice are incalculable but it is clearly something that spans the chasm between the modern world and the ancient past. For the first time a natural Australian product with the capacity for vast commercial development will provide a source of income for Aboriginal custodians and owners to properly invest in the infrastructure necessary to support their landholdings.

There is a strong confluence between Aboriginal land care and environmental management strategies and the emerging kakadu plum industry. The Kakadu Plum industry will have a significant and lasting potential impact on Aboriginal land stewardship. The emerging industry may allow communities to look after their land and to gain an income from activities that connect them to healthy traditions. In remote communities with air access and regular flights in and out for routine health and infrastructure services there is the possibility of creating a kakadu plum network that will substantially expand the harvest of Kakadu plum. There is no current primary industry that could provide such a sustainable and long-lasting income that is in keeping with traditional Aboriginal land stewardship practices. Even in its early stages it is more environmentally and economically feasible for a small community to be involved in Kakadu Plum harvesting, with relatively little infrastructure investment required, than say investing in a traditional primary industry such as cattle. The traditional burning practices in North East Arnhem land and across the North also enhance the produc-

³⁰ Emerging Business Model, p. 23

³¹ Emerging Business Models, p. 1-2

tivity of bush orchards and kakadu plum production in ways that traditional stewards readily understand. Mosaic burning is not just something to reduce hot fires or for carbon credits, it also has an intimate relationship with bush food cultivation and bush orchard development. It is no accident that kakadu plum trees grow thickly in areas where traditional burning is common place. The relationship between cultivation, propagation of native fruits and lie beyond the scope of this report but it is an important to point out that there is a link between native fruit productivity and mosaic soft burning when it is undertaken by experts in the field, namely Aboriginal people who have retained traditional knowledge about this important arena of Aboriginal agriculture.³² Certainly there is a clearer link between burning and underground tubers and yams, however, it is also the case that the propagation of seeds of even fruit trees is triggered by soft burning in small, constrained areas at the right time of year. All these areas are important potential linkages between rangers groups that are being formed across northern Australia and the kakadu plum industry.

The most advanced Aboriginal owned conventional orchards and nurseries for kakadu plum are in the Broome and Kimberley region. It is here over two decades that experimentation has occurred around propagation of seedlings and the creation of plantations. There are also established non-Aboriginal owned plantations in the Darwin region. Banduk Marika's Dundungurr Nursery at Yirrkala was also probably amongst the first Aboriginal owned enterprises to successfully propagate Kakadu plum in relation to mining rehabilitation. There is a very great economic opportunity for Aboriginal owned nurseries, ranger groups and businesses like Mamabalinjan, (Broome) Yolngu Business Enterprises (YBE) (Nhulunbuy) to create bush orchards in areas of rehabilitation after strip mining operations like the bauxite mines of Gove and Weipa where hundreds of hectares are required to be rehabilitated back to a native state each year. Mamabalanjin has also led the way in creating conventional plantations of Kakadu plum or Gubinge. There is a very large potential for the sale of trees as house and bush block plants throughout Northern Australian from Carnarvon across to Brisbane. It is possible to envision a virtuous circle of investment and income in which mining companies invest in Kakadu plum development as part of native re-vegetation and this then forms an income base for traditional owners and land stewards and custodians.

Sacred Food: Modern Consumers and Aboriginal Provenance, Culture and Sustainable Development

"If you lose that link between Aboriginal people and bush food, then you lose everything. It's hollow. It's nothing" - Rayleen Brown³³

How can future developments around kakadu plum further benefit the Aboriginal people of Northern Australia? One of the important roles of a kakadu plum/native fruit marketing authority would be to regulate a cooperative network of Aboriginal harvesters, whole sale distributors, retail outlets, catering and marketing organisations that work together.³⁴

The idea of a "Sacred Food" network was first mooted at the Broome ILC Gubinge sym-

³² <https://capeyorkfire.com.au/2018-workshops/national-indigenous-fire-workshop-nsw>

³³ Merne Altyerre-ipenhe (Food from the Creation Time) Reference Group, Douglas, J. & Walsh, F. (2011). Aboriginal people, bush foods knowledge and products from Central Australia: Ethical guidelines for commercial bush food research, industry and enterprises. Desert Knowledge CRC Report, 71. Alice Springs, NT: Ninti One, p. 26 cited in Higgins-Desboilles et al, Indigenous Foods Benefiting Indigenous Australians,

³⁴ ILC Conference Broome, PwC Indigenous Consulting Emerging Business Models for the Kakadu Plum Industry, Nov 2017

posium of March 15, 2017. The concept was to create a marketing label that would signal to consumers the unique provenance of Australian native foods. This follows the lead of other Indigenous nations across the world.³⁵ The American Intertribal council licences the use of their “Made/Produced by American Indians” trademark and a similar process is envisioned for the sacred food trademark.³⁶

The concept of a sacred food for retail purposes needs to be disentangled from sacred Aboriginal law. In traditional ceremony there are sacred foods that have meanings and symbolism that Aboriginal initiates and community members learn about. The learning goes on all their lives from the so-called outer circles of knowledge to the inner circle of knowledge that only men and women with grey hair, after a life time of study and meditation, can understand. This kind of sacred food belongs only to Aboriginal custodians. It is distinct for each Aboriginal nation and community and is specific to language, geography, cosmology and knowledge systems and peoples.

The concept of sacred food label for the purposes of advancing kakadu plum as a twenty first century sustainable, wild food industry is something different. At minimum the labelling of kakadu plum products should include a sacred food label with the traditional Aboriginal name of *terminalia ferdiniana*, the people who harvested the product and the traditional land from which it was harvested. The sacred food label should also link food with knowledge about how to look after land and health. In this way the sacred food label would protect Aboriginal provenance and commercial property and intellectual rights in the day to day market activity of contemporary society. The idea of the sacred food label is that different Aboriginal philosophies of sustainability can be shared with, owned and appreciated by the world. It would bring a sense of one-ness with the land and appreciating the world's oldest continuously evolving cultures.

The sacred food logo could also indicate that the organisations involved in the production of the food are Aboriginal owned, managed and that income flows back to Aboriginal people and communities. In this respect it would be much like the “Made in Australia” logo in informing consumer decisions about which products they buy.

In summary a sacred food logo would be a marker of Australian Aboriginality. It would guarantee that the product is an Australian native fruit sourced in Australia. The logo would educate consumers about an ancient food whose modern “discovery” derives from Aboriginal knowledge and the experience of living in the Australian landscape with continuous knowledge that goes back 60,000 years. A sacred food trademark would also denote “wildness” and the idea of a food that did not grow in energy intensive Western agricultural systems but in the wild orchards and groves of the bush with no conventional cultivation. A sacred food trademark would also guarantee that the food was harvested by Aboriginal people and was processed and sold in ways that ensure Aboriginal communities derive a strong percentage of any income from sales. In other words sacred food would contribute to Aboriginal economic sustainability within and alongside the mainstream economy.

³⁵ <http://www.indianaglink.com/our-programs/american-indian-foods/>

³⁶ http://www.americanindianfoods.com/wp-content/uploads/2010/06/2009-02-27_trademark_application.pdf

By marketing native foods as sacred food, Aboriginal people would gain a real competitive advantage from their existing life practices involved in caring for the fragile ecology of the Australian landscape that has been so misunderstood and abused by Western agricultural and living systems.

Kakadu plum may just be the beginning of a major native fruit industry for Australia. There are many wild foods that are known to Aboriginal communities that are only just being discovered by Australians and the rest of the world. Kakadu Plum is the latest most spectacular example. However other Australian native products like the macadamia nut, eucalyptus oil and the acacia have been very quickly understood and commercialized elsewhere. The concept of sacred food would allow world consumers to understand the provenance and knowledge systems behind Australian native fruits and other products.

There is also something true to Aboriginal philosophy about the concept of sacred food. The true goodness of the food can only be captured by understanding its place in the land and the seasons. Sacred in this respect asks us to envision a world in which human beings are not just consumers and actors but are related to trees and fruit as family members. When searching for Kakadu plum in North East Arnhem land the harvester calls the name of the fruit [ñäṅka-bakarra](#) and imagines its properties and uses and, if all is well, and the season is right, it appears in the quantity and quality it is needed. Just as a relative may be appreciated for a kindness, the tree is thanked, appreciated and remembered. When hunting and gathering in this way the bush itself takes on many different qualities. It is not just a mass of flora and fauna. It is truly a garden with unique characters and features and dynamics. Aboriginal people learn over the course of their lives the extraordinary intricate connections between water systems, winds, underground aquifers, plants and animals. By buying a sacred food a consumer becomes in a sense a family member too. They invest in a way of life that just cannot be substituted by the written word, by films or videos or how to manuals or by creating plantations of trees. By investing in sacred food consumers reverse the destruction of Aboriginal society and culture. They are valuing a product that allows Aboriginal people to glory in one of their finest attributes their capacity to live and protect native ecological systems.

Kakadu Plum: Ancient Culture, Lessons for the Future

Healthy human lives, land, plants and animals are ineluctably linked. Kakadu plum is an ancient food recently discovered by twenty first century science. It's Aboriginal heritage helps us to unlock the secrets of a better human life and a more sustainable future. Australian Aboriginal knowledge systems and modern science should be intimately linked. If we can join them then there will be a new and truly prosperous future for us all in the twenty first century of Western civilization.



Gathering food with young *ṇäṇ'ka-bakarra/kakadu* plum seedlings in foreground, Mata Mata, North East Arnhem Land. Batumbil Burarrwanga

Part Two: Larger Thoughts, Research Raw Materials for Future Research Papers and Ongoing Questions

Health, Food and Life: Aboriginal Knowledge & Wisdom

"Health... is not a simple matter of good fortune, a prudent lifestyle or good diet. It is the outcome of a complex interplay between the individual, his territory of conception, and his spiritual integrity: his body, his land, and his spirit." Body, Land and Spirit: Health and healing in Aboriginal society, University of Queensland Press, St Lucia., p. 91

Aboriginal communities across the Australia's Top End, above the tropic of Capricorn, from Broome to Cairns, continue to draw on traditional knowledge to create sustainable businesses through the harvest and processing of native bush foods. Aboriginal peoples of the Centre and South are restoring their own traditional knowledge systems and creating through bush medicine outlets, Aboriginal food and cuisine companies. A healthy and strong network and set of relationships is emerging which replicates the songlines and the ancient national trading system of the past in which ochres and foods criss-crossed the continent north/south, east/west. Aboriginal knowledge and agriculture is dancing back into the heart of the city but this promising set of contemporary developments needs investment, support and most of all awareness. (See below Sustainability, Sacred Food: Modern Consumers and Aboriginal Provenance)

Australian Aboriginal intellectual property and knowledge has been unceremoniously stolen since the formation of the British colony in 1788. Kakadu Plum is symbolic of a new era with new hopes and threats. What happens with the kakadu plum could represent the beginning of a new age in which the full dimensions of Aboriginal culture, knowledge and rights over native flora and fauna are respected. It could also be a much-needed source of income in remote areas and particularly traditional homelands. Alternately it could lead to a new era of bio-piracy where great profits are reaped by domestic and international developers without acknowledgement of its Aboriginal provenance. The native Australian macadamia nut and properties of the acacia "wattle" tree are now harvested and more commercially profitable in international arenas than they are in Australia. There is a threat that this could also occur with the kakadu plum. The report comes after a long line of important studies that have shown the importance of Aboriginal knowledge and Australian bush foods. The Aboriginal pharmacopeia is vast and largely unexplored.) We have yet to identify the many uses and concepts of plants and animals. In fact our understanding of Aboriginal knowledge is still basic. See for example the dictionary of Yolngu bush fruit terms in the appendix of this report that remains to be properly documented, studied and explored from a Western medical and pharmacological basis. (See Appendix Five)

Aboriginal Agriculture

From the first contact Australian immigrants learned from Aboriginal people. In South Eastern Australia Dame Mary Gilmore reminded us in the early part of the twentieth century that many mainstream pharmaceutical techniques including eucalyptus extraction, the sucking of snake venom from bites, the application of black wattle bark for tanning, the use of clean mud for poultices, the use of eucalyptus beds and steam pits for colds and rheumatism and much more derived from Aboriginal traditional practices.

We are evolving in our understanding and our most basic mistake has been to attribute superiority to Western science and primitivism to Aboriginal techniques, knowledge and methods. In fact we have viewed Aboriginal culture through a false lens. Perhaps one of the biggest conceptual misunderstandings has been to try to find in Aboriginal society something akin to our doctors, hospitals and chemists. The fact is that in everyday life the ordinary Aboriginal citizen had the knowledge of the natural pharmacopeia all around him or her to solve most ailments and problems. It was only in extraordinary circumstances that a clever man or healer was required or a death un-accounted for. The truth is Aboriginal society was amongst the most healthy and sustainable communities in world history. It's longevity and continuity over 60,000 years are incomprehensible in modern historiographical terms.

The evolution of our knowledge of Aboriginal knowledge of food and medicine has gone through several phases. Joseph Banks documentation of the unique flora and fauna of Australia probably represents the first phase of our understanding. Then followed a naturalist and anthropological phase that involved apply-

ing western knowledge systems to classifying human and material phenomena in Australia. We missed so much because the non-Aboriginal gaze could not see the nuances and richness of the land. Probably the most useful developments occurred where Aboriginal and non-Aboriginal people worked in partnerships. In this way we have as Dame Mary Gilmore reminds us whole industries derived from Aboriginal knowledge of plants and animals. As she says in the racist terms of the day “the white forgets the uncounted ways in which he .. was unintelligent (and still would be) but for what the blacks taught”.

Now we are entering a new phase of understanding. From texts like Jennifer Isaacs Bush Food Aboriginal Food and Herbal Medicine, 1987 to Bruce Pascoe’s Dark Emu Black Seeds: Agriculture or Accident? 2014 to Bill Gammage’s The Biggest Estate on Earth, 2011 the sophistication of Aboriginal agronomy and pharmacology is slowly emerging. In this context a so-called super food like Kakadu plum seems to be a revelation of a natural secret. But Aboriginal knowledge of the kakadu plum is much more than that it is a unique means of understanding the extraordinary ecology and health of Aboriginal Australia. Beyond the substance itself there are lessons for our modern society in the way we harvest, consume and share the bounty of our world.

Gubinge: Why Were Broome and the Kimberley First Movers?

The non-Aboriginal, Western and Eastern gaze/consciousness, is incommensurate with the Australian Aboriginal gaze/consciousness in many ways. There are so many rich points of difference and misunderstandings. The Australian continent was not only one cosmos, cut off from the modern histories of Western and Eastern countries, over thousands of years, it was many inter-connected, sometimes conflicting world systems and languages. This is why when we ask with a modern lens what is the health-giving qualities of a particular plant or herb? a traditional Aboriginal people may sometimes look at us quizzically. Was it the food or the land or the season or the circumstances that gave “health” to a person?

A series of frames would form in a traditional Aboriginal mind: time of year or seasonality, the corresponding life practices, the order of life and ceremony and the continuum of orchards, plains and hunting fields – all these things could not be de-linked from eating a particular food or herb or from the idea of health.

In many parts of the Australian continent the traditional Aboriginal health consciousness was threatened and sometimes destroyed by the stasis of Western and Eastern life. Houses, fences, the imposition of foreign agricultural systems including foreign animal husbandry and horticulture and the creation of infrastructure such as dams, pipes and roads were anti-thetical to a healthy life in Australian Aboriginal terms. Even in parts of the Australian continent where there was not a large population invasion the subtle effects of refrigeration, electricity, permanent housing, motorized and fast transportation by air, land and sea, water pipes and storage, concrete and steel changed Aboriginal life profoundly. Many profound components of Aboriginal knowledge were not appreciated or recognized.

Such was the dominance and the automatic assumption of superiority of the Western knowledge systems and technology that little could be known from Aboriginal Australia outside a problematical ethno-anthropological inquiry into a strange and seemingly primitive world. Ironically Western science is only now discovering truths that Aboriginal people knew for thousands of years. These truths were locked in an epistemology and ontology that was completely anti-thetical and even un-recognisable to even those anthropologists and scientists who were tasked with “understanding” Aboriginal life. To truly understand the Aboriginal arts of life and health requires either a profound proficiency in first languages or Aboriginal people who have mastered non-Aboriginal languages and come to terms with very different ways of viewing the world and that is why it is only now in the early twenty first century that the sophistication of Aboriginal food and health systems and many other aspects of their culture are being appreciated. This is not just some sort of charitable reconciliation it is akin to a breakthrough or revelatory meeting of minds for the first time.

There is much that Aboriginal people can teach the world about food, life, environmental management and sustainability.

Bruno Dann hints at the cosmology of the Broome and Kimberley peoples when he talks about gubinge. To truly gain the health benefits of gubinge, one must be with the gubinge tree harvesting the fruit in the man-gala season. This would be the time to eat gubinge when it was ripe. The seasonal produce would be balanced with the food available in the other five seasons: Marrul (April-May) Wirralburu (May to June), Barrgana (June-August), Wirilburu (September-October) and Laja (November-December). The extra-ordi-

nary quality of guibinge that Western science tells us about, now is that it is a unique preservative, means that the fruit could be preserved as a paste over the winter months, and even dried fruit on the ground might be an important food source in the cooler months, but the point that Bruno makes about the lessons he learned from elders past is that food uniquely belongs to time, place and season.

Seasonal Life

The subtle dimension of all this is that there were no doctors or hospitals for many thousands of years in Aboriginal civilization health was a peoples' skill that came from travelling with the seasons, harvesting the appropriate foods and continually laying the bountiful foundations for future seasons by burning grass lands and allowing native orchards to flourish.

But there was also much more than this. What we know as aquifers and underground springs are linked to cosmological pathways capable of bring rain, storms, lightning and life. What we might think of as magnetic forces pass through these systems of life underground and in escarpments and must be nurtured by Aboriginal song, meditation and ceremony. If these forces lie dormant, or are interfered with and not properly respected then seasons, food and life can be catastrophically disrupted.

To truly understand the value of the kakadu plum means understanding "bush peoples'" knowledge of the seasonal effect of foods and the way they were used from a bush peoples perspective.

Batumbil Burarrwanga tells us that when families were about to make a long walking journey children were instructed to fill up their dilly bags with n̄an'ka-bakarra whenever they could. She knew that the fruit was also known as an anti-inflammatory agent. The fruit and the bark of the tree was used as a balm on a swollen knee or joint. It was also known to be a healing agent for wounds and cuts. It was also known as a cure for headaches.

The Modern World Catches Up and Recognises Aboriginal Concepts of Health and Agriculture

What we know as the healthful qualities of vitamins and minerals would have been assumed by Aboriginal peoples eating their seasonal produce. But food was not something that came about by chance. In what Western eyes would only see as bush, there were orchards of trees that would be visited, inspected and nurtured at the appropriate times of the year. As families travelled the lands children were reminded of the geography and location of these food groves and native orchards. Perhaps at the end of the harvest as the cooler months approached the lands might be burned so that the defined trees and food areas could thrive in the wet season and monsoon times. And so the cycle would begin again. Science now tells us that fire was an important part in the propagation of kakadu plum. This knowledge was also known by traditional peoples all over the Australian continent .

Bruce Pascoe's important book *Dark Emu Black Seeds: Agriculture or Accident?* has shown us the way European eyes could not see native agriculture. In the same way what looks like a uniform piece of bush in Northern Australia is a vast pharmacy and supermarket full of orchards that are supported by the oldest agricultural practices in the world. A further and very important dimension is the concept of food as medicine and life practices as recipes for health. Many traditional peoples around the world have similar philosophies and it is being recognised that it is not just food itself that is important but the way life and food intersect. As the tribal people of Tamil Nadu in South India argue "Food is Medicine". It is the basic life style of our ancestors. Right food in the right time is the basis for better living. Due to modernization of our lives, everything is in fast mode, the result of the fast mode is more disease and more medicines. For many centuries, the tribal people of Anaikatti hills in Tamil Nadu, India are practicing their traditional cooking for nutritional food using small millets and other natural items." Within contemporary Western society the traditions of herbal medicine are also reinforcing a need for people to think about food as more than just something to be consumed but as a therapeutic medicine in its own right. Judith Griffin asks: "Have we forgotten how simple it is to enhance our own well being? Have we become too dependent on the quick fix and neglected to really care for our bodies? Have we exchanged the joys of gardening for the drive-through at a fast-food restaurant?" Similarly the Asian traditions of "healing with whole foods" are important new dimensions of consumer consciousness that are being recognised in the modern industrialised countries. The long thousand year tradition of Chinese medicine creates a new appreciation of the role of a fruit like Gubinge. It is no accident that the relationship of the Chinese and Japanese community with the Aboriginal

community in Broome has been one of the reasons why gubinge has been appreciated for many decades in the Kimberley and North West region of Australia. It is also one of the reasons why the Aboriginal community of Broome, and through this link to Darwin, are the pioneers in bringing Gubinge to the forefront of contemporary thinking.

The convergence of natural herbal traditions, Chinese and Asian food traditions into contemporary consumer consciousness have opened our eyes to the treasures of Australian Aboriginal knowledge systems and Australian native foods. The question is now: can the appreciation and development of the kakadu plum make a difference to Australian and Aboriginal Australian ecological, economic and social well being?

Contemporary Sustainability

I feel like going back home

Right now while the gubinge is ripe

Stephen Pigram, Pigram Brothers, Saltwater Country,

Bush foods, and particularly Gubinge/ Marnybi/Kakadu Plum/Nän'ka-bakarra, represent one of the most important and potentially transformative economic opportunities for Aboriginal communities of the north. If developed sensibly this arena is capable of changing forever the northern Aboriginal economy and society. The gathering of seasonal produce with a high economic value links Aboriginal people to their traditional way of life and to the stewardship of their estates and orchards and is an important source of sustainability in the modern world. It can be argued that the modest and bush based native foods industry could potentially do more for the health of Aboriginal communities than multi-billion dollar mining and conventional agricultural projects – but it should also be noted that where such investments exist there is important cross over fertilization through in the mining industry the link between native re-vegetation and Aboriginal nurseries and bush orchard expertise and in the need for mass produce close to city centres. However for Australia and Northern Aboriginal peoples to truly seize the moment, it is important for there to be several measures and initiatives put in place.

