Australian Native Food Industry
Stocktake

by Michael Clarke

August 2012
RIRDC Publication No. 12/066
RIRDC Project No. PRJ-005855
The information contained in this publication is intended for general use to assist public knowledge and discussion and to help improve the development of sustainable regions. You must not rely on any information contained in this publication without taking specialist advice relevant to your particular circumstances.

While reasonable care has been taken in preparing this publication to ensure that information is true and correct, the Commonwealth of Australia gives no assurance as to the accuracy of any information in this publication.

The Commonwealth of Australia, the Rural Industries Research and Development Corporation (RIRDC), the authors or contributors expressly disclaim, to the maximum extent permitted by law, all responsibility and liability to any person, arising directly or indirectly from any act or omission, or for any consequences of any such act or omission, made in reliance on the contents of this publication, whether or not caused by any negligence on the part of the Commonwealth of Australia, RIRDC, the authors or contributors.

The Commonwealth of Australia does not necessarily endorse the views in this publication.

This publication is copyright. Apart from any use as permitted under the Copyright Act 1968, all other rights are reserved. However, wide dissemination is encouraged. Requests and inquiries concerning reproduction and rights should be addressed to the RIRDC Publications Manager on phone 02 6271 4165.

**Researcher Contact Details**

Michael Clarke  
44 Barons Crescent  
Hunters Hill NSW 2110  
Email: Clarke@AgEconPlus.com.au

In submitting this report, the researcher has agreed to RIRDC publishing this material in its edited form.

**RIRDC Contact Details**

Rural Industries Research and Development Corporation  
Level 2, 15 National Circuit  
BARTON ACT 2600  
PO Box 4776  
KINGSTON ACT 2604

Phone: 02 6271 4100  
Fax: 02 6271 4199  
Email: rirdc@rirdc.gov.au  

Electronically published by RIRDC in August 2012  
Print-on-demand by Union Offset Printing, Canberra at [www.rirdc.gov.au](http://www.rirdc.gov.au)  
or phone 1300 634 313
Foreword

This Australian Native Food Industry is small, vibrant and diverse. In 2010 farm gate production was valued at between $15 million and $25 million and direct employment in regional Australia was between 500 and 1,000 individuals. Up to half of these individuals were Indigenous people living in remote communities.

The industry is maturing away from wild harvest and R&D is playing an increasingly important role in developing viable cultivation and post-harvest management systems. Particularly pleasing is the increasing interest shown by mainstream food manufacturers and retailers in Australian native foods.

The Australian native food industry offers farm income diversification opportunities and scope for Indigenous people to generate additional income streams on Aboriginal owned land.

The purpose of this stocktake was to provide a first ever situation assessment for the Australian native foods industry; to analyse stocktake findings and determine implications for R&D and strategy; to deliver a survey questionnaire that could be used in the future to update the stocktake; and to develop a simple industry database of willing and publically available contacts.

The stocktake is an important addition to RIRDC’s diverse range of over 2,000 research publications and forms part of our Native Foods R&D program. The Native Foods R&D program aims to support market growth, improve growing efficiency, investigate new species, build capacity and improve native food industry communication.

Most of RIRDC’s publications are available for viewing, free downloading or purchasing online at www.rirdc.gov.au. Purchases can also be made by phoning 1300 634 313.

Craig Burns
Managing Director
Rural Industries Research and Development Corporation
Acknowledgments

The author and RIRDC wish to acknowledge the assistance and support of the Australian native foods industry and the ANFIL Board whose assistance with contacts and data made this study possible. The breadth and depth of assistance provided makes singling out of individuals inappropriate.

Abbreviations

<table>
<thead>
<tr>
<th>Abbreviation</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>ACRA</td>
<td>Australian Cultivar Registration Authority</td>
</tr>
<tr>
<td>AFGA</td>
<td>Australian Fingerlime Growers Association</td>
</tr>
<tr>
<td>ANBIC</td>
<td>Australian Native Bushfood Industry Committee</td>
</tr>
<tr>
<td>ANFIL</td>
<td>Australian Native Food Industry Limited</td>
</tr>
<tr>
<td>ANLMF</td>
<td>Australian Native Lemon Myrtle Farms</td>
</tr>
<tr>
<td>ANPI</td>
<td>Australian Native Produce Industries</td>
</tr>
<tr>
<td>AQIA</td>
<td>Australian Quandong Industry Association</td>
</tr>
<tr>
<td>CRC</td>
<td>Cooperative Research Centre</td>
</tr>
<tr>
<td>DEEDI</td>
<td>Department of Employment, Economic Development and Innovation Queensland</td>
</tr>
<tr>
<td>EU</td>
<td>European Union</td>
</tr>
<tr>
<td>GFC</td>
<td>Global Financial Crisis</td>
</tr>
<tr>
<td>GRAS</td>
<td>Generally Recognised as Safe</td>
</tr>
<tr>
<td>GVP</td>
<td>Gross Value of Production</td>
</tr>
<tr>
<td>HACCP</td>
<td>Hazard Analysis Critical Control Point</td>
</tr>
<tr>
<td>HS</td>
<td>Harmonized Commodity Description and Coding System</td>
</tr>
<tr>
<td>IEK</td>
<td>Indigenous Ecological Knowledge</td>
</tr>
<tr>
<td>IFA</td>
<td>Indigenous Foods Australia</td>
</tr>
<tr>
<td>IHA</td>
<td>Indigenous Harvest Australia Cooperative</td>
</tr>
<tr>
<td>IP</td>
<td>Intellectual Property</td>
</tr>
<tr>
<td>NRIA</td>
<td>New Rural Industries Australia</td>
</tr>
<tr>
<td>PAWCNT</td>
<td>Parks and Wildlife Commission Northern Territory</td>
</tr>
<tr>
<td>PBR</td>
<td>Plant Breeders Rights</td>
</tr>
<tr>
<td>PIRSA</td>
<td>Department of Primary Industries and Regions South Australia</td>
</tr>
<tr>
<td>QAAFI</td>
<td>Queensland Alliance for Agriculture and Food Innovation</td>
</tr>
<tr>
<td>RIRDC</td>
<td>Rural Industries Research and Development Corporation</td>
</tr>
<tr>
<td>SANFA</td>
<td>South Australian Native Food Association</td>
</tr>
<tr>
<td>TGA</td>
<td>Therapeutic Goods Administration of Australia</td>
</tr>
</tbody>
</table>
# Contents

Foreword ............................................................................................................................................... iii
Acknowledgments................................................................................................................................. iv
Abbreviations ........................................................................................................................................ iv
Contents .................................................................................................................................................. v
Tables ..................................................................................................................................................... vi
Figures ................................................................................................................................................... vi
Executive Summary............................................................................................................................. vii
1. Introduction ....................................................................................................................................... 1
2. Literature Review .............................................................................................................................. 3
3. Lemon Myrtle .................................................................................................................................... 5
4. Anise Myrtle ....................................................................................................................................... 8
5. Wattleseed ........................................................................................................................................ 11
6. Bush Tomato .................................................................................................................................... 15
7. Davidson Plum .................................................................................................................................. 20
8. Riberry ............................................................................................................................................. 24
9. Kakadu Plum .................................................................................................................................... 27
10. Muntries ......................................................................................................................................... 32
11. Lemon Aspen ................................................................................................................................... 35
12. Desert Limes ................................................................................................................................... 38
13. Finger Limes .................................................................................................................................... 42
14. Quandong ....................................................................................................................................... 46
15. Mountain Pepper ........................................................................................................................... 50
16. Other Plants ................................................................................................................................... 55
17. Summary of Stocktake Findings .................................................................................................. 56
18. R&D Priorities ................................................................................................................................ 61
19. Implications for Industry Strategy .............................................................................................. 64
20. Study Conclusions ......................................................................................................................... 65
Appendix 1: Survey Questionnaire .................................................................................................... 66
Appendix 2: Industry Database ......................................................................................................... 69
References ............................................................................................................................................ 75
Tables

Table 4.1: Anise myrtle average price per kilo 2011 ................................................................. 8
Table 5.1 Farm Gate Value of Wattleseed 2010 ........................................................................ 11
Table 6.1 Bush tomato value along the supply chain 2011 ......................................................... 16
Table 7.1 Davidson Plum Farm Gate prices 2010................................................................. 20
Table 8.1 Estimated Farm Gate, Wholesale and Retail Value of Riberry 2010 ($) .................. 24
Table 12.1 Desert Lime Product Forms and Uses................................................................. 38
Table 13.1 Estimated Farm Gate and Retail Value of Finger Lime 2011 ................................. 42
Table 14.1 Quandong prices per kilo 2011 .............................................................................. 47
Table 15.1 Estimated Farm Gate and Retail Value of Mountain Pepper Products ($) ............. 51
Table 17.1 Summary of Australian Native Food Industry Stocktake Findings .......................... 59

Figures

Figure 6.1: Generic bush tomato and wattle seed supply chain .................................................. 17
Figure 9.1 Northern Territory permit data for the commercial harvest of Kakadu Plum 1996–06 .... 28
Executive Summary

What the report is about

This stocktake addresses the various sectors of the native food industry including, wild harvest, cultivation, product forms, uses, industry value, supply chains, manufacturing, markets and Indigenous participation. The stocktake considers opportunities for the industry with a focus on the RIRDC and ANFIL identified thirteen most important Australian native food species. The emerging native food species are also identified and implications are presented for both R&D and industry strategy.

Who is the report targeted at?

The report is relevant to participants in the Australian native food industry, potential investors, researchers and policy analysts.

Where are the relevant industries located in Australia?

The industry is truly national in its base with commercial native food production taking place in all Australian states and territories.

Background

The Australian native foods industry stocktake was a joint initiative of RIRDC and ANFIL. ANFIL is the peak body for the Australian native food industry. The stocktake was funded with RIRDC core funds provided by the Australian Government.

Aims/objectives

The objectives of the project were to prepare a robust stocktake of the Australian native foods industry; analyse stocktake findings and determine implications for R&D and strategy; deliver a survey questionnaire that could be used in the future to update the stocktake; and develop a simple industry database of willing and publically available contacts.

Methods used

The study was completed using a combination of literature review, consultation and analysis. Key data was provided with the assistance of the industry supply chain including product aggregators and processors.