Kakadu Plum as an Income Source for Aboriginal People and an Important Transition Point between Mainstream and Aboriginal Community Economy

The income of registered Aboriginal wild harvesters of native foods, who are authorized by traditional owners and landholders, should be deemed tax free and should be neutral for the purposes of all Commonwealth welfare payments including especially unemployment, disability and pension payments. While “hobby or hobby farm income” is not taxable if it is sporadic and under \$18,000 per annum, such income has problematic complications for Commonwealth Centrelink allowances. For this reason this report strongly argues that the seasonal income from harvesting kakadu plum should be seen as symbolic of the traditional Aboriginal ownership of land and native foods and should belong to a special category of income that is untaxed and allowable as supplementary income that does not effect payments by Centrelink and all Commonwealth and State welfare agencies. The problem with seasonal income from the harvesting of kakadu plum as a hobby is that it comes within a short period. If an individual harvester or family earned over \$989.67-1149.84 in a fortnight then a Centrelink payment could be reduced to zero. This would discourage harvesters from fully participating in the annual harvest. In Broome one family was able to gather 255 kilograms of kakadu plum in a two week period earning \$5000. Evidence suggests that many Aboriginal harvesters in Broome collect only enough kakadu plum to be able to retain their allowances. We should be encouraging Aboriginal harvesters to collect the maximum wild harvest yield possible and to derive an appropriately income for that work which is an extension of traditional hunting and gathering with major health and psychological benefits. As the world's greatest social entrepreneur Dr. Muhammad Yunus argues “If we can turn unemployment into entrepreneurship, the amount of human creativity, talent and productivity we will unleash is almost beyond measuring”. In the case of the kakadu plum and Aboriginal traditional knowledge this would be a truly righteous and rewarding outcome with benefits for Australia as a whole.

In a recent address in Sydney Professor Yunus the inspirational founder of the People's Bank of Bangladesh reflected on the lessons of bringing micro-finance to the United States. The irony he noted was that as soon as people start to get on their feet with a micro-loan their social benefits are cut off throwing the individ-

ual's self-employment strategy into chaos. Professor Yunus noted that government policy wants to create the perfect poverty trap from which no-one can possibly escape. Professor Yunus' sentiments match the last ten years of work of the ISX where so many small enterprises have not started because any form of self employment would jeopardise the stability of welfare or disability payments. The United States is also a very useful example of why a minimal welfare state is not the answer either, this creates a situation where people work many jobs and still struggle. Instead of seeing the first steps of self employment as something to encourage, the modern welfare society discourages these steps by stripping away an individuals social benefits. The so-called downwards envy of Western democracy perpetuates an invidious and hateful social and economic stratification that never ends.

If the kakadu plum industry is going to be a success, not only for Aboriginal Australia, but for the nation as a whole then public investment ie welfare dollars must be seen as a foundation stone for the future development of the industry. The potential income to registered Aboriginal harvesters that can come from the kakadu plum industry should supplement their existing forms of income from welfare or work and should be completely tax free for at least the next ten years. This will motivate Aboriginal people to really develop their bush orchards and to support their community mutual and cooperatives such as Mamabalanjin in Broome, Palngun Wurnagat in Wadeye and Gunddjejihmi in Darwin.

Real Examples of Kakadu Plum as an Income Source for Broome Harvesters with Contemporary Prices and Distribution

In Broome one Aboriginal family was able to gather 255 kilos of Gubinge and received over \$5000 in income in a two week period. Other individuals gathered small amounts in the range of 10 kilos and used the income to supplement their weekly shopping, to pay for school books, uniforms for their children. The average income for the 157 harvesters in Broome in 2016 over that year's harvest period from 5 January to 26 February was \$281.30. In the 2017 harvest there was a smaller window of buying only 3 days and only 70 harvesters brought Gubinge for sale. In 2017 the average income for a harvester was \$483.70.

Hubs, Spokes and Cooperatives

The importance of the Kakadu plum for the contemporary sustainability of remote Aboriginal homelands and regional and remote communities in Australia's North is unprecedented. The current harvest of Aboriginal sources kakadu plum is estimated to be between 5 to 10 tonnes per year.. The price for a kilo of un-processed fruit to an Aboriginal harvester where there is a community hub is \$20. The current price for processed fruit can be as high as \$85. Some estimates are that the price for a kilo of processed fruit could rise as high as \$760. Other unsourced claims are that the demand from China alone could rise to 100 tonnes a year . In their recent report for the Australian government PWC Indigenous Consulting argue that there is substantial scope for the industry to be price makers not price takers. PWC Indigenous Consulting also predict exponential growth in demand for the plum . But this remains to be seen in the international market place given that Australia's north is for the time being the sole provider of Kakadu plum and its value added products.

However, even within the current price range there are a range of opportunities for Aboriginal individuals, communities, families and commercial businesses to create income, even using existing infrastructure and distribution systems. The potential revolutionary role of the Kakadu plum as a source of income for Aboriginal individuals has been demonstrated and proved by Mamabalanjin Aboriginal Corporation in Broome and the Palngun Wurnangat Aboriginal Corporation in Wadeye. With the support of philanthropists and government investment these organisations bought and sold over eight tonnes of Kakadu plum from individual harvesters in and around the town of Broome and from a remote Aboriginal community centre at Wadeye in 2016 and 2017. In the process \$160,000 in direct benefits was distributed to community harvesters in both communities and although it took time the wholesale organisations were able to make a profit on their purchases.

At first sight the individual income of Aboriginal harvesters seems small. However it should be observed that there is great potential demand for kakadu plum and it is readily storable for up to four years as a refrigerated product. There are few Australian agricultural products who have these characteristics and are as a form of wild harvest very economical to maintain and nurture. The other characteristic of the kakadu

plum industry is that it encourages Aboriginal people to be on their own country and to walk and appreciate their lands. The benefits of health and well being for such a natural practice are inestimable but it is clearly something that spans the chasm between the modern world and the ancient past. For the Indigenous Land Corporation kakadu plum should be seen as a god send. For the first time a natural Australian product with the capacity for vast commercial development will provide a source of income for Aboriginal custodians and owners to properly invest in the infrastructure necessary to support their landholdings. It is common for Australian governments to subsidise natural resources industries and the cotton industry the question is how could public and private investment co-mingle to support the development of the kakadu plum and native fruit industry?

Geographically the main hubs of the gathering industry are currently Broome, Wadeye and Darwin. There is the potential to develop a further hub in Nhulunbuy to take advantage of the rich bounty of Arnhem Land. The hubs are needed to develop the industry and to create “sticky money” that stays in the community. The model here is to build something like the mutual and co-operatives that have supported the famous Barossa Valley food and wine industry. In Broome Mamabulanjin has the most advanced model in this regard it has the history, the orchards, the processing capacity and the community base to develop a cooperative-like model. The ingredients for which it would need partnerships are product development – potential partnerships with a range of small local gubinge product developers, land holders and potentially native re-vegetation projects around mining sites

Contemporary Scientific Findings: Recognising and Extending Traditional Knowledge Systems

The Blindness of Early Australian Botany

Whereas traditional Aboriginal knowledge systems place people in an ecology where trees and even insects are family members and intimately related, Western science and medicine has a different outlook. As Roy Porter argues in his history of medicine from antiquity to the present “The West has a culture preoccupied with self, with the individual and his or her identity, and this quest came to be equated with (or reduced to) the individual body and the embodied personality, expressed through body language. Hamlet wanted this too solid flesh to melt away. That – except in the context of slimming professions- is the last thing modern westerners want to happen to their flesh, they want it to last as long as possible”. The point at which Aboriginal knowledge and the Western medico-scientific mind meets is where something is found in the Aboriginal knowledge system that is of great benefit to “individual embodied well-being”. When this occurs suddenly there is something to talk about and for paradigms of knowledge to be crossed. It is no accident that Kakadu Plum with its extra-ordinary nutritional qualities and potential bio-medical uses has become the object on which Western science is now concentrating. As nutrition, as a skin care supplement, as a medicine and as a preservative kakadu plum has properties of great benefit to individuals in their daily lives and to medical and food corporations in the business of mass production. Kakadu plum is something that an individual can simply eat and gain great health benefits but it is also something which may revolutionise food production and preservation, medicinal sanitation and drug production.

Over the past two decades there has been growing scientific recognition of the pharmaceutical, nutritional and industrial uses of Australian native plants. Perhaps it is because of the abundance of natural mineral resources, the predominance of a European agricultural gaze on the Australia continent from 1788 and the marginalization and mainstream incomprehension of Aboriginal knowledge that many of the properties of native foods, plants and vegetation have been overlooked albeit for Western botanical taxonomies and museum based ethnobotanists. The important commercial rights of such products have also arguably been allowed to founder or to be taken up internationally.

Ethnobiology Helps Build Bridges between Aboriginal Knowledge and Science

There is good reason why the knowledge systems of Aboriginal Australia and science missed each other for so long, they were literally speaking different languages and not able to recognise each other's value systems. J.H. Maiden, one of Australia's principal 19th century botanists, dismissed Aboriginal knowledge in racist terms and this scientific ignorance of the depth of Aboriginal knowledge arguably retarded Australian science and our economy and society in general until late in the 20th century. Aboriginal intermediaries have often been ignored or simply hidden away in anthropological texts. While many plants and animals

were registered in a conventional botanical taxonomy, voices like Queensland's first Aboriginal national park ranger Bennett Walker, an expert on rain forest trees, plants and foods, have been voices in the wilderness for many years. In addition, the enormous philosophical and qualitative natural knowledge of Australian flora and fauna that is evident in Aboriginal paintings has continued to be overlooked and not understood. As a result the science of Australian native plants is in its infancy. This is partly because one of the principal knowledge source, Aboriginal Australia, and the scientific community have been remote from each other for much of Australian history. Thankfully, through the work of ethnobiologists from the 1980s, times have changed. The recognition of the kakadu plum's high qualities for health and industry is also creating change and a new found appreciation of Aboriginal traditional knowledge. Old texts are being re-read with new eyes.

In the last twenty years ethnobiological understanding has created new impetus for food scientists to study Australian flora anew. Horticultural research has been carried out on the top 14 commercially significant Australian native edible plants; however the majority of the research has focused on propagation, breeding, cultivation, nutritional value and the isolation of natural products. On even the most studied species research is only just beginning, in the year 2000 of the most recognised native plant species, three species had no scientific papers published about them. There is a great deal of work to be done.

In 2011 Mohanty and Cock expressed the enormous potential of kakadu plum as follows: "Plants contain a myriad of natural compounds which exhibit important bioactive properties. These compounds may provide alternatives to current medications and afford a significant avenue for new drug discovery. Despite this, little information is available in the literature regarding native Australian plants and their potential for medicinal and industrial uses. Recent studies have reported *Terminalia ferdinandiana* to be an extremely good source of antioxidants. Indeed, *T. ferdinandiana* has

been reported to have ascorbic acid levels per gram of fruit more than 900 times higher than blueberries. *T. ferdinandiana* also has high levels of a variety of other antioxidants, including phenolic compounds and anthocyanins. Antioxidants have been associated with the prevention of cancer, cardiovascular diseases, and neurological degenerative disorders. They are also linked with antidiabetic bioactivities and have been associated with the reduction of obesity. Antioxidants can

directly scavenge free radicals, protecting cells against oxidative stress-related damage to proteins, lipids, and nucleic acids. Therefore, *T. ferdinandiana* has potential in the treatment of a variety of diseases and disorders and its potential bioactivities warrant further investigation". That last sentence is an understatement, over the past decade there has been an extensive international scientific effort to understand and harness the chemistry and bio-activity of the kakadu plum. **Vitamin C, Anti-oxidants & the Chemistry of the Kakadu Plum**

Kakadu Plum first came to international attention in 1982 with the publication by Brand et al of an article in *Lancet* that found ascorbic acid contents 3150, 2850 and 2300mg per 100g in edible fruit. This was fifty times as much vitamin C in oranges and kakadu plum was argued to be the richest source of vitamin C in the world. Since the publication of this ground-breaking article, and the realization of the potential of the fruit for consumer, medical and industrial purposes, the commercial and scientific community began to focus on the kakadu plum. But it should be noted that the majority of scientific research articles have been published in the past eight years.

Science and Bio-Piracy

The first serious scientific recognition of the properties of the kakadu plum was followed by an attempt to patent the biological properties of the fruit. Biopiracy or bioprospecting has clear linkages to colonial appropriations of natural resources like pepper, sugar, coffee, quinine and rubber in the 18th and 19th century. The use and ownership of these resources still have significant impact on the skewing of world economies away from first peoples interests. In all cases the rights of Indigenous communities were ignored. No doubt recognizing that the kakadu plum had a high concentration of vitamin C which could bring high therapeutic qualities to skin care products, representatives of US cosmetics company Mary Kay came to Australia, illegally obtained the plants, fruit and seeds and were able to secure a US patent for the fruit in 2007. "Patents and trademarks are hotly defended by international trade organisations and multinational groups. But for many traditional farmers or indigenous groups, owning a constantly evolving and changing organism is illogical, as is assigning ownership to one person instead of a community of users". Mary Kay was initially grant-

ed the patent in 2007, but subsequently withdrew its application in 2011 following strong representation from Indigenous communities. As more scientific study is concluded on the kakadu plum the pressure to obtain proprietary rights becomes something to be guarded. It should be noted that the plant turmeric was patented by the University of Mississippi in 1995 so this remains a charged and important field of concern. Thankfully international law is beginning to recognise the larger issues around biopiracy and prospecting. However this has strong implications for Indigenous land rights and the management of access to private, native title, native owned and privately owned Australian lands.

Evaluating Australian Native Fruits

The initial findings of Brand et al's article in Lancet have now been confirmed many times over in laboratory tests. Tests extended to a range of Australian native fruits. Netzel et al conducted a study of twelve native Australian fruits, finger lime (red and yellow), riberry, brush cherry, Cedar Bay cherry, muntries, Illawarra plum, Burdekin plum, Davidson's plum, Kakadu plum, Molucca raspberry and Tasmanian Pepper, were investigated for their antioxidant capacity and presence of phenolic compounds, anthocyanins and ascorbic acid. The radical scavenging activities of five of the evaluated fruits were significantly higher (3.1 to 5.2-fold in the TEAC assay and 1.2 to 4.2-fold in the PCL assay, respectively) than that of the control blueberry, cv. Biloxi. The total phenolics level (Folin-Ciocalteu assay) in six of the twelve fruits was 2.5 to 3.9-fold of that of blueberry. Kakadu plum was identified as the richest source of ascorbic acid (938-fold of that of control). A high correlation between total phenolics (but not anthocyanins) and antioxidant capacity was observed. The HPLC-DAD/ESI/MS-MS profiles revealed simple anthocyanin composition (one to four individual pigments) with cyanidin as the dominating type. Australian native fruits investigated in this study are shown to be a novel rich source of antioxidant compounds. Over the past five years research has also been conducted into the properties of Kakadu Plum in different locations and by different harvesting methods. Amongst commercially grown fruit Konczak found that commercially grown kakadu plum had unique nutritional qualities: it exhibited a superior ORAC-T value (430.0 μ M trolox eq/g fresh weight, TEq/g FW) with 26.7% contribution of the lipophilic fraction. The major compounds of Kakadu plum's lipophilic fraction were alpha-tocopherol (1.022 \pm 0.1 mg/100 g FW), lutein (0.26 \pm 0.01 mg/100 g FW) and chlorophyll a and b (2.72 \pm 0.1 and 0.54 \pm 0.1 mg/100 g FW, respectively). Konczak et al investigated the variations in the levels of phenolic compounds, vitamin C, sugars and antioxidant capacities of 45 newly collected accessions of *Terminalia ferdinandiana* (Kakadu plum). This study for the first time revealed a unique phytochemical profile and significant variability in phytochemical composition of Kakadu plum. These features create opportunities for selection of sources with different characteristics addressing the needs of the nutraceutical industry, food processors and the consumers of fresh fruit. Kakadu plum also had the highest levels of lipophilic antioxidants and minerals of all commercially grown Australian native fruits. In another study Konczak and Zabaras, analysed hydrophilic phytochemicals and antioxidant capacities of eight commercially grown native Australian fruits. Kakadu plum (*Terminalia ferdinandiana*) contained a 6-fold higher level of total phenolic compounds and quandong (*Santalum acuminatum*) a 1.9-fold higher level of total phenolic compounds (TP, Folin-Ciocalteu assay) than blueberry (*Vaccinium* sp., cv. Biloxi). Both fruits displayed superior oxygen radical-scavenging capacity (ORAC-H assay) that was, respectively 4.1-fold and 6.5-fold of that of blueberry. The total reducing capacity (TRC; ferric reducing antioxidant power (FRAP) assay) of Kakadu plum and quandong exceeded the TRC of blueberry, respectively, 13.1- and 2.3-times. The primary sources of antioxidant capacities in the evaluated fruits were phenolic acids (benzoic and cinnamic) and flavonoids (flavonols, flavanones and anthocyanins) tentatively detected by liquid chromatography-mass spectrometry (LC-PDA-MS/MS). A high level of vitamin C was recorded for Kakadu plum and Australian citrus fruits. The major organic acids detected were citric and malic acid. In 2013 Sommano et al evaluated seven kinds of bush plants, namely, bush tomato (BT), lemon myrtle (LM), wild lime (WL), finger lime (FL), wattle seed (WS), Davidson's plum (DP), and Kakadu plum (KP) were investigated for antioxidant capacity by 2,2-diphenyl-1-picrylhydrazyl radical, Trolox equivalent antioxidant capacity assay, or 2,2'-azinobis-93-ethyl-benzothiazoline-6-sulfonic acid radical, total polyphenols, and flavonoids. It was found that there was a positive correlation between antioxidant activities examined by the two methods. However, there was a negative correlation between total phenol and each of the antioxidant activity tests; for example, Davidson's plum contained the phenolic content as high as 890 mg GAE/100 g while low antioxidant activities were detected (23 TE/100 g and 45% for TEAC and % DPPH, respectively). For the qualitative flavonoids test, bush tomato contained ferulic acid, caffeic acid, naringenin, and hesperetin.

Lemon myrtle contained catechin, epicatechin, vanilic acid, myricetin, kampferol, and naringenin. Finger lime contained caffeic acid and vanilic acid. Wild lime contained epicatechin, vanilic acid, luteolin, and naringenin. Kakadupum contain catechin and naringenin. Davidson's plum contained naringenin and hesperetin. Wattle seed contained naringenin. However, some other compounds could not be identified because there was no standard to confirm the retention time available. Absorbance was changed for the detection of anthocyanins in Davidson's plums from 220-400 to 525 nm. It was shown by liquid chromatography mass spectrometry that six major anthocyanidins (delphinidin, cyanidin, petunidin, pelargonidin, peonidin, and malvidin) attached with the sugar molecules (hexose and pentose) were found and the major anthocyanin was cyaniding-hexose-pentose. This study suggests that regarding the antioxidant capacity, these Australian Native plants have potential as functional food ingredients.

Food Safety and processing

The safety of Australian native food ingredients in processed products has also been carefully studied. Somanno and Caffin found that bioactive compounds such as vitamin C and lycopene are available in these plants; however, some work has reported evidence of toxic compounds in these plants. A recommendation to eliminate or reduce the toxicity has been made for each of the plants. Food standard practices throughout Australian native product (sauces) manufacturing have been formulated in order to make recommendation to producers and processors to enhance ingredient quality and stability as well as to provide the Australian native food industry with information on the positive nutritional benefits of these native fruits and seeds and to assist in ongoing promotional activities. Somanno and Caffin suggests that there are two aspects to food safety issues in the use of Australian native plants. First, finding ways to eliminate toxic compounds is essential. Second, during processing of the products, the critical control points need to be carefully tested in order to protect the products from contamination.

Food safety and labelling standards are required for any food that is sold in the retail market. In 2013 Sommano et al investigated the effect of food processing on the survival of bioactive compounds in Australian bush food products. The lycopene, beta carotene, and ascorbic acid were detected from bush tomato sauce, bush tomato ketchup and Kakadu plum chilli and ginger sauce. The finished product samples were collected during real food production line at three interval times; beginning, middle and the end of the real time manufacturing processes. The bioactive contents from the three products were stable throughout the heating process. In another experiment, bush tomato sauce (16% dried bush tomato content), Kakadu plum sauce (70% Kakadu plum filtrate) were prepared in the laboratory. Bioactive contents (lycopene and beta carotene) in lab formulated bush tomato sauce increased by 48 and 14% respectively. In contrast, ascorbic acid content in the Kakadu plum sauce lost by 16.9%. The experiment suggested that heat processing increased the level of lycopene and betacarotene but minimised ascorbic acid content in processed Australian Bush food products .

Anti-inflammatory Properties

The long held Aboriginal knowledge anti-bacterial and anti-inflammatory properties of kakadu plum was investigated in scientific literature by Cock and Moriarty in 2011 . Kakadu plum is a natural anti-bacterial and anti-inflammatory substance and it was not long before its significance for auto-immune diseases began to be investigated. Auto immune diseases are caused by an unknown trigger. As a result, the immune system may begin producing antibodies that instead of fighting infections, attack the body's own tissues. Treatment for autoimmune diseases generally focuses on reducing immune system activity. Examples of autoimmune diseases include: Rheumatoid arthritis, Systemic lupus erythematosus (lupus), Inflammatory bowel disease (IBD), Multiple sclerosis (MS), diabetes mellitus, Guillain-Barre syndrome, Chronic inflammatory demyelinating polyneuropathy, Psoriasis, Graves' disease, Hashimoto's thyroiditis, Myasthenia gravis, Vasculitis. It takes years before research and development and clinical trials can be completed by pharmaceutical companies in these areas. However for self-treating patients the advantages of trialing kakadu plum as a food additive is that in common sense dosages there are no dangers to health and the large Vitamin C and anti-oxidant properties of the fruit are a benefit to general well being.