Key findings and their implications for relevant stakeholders

In 2010 the Australian native food industry was small, vibrant and diverse. Gross value of production at the ‘farm gate’ was between $15 million and $25 million and value adding may increase this estimate by up to 500%. Industry employment was estimated at between 500 and 1,000 persons and up to half of these individuals were Indigenous people living in remote communities. The industry is dominated by the production of lemon myrtle and to a lesser extent bush tomato and mountain pepper.

Findings from the native food stocktake include:

- Commercial native food production takes place in all Australian states and territories and there is an equal number of tropical or semi-tropical ‘rainforest’ species and arid or semi-arid ‘desert’ species. Most species are now mainly sourced from cultivated supply. Wild harvest remains the dominant source of supply for mountain pepper, bush tomato and Kakadu plum.
Overwhelmingly native foods are used as raw material for processed foods. This has implications for the price growers / wild harvesters are able to charge for their output. Innovation and productivity gains are critical to drive down the breakeven cost of supply.

Production across twelve of the thirteen priority species averaged a modest eight tonnes per annum in 2010. The standout and only exception was lemon myrtle leaf which was the industry’s ‘giant’ at an estimated annual production of between 575 tonnes and 1,100 tonnes. Lemon myrtle production is vulnerable to myrtle rust and ongoing myrtle rust research is a clear priority for the native foods industry given that it affects multiple native food crops (i.e. lemon and anise myrtle and ribberries).

Production variability is an issue for the native foods industry – it is very difficult to commit to customers when production is available one year but not the next. In 2010 variable production was an issue for eight of the thirteen priority species.

Producers were asked about the production outlook for their enterprise and their species as a whole as part of the stocktake survey. Most indicated that the supply outlook through to 2016 was either stable or that modest production increases were planned. The industry is likely to remain a niche producer for the foreseeable future.

For most native food species production tends toward oversupply for current niche markets but undersupplied for potential scale based opportunities. There are large scale markets for constantly supplied low cost native foods that are not being developed. Failure to develop these markets is a function of both missing technology and the nature of current industry participants.

Native food production enterprises are typically small and grow a range of crops. Successful producers have either value added their native foods, joined buying or marketing cooperatives or both in order to capture enough value to make a profitable business. Other producers have gone for scale and have linked in to mainstream processors and through them to major retailers. Both enterprise models are sustainable and service different native food markets.

Native food producers service farmer markets, online sales, processors, wholesalers and a range of domestic retailers. Noteworthy is the number and importance of Australian native food export markets.

The involvement of Indigenous people in the native foods industry is strongest in the wild harvest species - wattleseed, bush tomato and Kakadu plum. Care will be needed to ensure that this involvement is not displacement as species move from wild harvest to cultivation. This is of concern to the broader industry that feels that Aboriginal participation brings authenticity and integrity to Australian native foods.

Recommendations

R&D already completed by RIRDC on behalf of the industry is valued. Industry believes that research funded by RIRDC and others has prevented Australian grown native foods from sliding into a least cost commodity status from which producers would not be able to compete. R&D priorities for the period through to 2017 are identified in relation to: Production; Post-harvest, food safety and quality assurance; Product information and market access; and Communication, capacity building, extension and industry analysis.

Review of stocktake findings results in recommendations for industry strategy in relation to: communication of stocktake findings to government; increasing the membership of ANFIL; development of new industry partnerships; and encouraging information recording and sharing.

This study has provided tools including a questionnaire and a database that will allow the industry to complete an update of the stocktake in the future.
1. Introduction

The Australian native foods industry stocktake was a joint initiative of the Rural Industries Research and Development Corporation (RIRDC) New Plants Program and Australian Native Food Industry Limited (ANFIL). ANFIL is the peak body for the Australian native food industry. The stocktake was funded with RIRDC core funds provided by the Australian Government.

Stocktake Background

The native food industry is diverse and includes product sourced from wild harvest as well as from cultivation. Wild harvest covers the breadth of the country from wild harvest of Kakadu plums in the north to bush tomatoes and wattle seed in the arid interior and mountain pepper in Tasmania. Cultivation of Australian native flora has grown as wild harvest has plateaued. Native food cultivation spans rainforest fruits in the north east of Australia to muntries in South Australia and Victoria.

The industry includes Indigenous people who are involved in bush harvest, cultivation, manufacture and distribution, and the rights over traditional knowledge and uses are respected by the native food supply chain. The meaningful involvement of Aboriginal people brings authenticity and integrity to the native foods industry.

The native foods industry is focussed on bringing a unique Australian flavour experience to all consumers and in doing so creating profitable enterprises in regional areas of Australia.

The stocktake focuses on enterprises and products identified by ANFIL and RIRDC as being the twenty key crops, starting with the twelve priority species for the industry plus finger limes.

Key species identified by ANFIL and RIRDC which are the focus of this stocktake are:
1. Lemon myrtle *Backhousia citriodora* (leaf and oil)
2. Anise myrtle *Backhousia anisata* (leaf and oil)
3. Wattleseed *Acacia victoriae*
4. Bush tomato *Solanum centrale*
5. Davidson plum *Davidsonia spp.*
6. Riberry *Syzygium leuhamii*
7. Kakadu plum *Terminalia ferdinandiana*
8. Muntries *Kunzea pomifera*
9. Lemon aspen *Acronychia acidula* and *Acronychia oblongifolia*
10. Desert limes *Citrus glauca*
11. Finger limes *Citrus australasica*
12. Quandong *Santalum acuminatum*
13. Mountain pepper *Tasmannia lanceolata* (leaf and berry)

The project is concerned with the food production potential, status and outlook for these native plants.

Project Objectives

The objectives of the project were to:
1. Prepare a robust stocktake of the Australian native foods industry;
2. Analyse stocktake findings and determine implications for R&D and strategy;
3. Deliver a survey questionnaire that could be used in the future to update the stocktake; and
4. Develop a simple industry database of willing and publically available contacts.
Methodology

The stocktake was completed via the following process:

1. Finalisation of stocktake scope with ANFIL and RIRDC including informal discussions with key industry leaders.

2. Literature review focussing on previous attempts to describe and set priorities for the industry.

3. Industry telephone survey – interviews spread evenly across each of the key priority species. Each respondent was asked to identify ‘who else is relevant to the completion of this study’. These stakeholders were then surveyed in a second round of interviews. A copy of the final survey questionnaire is included as Appendix 1.

4. Database development – stakeholders surveyed and known industry leaders whose details are publicly available are summarised in a database at the end of each chapter. There is some repetition between chapters reflecting stakeholder knowledge across multiple species.

5. Indigenous engagement – achieved through asking each telephone survey respondent about their knowledge of Indigenous participation in the industry and following-up with identified Indigenous stakeholders.

6. Stocktake assessment – analysis of consultation data and literature review findings. For each of the key species the stocktake addressed:
   - Production location
   - Product forms and uses – including fresh, frozen, dried, ground, milled and processed
   - Production volume, value and variability
   - Supply status and trends – under or over supplied
   - Enterprise characteristics and profile – wild harvest or cultivated, enterprise numbers, their sizes and employment
   - Product supply chains – including the relevance of wild harvesters, nurseries, growers, distributors/wholesalers, processors/value adding, retailers, restaurants, export and crop associations (e.g. research groups or marketing alliances)
   - Markets and market trends
   - Indigenous participation details and future native food industry opportunities
   - Species specific strengths, weaknesses, opportunities and threats.

7. Implications of findings for R&D and strategy development (including market and product development, policy development, future research investment and lobbying for support).


Report Structure

A brief literature review is provided in Chapter 2 and a report chapter is dedicated to each of the key Australian native food species. Chapters on each key species follow the same sub headings but are not presented in any special order. Chapter 16 lists incidental data collected on other native food species. Stocktake implications are documented in Chapter 17. The survey questionnaire is included as Appendix 1 and an industry directory as Appendix 2.
2. Literature Review

Key references that ‘set the scene’ for the stocktake include the ‘New Crop Industries Handbook’ (RIRDC 2004) and the Native Foods R&D Priorities and Strategies 2007-2012 (RIRDC 2008).

The New Crop Industries Handbook, RIRDC 2004

The New Crop Industries Handbook (RIRDC 2004) provides a native food industry overview and specific information on bush tomato, lemon myrtle, native citrus, native pepper, quandong and the Davidson plum. The industry overview notes that the Australian native foods industry has grown slowly since its inception in the mid-1980s. With no existing production systems, agronomy, plant material (variety and yield), market or consumer knowledge, native foods have proved difficult to commercialise.

RIRDC 2004 segments the industry into four major supply chain links:
- Nursery operators
- Cultivators and wild harvesters
- Commodity traders and value adders – retail and food service
- Marketers – food service and retail, domestic and export.

The industry operates within a variety of commercial structures – including sole traders, networks, cooperatives and vertically integrated operations. The majority of native foods are further processed prior to consumption and products are used in the broader food industry as a defining flavour for an existing food product or process. Typical native food products include condiments, sauces, biscuits and ice cream. Native food products are marketed in four major forms:
- Farm gate commodity – limited processing such as drying, freezing, cleaning, grinding
- Industrial food manufacturing - seasonings and flavourings
- Food service/hospitality products
- Consumer products.

In 2004 there was little or no mainstream retail interest in native food fresh fruit or herbs. The main markets for native foods were in the tourism food service, industrial food manufacturing and retail sectors.

Australian native food industry challenges in 2004 included:
- Supply not matching demand (under and over supply problems)
- Variable yields
- Agronomy unknown or essential elements missing
- Under capitalisation of the industry
- Lack of profit for growers, wild collectors, processors
- Food safety and quality standards not available or not always complied with
- Communication and cooperation missing
- Need to better incorporate Indigenous interests
- Increasing food industry homogenisation which closes doors to supply opportunity
- Ongoing product and market development needed
- Lacking market focus (the industry was production driven).

RIRDC 2004 concluded that the Australian native food industry offered farm income diversification, opportunities for sustainable / environmentally appropriate agriculture, unique products, nutritional and functional food benefits and potentially, benefits to Indigenous stakeholders.
Native Foods R&D Priorities and Strategies 2007-12 (RIRDC 2008)

The Australian native food industry’s research and development (R&D) plan (RIRDC 2008) provides a mission statement, R&D objectives and an updated industry overview.