The most promising results thus far have involved rheumatoid arthritis an autoimmune disease which can be triggered in genetically susceptible individuals by Proteus spp. infections. In 2015 Sirdaata et al studied terminalia ferdinandiana (Kakadu plum) fruit extracts by disc diffusion assay against reference and clinical

strains of *Proteus mirabilis* and *Proteus vulgaris* and their MIC values were determined. Polar extracts displayed potent antibacterial activity against the bacterial triggers of rheumatoid arthritis, with MIC values as low as 32 μ g/ml (methanolic extract against the *P. mirabilis* reference strain). The aqueous extract was also a potent inhibitor of *Proteus* growth (MIC values <300 μ g/ml against all bacterial species). Whilst substantially less potent, the ethyl acetate and chloroform extracts also displayed moderate to good inhibition (as determined by MIC) against both *P. mirabilis* strains. All *T.ferdinandiana* fruit extracts were nontoxic in the *Artemia franciscana* bioassay. The most potent extract (methanolic extract) was analysed by HPLC-QTOF mass spectroscopy (with screening against 3 compound databases). Five stilbenes and 7 tannins were identified in the methanolic extract. The low toxicity of the *T. ferdinandiana* fruit extracts and their potent inhibitory bio-activity against some bacterial triggers of rheumatoid arthritis indicates their potential as medicinal agents in the treatment and prevention of this disease.

In 2011 Tan and Hou studied purified polyphenolic-rich extracts from four native Australian fruits, Illawarra Plum (*Podocarpus elatus* Endl., Podocarpaceae), Kakadu Plum (*Terminalia ferdinandiana* Exell, Combretaceae), Muntries (*Kunzea pomifera* F. Muell., Myrtaceae) and Native Currant (*Acrotriche depressa* R.Br., Epacridaceae). They were screened for their ability to modulate anti-inflammatory activity in LPS-activated murine macrophages (RAW 264.7). The Kakadu Plum extract inhibited the expression of inducible nitric oxide synthase (iNOS), and importantly was the only fruit in this study that displayed differential inhibition of the expression of cyclooxygenase (COX)-2 but not COX-1. Illawarra Plum (COX-2 and iNOS) and Native Currant (iNOS only) also inhibited inflammatory enzymes, while Muntries exhibited none of these activities under the same conditions. All evaluated extracts inhibited the production of prostaglandin E-2 and nitric oxide, suggesting the involvement of alternative pathways in their regulation for the Muntries extract. Further molecular investigations, showed that Kakadu Plum inhibited the NF-kappa B pathway, but not the p44/42 mitogen activated protein kinase (MAPK) pathway. Collectively, these results demonstrate potential anti-inflammatory activities of native Australian fruits, in particular Kakadu Plum, in LPS-activated murine macrophages, thus confirming the potential biological activities of these fruits. The reason this work is important links to our understanding of cell mediated immunity (CMI) and the importance of activated macrophages as key immune effector cells. It is likely that the number of different macrophage populations that can arise may be as diverse as the activating stimuli that induce them. Some of these stimuli can instruct macrophages to kill microbes (classical activation), lay down extracellular matrix components to promote wound healing (alternative activation), or secrete anti-inflammatory cytokines to terminate inflammation (regulatory macrophages).

Tan and Koczek (2011) also studied four native Australian fruits, Illawarra Plum (*Podocarpus elatus* Endl., Podocarpaceae), Kakadu Plum (*Terminalia ferdinandiana* Exell, Combretaceae), Muntries (*Kunzea pomifera* F. Muell., Myrtaceae) and Native Currant (*Acrotriche depressa* R.Br., Epacridaceae) for antioxidant and cellular protective activities. Each fruit showed significantly greater antioxidant activity than a blueberry (*Vaccinum* sp., cv. Biloxi) reference with Kakadu Plum exhibiting 13.3-fold and 2.4-fold activity of blueberry in the ferric ion reducing antioxidant power (FRAP) and oxygen radical absorbance capacity (ORAC-H) assays, respectively. A lyophilised polyphenolic-rich extract of Kakadu Plum exhibited the greatest cellular antioxidant activity (CAA assay) of 71.5 μ mol QE/g, and was followed by Illawarra Plum, Native Currant and Muntries (46.3, 20.0 and 14.4 μ mol QE/g, respectively). Polyphenolic-rich extracts of Kakadu Plum and Muntries (but not Illawarra Plum and Native Currant) extracts efficiently protected RAW 264.7 cells against hydrogen peroxide induced apoptosis in a dose-dependent manner. Kakadu Plum and Native Currant polyphenolic-rich extracts increased the Nrf2/Keap1 ratio, suggesting activation of the antioxidant response element (ARE) through the Nrf2/Keap1 complex. The results suggest Kakadu Plum exhibits the greatest antioxidant potential, exerting antioxidant activity through free radical scavenging and affecting two (Nrf2/Keap1) downstream transcription factors.

Anti-bacterial

Following Monty and Cock in 2012 the anti-bacterial qualities of kakadu plum are now starting to be intensively investigated. Kakadu plum has been shown to be a natural inhibitor of gastro-intestinal diseases. Giardia is one of the most common infections worldwide of water and food borne diseases. Kakadu plum shows promise as both a preventive agent and a treatment. Giardiasis is a debilitating disease that can cause long term illnesses in children and is caused by gastrointestinal parasites of the genus *Giardia*. High-antioxi-

dant *T. ferdinandiana* fruit extracts were investigated by Rayan and Mathews in 2015 for the ability to block *Giardia duodenalis* growth. Methanolic and aqueous extracts had the most potent growth inhibitory activity (IC₅₀ values of approximately 700 and 140 μ g/ml, respectively). Ethyl acetate and chloroform extracts also inhibited *G. duodenalis* growth, albeit with lower potency. The hexane extract was completely devoid of *G. duodenalis* growth inhibitory activity. All extracts were nontoxic in the *Artemia franciscana* bioassay. Nontargeted HPLC-quadrupole time-of-flight (QTOF) mass spectroscopy (with screening against three compound databases) putatively identified 17 compounds in all of the inhibitory extracts but not in the inactive hexane extract. The low toxicity of the *Terminalia ferdinandiana* fruit extracts and their potent *G. duodenalis* growth inhibitory bioactivity indicate their potential as medicinal agents in the treatment and prevention of this disease.

Kakadu plum has also a significant future role in the prevention and treatment of the potentially fatal gangrene infection and food poisoning. *Clostridium perfringens* is one of the leading causes of food poisoning. In 2008, ten elderly people died at a Blue Mountains nursing home in New South Wales following a *Clostridium perfringens* outbreak which affected more than eighty residents. Contaminated meats in stews, soups and gravies are usually responsible for outbreaks and causes about 250,000 cases of foodborne illnesses occur in the United States every year. Williams and Sirdharta found that kakadu plum has an inhibitory effect on *clostridium perfringens* and could have an important in the prevention and treatment of gangrene. They further found that kakadu fruit and leaf extracts inhibited the growth of anthrax.

In 2016 Wright et al have extended the findings about the anti-bacterial potential of kakadu plum extracts. They demonstrated that kakadu plum leaf methanolic and ethyl acetate and methanolic fruit extracts block *C. perfringens* growth. The importance of these sources as nontoxic or of low toxicity, means they have potential as strong preventive and treatments of clostridial myonecrosis and enteritis necroticans. Further studies aimed at the purification and identification of the bioactive components are needed to examine the mechanisms of action of these agents.

Food Preservation and Bio Security

Over the past eight years food science research and industry partnerships around kakadu plum have started to emerge. One development is the overlap between Australian native foods research and the work of the Australian Seafood Cooperative Research Centre and Aquaculture Prawn Farmers Association seeking to extend the shelf-life of cooked chilled prawns. This has become the main stay of the Queensland Alliance for Agriculture and Food Innovation. In 2012/13 research and trials began using kakadu plum as a natural food preservative. The shelf life of prawns increased from 2-4 days to up to 14 days. In 2014/15 \$22.5 million worth of prawns were treated with a Kakadu Plum extract formulation. In 2016 15 per cent of Queensland's prawn farming industry is using Kakadu Plum extract there are now obvious flow on benefits of kakadu plum extract for all fresh food produce from poultry and vegetables to meat. Companies who have a business of preparing frozen meals are also starting to use kakadu plum extract.

Cancer Prevention

Kakadu Plum is also the most effective of Australian native fruits so far tested as an anti-cancer agent. Apoptosis is one of the most critical forms of defense against cancer, and the induction of apoptosis by dietary polyphenols represents significant potential for cancer preventive activity. Tan and Konczak examined polyphenols extracted from selected native Australian fruits Illawarra plum (*Podocarpus elatus* Endl., Podocarpaceae), Kakadu plum (*Terminalia ferdinandiana* Exell, Combretaceae), muntries (*Kunzea pomifera* F. Muell., Myrtaceae), and native currant (*Acrotriche depressa* R.Br., Epacridaceae) for antiproliferative activity against a panel of cancer and normal cell lines. Each fruit selectively inhibited the growth of cancer cell lines in a dose-dependent manner. The mechanism of growth inhibition of the human promyelocytic leukaemia cells (HL-60) was determined to be apoptosis by morphological assessment, DNA fragmentation, flow cytometry, and caspase-3 induction. Furthermore, Kakadu plum was found to activate caspase-7, -9, and poly (ADP-ribose) polymerase (PARP), suggesting it acts via the intrinsic apoptosis pathway. The same fruit also caused direct DNA damage in colon adenocarcinoma cells (HT-29) as detected using the cytokinesis-block micronucleus cytome (CBMN Cyt) assay. Tan and Konczak further examined Kakadu plum (*Terminalia ferdinandiana* Exell, Combretaceae) and Illawarra plum (*Podocarpus elatus* Endl., Podocarpaceae) in which extracts were fractionated, using a bioassay-guided approach and screened for antioxidant activity [oxygen radical absor-

balance capacity (ORAC) and cellular antioxidant activity (CAA) assays] and antiinflammatory activity (nitrite concentration and prostaglandin E(2) release in lipopolysaccharide (LPS)-activated murine macrophages). Among 8 fractions obtained from KP and 5 fractions obtained from IP, fraction KPF5 from KP exhibited superior activity in all assays, with an ORAC value of 3,776 \pm 603 μ mol Trolox/g DW and a CAA value of 52.2 \pm 8.6 μ mol quercetin equivalents/g DW. In addition, KPF5 further demonstrated an upregulation of the Nrf2/Keap1 ratio in Hep G2 cells. KPF5 also inhibited the expression of COX-2 and iNOS in LPS-activated murine macrophages, potentially through the NF-kappa B, p44/42 mitogen activated protein kinase and Akt pathways. KPF5 also induced apoptosis and DNA damage in HT-29 cells, as determined by the cytokinesis block micronucleus cytome assay.

Ellagic Acid

As the importance of plant-based antioxidants to human health becomes clearer there is a rapidly expanding search for rich sources of these compounds. Much attention is currently focused on the antioxidant potential of ellagic acid (EA). Kakadu Plum and several other Australian native fruits have been found to be a plentiful source of ellagic acid which has antiproliferative and antioxidant properties. The antiproliferative properties of ellagic acid may be due to its ability to directly inhibit the DNA binding of certain carcinogens, including nitrosamines and polycyclic aromatic hydrocarbons. As with other polyphenol antioxidants, ellagic acid has a chemoprotective effect in cellular models by reducing oxidative stress.

Ellagic acid has been marketed as a dietary supplement with a range of claimed benefits against cancer, heart disease, and other medical problems. The U.S. Food and Drug Administration have argued that ellagic acid marketed for direct consumption is a "fake cancer 'cure' consumers should avoid". A number of U.S.-based sellers of dietary supplements have received Warning Letters from the Food and Drug Administration for promoting ellagic acid with claims that violate the Federal Food, Drug, and Cosmetic Act. Nevertheless recent investigations into plant tissues have indicated that the free form of the natural polyphenolic antioxidant, ellagic acid (EA), is much more plentiful than first envisaged; consequently a re-assessment of solvent systems for the extraction of this water-insoluble form is needed.

Williams and Edwards have been the most active investigators of ellagic acid in kakadu plum. They have shown that ellagic acid (EA) occurs in different forms: free EA, EA glycosides and polymeric ellagitannins. The overall structure of these forms has a pronounced effect on their antioxidant efficiency and is responsible for widely differing reactivity, solubility and hence bioavailability properties. Often associated with EA is vitamin C which also contributes to the plant foods total antioxidant activity. Previous studies have suggested that ascorbic acid may have protective effects on the polyphenol content of plants. With a view to gaining evidence that the bioactive forms of vitamin C influence EA content, Williams and Edwards further examined several fruits with a range of EA and vitamin C content. To facilitate a more detailed assessment of the selected fruits antioxidant potential the relative proportions of EA forms were also determined. In strawberries and boysenberries EA content was predominantly in the polymeric form (21% and 12% free EA plus EA glycoside vs total EA levels for strawberry and boysenberry respectively), while in Kakadu plum it was mainly in the free form (70% of total EA). An increasing percentage of dehydroascorbic acid (9 to 14% of total vitamin C) indicating enhanced transformation of ascorbic acid to its oxidative degradation product together with stable free EA levels (approximate to 950 mg/100 g DW) over the 4 month frozen storage period for the Kakadu plum samples are consistent with a possible protective effect of EA by ascorbic acid.

As EA solubility and its UV-Vis spectrum, commonly used for detection and quantification, are both governed by pH, an understanding of this dependence is vital if accurate EA measurements are to be achieved. After evaluating the pH effects on the solubility and UV-Vis spectra of commercial EA, an extraction protocol was devised that promoted similar pH conditions for both standard solutions and plant tissue extracts. The extraction so devised followed by HPLC with photodiode-array detection (DAD) provided a simple, sensitive and validated methodology that determined free EA in a variety of plant extracts. The use of 100 % methanol or a triethanolamine-based mixture as the standard dissolving solvents were the best choices, while these higher pH-generating solvents were more efficient in extracting EA from the plants tested with the final choice allied to the plants' natural acidity. Two of the native Australian plants anise myrtle (*Syzygium anisatum*) and Kakadu plum (*Terminalia ferdinandiana*) exhibited high concentrations of free EA. Furthermore, the dual approach to measuring EA UV-Vis spectra made possible an assessment of the effect of acidified eluent on EA spectra when the DAD was employed. Accurate quantification of ellagic acid and its derivatives,

ellagic acid glycosides and ellagitannins, present in plant-based foods is a vital prerequisite for any study of their health-promoting properties. This goal is impeded by the lack of commercially available standards and the fact that these three forms differ widely in solubility. This disparity necessitates careful attention being paid to the choice of extraction solvents to ensure that precise and reproducible content measurements are achieved. Williams and Edwards (2016) sought to devise an extraction protocol that is effective for all ellagic acid forms whilst keeping the water-insoluble free ellagic acid solubilised during all analysis stages. To overcome this unavailability of commercial standards, the designated “targeted” ellagic acid derivatives identified in the selected fruit were monitored during the course of extraction that employed a number of commonly used solvents. Large variations in the extraction yield of the solvents tested for the ellagic acid and its derivatives were identified, extending even to the different fruit samples for the same form. It is regarded as unlikely that any selected extraction solvent could be universally employed to effectively extract all the ellagic acid compounds; however, the use of the solvent 50 : 50 vol. methanol-dimethylformamide satisfied most requirements .

Williams and Edwards 2016b have further found that phenolic ellagic acid, noted for its nutritional and pharmacological potential as an antioxidant and antimicrobial agent, needs to be isolated from oxalic acid if it is to be a useful therapeutic drug. Kakadu plum (*Terminalia ferdinandiana*) fruit was found to be an abundant source of this phytochemical. The fruit also contains large amounts of vitamin C (mainly as ascorbic acid, AA) and possibly the undesirable oxalic acid (OA). Regular consumption of high oxalate foods poses a variety of health risks in humans including interference with calcium absorption and kidney stone formation. Oxalate is also the end-product of AA metabolism so that consumption of fruit with heightened AA content has the potential to elevate urinary oxalate levels. The Williams and Edwards study seems to confirm traditional Aboriginal protocols about eating kakadu plum in moderation. Walker and Edwards investigated the distribution of EA and the presence of other bioactives in other Kakadu plum tissues. Chemical analysis of Kakadu plum fruit and leaves for EA (free and total), OA (water-soluble and total), calcium (Ca) and AA indicated that EA and AA concentrations were high in the fruit while the leaves had significantly higher EA levels but little or no detectable AA. OA content in fruit and leaves was substantial with the fruit being placed in the high-Oxalate category. These findings suggest that there is potential to elevate oxalate levels in the urine of susceptible people and intake of fruit-derived products should be closely monitored. By measuring tissues collected from specific trees, high EA-producing or low OA-containing individuals were identified. The science of the kakadu plum is clearly only just beginning. There is much more to be understood and written. So far the relevance of kakadu plum for the health of individuals, for medicine, for the hygiene industry, for the food industry and for public health knows no bounds.

Sacred Food: How Modern Consumers Can Support Aboriginal Provenance, Culture and Sustainable Development

They danced us into the heart of the city
The power of their presence like unseen hands
Gathering us together with all our histories
These simple tribal people of the Centre and the Top
The true royals of the day.

Noel Davis, “Dancing the Spirit Back”, *Heart Gone Walkabout*, 1991

How can future developments around kakadu plum benefit the Aboriginal people of Northern Australia? It is becoming clear that there needs to be a cooperative network of Aboriginal harvesters, whole sale distributors, retail outlets, catering and marketing organisations that work together to reap the benefits of the future.

The idea of “Sacred Food” is designed to signal to consumers the unique provenance of Australian native foods. In traditional ceremony there are sacred foods that have meanings and symbolism that Aboriginal initiates learn about. The learning goes on all their lives from the so-called outer circles of knowledge to the inner circle of knowledge that only men and women with grey hair, after a life time of study and meditation, can understand. This kind of sacred food belongs only to Aboriginal custodians. It is distinct to each Aboriginal nation and community and is specific to language, geography and people. The concept of sacred food advanced here is something different. It is meant as a rallying logo and philosophy that will protect Aborigi-

nal provenance and commercial property and intellectual rights in contemporary society. In this sense it is a concept that can be shared with, owned and appreciated by the world. It comes from respecting all Australian Aboriginal communities one-ness with the land and appreciating the world's oldest continuously evolving cultures. When people see the sacred food logo or mark they will know that the organisations involved are Aboriginal owned, managed and that income flows back to Aboriginal people and communities. This we believe will be as important as the "Made in Australia" logo in informing consumer decisions about which products they buy to support the economic development of Aboriginal people.

This idea of sacred food is first and foremost a marker of Aboriginality from the more urbanised and colonized places to the remote areas of Australia. The first thing that this concept of sacred food signals is that native food is uniquely of this land Australia. The second feature of sacred food is that it denotes food whose "discovery" comes primarily from Aboriginal knowledge and the experience of living in the Australian landscape with continuous knowledge that goes back 60,000 years. The third feature of sacred food is that it does not necessarily grow best in Western agricultural systems but in the wild orchards and groves of the bush with no conventional cultivation. The fourth feature of sacred food is that it is harvested by Aboriginal people. The fifth feature of sacred food is that it is processed and sold in ways that ensure Aboriginal communities produce an income and thus are sustainable within and alongside the mainstream economy. The sixth feature of sacred food is that it allows Aboriginal people a real competitive advantage in caring for the fragile ecology of the Australian landscape that has been so misunderstood and abused by Western agricultural and living systems.

It is suggested that the sacred food logo be created by the renowned Yolngu artist Banduk Marika. (Note Curating a logo requires the approval of the ILC and an investment to secure the copyright to use the logo for the purposes of the sacred food network. Banduk Marika is one of Australia's most respected traditional artists and her family have been closely associated with the formation of Aboriginal land and sea rights over the past forty years. She also created the first nursery at Yirrkala which cultivated Kakadu plum well before its "modern discovery", Banduk was one of the founders of the first Indigenous rangers in Australia and has many other unique qualifications.)

But there is another dimension of sacred that needs to be appreciated. There are many wild foods that are known to Aboriginal communities that are only just being discovered by Australians and the rest of the world. Kakadu Plum is the latest most spectacular example. Like the macadamia nut or the acacia its properties have been very quickly understood and commercialized elsewhere.

But the true goodness of the food can only be captured by combining Aboriginal knowledge with science and by widening our understanding of what orchards and fruit production is all about. Sacred in this respect asks us to envision a world in which human beings are not consumers and actors but are related to trees and fruit as family members. When searching for Kakadu plum in North East Arnhem land the harvester calls the name of the fruit *nj̄n̄ka-bakarra* and imagines its properties and uses and, if all is well, and the season is right, it appears in the quantity and quality it is needed. Just as a relative may be appreciated for a kindness, the tree is thanked, appreciated and remembered. When hunting and gathering in this way the bush itself takes on many different qualities. It is not just a mass of flora and fauna. It is truly a garden with unique characters and features and dynamics. Aboriginal people learn over the course of their lives the extraordinary intricate connections between water systems, winds, underground aquifers, plants and animals. By buying a sacred food a consumer becomes in a sense a family member too. They invests in a way of life that just cannot be substituted by the written word, by films or videos or how to manuals or by creating plantations of trees. By investing in sacred food consumers reverse the destruction of Aboriginal society and culture. They are valuing a product that allows Aboriginal people to glory in one of their finest attributes their capacity to live and protect native ecological systems.

Towards a Sacred Food Network: Kakadu Plum Gubinge (Broome), Marnybi (Wadeye), Murunga (East & Central Arnhem) njäṅka-bakarra (North East Arnhem)

The following Aboriginal organisations are currently harvesting, growing, selling, developing the kakadu plum industry. This is the basis of the sacred food network.