Mission

The R&D program’s mission was to provide R&D that will underpin the industry’s ability to create and sustain an authentic Australian flavour experience for consumers by:

- Building consumer recognition and appreciation of the unique flavour experience
- Achieving a global reputation for reliable and safe supply
- Solving production problems that threaten reliability
- Recognising the contributions of Indigenous culture and food practices in the industry.

Objectives

R&D objectives for the native food industry 2007-12 were:

- Developing and supplying product information to support market access and market growth
- Improving production (growing) efficiency
- Investigating new species for their potential to add to the appeal and profitability of industry
- Building research and industry capacity and improved R&D communication.

Products and production

The industry is made up of a great diversity of species, geographical areas, and uses. It includes wild harvest, specialist growers and importantly a number of vertically integrated firms as well as firms that process and market Australian native food products as part of their product portfolio. Except for a small amount of fresh produce going to restaurants, the bulk of domestic produce is dried, frozen or further processed, often in combination with non-native food ingredients, into a wide range of value-added foodstuffs. Gift and specialty shops are important outlets in this sector of the market. The food service sector is becoming increasingly involved but uptake by processors servicing the larger retail and wholesale food service market, in 2008, was limited.

There is no formal data available on the volume of production or sales, with some product still sold directly to final users (such as restaurants) or in farmer markets. Collection and dissemination of robust statistical information was seen as an important challenge for the Australian Native Foods Industry.

Structure and value

RIRDC 2008 concludes that there were approximately 500 active participants in the industry excluding a significant number of Aboriginal participants through the Land Councils and other groups.

Some participants favour the production of native food by mainstream agricultural and horticultural methods whereas others prefer alternative approaches that are perceived to be more environmentally friendly than conventional methods.

The absence of registered chemicals/minor use permits for native species means that pesticide free practices are the norm. Native citrus do have chemical permits as they are classified with common Citrus spp and are therefore the only exception to this. Native foods generally comprise only a part of the overall business activity for many of those involved in the industry.
3. Lemon Myrtle

Lemon myrtle (*Backhousia citriodora*) is a medium sized native tree (3-20m) originating in Queensland coastal rainforests, which prefers neutral soils in areas with rainfall greater than 800mm. The tree produces intensely flavoured leaves with an essential oil that is high in citral and has a distinctive lemon/lemon grass flavour. Lemon myrtle leaves are used as a fresh or dried culinary herb and as a tea, while the oil is used as a food flavouring agent and in cosmetics. Lemon myrtle is one of the most cultivated and commercially mature species in the native food industry (RIRDC 2004; Interviewees personal communication 2011).

Lemon myrtle is high in anti-oxidants, vitamin E, lutein (a carotenoid compound important for eye health) and calcium (Konczak 2009) and has antimicrobial and antifungal properties that are superior to tea tree oil (RIRDC 2004, Ryder 2008).

Lemon myrtle is one of several native food species under threat from myrtle rust, a fungal disease first found in Australia in April 2010. In December 2011, myrtle rust had spread from Cairns in Far North Queensland to well into Victoria. A single fungicide use permit for a range of chemicals is available for the treatment of myrtle rust on riberry, anise myrtle and lemon myrtle (Booth 2011; DEEDI 2011).

Production location

Although lemon myrtle has been grown on a small scale in Victoria, South Australia and Western Australia, most of the crop is located in northern NSW and Queensland. By far the largest plantation (1.2 million trees) is located at Palm Grove in Queensland. Many other smaller plantations (up to 10,000 trees) are located in northern NSW and south east Queensland. In the late 1990s it was reported that there were over 150,000 trees planted in NSW (RIRDC 2004), but growers explain that a significant proportion of trees in smaller plantations (approximately 30,000 trees) are no longer commercially maintained (Interviewees personal communication 2011).

Product forms and uses

Lemon Myrtle is a versatile native food. It is generally dried and milled for use as a tea or spice, or steam-distilled to obtain lemon myrtle essential oil. Lemon myrtle has both sweet and savoury applications. It can be used instead of lemon grass in cooking, and is popular in curries, pastas, cheesecakes, ice-cream, breads, dressings, sauces, drinks and syrups. Lemon myrtle is used in personal care products such as soaps, creams, toothpaste, shampoos and conditioners. The health properties of lemon myrtle mean that it has potential as a functional food, and recent research confirms its potential as a natural food preservative (Lazar *et al* 2011, ANFIL website accessed December 2011).

Production volume, value and variability

Volume and value

Accurate production figures for the lemon myrtle industry remain elusive due to the lack of data from key producers. It has been reported that the 1.4 million lemon myrtle trees which have been planted commercially in Australia have the capacity to produce 2,100 tonnes per annum of fresh leaf, equivalent to 50 tonnes of oil (Foster & Bird 2009). However, smaller growers report a significant gap between capacity and production (Interviewees personal communication 2011).

Farm gate prices for dried lemon myrtle vary significantly depending on sale volume. Medium scale commercial players report prices in the range of $17 - $30 per kilo, while small-scale growers report low volume sales at $35 - $45 per kilo. Wholesale prices range from $35 - $50 per kilo dried leaf. Most retail sales are for value-added products or very small volumes of dried leaf or oil for individual use.
Total farm gate value, based on best available evidence, is estimated at between $6.95 million and $22.9 million and includes both dried leaf and essential oil.

**Variability**

Most commercial plantings of lemon myrtle are from two main varieties supplied by specialist nurseries (RIRDC 2004). Only one of these varieties produces food grade lemon myrtle, and many growers who have the other variety use it to produce soaps and beauty products. Commercial size plantings mean that supply variability is less of an issue than for other native food species. While moisture stress can affect production, especially from young trees, lemon myrtle tends to be grown in wetter areas that have fewer droughts. The long-term impact of myrtle rust on the quantity and quality of supply is not yet known (DEEDI, 2011).

**Supply status and trends**

Following mass plantings of lemon myrtle in the mid to late 1990s, there was a period when lemon myrtle was over-supplied. In 2004 it was reported that there was a glut of raw material (RIRDC 2004), and over the period to 2011, some growers have ceased commercial operations due to the lack of a market for their product. However, at the same time there has been substantial market growth both in Australia and internationally and more uses for lemon myrtle have been developed. These developments have resulted in lemon myrtle being undersupplied at the larger volume commercial level, with several growers reporting an inability to fill market requests for large orders. Some small-scale growers whose volume is not large enough to fill these orders still report difficulty selling their crop at what for them is a profitable price (Interviewees personal communication 2011).

Best available data would indicate a stable supply outlook for the period through to 2016.

**Enterprise characteristics and profile**

The lemon myrtle industry is made up of one large commercial operation and approximately 60 small to medium sized growers in northern NSW and south east Queensland. ANLMF Palm Cove, the large commercial operation, uses no irrigation or fertiliser, is certified organic, does its own processing and exports 90% of its lemon myrtle output. Twenty people are employed in the business (Milgate, 2011).

Many small growers have mixed species plantings with less than 1,000 lemon myrtle trees. These growers value-add and market their own product. There are also a handful of medium size commercial enterprises which have between 2,000 and 20,000 trees and produce value-added foods. Medium size businesses may buy additional harvested leaf from smaller growers. Small and medium sized growers have formed successful cooperatives to jointly process and market their lemon myrtle products (Interviewees personal communication 2011).

**Product supply chains and markets**

On farm, trees are harvested mechanically or by hand. Harvesting occurs outside of the wet season. Several growers harvest to order, picking fresh leaves when orders are secured. Others undertake a major harvest a number of times a year. Larger commercial operations generally harvest mechanically, using purpose-built equipment (Interviewees personal communication 2011; ANFIL 2011; RIRDC 2004).

Lemon myrtle must be dried quickly to preserve its citral content and most drying takes place on farm. Dried leaves are ground to a variety of sizes that meet customer requirements and are stored in dark, temperature controlled environments. Steam distillation is used to produce essential oil from lemon myrtle leaf. Leaf and oil are either value-added on site or shipped to distributors, wholesalers or processors for further manufacturing (Ryder 2008, ANFIL 2011; Interviewees personal communication 2011).
Markets and market trends

Almost 90% of lemon myrtle produced in Australia is exported in dried form. The United States (US) is a major market for lemon myrtle where it is consumed as a specialty tea. The European Union (EU) is also an important outlet for the lemon myrtle industry and ongoing market access was secured with a RIRDC funded project in 2009. The Global Financial Crisis (GFC) has had a dampening effect on lemon myrtle export demand.

Indigenous participation

There are no known Indigenous growers of lemon myrtle, although one Indigenous owned processing company, Native Oz Cuisine uses lemon myrtle (and many other native species) in its products and an Indigenous chef, Dale Chapman of the Dilly Bag, purchases lemon myrtle from growers.

SWOT

<table>
<thead>
<tr>
<th>Strengths</th>
<th>Weaknesses</th>
</tr>
</thead>
<tbody>
<tr>
<td>Commercial scale plantations</td>
<td>No HS – internationally harmonised commodity description, coding system or GRAS (Generally Recognised as Safe).</td>
</tr>
<tr>
<td>Easily grown species</td>
<td></td>
</tr>
<tr>
<td>Anti-fungal and anti-microbial properties</td>
<td></td>
</tr>
<tr>
<td>Market recognition of product and its health benefits.</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Opportunities</th>
<th>Threats</th>
</tr>
</thead>
<tbody>
<tr>
<td>Promotion of lemon myrtle’s functional food properties</td>
<td>Myrtle rust is a major threat to supply</td>
</tr>
<tr>
<td>Potential for use as a natural preservative</td>
<td>Lower cost overseas supply – lemon myrtle is grown in five other countries (RIRDC 2008)</td>
</tr>
<tr>
<td>Potential for use as a cleaning agent (non-food use)</td>
<td>Synthetic and substitute citral resources (RIRDC 2008)</td>
</tr>
<tr>
<td>Facilitation of cooperatives for small to medium size growers.</td>
<td>Ongoing economic downturn, especially in Europe which is a major lemon myrtle market.</td>
</tr>
</tbody>
</table>

Research Priorities

R&D Value

Lemon myrtle growers are aware of RIRDC research and most were positive about its importance and direct relevance to them. Examples cited by growers included RIRDC’s involvement in overcoming EU market access restrictions, health benefits research, establishing Australian Standards for lemon myrtle oil, emergency permits for use of fungicides to control myrtle rust, trials of ways to control myrtle rust and packaging trials to improve shelf life (Interviewees personal communication 2011).