Nurseries

Bidyadanga Nursery

Key Contact

Merridoo Walbidi

<https://www.youtube.com/watch?v=RN1ypXyr5Qw>

Dundungurr (Yirrkala Nursery)

Key Contact

Banduk Marika

Phone

0456 855 372

Mailing Address

Tuffin Way, Yirrkala, 0881 NT

Mamabulanjin Aboriginal Corporation

Skuthorpe & Crab Creek Nurseries

Key Contacts

Neil Gower

Phone

08-9192-1662

Email

Mailing Address

PO Box 664

Broome,

WA, 6725

Aboriginal Wholesale Suppliers

Mamabulanjin Aboriginal Corporation

Mamabulanjin Aboriginal Corporation (MAC) was first established in 1985 as Broome's first Aboriginal resource centre. From that time it has developed into a multi-functional support service to Indigenous people in this part of the Kimberley.

Key Contacts

Neil Gower

Phone

08-9192-1662

Email

mac.ceo@mama.org.au

Mailing Address

PO Box 664

Broome,

WA, 6725

Australia

Palngun Wurnangat Aboriginal Corporation

Key Contacts

Margo Northey

Phone

08-8978-2229

Mailing Address

Women's Centre,
Perjert St
Wadeye, NT, 0662
Email
manager@wpw.org.au
Retail sales through <https://austsuperfoods.com.au>

T.H.E. Kakadu Plum (Traditional Homelands Enterprise)
Key Contact
Anne Stanley
Phone
0408 012 426
Mailing Address
PO Box 1205
Camberwell, Vic, 3124
Email
astanley@kindridspiritsfoundation.org.au

Gundjeihmi Aboriginal Corporation
Managing a harvesting enterprise on the Kakadu Aboriginal Land Trust
Key Contact
Chris Malcolm
Mailing Address
PO Box 245
Jabiru, NT, 0836
Phone
0438 820 147
Email
chris@mirarr.net

Mata Mata Homelands*
Key Contact
Batumbil Burarrwanga
Mailing Address
Mata Mata Homelands
PMB 62
Marthakal
Winnelie, NT, 0822
Phone
08 8970 4923

Bruno Dann & Cynthia Winawarl
Twin Lakes/Manowan Aboriginal Corporation
Mailing Address
PO BOX 5306
Cable Beach WA 6726
Phone
p: 08 9192 3825
m: 0416 257386 (no reception at Twin Lakes)
Email
twinlakesculturalpark@gmail.com
Retailing through Loving Earth
<https://m.lovingearth.net>

Email: info@lovingearth.net

Information on Bruno Dann see <https://vimeo.com/112346591>

Lombadina Aboriginal Corporation

Rob Sibosado

Lombadina Aboriginal Corporation

Email: lomboreception@westnet.com.au

Ph (08) 91924936

Fax (08) 91924116

Dampier Peninsula

Email rsibosado@westnet.com.au

Marra Worra Worra Aboriginal Corporation

PO BOX 35 Fitzroy Crossing WA 6765

08-9193-0600

jason.dinning@mww.org.au

www.mww.org.au

Plantation about 2 years away from production

Aboriginal Bush Traders

Liz Martin

coordinator@aboriginalbushtraders.com

(08) 8931 6650 74 The Esplanade Darwin NT 0800

WEB: www.aboriginalbushtraders.com FB: Aboriginal Bush Traders INSTA: [aboriginal_bush_traders](#)

*Large bush orchard available but not yet selling to regional hub or retailers in large amounts.

Direct Retail Sellers

Kimberley Wild Gubinge

Key Contacts

Lenny O'Meara

Jacinta Monck,

Location:

Pender Bay

Dampier Peninsula

Western Australia

Phone

08-9192-4000

Email

jacinta@kimberleywildgubinge.com.au

Mailing Address

P.O Box 2081,

Broome

WA 6725

Australia

Indigiearth

Contact: Sharon Winsor

Phone: 1300 551 525

General & Wholesale Enquiries: enquiries@indigiearth.com.au

Wholesale orders: orders@indigiearth.com.au
Non-Aboriginal companies buying from Indigenous communities
Kakadu Life
Email: sales@kakadulife.com
Phone: (08) 9256 4242
Address: 14 Meares Way
Canning Vale 6155 Australia
ABN: 19607145460

Wild Harvest NT
Contact David Boheme
PO Box 207
Humpty Doo
0836 NT
Australia

Go Wild Australia
Email: info@gowildaaustralia.com
www.gowildaaustralia.com

The Source Bulk Foods
PO Box 890
Mullumbimby NSW 2482
Email: info@thesourcebulkfoods.com.au
[Https://thesourcebulkfoods.com.au](https://thesourcebulkfoods.com.au)

The Australian Super Food Company
Suite 108, 181 St Kilda Rd
St Kilda, Vic 3182
Tel: 1300 574 406
Int: +61 455 965 570
Email: info@austsuperfoods.com.au
ABN: 32 345 220 856
Phone 1300 574 406.
<https://austsuperfoods.com.au>

Acknowledgements

The author wishes to acknowledge the many Aboriginal elders past and present who have contributed to the ideas and understanding that are captured in this research project. The author particularly acknowledges Bennett Walker, Batumbil Burarrwanga, Ms. S.D..Gurruwiwi, Dopia Yunupingu, Banduk Marika, Daniel Briggs and the Briggs family, Ronnie Rowe and the Rowe family, Stephen Pigram and the Pigram family, Paul Lane, Neil Gower, Kevin Fong and the Fong family, the Dann family, the Mc Leod family, the Yawuru people, the Goorabaloo people, the Yolngu people, the Kuku Yalanji people and the Yorta Yorta people. All have housed, fed and taught the author many things relevant to an understanding of “bush foods” over many years. Special thanks also to B. Ross for research support, guidance, knowledge, library references, books, encouragement and enthusiasm. The author alone is responsible for any mistakes in this report.

Abbreviations

ABS	Australian Bureau of Statistics
AMS	Australian Macadamia Society
ANFAB	Australian Native Foods and Botanicals
ANFIL	Australian Native Food Industry Limited
APW	Australian Premium White
ASIC	Australian Securities and Investment Commission
AWB	Australian Wheat Board
AWI	Australian Wool Innovation
CDEP	Community Development Employment Program
DAWR	Department of Agriculture and Water Resources
EOI	Essential Oils Industry
EI	Ellagic Acid
EU	European Union
FNQ	Far North Queensland
FSANZ	Food Standards Australia and New Zealand
FWPA	Forest and Wood Products Association
GCNA	Global Compact Network of Australia
GRDC	Grains Research Development Corporation
GDP	Gross Domestic Product
GVP	Gross Value of Production
IAK	Indigenous Agricultural Knowledge
IAS	Indigenous Advancement Strategy
IBA	Indigenous Business Australia
ICE	Intercontinental Commodity Exchange
IFOAM	International Federation of Organic Agriculture Movements
ILO	International Labour Organisation
IP	Intellectual Property
IPM	Integrated Pest Management
ISX	BAMA ISX www.isx.org.au
KPI	Key Performance Indicator
NFF	National Farmers Federation
NGO	Non-Government Organisation
NRIA	New Rural Industries Australia
PWA	Palngun Wurnangat Association
PwC	PricewaterhouseCoopers
R&D	Research and Development
RAP	Reconciliation Action Plans
RD&E	Research, Development and Extension
RIRDC	Rural Industries Research and Development Corporation
T.H.E	Traditional Homeland Enterprises
TAFE	Technical and Further Education
UNGC	United Nations Global Compact
WA	Western Australia
WWF	World Wildlife Fund

Background, Intelligence & Methodology

The methodology behind this report and the intelligence about the prospect of the kakadu plum industry comes from a large network of Aboriginal people, supporters, investors and corporate leaders across Northern Australia. It also derives from research and field work over twenty years.

The author is voluntary national secretary of the ISX and is in daily contact with a large number of Aboriginal colleagues in grass roots community settings. The ISX has worked with Aboriginal people around the development of gubinge and other economic development matters in Broome since the early 2000s. From its first beginnings the ISX has been determined to bring private investment into Aboriginal communities that had been dominated by welfare and government administration. Aboriginal communities suffer on two fronts: they have not had enough public funding when compared to the mainstream community and this is particularly valid for remote communities, and secondly, limited public dollars are often the only investments in Aboriginal communities and one of the principal problems has been control and a lack of freedom to save, invest and develop personal and corporate capital. As Gerhardt Pearson, one of the founders of the ISX, famously observed at a meeting with corporate investors, in the early 1960s his father had to apply to Queensland's Protector General of Aborigines to draw funds from his own bank savings to purchase new equipment for his butcher shop in Hopevale. In the 2000s the dominance of government and backward concepts of welfare continue to constrain the prospects of Aboriginal communities. Even when Aboriginal communities gain control of their land and are given access to land titles the lack of capital, the lack of freedom to manage, invest and attain self determination combined with the ability to access sufficiently high levels of income is extremely constraining. (See Sustainability)

The ISX was founded by Noel and Gerhardt Pearson, Kevin Fong, Barry Taylor, Father Nic Frances, Peter Botsman and Aboriginal community representatives on May 21, 2003 in Canberra at the "Ngunnawal Trading Floor". Aboriginal representatives from all over Australia came to the meeting and agreed that there was a need for a form of "Indigenous Stock Exchange" which was informal and focused on grass roots people's aspirations in urban, regional and remote Aboriginal Australia. One of the major motivations for the ISX was the need to bring ideas from the grass roots to the centres of finance, business information and infrastructure. In the same way the ASX is a place for business to attract investment. It was recognised that there needed to be some place where Aboriginal businesses could present their ideas to investors and that any such forum had to have an eye for the unique qualities of Aboriginal Australia and not just copy existing capital raising forums. The ISX was inspired by Muhammad Yunus' concept of a peoples bank in which communities would determine their own financial destiny through lending circles and priorities and the work of Reverend Andrew Mawson's community work in the East End of London in which welfare dollars were used to create community based businesses. The ISX also arose from work in conjunction with the Social Entrepreneurs Network in 2000-2003. The ISX's work was recognised immediately when it received a Black Box Business Award in Sept 2003 and it was short listed for the 2004/5 World Innovation Award of Silicon Valley's Tech Museum and the Stockholm Prize in 2006.

The most important thing that was built up through the early years of the ISX was an extraordinary network of people and communities which still remain close and linked. Between 2004 and 2009 over 5,000 Indigenous people, enterprises and communities nationwide used the ISX to post information and to track down investors, supporters and mentors.

There have been many learnings along the way. From 2003-2010 the ISX conducted community trading floors across the remote and regional parts of Australia. This process involved the then fledgling satellite and internet system to broadcast into major board rooms across the world. Because it was convened by local Aboriginal people it allowed many Aboriginal entrepreneurs who had not been identified by existing government business agencies to come forward through streamed video conferences to Sydney, Melbourne, Canberra, Los Angeles, New York and London and allowed them to project their ideas publicly and to link with investors and supporters.

The principal of the ISX is that all funds that are raised go directly to Aboriginal people with as little administration costs as possible. Private investment dollars flowing to Aboriginal businesses are precious and scarce. After 2010 it was recognised that the cost of trading floors and travel was a significant flow of funding that was not going directly to Aboriginal businesses, but rather to airlines, telecommunications companies and to indirect activities such as to the cost of running events.

From 2010 the preferred mode of work has been to use the internet to promote and connect Aboriginal

businesses with investors directly. While this has reduced the public profile of the ISX the number of significant collaborations and successful investments in Aboriginal businesses and communities has increased. From 2009 the ISX has concentrated its work in the north of Australia particularly on North East Arnhem land.

The ISX is an Aboriginal owned not-for-profit organisation which has eschewed meetings, administration and corporate structures. The ISX is a project of BAMA (Broome Aboriginal Media Association) and is held in trust on behalf of Aboriginal communities and entities who are welcome to apply for partnership/ownership after an initial period of work and collaboration with the ISX. Other kindred organisations close to the ISX are Balkanu Cape York Economic Development Association, the Kaiela Institute, Ngala Ngarli Yarndu Foundation, Mata Mata Homelands, Baniyala homelands, Marpuru homelands and several Aboriginal individuals and leaders.

Through the ISX's involvement in the north, the author of this report has a long association with Gubinge/Marnybi/Kakadu Plum/Näṇ'ka-bakarra. Neil Gower first presented his ideas about a Mamabalanjin Gubinge plantation and the prospects of Gubinge as an important revenue source for Aboriginal people at the Yawuru trading floor of the ISX in 2004, as did representatives of the Lombadina community and the Bidjadan-ga community. In 2009 the ISX also first became associated with and sought to promote Banduk Marika's nursery at Yirrkala. From 2009 the ISX has invested over many hundreds of thousand dollars in North East Arnhem Land homelands and this has included education, tourism, film, art, retail shop, transport, gardening and environmental projects at Gapuwuyak, Baniyala, Yirrkala, Biritjimi, Gi'kal and Mata Mata homelands. Every Monday morning since 2015 on Goolarri Radio and the National Indigenous Radio network Sandy Dann and the author survey Aboriginal business and social enterprise prospects that emerge through the ISX network. Gubinge/Kakadu Plum/Näṇ'ka-bakarra and the developing businesses of the north have been a constant discussion point over that time and continue to be an item of much interest amongst the radio audience. Frequently contact is made with the radio audience who become interested in particular areas of discussion from the discussions that occur on Monday mornings.

The author of this report completed his Bachelors Honors Degree on Manning Clark's A History of Australia, his Masters on contemporary philosophy, a diploma of education (Uni Melb) and his Ph.d on the history of clinical medicine at the University of NSW in 1989. He has headed several academic and political think tanks and is the author of over fifty reports and studies from telecommunications, US national health insurance to studies of a wide range of Aboriginal policies and issues. The authors academic posts include convenor and designer of inter-disciplinary technology studies for engineering, accounting, computing, humanities students at UTS, Sydney 1988-1990, Associate Professor of Public Health (Uni of Western Sydney), Professor of Public Policy (University of Queensland) and currently Honorary Fellow (University of Melbourne).

Bibliography

Ethno-biological, Historical and General Sources

- (1993) Traditional aboriginal medicines in the Northern Territory of Australia. Conservation Commission of the Northern Territory of Australia, Darwin, p 651
- (2007). "Throw another Kakadu plum on the barbie." *Food Australia* 59(11): 565-565.
- Aboriginal Communities of the Northern Territory
- Agri-Futures Australia/PWC Indigenous Consulting, Emerging Business Models for the Kakadu Plum Industry, 2018
- Altman, J.C 1987 Hunter-Gatherers Today: An Aboriginal economy in north Australia, Australian Institute of Aboriginal Studies, Canberra.
- Altman, J.C. 1984 The dietary utilisation of flora and fauna by contemporary hunter-gatherers at Momega outstation, northcentral Arnhem Land, *Australian Aboriginal Studies* 1984/1:35-46.
- Anderson, C. 1996 Traditional material culture of the Kuku-Yalanji of Bloomfield River, north Queensland, *Records of the South Australian Museum* 29(1):63-83.
- Anderson, C. and F. Dussart 1988 Dreamings in acrylic: Western Desert art. In Sutton, Dreamings, 89-142.
- Australian Plant Name Index (2010) IBIS database, Centre for Plant Biodiversity Research, Australian Government, Canberra.
- Baker, R.M. 1999 *Land is Life. From Bush to Town: The story of the Yanyuwa people*, Allen & Unwin, Sydney.
- Balick, M.J. and P.A. Cox 1996 *Plants, People and Culture: The science of ethnobotany*, Scientific American Library, New York.
- Bancroft, J. 1872 *The Pituri Poison*, paper read before Queensland Philosophical Society, Queensland Government Printer, Brisbane.
- Barr, A., J. Chapman, N. Smith and M. Beveridge 1988 *Traditional Bush Medicines: An Aboriginal pharmacopoeia*, Greenhouse Publications, Melbourne.
- Barton, J.H. 1994 Ethnobotany and intellectual property rights. In Prance et al, *Ethnobotany and the Search for New Drugs*, 214-27.
- Baymarrwanga, L, James, B, Yan-nhangu Atlas and Illustrated Dictionary of the Crocodile Islands, Tien Wah Press, 2014, Singapore, Sydney
- Beck, W., A. Clarke and L. Head (eds) 1989 *Plants in Australian Archaeology*, Tempus, Archaeology and Material Culture Studies in Anthropology, University of Queensland, St Lucia.
- Berkinshaw, T.D. 1999 *The business of bush foods: ecological and socio-cultural implications*, postgraduate thesis, University of Adelaide.
- Berndt, R.M., C.H. Berndt with J.E. Stanton 1999 *Aboriginal Art: A visual perspective*, rev. edn, Methuen Australia, Sydney.
- Bindon, P. 1996 *Useful Bush Plants*, Western Australian Museum, Perth.
- Blake, N.M., G. Wightman and L. Williams 1998 Iwaidja Ethnobotany: Aboriginal plant knowledge from Gurig National Park, northern Australia, *NT Botanical Bulletin* 23, Parks and Wildlife Commission of Northern Territory, Darwin.
- Boland, D. 1997 Some thoughts about CSIRO research in bushfoods, *Australian Bushfoods Magazine* 2:26-8.
- Bonney, N. 1994 *Uses of Native Plants in the South East of South Australia by the Indigenous Peoples before 1839*, Celebration South East (vol. 4), Southeast Book Promotions, Naracoorte, South Australia.
- Brand JC, Cherikoff V, Lee A, McDonnell J (1982). "Nutrients in important bushfoods". *Proceedings of the Nutritional Society of Australia*. 7: 50-54
- Brand Miller J, James KW, Maggiore P (1993) *Tables of composition of Australian aboriginal foods*. Aboriginal Studies Press, Canberra
- Brand Miller, J.C., K.W. James and P.M.A. Maggiore 1993 *Tables of Composition of Australian Aboriginal Foods*, Aboriginal Studies Press, Canberra.
- Brand, J.C. and P.M.A. Maggiore 1992 The nutritional composition of Australian acacia seeds. In House and Hardwood, *Australian Dry-Zone Acacias for Human Food*, 54-67.
- Brand, J.C. and V. Cherikoff 1985a The nutritional composition of Australian Aboriginal food plants of the

desert regions. In G.E. Wickens, J.R. Goodin and D.V. Field (eds), *Plants for Arid Lands*, George Allen & Unwin, London, 53-68.

Brand, J.C. and V. Cherikoff 1985b Australian Aboriginal bushfoods: the nutritional composition of plants of the desert region, *Australian Aboriginal Studies* 1985/2:38-46.

Brand, J.C., C. Rae, J. McDonnell, A. Lee, V. Cherikoff and A.S. Truswell 1983 The nutritional composition of Australian Aboriginal bushfoods: part 1, *Food Technology in Australia* 35(6):293-8.

Breedan, S. and B. Wright 1991 *Kakadu: Looking after country--the Gagudju way*, Simon Schuster, Sydney.

Brock J (1988) *Top end native plants*. John Brock: Winnellie, Darwin, 354 ppr

Brokensha, P. 1975 *The Pitjantjatjara and Their Crafts*, Aboriginal Arts Board, Australia Council, Sydney.

Brown, C.H. 1986 The growth of ethnobiological nomenclature, *Current Anthropology* 27(1):1-19.

Brown, M.F. 1998 Can culture be copyrighted? *Current Anthropology* 39(2):193-222.

Bruneteau, J.-P. 1996 *Tukka: Real Australian food*, Angus & Robertson, Sydney.

Buhmann, J., R. Robins and M. Chase 1976 Wood identification of spearthrowers in the Queensland Museum, *Australian Institute of Aboriginal Studies Newsletter (New Series)* 5:43-4.

Burbidge, A.A., K.A. Johnson, P.J. Fuller and R.I. Southgate 1988 Aboriginal knowledge of the mammals of the Central Deserts of Australia, *Australian Wildlife Research* 15:9-39.

Campbell, T.D. 1939 Food, food values and food habits of the Australian Aborigines in relation to their dental conditions, *Australian Journal of Dentistry*, January, February and March 1939 issues.

Cane, S. 2002 *Pila Nguru: The spinifex people*, Fremantle Arts Centre Press, Fremantle.

Cawte, J. 1974 *Medicine is the Law*, University Press of Hawaii, Honolulu.

Chaloupka, G. 1993 *Journey in Time: The world's longest continuing art tradition. The 50,000-year story of the Australian Aboriginal rock art of Arnhem Land*, Reed, Sydney.

Chase, A. and P. Sutton 1981 Hunter-gatherers in a rich environment: Aboriginal coastal exploitation in Cape York Peninsula. In A. Keast (ed.), *Ecological Biogeography of Australia*, Junk, The Hague, 1819-52.

Cherikoff, V. and J. Isaacs 1989 *The Bush Food Handbook: How to gather, grow, process and cook Australian wild foods*, Ti Tree Press, Sydney.

Clarke, P.A. The study of ethnobotany in southern South Australia, *Australian Aboriginal Studies* 1986/2:40-7.

Clarke, P.A., Early Aboriginal plant foods in southern South Australia, *Proceedings of the Nutrition Society of Australia* 1998 22:16-20.

Clarke, P.A., Twentieth century Aboriginal hunting and gathering practices in the rural landscape of the Lower Murray, South Australia, *Records of the South Australian Museum* 36(1). 2003

Clarke, P.A., Aboriginal use of space in the Lower Murray, South Australia, *Conference of Museum Anthropologists Bulletin* 1996 28:74-7.

Clarke, P.A., Aboriginal use of subterranean plant parts in southern South Australia, *Records of the South Australian Museum* 1988 22(1):63-76.

Clarke, P.A., Aboriginal uses of plants as medicines, narcotics and poisons in southern South Australia, *Journal of the Anthropological Society of South Australia* 1987 25(5):3-23.

Clarke, P.A., Early European interaction with Aboriginal hunters and gatherers on Kangaroo Island, South Australia, *Aboriginal History* 1996 20(1):51-81.

Clarke, P.A., *Where the Ancestors Walked: Australia as an Aboriginal landscape*, Allen & Unwin, 2003 Sydney.

Cleland, J.B -The ecology of the Aboriginal in South and Central Australia. In B.C. Cotton (ed.), *Aboriginal Man in South and Central Australia: Part 1*, South Australian Government Printer, -1966 Adelaide, 111-58.