Future R&D Priorities

- Myrtle rust control and mitigation
- Continue research into the health benefits of lemon myrtle
- Addressing interstate trade restrictions imposed in the wake of myrtle rust including lack of communication and clear policy from state government agencies imposing restrictions.
- Food safety issues: what is in the pipeline with respect to post-harvest handling? Will more growers become subject to HACCP?
4. Anise Myrtle

Anise myrtle (Syzygium anisatum) is also known as aniseed myrtle and Ringwood. It was formerly classified as *Anetholea anisata* and *Backhousia anisata* and these names are often still used. In the wild, anise myrtle is found only in the sub-tropical rainforests of northern NSW in the Bellinger and Nambucca valleys where it occasionally grows as tall as 45m. In commercial plantations it is generally limited to the size of a large shrub or small tree. Anise myrtle leaves have strong liquorice and aniseed flavours. Young leaves are soft and pink, and become green and glossy with slightly wavy margins when mature. The tree produces fluffy, cream coloured flowers in late Spring (ANFIL website December 2011; White 2009).

Anise myrtle has antioxidant activity and is rich in magnesium. Anise myrtle is also a good source of lutein, folate, vitamin E, vitamin C and has been shown to have anti-fungal and anti-microbial properties (Konczak 2009, ANFL 2011).

**Production location**

Anise myrtle is grown commercially in the same locations as lemon myrtle and the two are often grown together. Most commercial plantings are located in northern NSW and south east Queensland, with one or two in South Australia and Western Australia. Plantations almost always have more lemon than anise myrtle, due to a perceived greater market potential (Interviewees personal communication 2011).

**Product forms and uses**

Anise myrtle leaves can be used fresh, but are generally dried and ground for use as a spice or tea. The leaves are also distilled into an essential oil which can be used as a food flavouring, or in health, cosmetic and body care products. Anise myrtle is sometimes sold as ‘anisata spice’ and can replace aniseed or star anise in sweet or savoury cooking. To date, far fewer value-added products containing anise myrtle have been developed compared to the extensive range containing lemon myrtle. One company produces aniseed myrtle pasta and another manufactures a Davidson Plum and Aniseed myrtle paste but these tend to be the exception (Interviewees personal communication 2011).

**Production volume, value and variability**

**Volume and value**

In 2010, total annual anise myrtle production was between 6 and 10 tonnes of dried leaf and 0.7 – 1 tonne of oil. Existing plantings have the capacity to produce much larger volumes, but many small growers report that they are not harvesting due to lack of a market for their produce.

As is the case with lemon myrtle, prices for anise myrtle vary significantly depending on the volume of the sale. As might be expected, large volume sales destined for export markets are trading at well below the prices achieved by small-scale growers selling a few kilos per annum. Farm gate prices for anise myrtle are set out in Table 4.1. Prices are slightly higher throughout the supply chain for certified organic product. Based on an average farm gate price of $36 per kilo dried and ground and $140 per kilo for essential oil, total farm gate value for 2010 was $410,000.

**Table 4.1: Anise myrtle average price per kilo 2011**

<table>
<thead>
<tr>
<th></th>
<th>Farm gate</th>
<th>Wholesale</th>
<th>Retail</th>
</tr>
</thead>
<tbody>
<tr>
<td>Dried and ground</td>
<td>$27 - $45</td>
<td>$50 - $60</td>
<td>$60 - $70</td>
</tr>
<tr>
<td>Essential Oil</td>
<td>$130 - $150</td>
<td>$300 - $400</td>
<td>$400 - $450*</td>
</tr>
</tbody>
</table>

*Domestic retail sales of anise myrtle essential oil are generally in much smaller quantities than 1 kg, and the price is far higher e.g. $12 per 15ml Source: Interviewees personal communication 2011
Variability
Market demand for a consistent supply of anise myrtle, as well as concerns about the environmental impact of wild harvesting, have seen the industry switch to an all cultivated and hence consistent supply (ANFIL website accessed November 2011).

Supply status and trends
In 2011, anise myrtle is oversupplied for existing markets. Some smaller scale growers of anise myrtle report difficulty selling due to a lack of demand. Several are no longer harvesting their trees for commercial purposes and others harvest only to fill ad hoc orders. Most report that anise myrtle is at best a “slow mover’ when compared to lemon myrtle. For larger growers the outlook appears more favourable with supply and demand in balance, especially for those servicing export markets (Interviewees personal communication 2011).

Enterprise characteristics and profile
The profile of the anise myrtle industry matches that of the lemon myrtle industry with most growers also growing lemon myrtle (See Chapter 3). Anise myrtle tends to be a sideline for lemon myrtle growers.

In 2001, it was reported that 11,000 anise myrtle trees had been planted on the mid-north coast of NSW. More than that were also planted on the far north coast of the state and in south east Queensland, taking the total number of trees in plantations to over 30,000. While some growers planted several thousand trees each, many plantings of anise myrtle were small (less than 300 trees) and were part of poly-cultural enterprises that also included lemon myrtle, cinnamon myrtle, Davidson plums and sometimes round or finger limes, lemon-scented tea trees, riberies and other species (Australian Bushfoods Magazine, 2001).

One of the largest growers of lemon myrtle, Australian Rainforest Products, also grows and processes anise myrtle in significant quantities on the NSW North Coast.

Product supply chains and markets
All commercial anise myrtle comes from plantations and most specimens have been propagated by nurseries to order. Harvest can occur all year round, and the trees can be cut three times in any one year.

Commercial operations have purpose-built mechanical harvesters and computerised drying systems. Smaller growers will hand harvest, and may send their crop to a contract processor for drying and milling. Dried and ground leaf is either packaged and value-added on site or on sold to a wholesaler or processor (Interviewees personal communication 2011).

Markets and market trends
The market for anise myrtle is far less developed than that for lemon myrtle in all categories: as a spice, as a tea, in value-added food products and in soaps and beauty products. The health benefits of the two myrtles were shown to be similar (Konczak 2009) and this may provide opportunities for the promotion of anise myrtle in the future. One major processor sees positive opportunity for anise myrtle and believes the demand will increase significantly in coming years (Interviewees personal communication 2011).

Indigenous participation
As with other east coast species, there is very little Indigenous participation in the industry.
SWOT

<table>
<thead>
<tr>
<th>Strengths</th>
<th>Weaknesses</th>
</tr>
</thead>
<tbody>
<tr>
<td>• Strong and unique flavour profile</td>
<td>• Very limited consumer awareness of anise myrtle</td>
</tr>
<tr>
<td>• Beneficial health properties</td>
<td>• Lack of market development</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Opportunities</th>
<th>Threats</th>
</tr>
</thead>
<tbody>
<tr>
<td>• promotion of health benefits</td>
<td>• myrtle rust (some growers report aniseed myrtle more susceptible)</td>
</tr>
<tr>
<td>• Invest and track the market development pathway used by lemon myrtle</td>
<td></td>
</tr>
</tbody>
</table>

Research Priorities

R&D Value
Anise myrtle growers were generally aware of RIRDC research and most were very positive about its value, especially the research into health benefits. Most of their comments regarding value related to lemon myrtle rather than anise myrtle.

Future Priorities
• R&D priorities mirror those of lemon myrtle.
• What is known re varietal differenced (may become important re: myrtle rust resistance)
5. Wattleseed

Wattleseed is the edible seed of *Acacia victoriae* which is also known as Elegant Wattle, Prickly Wattle, Gundabluey and Bramble Wattle. Aboriginal names include Arlep, Yarlirti and Pulkuru.

*Acacia victoriae* is an evergreen, multi-stemmed tree from 2m to 5m in height, with grey-green leaves and cream-coloured flowers. The seeds are 4mm – 6mm long, blackish-brown in colour and mature between November and February. Wattleseed is roasted and ground for use in a wide range of products. An essence can also be extracted (Ryder *et al* 2008; Bryceson 2008). Wattleseed has a low glycaemic index, high levels of protein and has recently been analysed as a good source of magnesium, zinc, calcium, iron and selenium (Konczak *et al* 2009).

**Production location**

*Acacia victoriae* grows naturally throughout mainland Australia in hot areas of low rainfall. Wild harvest occurs in South Australia, the Northern Territory and NSW. *Acacia victoriae* is cultivated commercially at a range of locations in south-east South Australia, at Stawell in Victoria and a small plantation has been established south of Alice Springs in the Northern Territory (PIRSA 2001; ANFIL 2011; Interviewees personal communication 2011).

**Product forms and uses**

Wattleseed has a strong nutty/ coffee flavour with a slight bitterness. It is traded whole or ground, usually roasted. Wattleseed can be milled into flour which is used for both sweet and savoury products including cakes, breads, casseroles and curries. Wattleseed is also used in ice-cream, sauces, marinades and as a caffeine-free ‘coffee’. The liquid essence can be extracted and is used in a range of products including a wattleseed balsamic and beer (Bryceson 2008; Ryder *et al* 2008; Interviewees personal communication 2011).

**Production volume, value and variability**

**Volume and value**

The volume of wattleseed produced in Australia is erratic due to changing environmental conditions including drought and bushfire. Previous estimates have reported wild-harvest volumes of ten tonnes in 1997/98 (PIRSA 2001) and seven tonnes in 2002/03 (Miers 2004). Both of these were relatively high-yield years. In 2008, Bryceson estimated that wild-harvest produced between 0.5 and 5 tonnes per annum (Bryceson 2008).

Cultivation has increased over the last ten years, and 3 - 4 tonnes per annum are now produced from plantations. Wild-harvest contributes up to 5 tonnes per annum in a high-yield year, taking the total volume across Australia to 4 - 8 tonnes per annum. The price per kilo currently ranges from $15 - $30 for raw seed and from $35 - $45 roasted and ground. Several industry players reported much higher prices ($60 - $80 kilo) from sales to mine site revegetation projects (Interviewees personal communication 2011).