Cleland, J.B. 1936 Ethno-botany in relation to the Central Australian Aboriginal, *Mankind* 2(1):6-9.

Cleland, J.B. 1957 Ethno-ecology: our natives and the vegetation of southern Australia, *Mankind* 5(4):149-62.

Cleland, J.B. and T.H. Johnston 1933 The ecology of the Aborigines of Central Australia: botanical notes, *Transactions of the Royal Society of South Australia* 57:113-24.

Clement, D. 1998 The historical foundations of ethnobiology (1860-1899), *Journal of Ethnobiology*, Winter 18(2):161-87.

Collins, D.J., C.C.J. Culvenor, J.A. Lamberton, J.W. Loder and J.R. Price 1990 *Plants for Medicine: A chemical and pharmacological survey of plants in the Australian region*, CSIRO, East Melbourne.

- Crawford, I.M. 1982 Traditional Aboriginal Plant Resources in the Kalumburu Area: Aspects in ethno-economics, Records of the Western Australian Museum Supplement 15, Western Australian Museum, Perth.
- Crawford, J. On the vegetable and animal food of the natives of Australia in reference to social position, with a comparison between the Australian and some other races of man, Transactions of the Ethnological Society of London (new series) 1868 6:112-22.
- Cribb, A.B. and J.W.Cribb - Wild Food in Australia, 1982 Fontana/Collins, Sydney.
- Cribb, A.B. and J.W.Cribb Wild Medicine in Australia, 1981 Fontana/Collins, Sydney.
- Cribb, A.B. and J.W.Cribb --Useful Wild Plants in Australia, 1981 Fontana/Collins, Sydney.
- Cunningham AB, Courtenay K, Gorman JT, Garnett S (2009) Eco-enterprises and Kakadu Plum (*Terminalia ferdinandiana*): "best laid plans" and Australian policy lessons. *Econ Bot* 63(1):16–28
- Curtis, B.V. 1974 Spare a spot for the Santalum, *Australian Plants* 7:337-8.
- Dadswell, I.W. 1934 The chemical composition of some plants used by Australian Aborigines as food, *Australian Journal of Experimental Biology and Medical Science* 12:13-18.
- Daley, C. 1931 Food of the Australian Aborigines, *Victorian Naturalist* 48:23-31.
- Davis, S. 1989 *Man of All Seasons: An Aboriginal perspective of the natural environment*, Angus & Robertson, Sydney.
- Devitt, J. 1992 Acacias: a traditional Aboriginal food source in central Australia. In *House and Hardwood, Australian Dry-Zone Acacias for Human Food*, 37-53.
- Dixon, R.M.W., W.S. Ramson and M. Thomas 1990 *Australian Aboriginal Words in English: Their origin and meaning*, Oxford University Press, Melbourne.
- Dodson, M. 2000 Human genetics: control of research and sharing of benefits, *Australian Aboriginal Studies* 2000/1&2:56-64.
- Douglas, W.H. 1988 *An Introductory Dictionary of the Western Desert Language*, Institute of Applied Language Studies, Perth.
- Eastwell, H. 1973 Co-operating with the medicine man, *Health*, first quarter, 12-14.
- Eastwell, H. 1978 Supporting Aboriginal ethnomedicine. Submission to the House of Representatives Standing Committee on Aboriginal Affairs, *Health Problems of Aborigines*, Hansard, 2017-28.
- Eastwell, H. The traditional healer in modern Arnhem Land, *Medical Journal of Australia* 1973 2:1011-17.
- Elkin, A.P. 1977 *Aboriginal Men of High Degree*, 2nd edn, University of Queensland Press, St Lucia.
- Flannery, T.F. 1994 *The Future Eaters: An ecological history of the Australasian lands and people*, Reed Books, Sydney.
- Flood, J. 1997 *Rock Art of the Dreamtime: Images of ancient Australia*, Angus & Robertson, Sydney.
- Ford, R.I. 1978 Ethnobotany: historical diversity and synthesis. In R.I. Ford (ed.), *The Nature and Status of Ethnobotany*, *Anthropological Papers* 67. Museum of Anthropology, University of Michigan, Ann Arbor, 33-49.
- Frankel, D. 1982 An account of Aboriginal use of the yam-daisy, *The Artefact* 7:43-5.
- Gammage, B, *The biggest estate on earth*, Sydney : Allen & Unwin, 2000
- Gilmore, M, *More Recollections*, Angus & Robertson, 1935
- Goddard, C. 1992 *Pitjantjatjara/Yankunytjatjara to English Dictionary*, 2nd edn, Institute for Aboriginal Development, Alice Springs.
- Goddard, C. and A. Kalotas (eds) 1988 *Punu: Yankunytjatjara plant use*, Angus & Robertson, Sydney.
- Golson, J. 1971 Australian Aboriginal food plants: some ecological and culture-historical implications. In Mulvaney and Golson, *Aboriginal Man and Environment in Australia*, 196-238.
- Gott, B. 1982 *Kunzea pomifera*--Dawson's 'nurt', *The Artefact* 7(1):3-17.
- Gott, B. 1982a Ecology of root use by the Aborigines of southern Australia, *Archaeology in Oceania* 17:59-67.
- Gott, B. 1983 Murnong--*Microseris scapigera*: a study of a staple food of Victorian Aborigines, *Australian Aboriginal Studies* 1983/2:2-17.
- Gott, B. 1984 Victorian ethnobotanical records, *Australian Aboriginal Studies* 1984/1:56.
- Gott, B. 1985 The use of seeds by Victorian Aborigines. In G.P. Jones (ed), *The Food Potential of Seeds from Australian Native Plants*, Deakin University Press, 25-30.
- Gott, B. 1997 Choosing acacia species for bushtucker, *Australian Bushfoods Magazine* 4:3-5.
- Gott, B. and J. Conran 1991 *Victorian Koorie Plants: Some plants used by Victorian Koories for food, fibre,*

medicines and implements, Yangernnanock Women's Group, Hamilton, Victoria.

Graham C, Hart D (1997) Prospects for the Australian native bushfood industry. Rural Industries Research & Development Corporation Research paper no. 97/22. Barton

Graham, C. and D. Hart 1997 Prospects for the Australian Native Bushfoods Industry, Research Paper no. 97/22, Rural Industries Research and Development Corporation, Canberra.

Griffin, G.F. and G.E. Allan 1986 Fire and the management of Aboriginal owned lands in central Australia. In B.D. Foran and B. Walker (eds), Science and Technology for Aboriginal Development, CSIRO and Centre for Appropriate Technology, Alice Springs, 72-6.

Griffiths, T. and L. Robin (eds) 1997 Ecology and Empire: Environmental history of settler societies, Melbourne University Press.

Hagger, J. 1979 Australian Colonial Medicine, Rigby, Adelaide.

Hallam, S.J. 1975 Fire and Hearth: A study of Aboriginal usage and European usurpation in south-western Australia, Australian Institute of Aboriginal Studies, Canberra.

Hamlyn-Harris, R. and F. Smith 1916 On fish poisoning and poisons employed among the Aborigines of Queensland, *Memoirs of the Queensland Museum* 5:1-9.

Hart, K.H. and P.A. Cox 2000 A cladistic approach to comparative ethnobotany: dye plants of the southwestern United States, *Journal of Ethnobiology* 20(2):303-25.

Harwood, C.E. 1994 Human food potential of the seeds of some Australian dry-zone acacia species, *Journal of Arid Environments* 27:27-35.

Head, L. 1989 Prehistoric Aboriginal impacts on Australian vegetation: an assessment of the evidence, *Australian Geographer* 20(1):37-46.

Heath, J. 1978 Linguistic approaches to Nunggubuyu ethnozoology and ethnobotany. In L.R. Hiatt (ed.), *Australian Aboriginal Concepts*, Australian Institute of Aboriginal Studies, Canberra, 40-55.

Hele, A.E. 2003 Researchers' Extension Program for the Native Foods Industry, Research Paper 03/013, Rural Industries Research and Development Corporation, Canberra.

Hegarty MP, Hegarty EE, Wills RBH (2001) Food safety of Australian plant bushfoods. Rural Industries Research & Development Corporation pub. no. 01/28, Barton

Henderson, J. and V. Dobson 1994 Eastern and Central Arrernte to English Dictionary, Arandic Languages Dictionaries Program, Language Centre, Institute for Aboriginal Development, Alice Springs.

Henshall, T., D. Jambijinpa, F.J. Kelly, P. Bartlett, L.J. Granites, J. Price, E. Coulshed and G.J. Robertson 1980 Ngurrju Maninja Kurlangu. Yapa Nyurnu Kurlangu. Bush Medicine, Warlpiri Literature-Production Centre, Yuendumu, Northern Territory.

Hetzal, B.S. and H.J. Frith (eds) 1978 The Nutrition of Aborigines in Relation to the Ecosystem of Central Australia, CSIRO, Melbourne.

Hiatt (Meehan), B. 1967-68 The food quest and economy of the Tasmanian Aborigines, *Oceania* 38(2):99-133; 38(3):190-219.

Hiatt, L.R. and R. Jones 1988 Aboriginal conceptions of the workings of nature. In R.W. Howe (ed.), *Australian Science in the Making*, Cambridge University Press, 1-22.

Hicks, C.S. and H. Le Messurier 1935 Preliminary observations on the chemistry and pharmacology of the alkaloids of *Duboisia hopwoodii*, *Australian Journal of Experimental Biology and Medical Science* 13:175-88.

Hiddins, L.J. 1996 *Bushtucker Man: Stories of exploration and survival*, ABC Books, Sydney.

House, A.P.N. and C.E. Hardwood (eds) 1992 *Australian Dry-Zone Acacias for Human Food*, Australian Tree Seed Centre, Canberra.

Hyam, G.N. 1943 Living off the land, *Victorian Naturalist* 59:171-3.

Irvine, F.R. 1970 Evidence of change in the vegetable diet of Australian Aborigines. In A.R. Pilling and R.A. Waterman (eds), *Diprotodon to Detribalisation*, Michigan State University Press, East Lansing, 278-84.

Isaacs, J 1992 *Desert Crafts: Anangu maruku punu*, Doubleday, Sydney.

Isaacs, J, *Bush Food, Aboriginal Food and Herbal Medicine*, New Holland, 1987

Isaacs, J. 1987 *Bush Food: Aboriginal food and herbal medicine*, Weldon, Sydney.

James, B., Maypal, Mayali' ga Wana: Shellfish, Meaning & Place, A Yolngu Bilingual Identification Code to Shellfish of North East Arnhem Land, NAILSMA, 2016

Johnston, T.H. and J.B. Cleland 1943 Native names and uses of plants in the north-eastern corner of South Australia, *Transactions of the Royal Society of South Australia* 67(1):149-73.

- Jones, D.S., S. Mackay and A.M. Pisani 1997 Patterns in the valley of the Christmas bush, *Victorian Naturalist* 114(5):246-9.
- Jones, G.P. (ed.) 1985 *The Food Potential of Seeds from Australian Native Plants*, Deakin University Press, Geelong.
- Jorgenson, J. 1837 Manners and customs of the Aborigines. In N.J.B. Plomley (ed.), *Jorgen Jorgenson and the Van Diemen's Land*, Blubber Head Press, Hobart, 1991, 47-132.
- Kamminga, J. 1988 Wood artefacts: a checklist of plant species utilised by Australian Aborigines, *Australian Aboriginal Studies* 1988/2:26-55.
- Kean, J. 1991 Aboriginal-acacia relationships in Central Australia, *Records of the South Australian Museum* 24(2):111-24.
- Kimber, R.G. 1976 Beginnings of farming? Some man-plant-animal relationships in Central Australia, *Man-kind* 10(3):142-50.
- King, B 1998 Muntari: much more than a ground cover, *Australian Bushfoods Magazine* 6:10-11.
- King, B. 1997 Acacia: research, field trials and databases, *Australian Bushfoods Magazine* 4:10-11, 14.
- King, J.R. 1997 Observations on Bunya processing, *Australian Bushfoods Magazine* 3:30-1.
- Kyriazis, S. 1995 *Bush Medicine of the Northern Peninsula Area of Cape York*, Nai Beguta Agama Aboriginal Corporation, Bamaga, Queensland.
- Ladd, P.G. 1988 Floral analysis and archaeology: is Australia different? *Australian Aboriginal Studies* 1988/2:2-18.
- Lands, M. (ed.) 1987 *Mayi: Some bush fruits of Dampierland*, Magabala Books, Kimberley Aboriginal Law and Culture Centre, Broome.
- Lassak, E.V. and T. McCarthy 1983 *Australian Medicinal Plants*, Methuen, Melbourne.
- Latz, P. 1974 Central Australian species of *Nicotiana*, *Australian Plants* 7:280-3.
- Latz, P. 1995 *Bushfires and Bushtucker: Aboriginal plant use in Central Australia*, Institute for Aboriginal Development, Alice Springs.
- Latz, P. 1998 The desert raisin and other *Solanum*, *Australian Bushfoods Magazine* 5:8-9.
- Lee, R.B. and I. DeVore 1968 *Man the Hunter*, Aldine Publishing, Chicago.
- Leichhardt, L. 2000 (1847) *Journal of an Overland Expedition in Australia, from Moreton Bay to Port Essington, a Distance of Upward of 3000 Miles, during the Years 1844-1845*, Corkwood Press, Adelaide.
- Leiper, G. and J. Hauser 1983 *Mutooroo: Plant use by Australian Aboriginal people*, Assembly Press, Brisbane.
- Levitt, D. 1981 *Plants and People: Aboriginal uses in plants on Groote Eylandt*, Aboriginal Studies Press, Canberra.
- Low T (1991) *Wild food plants of Australia*. Angus & Robertson, North Ryde, 240 pp
- Low, T. 1985-86 Australian wild foods, *Australian Natural History* 21(11):468-9.
- Low, T. 1989 *Bush Tucker: Australia's wild food harvest*, Angus & Robertson, Sydney.
- Low, T. 1991 *Wild Food Plants of Australia*, rev. edn, Angus & Robertson, Sydney.
- Low, T. 1991 *Wild Herbs of Australia and New Zealand*, Angus & Robertson, Sydney.
- Low, T. 1999 *Feral Future: The untold story of Australia's exotic invaders*, Viking, Melbourne.
- MacPherson, J. 1925 The gum-tree and wattle in Australian Aboriginal medical practice, *Australian Nurses Journal*, 15 December, 23(12):588-96.
- MacPherson, J. 1939 The eucalyptus in the daily life and medical practice of the Australian Aborigines, *Mankind* 2(6):175-80.
- Maddock, K. and J.E. Cawte 1970 Aboriginal law and medicine, *Proceedings of the Medico-Legal Society of New South Wales* 4:170-90.
- Maiden, J.H. 1889 *The Useful Native Plants of Australia*, Trubner, London.
- Marrfurra, P. 1995 Ngan'gikurunggurr and Ngangiwumirri Ethnobotany: Aboriginal plant use from the Daly River area, northern Australia, *Botanical Bulletin* 22, Conservation Commission of Northern Territory, Darwin.
- Martin, G.J. 1995 *Ethnobotany: A methods manual*, Chapman and Hall, London.
- Matthews, D.J. 1997 The quandong (*Santalum acuminatum*), *Australian Bushfoods Magazine* 1:14-15.
- McConnel, U.H. 1953 Native arts and industries on the Archer, Kendall and Holroyd rivers, Cape York Peninsula, north Queensland, *Records of the South Australian Museum* 11(1):1-42.

- McConnel, U.H. 1930 The Wik-Munkan tribe of Cape York Peninsula, Oceania reprint (originally Oceania 1(1):97-104, 181-205).
- McEntee, J.C., P. McKenzie and J. McKenzie 1986 Witi-ita-nanalpila: Plants and birds of the northern Flinders Ranges and adjacent plains with Aboriginal names, the authors, South Australia.
- McKnight, D. 1999 People, Countries, and the Rainbow Serpent: Systems of classification among the Lardil of Mornington Island, Oxford University Press, New York.
- Meehan (Hiatt), B. 1982 Shell Bed to Shell Midden, Australian Institute of Aboriginal Studies, Canberra.
- Meggitt, M.J. 1962 Desert People: A study of the Walbiri people of Central Australia, Angus & Robertson, Sydney.
- Morphy, H. 1998 Aboriginal Art, Phaidon Press, London.
- Morris, P.F. 1943 Some vegetable foods of the Wimmera and Mallee, Victorian Naturalist 1:167-70.
- Morse, J. 1997 CSIRO on acacias, Australian Bushfoods Magazine 1:28. Mountford, C.P. 1958 The Tiwi: Their art, myth and ceremony, Phoenix House, London.
- Mulvaney, D.J. and J. Golson (eds) 1971 Aboriginal Man and Environment in Australia, Australian National University Press, Canberra.
- Mutitjulu Community and L. Baker 1996 Mingkiri: A natural history of Uluru by the Mutitjulu Community, Institute for Aboriginal Development Press, Alice Springs.
- Nabhan, G.P., A. Joaquin, N. Laney and K. Dahl 1995 Sharing the benefits of plant resources and Indigenous scientific knowledge. In S.B. Brush and D. Stabinsky (eds), Valuing Local Knowledge: Indigenous people and intellectual property rights, Island Press, Washington DC, 186-208.
- Orchard, A.E. and A.J.G. Wilson 1999 Utilisation of the Australian flora. In A.E. Orchard and H.S. Thompson (eds), Flora of Australia (vol. 1), Introduction, 2nd edn, Australian Biological Resources Study, Canberra, 437-66.
- Paddy, E., S. Paddy and M. Smith 1987 Boonja Bardak Korn: All trees are good for something, Community Report 87/1, Anthropology Department, Western Australian Museum, Perth.
- Palmer, K. 1999 Swinging the Billy: Indigenous and other cooking styles of Australian bush cooking, Aboriginal Studies Press, Canberra.
- Parker, A. 1980 An ethnobotany of the Western Desert, Leonora, Western Australia, 1977, Australian Institute of Aboriginal Studies Newsletter (new series) 13:37-42.
- Pascoe, B. Dark Emu Black Seeds: Agriculture or Accident?, Magabala Books, 2014
- Paul Pitchford, Healing with Whole Foods Asian Traditions and Modern Nutrition, North Atlantic Books, Berkeley, 2002
- Peerzada N, Renaud S, Ryan P (1990) Vitamin C and elemental composition of some bushfruits. J Plant Nutr 13(7):787-793
- Peterson, N. 1976 The natural and cultural areas of Aboriginal Australia. In N. Peterson (ed.), Tribes and Boundaries in Australia, Social Anthropology Series no. 10, Australian Institute of Aboriginal Studies, Canberra, 50-71.
- Peterson, N. 1977 Aboriginal uses of Australian Solanaceae. In J.G. Hawkes, R.N. Lester and A.D. Skelding (eds), The Biology and Taxonomy of Solanaceae, Academic Press, London, 171-88.
- Phelps, D.G. 1997 Feasibility of a Sustainable Bushfoods Industry in Western Queensland, Research Paper 97/11, Rural Industries Research and Development Corporation, Canberra.
- Phelps, W. and D. Phelps 1997 Desert lime, Australian Bushfoods Magazine 2:16-17.
- Plomley, N.J.B. and M. Cameron 1993 Plant foods of the Tasmanian Aborigines, Records of the Queen Victoria Museum 101:1-27.
- Plooi, D. and G. O'Brien 1973 Culture training manual for technical workers in Aboriginal communities (mechanics, stockmen, builders and storemen), School of Social Sciences, Flinders University, Adelaide.
- Posey, D.A. 1990 Intellectual property rights: what is the position of ethnobiology? Journal of Ethnobiology Summer 10(1):93-8.
- Prance, G.T., D.J. Chadwick and J. Marsh (eds) 1994 Ethnobotany and the Search for New Drugs, Wiley, Chichester, NY.
- Puruntatameri, J. 2001 Tiwi Plants and Animals: Aboriginal flora and fauna knowledge from Bathurst and Melville Islands, northern Australia, Parks and Wildlife Commission of Northern Territory and Tiwi Land Council, Darwin.