Given an average price of $25 per kilo for raw seed and average volume of 4 – 8 tonnes, industry farm gate value sits between $100,000 and $200,000.

**Table 5.1 Farm Gate Value of Wattleseed 2010**

<table>
<thead>
<tr>
<th>Form</th>
<th>Volume</th>
<th>Price per kilo</th>
<th>Farm gate value 2010</th>
</tr>
</thead>
<tbody>
<tr>
<td>Wild harvest wattleseed</td>
<td>1 - 4 tonnes</td>
<td>$15 - $30</td>
<td>$25,000 - $100,000</td>
</tr>
<tr>
<td>Cultivated harvest wattleseed</td>
<td>3 - 4 tonnes</td>
<td>$15 - $30</td>
<td>$75,000 - $100,000</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>4 - 8 tonnes</strong></td>
<td><strong>$15 - $30</strong></td>
<td><strong>$100,000 - $200,000</strong></td>
</tr>
</tbody>
</table>

Source: Industry interviews
**Variability**

Wattleseed production is highly variable. Even under cultivation; bushfires, high winds, heavy rain and hail damage wattleseed pods. Drought restricts yield in the absence of irrigation. On the positive side, wattleseed has a long shelf-life (up to 10 years), which helps even out uneven production (Interviewee’s personal communication 2011).

**Supply status and trends**

There is agreement among industry players that wattleseed was over supplied in 2011 for existing boutique markets. Stockpiles that have carried the industry through the drought have been reduced over the last five years, bringing the situation closer to a supply-demand balance than was the case previously.

Despite the ready availability of wattleseed, processors argue that lower farm gate prices are required if wattleseed is to make the transition to mainstream markets, while growers report a lack of commercial viability at current volumes if prices are not maintained at their present levels.

In the absence of significant market growth, annual production of wattleseed is expected to increase slowly. By 2016, with improvements in cultivation and harvest methods, annual volume is forecast to increase to between 6 and 10 tonnes per annum (Interviewee’s personal communication 2011).

**Enterprise characteristics and profile**

Although cultivation is increasing, wild harvest remains a key source of supply. Seed from high-yield years is stored and sold in lean years. Wild harvest is undertaken by individuals on private land and Aboriginal women from communities in South Australia and the Northern Territory (Interviewee’s personal communication 2011). It has been estimated that between 300 and 500 Aboriginal women from eight language groups and 20 settlements participated in wild harvest between 2000 and 2006 (Merne Altyerre-ipenhe 2011).

*Acacia* species require little water compared to introduced crops and have potential for mitigation of dryland salinity and use in mine rehabilitation. Typically, wattleseed growers have commenced cultivation to diversify, or as an additional income stream in times of drought. Most enterprises have several other crops. Some plantations began by using *acacia* as a host plant (for quandong) or as a windbreak. Harvest occurs in summer and is mainly done by hitting the trees with sticks, although mechanical harvesting using tree shakers is also undertaken. While some growers sell the raw seed to processors, several reported that value-adding was necessary if the enterprise was to be profitable (PIRSA 2001; Bryceson 2008; Ryder et al 2008; Interviewee’s personal communication 2011).

One Aboriginal community grows wattleseed commercially at Murray Bridge, South Australia as part of the Outback Pride project. Outback Pride also sources wattleseed from its own non-Indigenous South Australian plantations (Outback Pride 2011).

**Product supply chains and markets**

The wattleseed supply chain was well-documented in a Desert Knowledge Cooperative Research Centre (CRC) report entitled *Value chain analysis of bush tomato and wattle seed products* (Bryceson 2008). Figure 6.1 in Chapter 6 describes bush tomato and wattleseed value chain relationships.

Post-harvest the seeds are cleaned by threshing and sieving. Wholesalers or processors roast and grind the seeds and obtain the microbiological certificates required by state food authorities. Wattleseed is favoured by the food service industry and features in the recipes of high profile chefs and in native food restaurants. In some cases, growers value add on site by processing the seeds into wattleseed essence and a range of other products which are sold online, via specialist distributors and farmers’ markets. Approximately 20 online stores currently sell roasted and ground wattleseed and value-added
products, many providing recipes and ideas for product use. Several larger processors manufacture and
distribute wattleseed products as part of a broader range of native foods which are sold online and via
distributors to speciality food and tourist stores, supermarkets and export markets (Bryceson 2008;
Interviewees personal communication 2011).

Markets and market trends

Wattleseed has been described as the ‘unsung hero of the Australian Native Food industry’ (Outback
Pride Project 2011). It is a very versatile food ingredient, and its chocolate/ nutty flavour is popular
with consumers and has found a secure niche in the food service industry. However, several industry
players noted a dampening of market demand due to the impact of the Global Financial Crisis (GFC),
and described the current market as steady at best (Interviewees personal communication 2011).

Significant market development is required if wattleseed is to transition from the boutique to
mainstream market. Only then will production increase enough to support such a leap. One market
with strong potential is the beer market - with two wattleseed beers already exhibiting strong sales -
one in Sydney and another in the Riverland district of South Australia.

Indigenous participation

Indigenous women in Central Australia collect half the wattleseed traded in the native food industry.
One Aboriginal community in South Australia cultivates wattleseed commercially. Two major
processors have invested many years in developing networks and supply chains to support their
ongoing participation in wild harvest and cultivation, although some wild-harvest networks are
difficult to maintain through periods of drought. Some Aboriginal communities report achieving much
higher prices (200%) for mine site revegetation projects than from sales to the food industry and many
are concerned about how Indigenous rights and opportunities to participate in and benefit from the
industry can be supported in the face of increasing cultivation and commercialisation (Interviewees
personal communication 2011).
SWOT

**Strengths**
- Taste that is popular with consumers and favoured by food service industry
- Plentiful in the absence of drought
- Good source of magnesium, zinc, calcium, iron and selenium
- Seed collection has positive social and cultural outcomes in Indigenous communities.

**Weaknesses**
- Weather dependent variable yield
- Supply chain traceability is missing
- Shortage of workforce for hand harvesting / harvesting method and cost need improvement
- Market development work required
- Species used and roasting quality impact on taste, so processing needs to be standardised around unknown consumer requirements

**Opportunities**
- Understand whether commercial-scale bush harvesting is a possibility and whether this is something Aboriginal communities wish to do
- Improved planting material and harvest techniques

**Threats**
- Cost effective African production (but poorer tasting wattleseed)
- Industry quite fractured; lack of trust and information flow along supply chain
- Mine site rehabilitation projects paying more for seed is a potential threat to food processors and retailers (while also a potential opportunity for growers and wild-harvesters)
- Possible loss of Indigenous participation and employment, along with erosion of cultural and intellectual property rights, if cultivation for mainstream markets expands.

Research Priorities

**R&D Value**
Some wattleseed growers were aware of existing RIRDC native food research and found it useful while others were not aware of the Program or its products. Several suggested that a continued focus on health benefits and nutritional values was important, as well as market development more broadly (Interviewees personal communication 2011).

**Future R&D Priorities**
- Knowledge about consumer preferences
- Market development
- Nutritional and health benefits of wattleseed
- Improved plant varieties & harvest techniques
- To support continued wild-harvest: expand involvement of Aboriginal enterprises and value adding; investigate cooperatives or other joint arrangements.
6. Bush Tomato

Bush tomato (Solanum centrale) is one of many plants belonging to the family Solanaceae, along with potato, tomato, capsicum and chilli. Australia is home to approximately 200 Solanum species (Vincent 2010). Bush tomato is also known as desert raisin and kutjera. Aboriginal names include Akatyerr, Akatjurra, Katyerr, Kampurarrpa and Yakajirri (Ryder 2008; Bryceson 2008). Solanum centrale is an often sprawling, under shrub or perennial herb which grows to 45cm. It has grey-green leaves and mauve /blue frilled flowers. The globular bush tomato fruit is usually 10mm – 15mm in size. Fruit turns from green to yellow as it ripens, then dries on the bush until it is a reddish colour and looks like a raisin (Bryceson 2008; Ryder 2008; Vincent 2010; RIRDC 2004).

Bush tomato has a strong flavour which has been described as earthy caramel and tomato with a pungent aftertaste and is mainly used as a spice or flavouring (Spencer 2011). Bush tomato is a good source of vitamin C (Bryceson 2008) and recent analysis identified it as a good source of selenium and iron (Konczak 2009).

Production location

Bush tomato is native to Western Australia, the Northern Territory and northern South Australia. Wild-harvest from Central Australia remains a major source of bush tomato, but research and cultivation have been underway for over a decade. Bush tomato has been grown outside its natural distribution in several locations including central and coastal South Australia and western New South Wales (RIRDC 2004). Plots in the cooler areas were less successful (ANFIL 2011). Bush tomato is grown commercially at Kingston and Eudunda in South Australia. Commercial plantations have also been established in Aboriginal communities in both the Northern Territory and South Australia.

Product forms and uses

Bush tomato is usually traded dried, either whole or ground into a powder, although mature yellow fruit can also be eaten fresh (Ryder 2008). Green fruit is toxic due to the presence of glycoalkaloids of the class containing solanine, as is the ripe fruit of some other Solanum species, making correct plant identification essential (Vincent 2010). Bush tomato is used as a savoury spice, and is processed into a range of value-added products including herb blends, pasta, relishes, chutneys, dressings, sauces and sprinkles (dukkahs). While Solanum centrale is by far the most used Solanum species in the industry, one major processor has also added Solanum cleistogonum (Passion Berry) and Solanum chippendalei (Tanami Apple) to their product range (Interviewees personal communication 2011).

Production volume, value and variability

Volume and value

Bush tomato volumes fluctuate greatly from year to year, making it difficult to calculate average industry volume. In 2002 and 2003, volumes of 7 – 10 tonnes were reported (RIRDC 2004; Miers 2004). More recently, total volume was estimated at 15 – 20 tonnes, but this estimate is based on high-yield years, and was accompanied by the caveat that volume varies significantly (Bryceson 2008). Interviews conducted in 2011 confirm that the years since 2008 have seen smaller volumes traded due to drought. Several buyers of wild-harvested bush tomato report nil availability for the four years to 2010 (Interviewees personal communication 2011).

Farm gate prices have risen significantly over the last decade, from $15 - $20 per kilo in 2001 (RIRDC 2004) to $32 - $40 per kilo in 2011, with some reports of prices as high as $45 per kilo. Buyers often have to further dry the fruit, resulting in loss of mass of approximately 5%. At retail, dried bush tomato sells whole or ground for between $55 and $80 per kilo. Smaller quantities of bush tomato in spice jars or sachets (50g to 100g) retail for up to $20 per 100 grams.
Based on an average farm gate price of $36, and annual volume of 15 tonnes, total industry farm gate value is $540,000.

Bush tomato value through the supply chain is summarised in Table 6.1.

Table 6.1 Bush tomato value along the supply chain 2011

<table>
<thead>
<tr>
<th>Wild-harvesters</th>
<th>Farm gate/Aggregators</th>
<th>Wholesale</th>
<th>Retail price per kilo</th>
<th>Small volume retail sales per 100g</th>
</tr>
</thead>
<tbody>
<tr>
<td>$5 - $15 / kg</td>
<td>$30 - $40 / kg</td>
<td>$38 - $50</td>
<td>$55 - $80</td>
<td>$11 - $19.50</td>
</tr>
</tbody>
</table>

Source: Bryceson 2008; Vincent 2010; Interviewees personal communication 2011

Variability

Wild-harvested bush tomato supply remains erratic due to changing environmental conditions including drought and bushfire. A good crop occurs every five to eight years, with minor harvests in between (Ryder et al. 2009). Quality also varies, although the quality of wild-harvested fruit, hand-picked by Aboriginal women has been observed to be higher than that from mechanised harvest and non-Aboriginal pickers. This improved fruit quality has been attributed to Indigenous Ecological Knowledge (IEK), resulting in optimal fruit selection and handling (Merne Altyerre-ipenhe 2011).

Lack of supply has seen increased horticultural efforts since 2000. However, cultivation has not yet overcome issues of variability. This is due to the high cost of production and the low average yields of seed-raised plants (Vincent 2010). The further development of newly established plantations and ongoing horticultural research should see variability in both quantity and quality lessen over the next five years.

Supply status and trends

Demand for bush tomato has increased consistently in recent years and now significantly outstrips supply (Interviewees personal communication 2011; RIRDC 2011, Bryceson 2008).

Tight supply has convinced many in the industry that cultivation is the only path to commercial success. Investment in plantations along with a major horticultural research project by the Cooperative Research Centre for Remote Economic Participation (including as partners the Central Land Council, Southern Cross University, Robins Foods and Coles) should see progress towards more consistent bush tomato supply.

Enterprise characteristics and profile

The wild-harvest of bush tomato is mainly undertaken by Aboriginal women in South Australia and the Northern Territory on Aboriginal freehold lands. Wild-harvest accounts for up to 80% of supply in a good year (Interviewees’ personal communication 2011). Like wattleseed, it has been estimated that between 300 and 500 mainly middle-aged and senior women were involved in wild-harvest between 2000 and 2006 (Merne Altyerre-ipenhe 2011).

Under cultivation, the fruiting cycle of bush tomato has been expanded from two to eight months (ANFIL 2011). Bush tomato is now being grown commercially in a range of locations. Under the Outback Pride project, five Aboriginal communities grow the plant, in far north-west and central South Australia, at Murray Bridge, and near Ceduna on South Australia’s west coast. The plantations at these communities are established by the Outback Pride project and produce is sold exclusively back to the project under growers’ contracts. Outback Pride is a subsidiary of Reedy Creek Nursery near Kingston which also cultivates bush tomato for the Outback Pride label.

Coles Indigenous Food Fund has supported the development of two plantations in Aboriginal communities in the Northern Territory. Desert Garden Produce has 30,000 plants on Aboriginal land
110km south of Alice Springs and the Laramba community has 10,000 plants 220km north-west of Alice Springs. Both are contracted to sell the fruit to Robins Foods for processing under the Outback Spirit brand.

In addition to the involvement of these two major processors of bush tomato, there are a large number of smaller-scale enterprises which grow or buy bush tomato and sell it to the food service industry or value-add by making products such as jams, chutneys and relishes which are sold at farmer’s markets and online.

**Product supply chains and markets**

The bush tomato supply chain is shown in Figure 6.1.

Supply chain relationships with Aboriginal communities centre on trust, take time to develop and may be difficult to maintain in years of low or nil supply. **Most cultivated fruit is grown under contract to Australia’s two major native food processors, who may also buy from other sources.** Other small producers sell to wholesalers, directly to the food service and catering industry, or value-add themselves by producing relishes, chutneys and spice mixes for sale at farmers’ markets, online and via specialist outlets.

**Key supply chain issues** include variability in quantity and quality of wild-grown product and the need to further develop horticultural expertise, food safety and traceability along the supply chain and to improve internal industry cooperation (Bryceson 2008).

**Figure 6.1: Generic bush tomato and wattle seed supply chain**

Source: Bryceson, K. (2008) *Value chain analysis of bush tomato and wattle seed products*
Markets and market trends

In 2004, bush tomato was described as ‘one of the most marketable products emerging from the Australian native foods industry’ (Robins and Ryder 2004). Bush tomato’s marketability has been confirmed since 2004 through ongoing increases in demand.

Bush tomato is used extensively in the native food service and catering industries and is available online from at least fifteen companies either dried whole and ground, or processed into value-added products. Specialty tourist and food shops are a major market for bush tomato products and mainstream supermarket sales have been established e.g. Coles beef and bush tomato flavoured sausages. The export market is also important for the bush tomato industry, with seasonings and flavourings available throughout Europe, the UK and Asia.

Indigenous participation

Aboriginal communities play a key role in the wild-harvest and cultivation of bush tomato.

At the current time, most cultivated bush tomato is produced in partnership with Aboriginal communities on Aboriginal land under contract to one of the industry’s two major manufacturers. In addition, the Cooperative Research Centre for Remote Economic Participation’s research project is also being conducted in partnership with Aboriginal communities.

However, many in the industry remain concerned about how commercial success can be achieved while protecting indigenous culture and intellectual property rights (Interviewees personal communication 2011). A recent report by the Merne Altyerre-ipenhe (Food from the Creation time) Reference Group, a group of Aboriginal women from Central Australia, outlines a series of ethical guidelines for commercial native food research, industry and enterprises. The guidelines aim to protect the rights of Aboriginal people and ensure ongoing access to the benefits created (Merne Altyerre-ipenhe 2011).

SWOT

<table>
<thead>
<tr>
<th>Strengths</th>
<th>Weaknesses</th>
</tr>
</thead>
<tbody>
<tr>
<td>• Unique flavour, well regarded by the food industry and popular with consumers</td>
<td>• Wild-harvest supply highly variable</td>
</tr>
<tr>
<td>• Relatively small ratios to total ingredients needed i.e. intensely flavoured food additive.</td>
<td>• Lack of purpose built harvest and post-harvest technologies</td>
</tr>
<tr>
<td>• Rich source of iron and selenium</td>
<td>• Difficult to get regular hand harvest labour</td>
</tr>
<tr>
<td>• Low sodium to potassium ratio which may assist in lowering hypertension.</td>
<td>• Other species of similar appearance and the green form are poisonous</td>
</tr>
<tr>
<td></td>
<td>• Cost and difficulty of establishing large-scale plantings and low yield of seed raised plants.</td>
</tr>
<tr>
<td></td>
<td>• Lack of traceability along the supply chain</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Opportunities</th>
<th>Threats</th>
</tr>
</thead>
<tbody>
<tr>
<td>• Development of varieties that are easier to grow and more profitable</td>
<td>• Loss of Indigenous participation, along with erosion of cultural and intellectual property rights</td>
</tr>
<tr>
<td>• Improved harvest methods, education and awareness and market development</td>
<td>• Internationalisation and homogenisation of the food industry</td>
</tr>
<tr>
<td>• Enrichment trial planting</td>
<td>• Mainstream supply base that is well researched and very low cost.</td>
</tr>
</tbody>
</table>
Research Priorities

R&D Value
Some industry players expressed concern about the number of researchers and consultants ‘hanging off’ the native foods industry and being paid substantially more than Indigenous wild-harvesters and many commercial producers. Others were aware of research undertaken or supported by RIRDC and found it useful and relevant (Interviewees personal communication 2011).

Future R&D Priorities
- Improved plant varieties and cultivation techniques
- Harvest and post-harvest technologies for wild harvest and cultivation
- Enrichment planting trials which provide opportunity for Aboriginal community involvement
- Traceability systems along the supply chain for wild harvest product
- Systems to increase supply chain cooperation and trust
- Quality and food safety systems for wild harvest product
7. Davidson Plum

The Davidson plum (Davidsonia spp.) is a native rainforest fruit of subtropical coastal NSW and tropical north-eastern Qld. The fruit is 3 – 6 cm in diameter and grows on a slender tree with large leaves. When ripe, the fruit has purple skin and soft burgundy-coloured flesh. Its acid taste profile makes it best suited for use as a processing or culinary fruit. There are three species of *Davidsonia*:

- *Davidsonia jerseyana* - also known as the NSW Davidson Plum or ‘hairy’ Davidson plum - grows to 5 metres and is the most widely cultivated species, though endangered in the wild;
- *Davidsonia johnsonii* - the smooth leaved Davidson Plum - is native to NSW, rarely cultivated and endangered in the wild;
- *Davidsonia pruriens* – the Queensland Davidson Plum, Aboriginal name *Ooray* - grows to a height of 12 m and is native to tropical north east Queensland.

Davidson plums have a higher anti-oxidant capacity than the blueberry, higher levels of lutein than avocado and a high ratio of potassium to sodium (Konczak *et al* 2009).

**Production location**

Davidson Plum production occurs in the sub-tropical coastal regions of NSW and in Queensland. In NSW plantations are found on the north coast from Port Macquarie to the Queensland border and up to 30 km inland. Queensland production occurs in both the south east of the state, and on the Atherton Tablelands in the tropical north east (RIRDC 2004, Interviewees personal communication 2011).

**Product forms and uses**

Davidson plum is used as an ingredient in a wide range of sweet and savoury products including jams, sauces, chutneys, cordials, ice-cream, wines and liqueurs. It is also used extensively in baking, and increasingly by restaurants. The fruit is generally traded frozen, either whole or deseeded. Very occasionally Davidson plum is traded as frozen puree. One grower also sells dehydrated fruit, which reduces by 90% (Interviewees personal communication 2011).