- PwC Indigenous Consulting Emerging Business Models for the Kakadu Plum Industry, Nov 2017
- Pyne, S.J. 1991 *Burning Bush: A fire history of Australia*, Holt, New York.
- Rae, C.J., V.J. Lamprell, R.J. Lion and A.M. Rae 1982 The role of bush foods in contemporary Aboriginal diets, *Proceedings of the Nutrition Society of Australia* 7:45-9.
- Ramson, W.S. (ed.) 1988 *The Australian National Dictionary: A dictionary of Australianisms on historical principles*, Oxford University Press.
- Ray Norris, "Aboriginal People: How to Misunderstand their science", *The Conversation*, April 21, 2014, <https://theconversation.com/aboriginal-people-how-to-misunderstand-their-science-23835>
- Raymond, E. and G.M. Wightman 1999 *Wardaman Ethnobiology*, Botanical Bulletin 25, Parks and Wildlife Commission of Northern Territory and Northern Territory University, Darwin.
- Reid, A 1995b A plan for all seasons, *Habitat Australia* 23(2):14-15.
- Reid, A. 1995a *Banksias and Bilbies: Seasons of Australia*, Gould League, Melbourne.
- Reid, E. 1977 *The Records of Western Australian Plants Used by Aboriginals as Medicinal Agents*, reprinted 1986, School of Pharmacy, Western Australian Institute of Technology, Perth.
- Reid, J. (ed.) 1982 *Body, Land and Spirit: Health and healing in Aboriginal society*, University of Queensland Press, St Lucia.
- Reid, J. 1978 Change in the Indigenous medical system of an Aboriginal community, *Australian Institute of Aboriginal Studies Newsletter* 9:61-72.
- Reid, J. 1979 Health as harmony, sickness as conflict, *Hemisphere* 23(4):194-9.
- Reid, J. 1983 *Sorcerers and Healing Spirits: Continuity and change in an Aboriginal medical system*, Australian National University Press, Canberra.
- Reid, J. and T.J. Betts 1979 Records of Western Australian plants used by Aboriginals as medicinal agents, *Planta Medica* 36(2):164-73.
- Roberts, J., C.J. Fisher and R. Gibson 1995 *A Guide to Traditional Aboriginal Rainforest Plant Use*, by Kuku Yalanji of the Mossman Gorge, Bamanga Bubu Ngadimunku, Mossman, Queensland.
- Roberts, N., B. Randall, J. Barker, M. Ward and P. Owen 1980 Wild foods of New South Wales, *Aboriginal Health Worker* 4(1):13-18.
- Robins, J. 1996 *Wild Lime: Cooking from the bushfood garden*, Allen & Unwin, Sydney.
- Robson, M.K. 1986 *Keeping the Culture Alive*, Aboriginal Keeping Place, Hamilton and Western District Museum, Victoria.
- Roff, D. 1983 *Bushtucker*, *Geo* 5(3):70-87.
- Rose, D. Bird 1984 *Preliminary Report: Ethnobotany in the Bungles*, Centre for Resource and Environmental Studies, Canberra.
- Rose, D. Bird 1987 *Bush Medicines: A Ngarinman and Bilinara pharmacopoeia*, Australian Institute of Aboriginal Studies, Canberra.
- Rose, D. Bird 1988 *Ethnobotany*, *Aboriginal Health Worker* 12(3):21-5.
- Rose, D. Bird 1996 *Nourishing Terrains: Australian Aboriginal views of landscape and wilderness*, Australian Heritage Commission, Canberra.
- Rose, F.G.G. 1987 *The Traditional Mode of Production of the Australian Aborigines*, Angus & Robertson, Sydney.
- Roth, W.E. 1901 *North Queensland Ethnography. Food: Its search, capture, and preparation*, Bulletin 3, Queensland Government Printer, Brisbane.
- Rural Industries Research and Development Corporation, *Health Benefits of Australian Native Foods – An evaluation of health-enhancing Compounds*, Canberra, 2009
- Russell-Smith, J. 1985 *Studies in the jungle: people, fire and monsoon forest*. In R. Jones (ed.), *Archaeological Research in Kakadu National Park*, Australian National Parks and Wildlife Service, Canberra, 241-67.
- Scarlett, N.H., N. White and J. Reid 1982 *Bush medicines: the pharmacopoeia of the Yolngu of Arnhem Land*. In Reid, *Body, Land and Spirit*, 154-91.
- Semple, S.J. 1998 The antiviral properties of traditional Australian Aboriginal medicines, *Proceedings of the Nutritional Society of Australia* 22:1-6.
- Smith, H. 1990 *Tiwi: The life and art of Australia's Tiwi people*, Angus & Robertson, Sydney.
- Smith, K. and I. Smith 1999 *Grow Your Own Bushfoods*, New Holland Publishers, Sydney.
- Smith, M. and A.C. Kalotas 1985 *Bardi plants: an annotated list of plants and their use by the Bardi Aborigi-*

nes of Dampierland, in north-western Australia, *Records of the Western Australian Museum* 12(3):317-59.

Smith, N.M. 1991 Ethnographic field notes from the Northern Territory, Australia, *Journal of the Adelaide Botanical Gardens* 14(1):1-65.

Smith, N.M. and G.M. Wightman 1990 Ethnobotanical Notes from Belyuen, Northern Territory, Australia, *Botanical Bulletin* 10, CCNT, Darwin.

Smith, N.M., B. Widdiburu, R.N. Harrington and G.M. Wightman 1993 Ngarinyman Ethnobotany: Aboriginal plant use from the Victoria River area, northern Australia, *Botanical Bulletin* 16, Conservation Commission of Northern Territory, Darwin.

Smyth, D. 1982 Aboriginal occupation of inland Cape York Peninsula: a report on ethnobotanical fieldwork along the Archer River in September 1981, *Australian Institute of Aboriginal Studies Newsletter* 17:8-13.

Smyth, R.B. 1878 *The Aborigines of Victoria*, 2 vols, Victorian Government Printer, Melbourne.

Specht, R.L. 1958 An introduction to the ethnobotany of Arnhem Land. In R.L. Specht and C.P. Mountford (eds), *Records of the American-Australian Scientific Expedition to Arnhem Land*, vol. 3, Melbourne University Press, 479-503.

Stack, E.M. 1989 Aboriginal pharmacopoeia, *Occasional Papers (Northern Territory Library Service)* 10:1-7.

Stewart, K. and B. Percival 1997 *Bush Foods of New South Wales: A botanical record and an Aboriginal oral history*, Royal Botanic Gardens, Sydney.

Sutton, P. (ed.) 1988 *Dreamings: The art of Aboriginal Australia*, Penguin Books, Melbourne.

Sutton, P. 1994 Material culture traditions of the Wik people, Cape York Peninsula, *Records of the South Australian Museum* 27(1):31-52.

Tate, R. (ed.) 1882 *Miscellaneous contributions to the natural history of South Australia*, *Transactions and Proceedings and Report of the Royal Society of South Australia* 4:135-8.

Telban, B. 1988 The role of medical ethnobotany in ethnomedicine: a New Guinea example, *Journal of Ethnobiology* 8(2):149-69.

Tent, Vanessa, *Traditional Bush Medicine of the Darug People*, 2010

Thieberger, N. and W. McGregor (eds) 1994 *Macquarie Aboriginal Words*, Macquarie Library, Sydney.

Thomson, D.F 1975 *Bindibu Country*, Nelson, Melbourne.

Thomson, D.F 1980 *Catalogue of the Donald Thomson Botanical Collection held in the National Museum of Victoria*, Melbourne, AIATSIS, Canberra.

Thomson, D.F 1985 *Donald Thomson's Mammals and Fishes of Northern Australia*, ed. and annotated by J.M. Dixon and L. Huxley, Thomas Nelson Australia, Melbourne.

Thomson, D.F 1987 *Aboriginal Artefacts in the Donald Thomson Collection: A microfiche catalogue*, comp. by E.G. Ramsay, University of Melbourne and Museum of Victoria, Melbourne.

Thomson, D.F. 1939 The seasonal factor in human culture: illustrated from the life of a contemporary nomadic group, *Prehistorical Society Proceedings* 5(2):209-21.

Thomson, N. and P. Merrifield 1988 *Aboriginal Health: An annotated bibliography*, Australian Institute of Aboriginal Studies, Canberra.

Tindale, 1977 Adaptive significance of the panara or grass seed culture of Australia. In R.V.S. Wright (ed.), *Stone Tools as Cultural Markers*, Australian Institute of Aboriginal Studies, Canberra, 345-9.

Tindale, N.B. 1974 *Aboriginal Tribes of Australia: Their terrain, environmental controls, distribution, limits, and proper names*, Australian National University Press, Canberra.

Tunbridge, D. 1985 Language as heritage: flora in place names. A record of survival in the Gammon Ranges, *Journal of the Anthropological Society of South Australia* 23(8):3-15.

Tunbridge, D. 1987 Aboriginal place names, *Australian Aboriginal Studies* 1987/2:2-13.

Tunbridge, D. 1991 *The Story of the Flinders Ranges Mammals*, Kangaroo Press, Sydney.

Veth, P.M. and F.J. Walsh 1988 The concept of 'staple' plant foods in the Western Desert region of Western Australia, *Australian Aboriginal Studies* 1988/2:19-25.

Von Mueller, F. 1881 *Select Extra-tropical Plants, Readily Eligible for Industrial Culture or Naturalisation, with Indications of Their Native Countries and Some of Their Uses*, T. Richards, Government Printer, Sydney.

Waddy, J.A 1982 Biological classification from a Groote Eylandt Aborigine's point of view, *Journal of Ethnobiology* 2(1):63-77.

Waddy, J.A 1988 *Classification of Plants and Animals from a Groote Eylandt Aboriginal Point of View*, 2 vols, North Australia Research Unit, Australian National University, Darwin.

- Waddy, J.A. 1979 Ethnobiology of Groote Eylandt: a progress report, Australian Institute of Aboriginal Studies Newsletter 11:46-50.
- Watson, P. 1983 This Precious Foliage: A study of the Aboriginal psychoactive drug pituri, Oceania Monograph 26, University of Sydney.
- Webb, L.J. 1948 Guide to the Medicinal and Poisonous Plants of Queensland, Council for Scientific and Industrial Research, Bulletin 232, Melbourne.
- Webb, L.J. 1959 The use of plant medicines and poisons by Australian Aborigines, Mankind 7:137-46.
- Webb, L.J. 1960 Some new records of medicinal plants used by the Aborigines of Tropical Queensland and New Guinea, Proceedings of the Royal Society of Queensland 71(6):103-10.
- Webb, L.J. 1973 'Eat, die, and learn': the botany of the Australian Aborigines, Australian Natural History 17(9):290-5.
- Webb, L.J. 1977 Ethnobotany: the co-operative approach to research, Australian Institute of Aboriginal Studies Newsletter (new series) 7:43-5.
- White, I. 1987 Australian Bush Flower Remedies, rev. edn, the author, Spit Junction, NSW, booklet, 52pp.
- Wightman G, Andrews M (1991) Bush tucker identikit. Conservation Commission of The Northern Territory, Darwin, 65 pp
- Wightman, G.M. and L. Mills 1991 Bush Medicine Identikit: Common medicinal plants of Australia's Top End, CCNT, Darwin.
- Wightman, G.M. and M. Andrews 1991 Bush Tucker Identikit: Common native food plants of Australia's Top End, Conservation Commission of Northern Territory (CCNT), Darwin.
- Wightman, G.M. and N.M. Smith 1989 Ethnobotany, Vegetation and Floristics of Milingimbi, Northern Australia, Botanical Bulletin 6, CCNT, Darwin.
- Wightman, G.M., D. Dixon, L.L.V. Williams and Injimadi Dalywaters 1992 Mudburra Ethnobotany: Aboriginal plant use from Kulumindini (Elliot), northern Australia, Botanical Bulletin 14, CCNT, Darwin.
- Wightman, G.M., D.M. Jackson and L.L.V. Williams 1991 Alawa Ethnobotany: Aboriginal plant use from Minyerri, northern Australia, Botanical Bulletin 11, CCNT, Darwin.
- Wightman, G.M., Gurindji elders, R.N.D. Frith and S. Holt 1994 Gurindji Ethnobotany: Aboriginal plant use from Daguragu, northern Australia, Botanical Bulletin 18, CCNT, Darwin.
- Wightman, G.M., J.G. Roberts and L.L.V. Williams 1992 Mangarrayi Ethnobotany: Aboriginal plant use from the Elsey area, northern Australia, Botanical Bulletin 15, CCNT, Darwin.
- Williams, N.M. and G. Baines (eds) 1993 Traditional Ecological Knowledge: Wisdom for Sustainable Development, Centre for Resource and Environmental Studies, Australian National University, Canberra.
- Wilson, G., A. McNee and P. Platts 1992 Wild Animal Resources: Their use by Aboriginal communities, Bureau of Rural Resources, AGPS, Canberra.
- Wiminydji and A.R. Peile 1978 A desert Aborigine's view of health and nutrition, Journal of Anthropological Research 34(4):497-523.
- Worsnop, T. 1897 The Prehistoric Arts, Manufactures, Works, Weapons, etc., of the Aborigines of Australia, South Australian Government Printer, Adelaide.
- Yunupingu, B. 1995 Rirratjinu Ethnobotany: Aboriginal plant use from Yirrkala, Arnhem Land, Australia, CCNT, Darwin.
- Zola, N. and B. Gott 1992 Koorie Plants, Koorie People: Traditional Aboriginal food, fibre and healing plants of Victoria, Koorie Heritage Trust, Melbourne.

Contemporary Scientific Literature

- Ahmed, A. K. and K. A. Johnson (2000). "Horticultural development of Australian native edible plants." Australian Journal of Botany 48(4): 417-426.
- Akter, Saleha, Netzel, Michael E., Fletcher, Mary T., Tinggi, Ujang and Sultanbawa, Yasmina (2018) Chemical and nutritional composition of Terminalia ferdinandiana (kakadu plum) kernels: a novel nutrition source. Foods, 7 4
- Brand JC, Cherikoff V, Lee A, Truswell AS (1982) An outstanding food source of vitamin C. Lancet 2:873
- Cock, I. E. and S. Mohanty (2011). "Evaluation of the antibacterial activity and toxicity of Terminalia ferdinandia fruit extracts." Pharmacognosy Journal 3(20): 72-79.
- Courtney, R., J. Sirdarta, et al. (2015). "Tannin components and inhibitory activity of Kakadu plum leaf ex-

tracts against microbial triggers of autoimmune inflammatory diseases." *Pharmacognosy Journal* 7(1): 18-31.

Holcombe, S. and T. Janke (2012). Patenting the Kakadu plum and the marjarla tree: Biodiscovery, intellectual property and indigenous knowledge. *Intellectual Property and Emerging Technologies: The New Biology*: 293-319.

Humphries, F., D. F. Robinson, et al. (2017). "Implications of Indigenous Land Tenure Changes for Accessing Indigenous Genetic Resources from Northern Australia." *Environmental and Planning Law Journal* 34(6): 560-579.

Konczak, I. and P. Roulle (2011). "Nutritional properties of commercially grown native Australian fruits: Lipophilic antioxidants and minerals." *Food Research International* 44(7): 2339-2344.

Konczak, I. and P. Roulle (2011). "Nutritional properties of commercially grown native Australian fruits: Lipophilic antioxidants and minerals." *Food Research International* 44(7): 2339-2344.

Konczak, I., D. Zabarar, et al. (2010). "Antioxidant capacity and hydrophilic phytochemicals in commercially grown native Australian fruits." *Food Chemistry* 123(4): 1048-1054.

Konczak, I., F. Maillot, et al. (2014). "Phytochemical divergence in 45 accessions of *Terminalia ferdinandiana* (Kakadu plum)." *Food Chemistry* 151: 248-256.

Logue, D., A. Pitsis, et al. (2017). "Social enterprise to social value chain: Indigenous entrepreneurship transforming the native food industry in Australia." *Journal of Management and Organization*: 1-17.

Mohanty, S. and I. E. Cock (2012). "The chemotherapeutic potential of *Terminalia ferdinandiana*: Phytochemistry and bioactivity." *Pharmacognosy Reviews* 6(11): 29-36.

Netzel, M., G. Netzel, et al. (2007). "Native Australian fruits- a novel source of antioxidants for food." *Innovative Food Science and Emerging Technologies* 8(3): 339-346.

Rayan, P., B. Matthews, et al. (2015). "*Terminalia ferdinandiana* extracts as inhibitors of *Giardia duodenalis* proliferation: a new treatment for giardiasis." *Parasitology Research* 114(7): 2611-2620.

Sadeghi Ekbatan, Shima, Sleno, Lekha, Sabally, Kebba Khairallah, Joelle. Azadi, Behnam. Rodes, Laetitia, Prakash, Satya, Donnelly, Danielle J., Kubow, Stan, "Biotransformation of polyphenols in a dynamic multistage gastrointestinal model", <https://doi.org/10.1016/J.FOODCHEM.2016.02.140>

Sirdaarta, J., B. Matthews, et al. (2015). "Kakadu plum fruit extracts inhibit growth of the bacterial triggers of rheumatoid arthritis: Identification of stilbene and tannin components." *Journal of Functional Foods* 17: 610-620.

Sommano, S., N. Caffin, et al. (2011). "Food safety and standard of Australian native plants." *Quality Assurance and Safety of Crops and Foods* 3(4): 176-184.

Sommano, S., N. Caffin, et al. (2011). "Measurement of ascorbic acid in Australian native plants." *International Food Research Journal* 18(3).

Sommano, S., N. Caffin, et al. (2013). "Screening for antioxidant activity, phenolic content, and flavonoids from Australian native food plants." *International Journal of Food Properties* 16(6): 1394-1406.

Sommano, S., N. Caffin, et al. (2013). "The impact of thermal processing on bioactive compounds in Australian native food products (bush tomato and Kakadu plum)." *Food Research International* 50(2): 557-561.

Tan, A. C., D. X. Hou, et al. (2011). "Native Australian fruit polyphenols inhibit COX-2 and iNOS expression in LPS-activated murine macrophages." *Food Research International* 44(7): 2362-2367.

Tan, A. C., I. Konczak, et al. (2011). "Antioxidant and cytoprotective activities of native Australian fruit polyphenols." *Food Research International* 44(7): 2034-2040.

Tan, A. C., I. Konczak, et al. (2011). "Native Australian Fruit Polyphenols Inhibit Cell Viability and Induce Apoptosis in Human Cancer Cell Lines." *Nutrition and Cancer-an International Journal* 63(3): 444-455.


Tan, A. C., I. Konczak, et al. (2011). "Potential antioxidant, antiinflammatory, and proapoptotic anticancer activities of Kakadu plum and Illawarra plum polyphenolic fractions." *Nutrition and Cancer* 63(7): 1074-1084.

Williams, D. J., D. Edwards, et al. (2014). "Profiling ellagic acid content: The importance of form and ascorbic acid levels." *Food Research International* 66: 100-106.

Williams, D. J., D. Edwards, et al. (2014). "Profiling ellagic acid content: The importance of form and ascorbic acid levels." *Food Research International* 66: 100-106.

Williams, D. J., D. Edwards, et al. (2016). "Measuring free ellagic acid: Influence of extraction conditions on recovery by studying solubility and UV-Visible spectra." *Chemical Papers* 70(8): 1078-1086.

Williams, D. J., D. Edwards, et al. (2016). "Measuring the three forms of ellagic acid: suitability of extraction solvents." *Chemical Papers* 70(2): 144-152.



Williams, D. J., D. Edwards, et al. (2016). "Organic acids in Kakadu plum (*Terminalia ferdinandiana*): The good (ellagic), the bad (oxalic) and the uncertain (ascorbic)." *Food Research International* 89: 237-244. .

Williams, D. J., D. Edwards, et al. (2016). "Organic acids in Kakadu plum (*Terminalia ferdinandiana*): The good (ellagic), the bad (oxalic) and the uncertain (ascorbic)." *Food Research International* 89: 237-244.

Wright, M. H., J. Sirdaarta, et al. (2016). "Growth inhibitory activity of kakadu Plum extracts against the opportunistic pathogen *Clostridium perfringens*: New leads in the prevention and treatment of clostridial myonecrosis." *Pharmacognosy Journal* 8(2): 144-153.

Wright, M. H., J. Sirdaarta, et al. (2017). "GC-MS headspace analysis of *terminalia ferdinandiana* fruit and leaf extracts which inhibit *Bacillus anthracis* growth." *Pharmacognosy Journal* 9(1): 73-82.

Appendix One. Interviews concerning Bush Fruit and Aboriginal Horticulture by Peter Botsman

Value Adding: Kimberley Wild Gubinge <https://soundcloud.com/kangaroova/value-adding-kimberley-wild-gubinge-a-discussion-with-jacinta-monck-and-lenny-omeara>

The Power of Women: Mi Marrarl (Kakadu Plum), Palngut Wurnangat, Coradji and Kindred Spirits <https://soundcloud.com/kangaroova/chris-brady-rose-read1>

A Walk in the BAMA Orchard with Bennett Walker <https://soundcloud.com/kangaroova/a-walk-in-the-garden-with-bennett-walker>

Batumbil Burarrwanga NÄN'KA-BAKARRA <https://soundcloud.com/kangaroova/gubinge>

Appendix Two First fruit for Bidyadanga

By Matt Brann from Lagrange , WA

Monday, 24/11/2008

After three years and plenty of hard work the community at Bidyadanga (180km south of Broome) is gearing up for its first harvest of gubinge (kakadu plum) and gumpja (pindan walnut).

Community leader Merridoo Walbidi says both he and eight TAFE students have worked hard on the plantation and he's proud to see the trees looking so healthy.

"This is what we've worked for and this is the first year (of fruiting) for us; so we are very happy" he says.

"I hope this can become an enterprise for the community, that's my dream, I want to see the community benefiting from this and I'd like to see other communities start their own project like this or whatever they dream of."

Horticulturalist Kim Courtenay has been helping out on the project and says it's a very significant crop because it's one of the first cultivated plantations of gubinge in Western Australia.

"This first harvest won't be a big one, it'll produce enough fruit for local people to use but it's significant because the trees have taken and they're growing well."

He says the current plantation covers about 1.5 hectares and consists of over 200 trees, but the plan is to continue planting on about 20 hectares, which is available for drip irrigation.

"I think there's very good opportunities for it to expand into all sorts of different markets, initially it was the pharmaceutical, health and cosmetic industries interested because it's (gubinge) so high in Vitamin C, but there's certainly potential for it to be developed as a fresh food."

Mr Courtenay says little is known about the pindan walnut and there is no real market for it as of yet, but gubinge is currently selling for about \$20/kg.

Appendix Three ABC Lateline Transcript

PIP COURTNEY, PRESENTER: Kakadu or bush plums have the highest known natural vitamin C content in the world. A group of Indigenous women in a remote Top End community are poised to benefit from selling Kakadu plums. But so-called bio pirates are circling in the murky business of locking up the intellectual property around bush foods. Kristy O'Brien reports from Wadeye in the Northern Territory.

KRISTY O'BRIEN, REPORTER: Nestled in bushland and mangroves on the edge of the Joseph Bonaparte Gulf, Wadeye is about as remote as you can get. Formerly the mission of Port Keats, it's one of Australia's biggest Indigenous communities.

The 1,500-strong population are entirely cut off by a sea of water for nearly half the year. There's five traditional kinship groups, English isn't widely spoken and devout Catholicism is laced through Aboriginal tradition and culture.

The dry season has just arrived and it's harvesting time. Over the next few weeks, about 200 women and children will go bush looking for a special fruit.

LOCAL WOMAN (subtitles): It's good for your headache. If we have headache of bush, we eat plum and it makes us feel good.

KRISTY O'BRIEN: Marnybi or Kakadu, bush or billygoat plum is cherished in traditional Indigenous medicine for its amazing healing properties. It grows in abundance after the wet across the Top End of Australia. But fruit in Wadeye is showing the highest concentration of vitamin C compared to other regions. While Indigenous people have known its value for centuries, the plant is fast becoming a hot ticket item in the Western world with international pharmaceutical, cosmetic and superfood markets all knocking.

MARGO NORTHEY, WADEYE PAINGUM WURNANGAT: Something like this is- not only is a real economic boon for Indigenous communities and for remote Indigenous communities, it's work that actually local people love to do and it will employ a lot of people.

KRISTY O'BRIEN: The Wadeye women could be onto a goldmine of potential. Powdered plum fetches around \$500 per kilogram.

LOCAL WOMAN II (subtitles): When we collected these plums, they will be sent off.

KRISTY O'BRIEN: Wadeye has had its problems with violence and social dysfunction. This industry is not only a chance to sustain traditional practices, but also make money and bring back much-needed pride to the place.

MAUREEN SIMON, THAMARRURR RANGER Think away in the community, it's, like, fighting and all that. And I think that community is coming up good. People just working around the community. Like, some go out bush, camping, collecting, teaching their children how to collect and, yeah.

KRISTY O'BRIEN: Margo Northey is the leader at the women's centre. She moved to the community six years ago after making a promise to return one day when she first visited Wadeye. In 2013, she helped the women to purchase a Sydney-based business that was already harvesting Kakadu plum from the north. Part of the transaction included a patent over processing the plum and technology, including machinery. The pre-existing knowledge and tools they purchased allowed the women to turn the plum from a wild fruit into the sellable powdered commodity.

MARGO NORTHEY: The women love the idea. It was doing something that they love to do out on country, so they, um- yeah, they looked at it, they thought about it, they own the local takeaway and had some money in the bank and were prepared to commit some of that money to exploring the possibility of that business.

KRISTY O'BRIEN: The women's centre is an old tin mission shed in the centre of town where the slogan is palngun wurnangat: strong women together. It's a hive of activity when it's plum season.

MARGO NORTHEY: They're not just doing that sort of work. They're actually running the business back in the women's centre. They're grading the fruit as it comes in. They're weighing it. They're actually going into the database and printing off the invoices for someone to pay the people, so it's, um- it's a really hands-on business.

KRISTY O'BRIEN: The process is a community effort. Women bring in the fruits every morning. The quality is checked, the fruit weighed and the picker paid.

MARGO NORTHEY: It is really difficult to keep the fruit frozen to transport. So we have it down to minus 18 degrees in our freezer containers and we need to do that to make sure it stays snap frozen within 24 hours.

KRISTY O'BRIEN: The women love having their own income and purpose. Durada Nicoe is due to go to hospi-

tal later today to give birth to her second child, but is picking right up until the final hour. So you're gonna have a baby this afternoon, but you picked all these yesterday.

DURADA NICOE: Yesterday.

KRISTY O'BRIEN: So no- no resting?

DURADA NICOE: No.

KRISTY O'BRIEN: The local rangers also play a part, keeping the wild crop in check, ensuring trees are not damaged and permits are being adhered to. Once collected and frozen, it's on to the local barge. The load will clock up several thousand kilometres as it heads to Sydney and Brisbane for processing into a powder. Some will land in laboratories like this one at the Queensland Alliance for Agriculture and Food Innovation where the plum is undergoing investigations for all kinds of diverse uses.

YASMINA SULTANBAWA, UNI. OF QLD: So in the freeze-dried powder we've even got products that are about 25 per cent vitamin C, which is quite- very high.

KRISTY O'BRIEN: Much like lemon myrtle, bush tomatoes and wattle seed, bush foods are increasingly attracting commercial interest. In an unlikely marriage, it's a combination of plums and prawns that has researchers excited.

YASMINA SULTANBAWA: So about six years ago, we were approached by the seafood industry to do a project on shelf life extension of prawns and they were looking interested in using natural plant extracts and Kakadu plum was of great interest because it showed very good antimicrobial and antioxidant properties, which are very important for shelf life extension.

KRISTY O'BRIEN: It's been embraced with gusto and international aquaculture companies are knocking.

YASMINA SULTANBAWA: And it was a hit. So now it's a long story. We've been using it in the prawn in the aquaculture industry for the past three years. So 2014 we dipped about \$10 million worth of prawns and last year \$12.5 million.

KRISTY O'BRIEN: Dr Yasmina Sultanbawa has been working extensively on the ground with the Wadeye women and says the project has become much bigger than science.

YASMINA SULTANBAWA: And the community that I'm specifically working with now, Wadeye, has been able to supply the prawn industry because there was a lot of nervousness when we introduced Kakadu plum.

KRISTY O'BRIEN: She has fallen in love with the place and the tenacity of the women.

YASMINA SULTANBAWA: That is where my heart is, that you can get these communities to work and really have an impact in terms of- with good science, you can really get a quality product into the market.

KRISTY O'BRIEN: Also spotting the potential was one local catering company in Darwin who joined the UQ research project to investigate how the plum can preserve the life of pre-packaged meals, particularly important in Indigenous communities, where fresh food is harder to come by.

KAREN SHELDON, CATERER: We're also being able to compete with companies- overseas companies and other companies that produce the same kind of products that we do, but of course are using a lot of preservatives in them.

KRISTY O'BRIEN: Importantly, the long life meals are part of her own Indigenous employment program, making the merits of this fruit come full circle.

There are 24,000 known native foods in Australia. The sale of them in a raw commodity is valued at around \$18 million. Products derived from these plants take that figure well into the \$200 million mark. But there are big, big threats to these native plants and foods. Enter the big, dark world of bio piracy. The intellectual property of bush foods is being largely exploited. Companies and individuals are patenting intellectual property of native plant knowledge. The motivation is simple: if it's locked up under a patent, then the competition cannot use the product without facing legal action.

DANIEL ROBINSON, UNIVERSITY OF SYDNEY: So a patent is a type of intellectual property that creates a 20-year monopoly and we found more than 100, about 150, that relate to endemic plant species, so that are clearly utilising plants that are found in Australia.

KRISTY O'BRIEN: The bush plum has several patents over its processing technique, one of which the Wadeye people own, but several others are with US companies.

MARGO NORTHEY: This is knowledge that's been around for a long time and it's great that it's being exploited to some extent, but recognition of whose knowledge it is and whose product it is is really important.

KRISTY O'BRIEN: There is no priority given to Indigenous people. Anyone, including big companies, can currently put in place patents on processing bush foods, making it difficult for Indigenous people to commercial-

ise them.

JOE MORRISON, NORTHERN LAND COUNCIL: Well there's basically no protection and that allows third parties, particularly multinationals, to come in and patent the use of products with very little consideration of the knowledge and the longstanding history that Aboriginal people have had with these products in Australia.

KRISTY O'BRIEN: Joe Morrison heads one of the most powerful Indigenous lobby groups in at the Top End, the Northern Land Council. It represents traditional owners and is calling for a blanket moratorium on all patents over native foods and plants until a legal framework protecting Indigenous interests can be enforced.

JOE MORRISON: I think there should be a serious look at the current situation, what that looks like, and Aboriginal people need to be across that in terms of what their legal rights are. And I think the Government should really put a moratorium on allowing further patents to be registered and executed in Australia when it comes to the use of native plants and other products here in Australia and allow Aboriginal people to get a foothold in relation to using their intellectual knowledge to gain an advantage in the international markets.

KRISTY O'BRIEN: But he fears for groups like the Wadeye women, it's too late.

JOE MORRISON: Oh, I think in terms of patenting the product and the use of various aspects of the product, I think the boat, unfortunately, has left, and that's a sad tale for many Aboriginal people around the country with the use of bush products, whether it's billygoat plum or whether it's some other form of native plant. That, unfortunately, is the sad history of Aboriginal plant knowledge in Australia.

KRISTY O'BRIEN: Like the infamous macadamia case, where native seeds were taken offshore to Hawaii in 1882 and a commercial crop established in the 1920s, the US established the macadamia industry, despite it being a native Australian food. It took 30 years for Australia to catch up. The same risk is now posed to the Kakadu plum.

KAREN SHELDON: We've been told that there's already plantations being started in Indonesia, and we think it won't be long before, just like the macadamia nut story, that the Kakadu plum story will be lost to Australia.

KRISTY O'BRIEN: All this is coupled with the substantial economic challenges of working in an extremely remote location with an emerging industry. Key aspects like the lack of scale could stop the industry from getting a real foothold.

Currently, demand far outstrips supply. Across Northern Australia, only 20 tonnes is harvested from the wild, and with requests for volumes of up to 800 tonnes from places like China, there's a need to find other ways to grow this fruit.

Orchards or enrichment planting are one such way to increase the scale of the industry. It's something Wadeye is slowly looking at. This nursery is the beginning of trees for a plantation.

In Broome, the idea of nurseries and plantations have taken off. There's talk a northern hub, combining all producers, would be an effective way to proceed forward.


MARGO NORTHEY: I'd like to see it as something that communities across the Top End could get into, you know, that it is- it does have huge potential. I would like to see some further expansion of it here, whether that's through enrichment planting and increasing the yield here. But the yield here is quite extraordinary. There are huge numbers of trees here. We put in an application for a permit to take up to 10 tonnes this year. Ah, I'm told by experts that that's either 0.01 or even 0.001 of a per cent of what's here in this region.

KRISTY O'BRIEN: As part of a northern hub, the Indigenous groups are proposing two processing plants- one in Broome, and Darwin, to cut down on the miles travelled.

MARGO NORTHEY: We now are working and talking with the guys over at Broome and they're- and, again - and the remarkable thing about this fruit is that it has an earlier season over in the west, so it starts off at Christmas time, December, and goes through till about March. Here, it'll kick off in April and go through till about June, July, and apparently it's a little bit later even over in Arnhem Land. So, by cooperating, we can actually extend the season and also have market stability. So, it's advantageous for everybody to have that cooperative development.

KRISTY O'BRIEN: It's big picture stuff, but out here and across many Indigenous communities in the Top End, there is a belief that the small niche industry should be the focus in the plans to develop the north.

JOE MORRISON: Northern development isn't about the large-scale port developments, roads and large infrastructure. It's also about the small to medium-sized enterprises, the social enterprises as well that involve Aboriginal people, particularly women and children, in marketing and enterprise development in remote Northern Australia.



KRISTY O'BRIEN: Traditional owners are right behind the Kakadu plum and other industries like it and say they're niche, achievable, and importantly, on country.

MARGO NORTHEY: Look, it has such potential in a range of areas. There are universities across Australia who are researching it from Alzheimer's to arthritis to cancer-inhibiting factors as well as the sort of skin care, etc. And so it has real potential, and if it does, that's fantastic, but let's make sure that it remains as it is. It is Indigenous knowledge and it's an Indigenous Australian plant.

Location: Wadeye 0822

Appendix Four Draft Yolngu Dictionary of Bush Fruit

This dictionary is being compiled with Mrs. Batumbil Burrarwanga, (Yiritja) Mata Mata and with the cooperation and advice of Ms. Banduk Marika (Dhuwa) in conjunction with Dr. Peter Botsman. The project has been progressing for several years at mata Mata and will involve photographs, scientific names, paintings and stories of Yolngu bush fruits. The following word list has been put together by Mrs. Burrarwanga based on the Gupapungu dialect. Each word has several variations for each of the North East Arnhem family groups and languages. This work builds upon the ground breaking work of L. Baymarrwanga and Dr. Bentley James and the work of M. Christie. The ground breaking exhibition and publication Mi[awarr/Harvest The Art of Mulku] Wirrpanda and John Wolseley is also acknowledged.

Word List

30/10/2017

- balman' tree--with edible plums and gum useful sap *Terminalia carpentariae*
- nirrinirri' insect--flying, said to buzz when green plums are ripe
- bāḍay vine/creeper--used as string has black fruit when ripe, can be eaten cooked when still red Burney Vine, Malaysia *soandens*
- baḷgurr shrub, fruit--edible Kurrajong
- baḷkpaḷk tree, fruit--almond-shaped, yellow, ripe around September, edible black nut (in red shell) good wood for firesticks inner bark used as a medicine for aching ears or inflamed eyes, it is scraped and mixed with breast milk or fresh water Red-Fruited Kurraj native peanut *sterculla quadrifida*
- balpaḍaṇan tree--edible fruit and sap Wild Peach, Red Cement Tree
- baluny'tjurr tree/shrub and its edible fruit cf See: BAMARAN
- bamaran tree/shrub and its edible fruit Big Green Plum, *Planchonella pohlmanii*
- barukanu tree/shrub--with small white flowers edible fruit--long orange pod, ripe in Mayaltha season
- baṭpaṭṭhun get, collect (shellfish), pick off (fruit), scrape the bark (off of tree)
- baṭṭjama fruit or inedible seed of mangrove trees
- bindiyay creeper with spiny fruits *Tribulus cistoides*
- biḷḷiyal'u dhuwa *amorphallus paeoniifolius* cheeky yam pumpkin yam elephant foot yam
- biray(') tree--edible fleshy fruits Yellow-fruited Tree, *Denhamia obscura* *Pouteria sericea*
- biṭa shrub--used as string fruit--black when ripe, can be eaten red if cooked Burney Vine
- biyawiliny tree fruit--small, grape-like, edible, available in jungle areas after Christmas
- bu'wutja aquatic herb with tubers, *triglacchin dubium*
- biyawilitj tree fruit--edible
- bominya tree/shrub--edible fruit Kurrajong
- bu'wutja dhuwa water yam *cynogeton dubium* yilpara p. 84 M
- bundjuṇu(') tree with large green/yellow fruit Wild Orange Tree, *Capparis umbonate* yirritja Mi[awarr p. 36
- bunydjuṇu fruit--green inside bush orange yirritja *Capparis umbonate* p. 36
- buṇaḷati tree--edible purple fruit
- burukpili tree--edible fruit taken as a medicine for colds and sore throat, root is used for yellow dye Great Morinda, Cheesefruit, Pain-Killer Fruit, *Morinda citrifolia*
- borum fruit (generic for local and introduced, but excludes cycad nuts)
- burumun' cheek (down to jaw) Ext island bud (of plant), fruit, nut
- bururpururr tree--small with edible fruits *Diospyros maritima*, *D. ferrea* (var. *humilis*)
- burrumburr tree/shrub--very white bark is used to make string inedible red fruit string
- buḍaga' fruit of Kurrajong tree
- buḷili bush fruit *Eugenia bleeseri*
- buḷṇu(') soft, fine, powderlike, crumbly (of ground or fruit) scattered bits (in fine pieces), ashes
- bulunu(') east (wind) fruit of White Berry Bush
- buḷurruka' shrub--with soft edible white fruits *Securinega virosa*
- bulwunu(') east (wind) fruit of White Berry Bush
- buwakul bush grape, fox grape three leafed wild vine, *cayratia trifolia* dhuwa
- Butjuwutju/Moja' dhuwa *brachystelma glabriflorum* bus potato (bawujin Katherine)
- ḍamaṭama tree--with inedible dark fruits, grows near billabongs

damudamurrk vine--edible fruit
 dangapa(') tree--edible fruit, juice mixed with water or breast milk is used as medicine for earache and pussy eyes Geebung, *Persoonia falcata*
 danganfruit--bush melon
 dapu(') vine--thorny good for firewood and firesticks edible fruit like sweet grapes *Asparagus racemosa* *Smilax australis*
 darrndarrndhirri bunches--be in (as a tree or banana plant laden with fruit)
 {arwirr yirritja *flagellaria indica* perennial climbing vine used for arm bands, whip vine
 datitji tree--edible purple fruit
 {awu/Ripipi dhuwa *figus virens* banyan tree grows thirty metres tall tree of knowledge still survives
 dilminyini(') tree--rainforest creeper with edible red fruit Termite Tree, *Ganophyllum falcatum* *Carallia brachiata*
 dhakadatj food--plant or vegetable (rootfoods, breads, cereals, fruits in contrast to meat, eaten for variety)
 dhakal cheek, jaw Ext island fruit (whole)
 dhalarrmuj tree/shrub--edible black fruit wood used to make firesticks *Leea rubra*
 dhangapa' tree--with edible fruit *Persoonia falcata*
 dhangi fruit
 dhangi(') dhuwa tree and its edible fruit, white flowers, bark used as fish poison Bush Mango, Billy-goat Plum, Cocky-apple tree, cocky apple *plachonia careya* Wild Quince p40 Mi[awarr
 dh^ma\ *aidia racemose* edible red or brown berries
 dha\uniya dhuwa *Ipomoea graminea* grass leaf yam
 [ilminyini yirritja *ganophyllum falcatum* scaly ash
 dhimurru(') east wind, fruit of White Berry Bush
 dhinir'yun bump (e.g., tree to make fruit fall), knock, brush (against)
 dhu\yun hit, hammer, build, kick (tree to make fruit fall)
 dhu\ hit, hammer, build, kick (tree to get fruit down)
 dhuma\ Cycad nut/fruit
 dhumumu(') tree--inedible fruit Quinine Bush, *Petalostigma pubescens*
 dhorraj nut--inner seed of Cycad fruit
 dhu\uruk dhuwa grass yam *curculigo ensifolia*
 djalandia shrub--with yellowish fruit in rainy season
 djalkurrk dhuwa *geodorum densiflorum* nodding swamp orchid
 djuluku] *marsdenia viridiflora* dhuwa busdh banana
 djälulu' fruit Wild Grape, *Ampelocissus* and/or *Cissus* sp.
 djambar tree, fruit Tamarind, *Tamarindus Indica* us,a (Rit) small plant (?)
 djanbirrk tree--edible fruit Great Morinda
 djänyi' shrub--with thorns and edible black fruits Conkerberry, *Carissa lanceolata*
 djäpa(') tree and its soft fruit which turns from red to a purplish colour when ripe--ready to eat around March
 djiñ'pu shrub--huge leaves useful as plates its fruit Fish-Plate Shrub, *Guettarda speciosa*
 djir'tjir tree--small-leaved, fruit-bearing shrubs *Drypetes* sp. (and/or) *Diospyros* sp. (?)
 djirrijiriny fruit--black, gathered in Wet shrub (on which it grows?)
 djetama Cycad fruit
 djupi' shrub--fruit-bearing *Antidesma ghaesembilla*
 djura' fruit of Wild Cashew (must be cooked and eaten with caution)
 dilmuy'tree--with usually inedible fruits *Canarium australium*
 djitama yirritja *discorea bulbifera* cheeky yam round yam
 gäbaba fruit--yellow, ripe
 gäku egg (without a chick inside) fruit of Fig roe of Trevally
 galañarr fruit of the Bush Mango/Wild Quince--yellow when ripe

gälurra tree--with a whitish fruit Yellow-Ball Flower, *Malotus nesophylus* (Rit) tree with small reddish fruits in the Wet Ficus platypoda (?) dhuwa

gäna tree--inedible fruit has Mangrove Worms Mangrove

ganarri tree--small inedible fruit good for shade Beauty Leaf, Oil Nut Tree, *Calophyllum ionophyllum*

ganguri yam *disocorea sativa* var. *elongate*, *vigna radiata* found in monsoon forest can be eaten raw or cooked

ganguri/ma]mu\ a *dioscorea transversa* long yam sung by the galpu

ganyawu(‘) tree fruit Wild Cashew, Queensland Tar Tree, *Semecarpus australiensis* Australian Cashew, *Anarcandium occidentale* (?)

gäna vine/climber--edible fruit Wild Passionfruit, *Passiflora foetida*

gatji fruit Wild Plum Ext mango

gatjjaninj shrub/bush with white flowers and tiny, juicy, edible black fruit Jungle Plum, Little Gooseberry Tree, *Carallia brachiata*

gäwaba fruit--yellow, ripe

gawatjark tree--edible fruit Red Jungle Berry, Grey Boxwood, Yellow Tulip, *Drypetes lasiogyna*

giningarr navel, “belly button”, umbilical cord part of fruit (where it is attached to tree) Ext button, switch, knob bullet, trigger winder keyhole, lock pipe-bowl

genydja tree edible fruit Banyan, Strangler Fig, *Ficus virens* Sand Fig, *F. henneana* *F. racemosa*

girba fruit Wild Passionfruit, *Passiflora foetida*

girri’ fruit of waterlily--reddish black *Nymphaea* sp.

gokawu tree--mangrove with white flowers and a large orange-green fruit *Sonneratia alba*

gulumunyu tree/shrub--orange fruit used as medicine for ringworm or fish poison Long-berried shrub, *Diospyros maritima*

gumbu(‘) shrub--especially its small, soft, edible fruit White Berry Bush

gunga pandanus *spiralis* dhuwa laluk orangey nuts are used in sauna

guninyi bush--edible fruit root used for dyeing pandanus

gongatha tree and its edible fruit Black Berry Tree, *Ixora klandorana*

gurrnji tree--no fruit and not used for anything

gurrumu(‘) fruit of Fig or Banyan tree *Ficus* sp.