**Production volume and variability**

**Volume and value**

Production of Davidson plum has increased significantly over the last ten years. Annual production in 2001 was reported to be between 4 and 6 tonnes (CSIRO 2004), and total production for 2010 has been estimated at 8 – 10 tonnes per annum.

Many growers value-add themselves – over 50% of total volume is further processed by the grower. However, average farm gate prices have been used to estimate an industry farm gate value. Table 7.1 shows farm gate values for Davidson plum in 2010. Prices for frozen whole fruit vary quite widely, depending on the volume of the sale and the quality of the fruit.

**Table 7.1 Davidson Plum Farm Gate prices 2010**

<table>
<thead>
<tr>
<th>Davidson Plum Product</th>
<th>Farm gate price per kilo 2010</th>
</tr>
</thead>
<tbody>
<tr>
<td>Whole Frozen</td>
<td>$4 – 12</td>
</tr>
<tr>
<td>Frozen Deseeded Halves</td>
<td>$13 - $15</td>
</tr>
<tr>
<td>Frozen Puree*</td>
<td>$11 - $15</td>
</tr>
<tr>
<td>Dehydrated (90% reduction rate)*</td>
<td>$180</td>
</tr>
</tbody>
</table>

*Product rarely sold in this form

Source: Interviewees personal communication 2011
In 2010, Davidson Plum has a total farm gate value of $90,000, based on an annual volume of 9 tonnes and a price per kilo of $10 - an average of whole and deseeded fruit prices. An industry retail value has not been calculated as the percentage of fruit in processed products is not known.

**Variability**

Both the quantity of Davidson plum and the quality of the fruit are variable, but its use by processors with their capacity to hold over and blend fruit makes this less of an issue than for some other native food species. Although no cultivars have yet been developed, some nurseries select particular trees for propagation and seedlings are fairly close to type. The yield of individual trees can vary significantly from season to season.

Growers of *Davidsonia jerseyana* face major crop and pest management issues including fruit fly and king parrot attack, both of which can have a major impact on fruit quality and production volumes. In addition, *Davidsonia jerseyana* is harvested once a year, resulting in a glut of fruit, whereas *Davidsonia pruriens* produces all year round and is not vulnerable to fruit fly issues. *Davidsonia pruriens* commands a higher price in some markets (Interviewees personal communication 2011).

**Supply status and trends**

Most industry players agree that Davidson plum is oversupplied for current markets. Several growers report difficulty selling their fruit, and some existing plantations are no longer being maintained commercially. Despite this apparent oversupply, current volumes of Davidson plum are not quite large or consistent enough for full-scale commercial production (Interviewees personal communication 2011).

However, the potential for growth is high. Some growers believe that greater industry cooperation would enable market development, which would in turn ensure all fruit is harvested and used, and facilitate the transition to a commercial level of production. One large processor is increasing production and several growers predict a doubling of their own volumes within the next five years (Interviewees personal communication 2011).

By 2016 annual production is forecast to increase to 12 – 15 tonnes per annum due to the anticipated expansion of several large-scale growers’ value-adding operations, and increases in retail sales of native foods more broadly.

**Enterprise characteristics and profile**

Davidson plum is now sourced entirely from cultivation. Both NSW species are listed as endangered in the wild. Recovery Plans are in place and a permit is required to pick any fruit. There has been no wild-harvest in NSW since 2001 (RIRDC 2004, Interviewees personal communication 2011).

Like other native food species, Davidson plum enterprises vary in size and type from small scale plantations established as a weekend interest or second income source, to full-scale commercial operations. By the late 1990s, total plantings of Davidson plum reached 30,000 trees, the majority of which were in small orchards of between 100 and 1,000 trees. Some of these were later removed or not maintained due to lack of a market for the fruit or difficulties with crop management (RIRDC 2004).

In 2011, both NSW and Queensland have several large orchards of 1,000 to 2,000 trees, and many smaller plantations which are typically part of a poly-cultural native food enterprise. The larger orchards are generally full-time grower enterprises. Most of these growers value-add or contract another business to do so on their behalf, while some sell their fruit to major processors.

Smaller plantations of Davidson plum are typically one of several species grown on the property. Those smaller growers that do not value-add generally have other employment or are retired and are not looking to build up their business beyond a certain relatively modest point (Interviewees personal communication 2011).
Davidson plum is unique in the native food industry in that one grower has established an orchard grown from seed and root suckers of many of the known populations of Davidson plum in north east NSW. In the last 12 years, over 2,000 trees have been planted at Ooray Orchards, all catalogued and traceable to their original wild site, so that the orchard provides a gene bank with enormous potential for the development of superior forms for horticulture (Ooray Orchards 2011).

**Product supply chains and markets**

All Davidson plum is grown from seed or root suckers and seedlings are available at a range of nurseries in New South Wales, Queensland, South Australia and Victoria.

On farm, the fruit is harvested by hand, sorted and washed. Davidson plum is generally not graded as it is used almost exclusively as a processing fruit, although one major wholesaler distinguishes between Queensland and NSW fruit. The majority of growers who don’t value-add themselves, prefer to sell whole fruit which is usually further ripened off the tree prior to freezing. Deseeding is done by machine or by hand, which is very labour intensive.

Several growers produce and market their own range of gourmet value-added products (some of which are certified organic) using both their own produce and that of other growers in their region. Others sell their frozen fruit to larger processors and wholesalers (Interviewees personal communication 2011).

**Markets and market trends**

Davidson plum products are currently sold at specialty food and tourist stores, at restaurants and cafes and at local markets. Sales occur predominantly in the areas where the product is produced, but increasingly sales are occurring outside of these areas and online. Davidson plum products have won several awards in recent years including at the Royal Queensland Show, the Mudgee Fine Food Fair and the Australian Food Challenge Awards. Several manufacturers are currently expanding into southern markets including Sydney and Melbourne, and Davidson plum products are also exported to Europe.

Davidson plum is also processed into several wine and liqueur products, which have found a ready market amongst local residents and tourists visiting production areas. A 2009 report, *Markets for Tropical Fruit Wine Products*, identified potential export markets in Japan, the United States, Canada, Europe and Singapore (Noller & Wilson, 2009).

**Indigenous participation**

There is no known Indigenous participation in the growing of Davidson plum. Indigenous chef Ms Dale Chapman of the Dilly Bag uses small volumes of Davidson plum in her recipes.
## SWOT

<table>
<thead>
<tr>
<th>Strengths</th>
<th>Weaknesses</th>
</tr>
</thead>
<tbody>
<tr>
<td>• Unique appearance and flavour profile</td>
<td>• Skills needed in product development and marketing to grow market demand</td>
</tr>
<tr>
<td>• Very high antioxidant content</td>
<td>• Oversupplied for cottage industry level but insufficient volume for commercial production</td>
</tr>
<tr>
<td>• Branded as Australian native ensures interest and some market demand</td>
<td>• Lack of communication and cooperation in the industry hampering development</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Opportunities</th>
<th>Threats</th>
</tr>
</thead>
<tbody>
<tr>
<td>• Previously abandoned orchards are being brought back into production</td>
<td>• Production pests including fruit fly, flying foxes and king parrot damage in some places</td>
</tr>
<tr>
<td>• Need for improved production efficiencies and technologies plus post-harvest processing techniques</td>
<td>• Extreme weather events including cyclones</td>
</tr>
<tr>
<td>• Greater adoption of the fruit in the food manufacturing sector</td>
<td></td>
</tr>
<tr>
<td>• Need for grower brokerage or a cooperative to ensure supply quality and quantity in order to access higher volume markets</td>
<td></td>
</tr>
<tr>
<td>• Netting: funding support from government (as for stone fruit) to deal with king parrot damage.</td>
<td></td>
</tr>
</tbody>
</table>

## Research Priorities

### R&D Value
Several growers were aware of research undertaken as part of the Native Foods Program and were positive about it, but did not see much direct relevance to them as yet.

### Future R&D Priorities
- Integrated pest management essential for the future of all native foods including Davidson plum
- No data re requirements for optimal photo-period, chilling hours or diurnal variation and more research in this area would be beneficial
- Fertiliser requirement for *Davidsonia spp* are not well understood or well researched
- Further product development R&D is critical
8. Riberry

Riberry (*Syzygium leuhmanii*) is a lilly pilly that produces red purple ovoid or pear-shaped fruit of 12 mm to 15 mm in length. Riberry, also marketed as ‘Rainberry™’ which is a registered trademark of Galeru Pty Ltd, is native to tropical and subtropical Queensland and subtropical NSW in areas with greater than 600 mm of rainfall close to the coast. The fruit is strongly flavoured tasting of cloves and spice and fades from red to pink when cooked. Riberry is used as a culinary or processing fruit.

**Production location**

Riberry is grown in cultivated plantations on the north coast of NSW and southern Queensland. At present NSW provides the crop’s main production base.

**Product forms and uses**

Riberry is used for both sweet and savoury products including jams, conserves, chutneys, relishes, ice cream, yoghurt, chocolates, cakes and sauces for meat dishes.

The fruit is harvested, washed and graded and either frozen whole or processed into a frozen pulp. Around 60% of harvest is frozen whole fruit while 40% is directed toward processing. Better quality fruit tends to be frozen whole but the split between the two product forms (frozen whole and pulp) depends on ruling market requirements. Growers may retain product ownership through processing and value adding their processed riberry into a range of consumable products e.g. yoghurt, cakes, or whole fruit compote.

**Production volume, value and variability**

**Volume and value**

In 2010 total annual riberry production was between 4 and 5 tonnes of plantation grown fruit approximately 70% of which was produced by members of Galeru Pty Ltd – a NSW and Queensland based marketing company. The balance of production was grown by a handful of other small plantation players. Wild harvest is now a minor and mainly supplementary source of riberry supply i.e. wild harvest will be drawn upon in light cultivation crop years.

At the farm gate whole frozen riberry sells for between $15 and $20/kg depending on volume purchased and an average price of $17.50/kg is appropriate (Personal communication, Woolgoolga Rainforest Products August 2011).