Gurrumu dhuwa *meiogyne cylindrocarpa* finger sop

gurrungurr tree--large with lots of leaves and a long straight trunk soft white edible fruit like grapes

gutjawutja dhuwa *milliusa brahei* raspberry-jam leaf

läluk Pandanus fruit--acts as a mosquito repellent if dried out and put in the fire

larrani(‘) shrub, fruit--edible Bush Apple, “Wild Apple” Ext brown(ish) Idm halfcaste

lingarr shrub/creeper or its edible root, purplish/black fruit is squeezed onto the skin as a treatment for ringworm

malanamba nut--inner seed of the cycad fruit

mamaljingurr fruit or inedible seed of various mangrove trees

mamanbu(‘) tree--edible fruit and sap

mananjilik tree--small, with reddish fruits, grows on hills Euphorbiaceae (?)

manimunak tree--with small yellow fruit

mängu tree and its fruit Mango

mapudumun(‘) tree edible gum and fruit inner bark is used in treating diarrhoea, pimples and sores Wild Peach, Red Cement Tree, *Terminalia carpentaria* also *T. ferdinandiana* (?) (its sap), murrpun’ (its fruits)

marathuwarr tree--mangrove with non-edible fruit, but Mangrove worms live in it

matharam(a) peel (fruit), shell (nut), scale (fish)

mawutarri shrub/creeper--edible red fruit Termite Tree, *Ganophyllum falcatum*

min(-)dju]kun tree--with yellow flowers and a small flat round fruit, wood used for spear shafts Coastal Hibiscus, Beach Hibiscus, Indian Tulip Tree, Pacific Rosewood, *Thespesia populnea* sometimes applies to *Hibiscus tiliaceus*

mininy’parr shrub, fruit Opiliaceae family, e.g., *Opilia amentacea* and/or *Cansjera leptostachya*

minitjpa tree/shrub--and its fruit look like Paperbark or Ti-Tree

minyirminyirr tree--edible purple fruit
 mirawurr nut--inner seed of the Cycad fruit
 milka(') fruit--withered of Wild Cashew
 milnhiri tree--with edible red fruit Kurrajong
 mulkmulk shrub--edible tiny red fruit Big-Veined Jungle Shrub, *Allophylus serratus* (Rit) sedge--with edible root portions
 muluna fig, fruit of *Ficus* spp.
 munbi vine--rainforest climber with edible reddish fruits *Malaisia scandens*
 munuymunuy tree/shrub--edible fruit young leaves boiled in fresh water and used as medicine for flu, coughs, diarrhoea and vomiting Paperbark, *Melaleuca* sp. (?)
 munydjutj tree and especially its fruit--green pea-like berry ready at the end of the dry season bark used as medicine for toothache or eyes leaves used as medicine for ringworm Green Plum, Wild Plum, *Buchanania obovata*
 mupan tree--edible fruit and sap juice of bark used for diarrhoea Wild Peach, Red Cement Tree, *Terminalia carpentaria*
 murnyan' food--plant or vegetable (e.g., yams, fruits, nuts, honey i.e., sweet or starchy delicacies)
 murrnyi/murrtjumun dhuwa emu berry *grewia retusifolia*
 murrpun' tree--especially its edible fruits *Terminalia carpentariae*
 murrtjumun tree/shrub--edible fruit
 muthir(') tree--with sandpaperlike leaves small round black fruit eaten as a medicine for diarrhoea inner bark is soaked in water and drunk as a medicine for stomach ache Sandpaper Fig, *Ficus opposita* var. *micracantha*, *F. aculeata*, *F. scobina*
 ṇāmbarra(') tree--edible fruit leaves used medicinally Paperbark sp., *Melaleuca leucadendron*
 ṇarraṇi shrub, fruit--edible, ripe in November, used as medicine for toothache, sores around mouth or on the tongue, cough and sore throat, Bush Apple, Red Love Apple, Red Wild Apple, Native Apple, *Syzygium suborbicularis* & *Eugenia suborbicularis* Ext brown(is)
 ṇayawuḍa fruit of Grey Mangrove tree--eaten by turtles /or/ small mangrove tree with cashew-like nuts which are cooked and left to soak overnight
 ṇuṇ waterlily fruit--large
 ṇuṅgaḷaḷurr tree--with edible white fruits *Mallotus nesophilus*
 ṇamanṇani yam, root food fruit
 ṇaṇa> fruit of Marble Tree
 ṇāṇarmaramapeel, skin (fruit), shell (crab), scale (fish)
 ṇāṇka-bakarra tree--edible green fruit Billygoat Plum, Green Plum, *Terminalia ferdinandiana* T. latipes, T. platypylla
 ṇaraminy tree--small edible fruit *Terminalia* sp.
 ṇathu palm--its fruit is edible, but requires special preparation: the nuts must be soaked for at least three nights and then they are pounded up and kneaded into loaves which are wrapped in paperbark and cooked Cycad Palm, *Zamia* Palm, Ricketty Tree, *Cycas med cycas orientis*
 ṇayawuḍa tree--mangrove and/or its nut-like fruit
 ṇaykurratjṇu *Pandanus* fruit
 ṇurruṇḍala fruit of Bush Apple--used as medicine for toothache, sores on the tongue and around the mouth, as well as for a cough or sore throat
 nhāṇaniṅ(') tree--used to make string for bags and headbands doesn't produce fruit
 nhāṇiniṅ(') tree that doesn't produce fruit Ext useless, worthless
 r^kay dhuwa *Eleocharis dulcis* water chestnut
 rāga shrub--and its small, sweet-tasting fruit White Berry Bush, *Securinega virosa* *Bridelia ovata*
 ritjarriṭ tree--with reddish fruits, common in spring country
 rrambafig, fruit of *Ficus* sp.
 rripipi tree, fruit--small, edible, white when ripe Rock Fig, *Ficus platypoda*
 riny'tja\u red skin yam dhuwa galpu rainbow yam wet season yam Chinese medicine lung/spleen yellow flowers

rruṅunhdha tree/shrub, fruit--edible , Bush Apple, *Syzygium suborbicularis* & *Eugenia suborbicularis*
 wäṅṅani tree--edible black fruit Native Peach, Peach-Leaf Poison Bush, Native Peach, *Trema asp a,e ra*
Coelospermum reticulatum
 w^kwak/dhatam/[irpu/dhera\}]i[a] yirritja/dhuwa nymphae spp. Water lily p. 100 M
 wakwakṅani tree--red edible fruit Red Jungle Berry
 walḍulu tree--edible fruit Paperbark sp.
 walpalun shrub--edible fruit
 wälpay tree--edible fruit *Santalum album*
 wäpura tree/shrub--mangrove edible fruit (?) *Mimusops elengi*
 wäpuru tree/shrub--mangrove edible fruit (?)
 warraṅuwa bush--with purple/blackish fruit Cheese Tree, Flat Berry Bush, *Antidesma ghaesambilla* Jungle
 Currant, *Glochidion disparapes*
 wäwuru(') tree--especially its edible fruit (turns from yellow to red after Sept should be cooked in hot
 sand first since it makes the tongue go dry if eaten raw) *Mimusops elengi* *mimusups*
 wiṅṅirri fruit--bush *Cucumis melo* *Melothria maderaspatana*
 wurintj orange (fruit colour)
 wurraṅaniṅ tree--small edible fruit Broom Berry, *Randia cochinchensis*
 wurrtjuḷu tree--edible fruit leaves used medicinally Paperbark sp. (?)
 wutjawutja tree--edible fruit (berry is black?)
 wudjal tree and its fruit "Black Plum"
 wuṇḍaṅ(') shrub--edible fruit Bush Currant, Black Plum, *Vitex glabra*, *V. acuminate*, *Euodia elleryana*
 dhuwa
 wuṅapu tree--edible purple fruit Wild Prune, *Pouteria sericea* *sersalisia sericea* duwa
 yalman tree--edible fruit exudes a milky substance used as a dye *Ficus* sp.
 yalwar' bark (thin--of tree) skin (of fruit)
 yarryun shake (tree, in order to knock down fruits or nuts)
 yiṇḍiṭi tree/shrub--fruit used as medicine for ringworm or fish poison
 yiri\ani\ red root for dying pandanus *haemodorum brevicaule*
 yukuwa yirritja stringy yam *vigna vexillta* . 52 M
 yulpa fruit—mangrove
 yuluk damp, moist, wet fresh (bark just stripped or fruit just picked)
 yulumuru tree--fruit not eaten does not have mangrove worms Northern Large Leaved Mangrove, *Bru-*
giera sexangula Spurred Mangrove, *Ceriops tagal*
 yurrrayurrwa fruit, inedible seed of various mangrove trees

Appendix Five John Wolseley & Mulkun Wirrpanda Interview Mulka Project Midawarr/Harvest

MULKUN WIRRPANDA: My relative Birrkitji number 1 taught me. He was a law man and a keeper of knowledge, and he taught me a painting called, yalata (the home of the brolgas).

In a place called Barrngul Dhuruputjpi. He taught me dängultji (broлга) painting.

I was working on that painting ... I also painted a Yirritja painting, my mother's painting called birrkuda (wild honey), while painting it, it made me understand I could see it through my own eyes, the honey painting, I was painting, I said to myself 'I'm going to stop painting this ... and I'm going to look for a different painting about food' that's what I said a bush food that I gathered and ate.

JOHN WOLSELEY: Mulkun Wirrpanda, the great Yolŋu artist, has painted thirty to forty paintings of the edible plants of her clan area. Each one of these paintings is a great work of art and each one of them is different and gets the particular quality of the particular food plant. Now she did this, because she said her people are dying because of eating the wrong food.

MULKUN WIRRPANDA: Wash it gently, not hard. Keep cleaning it, keep cleaning it. This one, but the root is salty, like this one, yes that one too.

JOHN WOLSELEY: What's that one there?

MULKUN WIRRPANDA: Buwakul.

JOHN WOLSELEY: Ah wonderful, my goodness me. Oh look!

MULKUN WIRRPANDA: That's yukuwa.

JOHN WOLSELEY: Look at that, yukuwa. Yukuwa.

MULKUN WIRRPANDA: This is the new shoots of the yam growing called ganguri.

Old people ate this food and they replanted the yam by pushing the soil back and then I learnt to replant the yam by pushing the soil back, at Yilpara I started doing this.

JOHN WOLSELEY: She decided to paint all these ... plants which don't usually figure in the traditional paintings about the Yolŋu beliefs and stories. It's almost as if she was doing an equivalent of a flora of the European idea of the flora of her country.

MULKUN WIRRPANDA: We established Yilpara homeland. We lived with and gathered manmunga (ganguri yam). We stayed full with this yam and nindan (another yam). We established Yilpara with only small amounts of white man's food.

This is the food our old people used to eat. We are painting a food called bulwutja. This is a corm we can eat called bulwutja. This is the corm's leaves and this is its water. Its pattern. The food grows in the water.

JOHN WOLSELEY: So this one is ... flowing in the water.

MULKUN WIRRPANDA: This is the pattern of the water. I don't know what kind of water you're drawing brother.

And this bulwutja is from Yalmakany and I painted this bulwutja. Bush food, but forgotten now. Our old people lived and survived on this food and they never got sick, our old people, and then the foreign food came, and brought sickness for the Yolŋu people. The Yolŋu people got sick with the foreign food. From white people. With our food our old people never got sick. They were strong. The food is bulwutja, it's ours grandchild for Djapu, our family, our spirit people. Here at Rarrirarri, where we are, where that food is located in our area at Garaanri.

JOHN WOLSELEY: It's one of the most powerful landscapes in the world within its culture and it is the landscape which has been cherished and lived in for thousands of years by the Yolŋu people who have got powerful stories about how the landscape was made.

MULKUN WIRRPANDA: Over this is the big swampy plain, it goes from here to a Yirritja place Until ... further on, further on to the place called Bomatjpi that's where the swampy plain ends. This is where we ate guwita (witchetty grubs) a long time ago a mob of us. Including Wongu ate them too.

Grandfather, old man Wongu Mutjanga's father. From räkay (water chestnuts) the grubs.

The name Längurrk (witchetty grub) what this man is named after ... I gave the name Längurrk, to this man.

Appendix Six Bush Plum Dreaming - David Wroth, Japingka Gallery, 2015

The Bush Plum Dreaming Story is a big story that spreads right across the western and central deserts from Lajamanu and Warlpiri country to the Utopia homelands. The Bush Plum Dreaming or Creation Story from the Utopia region goes like this: In the Dreamtime winds blew from all directions carrying the bush plum seed to the artists' ancestral lands. The first bush plum of the Dreamings grew and bore fruit and dropped more seeds. Many winds blew the seeds all over the Dreaming lands.

To ensure the continued fruiting of this plant each season, the Aboriginal people pay homage to the spirit of the bush plum by painting about it and recreating it in their ceremonies through song and dance. The patterns in the paintings celebrating the Bush Plum work on many levels: they represent the fruit of the plant, its leaves and flowers and also the body paint designs that are associated with it during ceremony.

The bush plum is a popular variety of bush tucker that is only found at certain times of the year. It is found throughout most of the Utopia region and as far west as Lajamanu. Sadly it has declined in abundance due to the grazing of introduced animals, particularly cattle and rabbits. The bush plum fruits in the summer after rain and is an important food source, even though not all of the plum is edible. The plums can be collected when ripe and immediately eaten, or they can be dried and eaten later.

When young, the fruit is green in appearance but as it matures, it becomes a purple-black colour and is similar in looks to an olive. The plant can grow up to 3 metres high and has blue-green leaves and produces a creamy white flower, making it an attractive looking plant.

The bush plum also plays an important part in Warlpiri Dreaming and ritual practices involved in Yilpinji, Love Magic. When a girl falls in love she goes to her female relatives and is instructed in how to attract her man as a lover. She weaves a belt out of hair while singing Yilpinji songs imbuing the belt with magic. When the man approaches she entices him with her charms until he comes under the influence of her allure. She reveals the belt as his ardour grows and persuades him to place the belt around her waist. As he does, he falls under her spell and they go off together as a couple. Together they eat bush plums and hunt for food. Other important Warlpiri, on learning of their tryst, follow them and confront them as a couple and also eat the bush plums. In this way the group recognizes their relationship and acknowledges that it is an appropriate match. They are now recognized by all as a couple. (From love... art & ceremony Yilpinji Christine Nicholls, The Australian Art Print Network)

Renowned Warlpiri artist Lorna Napurrula Fencer (1923 – 2006) celebrated the bush plum in her inimitable style. Lorna Napurrula was the custodian of inherited lands at Yumurrpa situated near Chilla Well, south of the Granites Mine Area of the Tanami Desert. In 1949 many Warlpiri, including Lorna Napurrula Fencer, were forcibly transported to the government settlement of Lajamanu at Hookers Creek, situated in the country of the Gurindji people, 250 miles to the north of their own country around Yuendumu. Lorna Napurrula Fencer nevertheless maintained and strengthened her cultural identity through ceremonial activity and art, and asserted her position as a prominent elder and teacher in the community.

Lorna Napurrula Fencer's mother's country was Yumurrpa. This is where the Yarla (Yam or Big Bush Potato) Dreaming track begins on its travels north toward Lajamanu. Her father's country was Wapurtali, home of the little bush potato. The travels of Napurrula and Nakamarra kinship or skin groups were the inspiration for Lorna Napurrula Fencer's work, and she was a custodian of the Dreamings associated with bush potato (yarla), caterpillar (luju), yam, bush onion, bush tomato, bush plum, many different seeds, and importantly springwater, for the Napurrula, Nakamarra, Japurrula, and Jakamarra skin groups

Appendix Seven Bush Plum Ahakeye, Utopia Lane Art Gallery

Also known as the native currant or citrus, the Ahakeye is favoured by Aboriginal people for its sweet taste and, as it can be reconstituted in water when dry, it is an invaluable desert food. It belongs to the *canthium attenuatum* shrub which grows about 3m high and is found across Utopia. This shrub produces small white flowers, deep green citrus-like leaves and the fruit (ahakeye) which are black when ripe and very small.

This Dreaming is more commonly the subject of men's paintings from Ilkawerne country who use traditional symbols and colours to depict elements of the story that is passed down generation to generation. Often white dots represent the white flower, U shapes represent men collecting the fruit, parallel lines represent travelling lines to and from the tree and, sometimes, black animal tracks such as the wild pigeon can be seen - walking all over the fallen fruit. It is not uncommon for other associated Dreaming stories or sacred sites to be featured in the same painting, for example the Arekwarr (Wild Pigeon) Dreaming or Aremela Rockhole.

Appendix Eight The Broome Model From the Grass Roots Up

“The Broome Model” leverages and wholistically coordinates social investment in the unique organisations of the culturally cohesive region of Broome, the Dampier Peninsular and Bidyadanga.. It has been devised and coordinated by the Kimberley Institute as a peak advocacy organisation for Aboriginal peoples of the region. The approach brings corporate and philanthropic investors into grass roots organisations through new social investment mechanisms including bonds., grants and venture capital that are tied to strong indicators and performance targets. Government in this model becomes an underwriting supporter not a top down director. This fundamentally changes the dynamic of solving community problems. While several aspects of the Broome Model have been attempted individually and within some spheres of activity, the Broome model takes a whole of community approach driven by a rigorous understanding of the nature of local problems and challenges. In this respect it is a model for social investment for the North of Australia and across the continent in general.

The Broome Model addresses Indigenous socio-economic disadvantage including:

High incarceration rates;

Juvenile anti-social behaviour including poor school attendance;

High incidence of substance abuse;

High incidence of poor physical and psychological health;

High rates of long-term unemployment; and

High incidence of domestic abuse or dysfunction.

These problems are addressed by an alliance of Broome Aboriginal NGO’s that are culturally appropriate providers of:-

Employment and training services

Primary and mental health services

Language and Cultural wellbeing services

Substance abuse services

Housing solutions services

Men’s and women’s outreach services.

This collective impact partnership also includes the Native Title holders of the area, being the Yawuru, through their Prescribed Body Corporate and their commercial entity Nyamba Buru Yawuru Limited.

One of the motivations for the new coordinated approach was the volatile annual Government funding cycles which challenges local capacity to address practical problems over short, medium and long term time frames.

The combined organisations and the Kimberley Institute have created a community investment partnership that leverages philanthropic and corporate financial support with the government as under-writer of the investment with agreed social indicators and targets. The model is more efficient than a cyclical top down investment model. It is tied to the delivery of outcomes, saves government money, reward goods performance and provides long term stability and professional development for organisations on the ground.

To work the grass roots community partners have to be able to define and show that key performance targets have been achieved. .

Once a priority has been identified a social investment strategy is designed over the medium and long term to support a package of services provided by the partnership. The community impact partners then negotiate with Governments and social investors on the amount of investment required, the dividend proposed by Government as underwriters and the specification of the services and outcomes to be delivered. As the lead coordinating group the Kimberley Institute negotiates with government but brings in a range of different sources of funding including social bonds, social debt, philanthropic grants, contributions from participant organisations, and in-kind contributions.

The Institute has been working with Nulungu Centre Notre Dame University, ANU Centre for Aboriginal Economic Policy Research (CAEPR) and UWA Law School to develop models that will allow for the demonstration of outcomes being achieved, such as the diminishment of incarceration and recidivism rates among the target group of people, as social returns on investment.

The benefits of the Broome model are that

It allows long term strategies for dealing with social issues rather than short term siloed programme funding strategies locked in Government funding cycles as is currently the case.

The social investors potentially see a financial return for their investment enabling them to contribute to the community in practical and beneficial outcomes.

For Governments it provides for long term strategies to deal with intransigent social problems.

It creates sustainable Funding model incorporating private, philanthropic, corporate and governments based on Social Investment Bonds

The development of a sustainable funding model for the delivery of social outcome services by Community based organisations in Broome.

A framework for the quantification and provision of empirical data for Social Development Projects in Broome based on Social Return on Investment principles

A framework for the negotiation of social investments in Broome that enables a rigorous assessment and evaluation of the investment potential of the delivery of social development projects in Broome and the Kimberley

It promotes the collaboration of Community based organisations

It will initially concentrate on Restoration Strategies and Juvenile Justice Diversion strategies in which providing employment and training strategies for those involved in the programme is the central component.

The Broome model has the potential to deliver secure funding for community based organisations that will provide employment security for employees.

The partnerships open gates to expanded work readiness and enhanced skill training which inevitably builds employment capacity among those involved in the programmes

Coordinated investment partnerships and social investment will become an important element of all programmes that are currently strictly the domain of public expenditure. The Broome model creates a linkage between public / corporate / community for the delivery of social outcomes in any particular region – a new way of delivering social outcomes through partnerships.

Potentially the CIP model will provide an avenue for Companies involved in developing the Kimberley to invest in Kimberley community service delivery in a structured manner on a long term basis rather than annual grant allocations as is the current funding model – which in turn builds strong partnerships between Industry partners and the communities where they are focusing their activities. A number of corporate funders can be sought that have funding motivation ranging from the fulfillment of their community investment and corporate social responsibility commitments – especially those operating in the Broome region- to obtaining a tax deduction. SIMs based on payment by outcome mechanisms may also allow some corporates to achieve both social and commercial returns. CIPs will also allow local industry to monitor and evaluate social impacts resulting from their activities in the region.

Our focus for potential social investors will be Corporates and philanthropic institutions and high net worth individuals (HNWI) and asking them to invest in new models dealing in areas of intransigent social problems that to date have proved beyond the wit of Governments to deliver any meaningful change.

Ideally Government can be brought in to underwrite part or all of the investment and in so doing provide some return to investors.

Developing the Broome Model was never a simple process and as is inevitable with developing ideas and models, largely from scratch, there are always going to be the unexpected opportunities and challenges.

Despite the recognition of the need and a desire to change, the capacity of the Community organisations themselves to embark upon a major change in their business model and their internal capacity to maximise their participation in the Change Management process is a limiting factor.

Getting engagement and leadership from the Yawuru Native Title Holders has been more difficult than expected especially in the early stages of the process.

The lack of interest from Government and some of its agencies in the potential for the concept of a Broome Model which would have inevitable benefits for the delivery of their service obligations in the community.

Capacity building in the community organisations takes time and resources but organisations are committed to the process and as is evidenced from the early stages of the two community impact partnership there is a willingness that is beginning to be rewarded with outcomes.

The Kimberley Institute and Ernst & Young have played an important role working directly with organisations to assist with planning and capacity across several organisations. This has been complemented with a series of development workshops on social return on investment and other areas of change management.

The Yawuru Native Title Holders have become fully involved with the process and with engagement is coming recognition of the potential benefits for all concerned. It has presented an opportunity to refocus on the concept of YSEA (Yawuru Social Enterprise Alliance) that Yawuru had embraced initially. The YSEA model, is a good one and certainly worth reactivating as we progress the Broome Model.

Government Engagement has been problematic to date in part but a concerted strategy of engagement with Governments and their agencies is being developed. It will be a strategy for serious engagement so that Governments might better understand the opportunity that exists with the collaborative approach of the Broome Model.

For any serious engagement with Government to occur the influence of our corporate partners is important and the partners will be seeking to develop a strategy around bringing that influence and access to bear in our engagement and dialogue in the public sphere in the future.