Riberry pulp has an estimated farm gate value of $30/kg and would find a ready buyer in the food manufacturing sector.

Industry value estimates farm gate, wholesale and retail are summarised in the table below.

<table>
<thead>
<tr>
<th></th>
<th>Farm Gate Value</th>
<th>Wholesale Value</th>
<th>Retail Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Riberry – whole</td>
<td>47,250</td>
<td>108,000</td>
<td>216,000</td>
</tr>
<tr>
<td>frozen</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Riberry – pulp</td>
<td>54,000</td>
<td>126,000*</td>
<td>252,000</td>
</tr>
<tr>
<td>Total</td>
<td>101,250</td>
<td>234,000</td>
<td>468,000</td>
</tr>
</tbody>
</table>

* Illustrative only product not currently supplied in this form
From the table it can be seen that annual farm gate production of between 4 and 5 tonnes with a value of $100,000 is ultimately worth close to $500,000 when incorporated into manufactured product and sold at retail.

**Variability**
Riberry production is somewhat variable and dependent on seasonal growing conditions. Plantations are not generally irrigated and drought can reduce riberry supply.

**Supply status and trends**
In 2011 riberry is in supply and demand balance for the small volume, high value markets growers and opportunistic wild harvesters are able to supply. Riberry is undersupplied if growers and harvesters choose to make the transition into supplying lower unit value, high volume commercial markets (Personal communication, Woolgoolga Rainforest Products August 2011).

By 2016 annual production is forecast to increase from 4 to 5 tonnes to between 15 and 20 tonnes.

**Enterprise characteristics and profile**
Enterprises focussing on wild harvest supply have declined in importance since the late 1990s and have been secondary to cultivation since at least the early 2000s (Robins in RIRDC 2004).

Galeru Pty Ltd has access to the largest riberry plantation with some 6,000 productive trees across 60 hectares. There are none of the large scale plantations of tens of thousands of trees that characterise other emerging native foods. Galeru Pty Ltd has three partners which each supply the marketing company in order to create a critical supply mass and economies of scale when purchasing inputs. Galeru Pty Ltd was originally established as part of an enterprise risk management strategy (Personal communication, Galeru Pty Ltd August 2011).

A typical riberry enterprise grows a combination of native foods and other crops such as seasonal vegetables in order to generate sufficient income to remain viable. In terms of production 100 to 500 trees, with 100 trees per hectare is reasonably typical (Personal communication, Woolgoolga Rainforest Products August 2011).

Riberry enterprises can be classified in terms of who they supply, with a clear bifurcation between larger operations that value add riberry in processed products through niche commercial supply chains and those that choose to distribute relatively simple products in small volumes via farmers markets.

**Product supply chains and markets**
Riberry nursery stock is sourced from either Woolgoolga Rainforest Products or the University of Queensland Gatton’s tree breeding program.

Typically, product harvested on farm is washed, graded, packed and frozen as whole fruit. Frozen whole fruit may be sent to distributors such as Robins Foods for incorporation in products for retail sale or the fruit is processed into pulp by a processor for ongoing sale to various manufactures of products. In 2010 sales were mostly online or direct to tourism related enterprises (e.g. gift shops in regional visitor centres).

Other supply chains make use of contract processors who turn the fruit into pulp and provide storage until the grower is ready to produce retail products. Some growers operate across the whole value chain (i.e. grow and retail value added products) and while they acknowledge that this is somewhat inefficient, it is one way of generating enough income to make a small holding a viable proposition.
Markets and market trends

In 2010 the market is approximately 50% farmers markets and food events; 30% sales through distributors and the balance of sales online. This range of markets is reasonably stable and will not alter significantly until additional fruit volume becomes available. With additional fruit volume larger industry players will be in a position to lower unit prices and attract more significant food manufacturers. Food manufacturers will find the crop appealing when a single source can guarantee a minimum annual supply of 8 to 10 tonnes (Personal communication, Galeru Pty Ltd August 2011).

Indigenous participation

Industry players are not aware of any Indigenous riberry growers or wild harvesters. There are a number of Indigenous chefs, such as Ms Dale Chapman and Leon Donovan who make use of riberry in their cooking.

SWOT

<table>
<thead>
<tr>
<th>Strengths</th>
<th>Weaknesses</th>
</tr>
</thead>
<tbody>
<tr>
<td>• Attractive flavour and colour</td>
<td>• Soft fruit with a short shelf life requiring rapid processing</td>
</tr>
<tr>
<td>• Versatile fruit that can be made into a range of sweet and savoury products</td>
<td>• Requires improved planting material, cultivation methods, harvest methods, education, awareness and market development</td>
</tr>
<tr>
<td>• Good communication and cooperation across the supply base.</td>
<td>• Industry wide product and quality standards (NB: Galeru Pty Ltd is HACCP-certified)</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Opportunities</th>
<th>Threats</th>
</tr>
</thead>
<tbody>
<tr>
<td>• The big challenge is low volume/high value; the industry needs to get to high volume so that it can enter mainstream consumer markets.</td>
<td>• Supply and demand in balance for a small industry but if a large food processor comes along and was interested in riberry, growers would have to quickly increase plantation sizes or augment production through harvesting street trees.</td>
</tr>
<tr>
<td></td>
<td>• Control needed for flying fox in NSW orchards</td>
</tr>
</tbody>
</table>

Research Priorities

R&D Value

• The Native Food R&D program has been of value to the riberry industry. Successes include the flavour wheel for native foods, research on native food health benefits, production research, food safety research and general industry awareness raising activities. Once complete the native food industry stocktake will also be of value.

Future R&D Priorities

• Future R&D priorities for the riberry industry include decreasing the cost of production, increase consumer awareness and mechanisms to drive demand.
• Research that is relevant to the whole native food sector includes agronomy research for all native food species; research to allow us to get away from wild harvest (pepper, bush tomato, Kakadu plum and wattle seed); work on selections/varieties for currently wild harvested species; marketing of native food and business models for financial success.
9. Kakadu Plum

Kakadu plum (*Terminalia ferdinandiana*) is known by a variety of names depending on location including gubinge, mardorr, kabiny, murunga, bush plum, billygoat plum and salty plum. This semi-deciduous tree grows to heights of between 4 and 10 metres, and produces pale green ovoid fruits. It is found in open woodland across Northern Australia from the Kimberley to Darwin and in Queensland. It is wild harvested for use as a food ingredient, in beauty products and increasingly for its functional properties. Kakadu plum has significant antioxidant capacities and contains high levels of vitamin C, vitamin E, lutein, folate and certain minerals (RIRDC 2009; Cunningham *et al* 2008).

Production location

Kakadu plum is wild harvested in the Kimberley region of Western Australia and in parts of the Northern Territory. Harvest occurs during the wet season and is carried out in hot, humid conditions, often in remote locations where roads may be impassable at times. Densities vary greatly and have been measured at more than 500 trees per hectare near the coast in the eastern part of its range. Trees of fruit-bearing age average between 170 and 270 trees per hectare on the coastal strip near Darwin, while a study in North Central Arnhem land reported lower densities, with higher levels ranging from 82 trees per hectare along the coast, to 42 trees per hectare on clay soils 40km inland (Cunningham *et al* 2009).

Enrichment planting for research and training purposes is being undertaken in the Broome area of Western Australia by Aboriginal producers working with the Kimberley College of Technical and Further Education (TAFE). The only large horticultural enterprise established to date was an orchard of 6,000 trees near Darwin. The orchard was established by a private company in the 1990s for commercial (private) research purposes. The orchard was removed following issues associated with exportation of tissue culture to establish an industry in Brazil (Cunningham *et al* 2009).

Product forms and uses

Traditionally, both the fruit and seed of Kakadu plum were eaten raw. The sap was roasted and the bark was boiled and used by Indigenous people to treat skin conditions and sores, or drunk as a tea for colds and flu.

Kakadu plum is fibrous and difficult to process but its market is increasing. Commercial harvest commenced in the late 1990s and Kakadu plum has been used as a food ingredient in jams, chutneys, sauces and sports drinks, and as an ingredient in beauty products including cleansers, body lotions, hand cream and lip balm.

Kakadu plum is also increasingly dried and ground into a powder for use in dietary supplements and health foods in order to capture its health properties. Kakadu plum contains the highest recorded levels of vitamin C of any plant in the world (over 100 times more than oranges). It has five times higher anti-oxidant capability than the blueberry, and importantly, contains both water and oil soluble antioxidants (whereas common fruits and vegetables are low in oil soluble antioxidants). In addition, Kakadu plum has significantly high levels of vitamin E, folate and lutein (a carotenoid compound important for eye health), as well as being a source of minerals including magnesium, zinc and calcium. Its high potassium to sodium ratio may enable the development of foods to reduce hypertension (RIRDC 2009).

Recent research has established that polyphenols extracted from Kakadu Plum (and selected other Australian native fruits) have successfully inhibited the growth of cancer cell-lines. Kakadu Plum demonstrated particular potential in the way it operated in the tests (Tan *et al* 2011).
**Volume and value**

Production volume of Kakadu Plum has been estimated to average between 15 – 17 tonnes per annum from the Northern Territory and Western Australia combined (Cunningham *et al* 2009; Interviewees personal communications 2011). These figures certainly reflect the period from 2004 – 2008, but since then production has decreased with the expiry of a contract between one of Australia’s main buyers of Kakadu plum and an international company specialising in dietary supplements.

**Variability**

In addition to demand fluctuations, production varies from year to year. Like many wild-harvested native foods, weather conditions including drought, bushfires and cyclones may impact on the volume of fruit available. Availability of pickers can also be an issue as harvesting is hot, difficult work which occurs in the wet season and may depend on roads being passable and transport being available. Changes to government programs including the Community Development Employment Projects (CDEP) Program since 2009 have also negatively impacted picking labour. Volume is difficult to estimate with certainty due to the machinations of permit requirements in different states, which may result in some under-reporting of Kakadu Plum harvest (Cunningham *et al* 2009).

**Figure 9.1 Northern Territory permit data for the commercial harvest of Kakadu Plum 1996–06**

![Total annual wild harvest (kg)](image)

In Figure 9.1, solid bars show Wild Harvest Take Permit (allowed to harvest, in kg); open bars show Wild Harvest Return Permit (reported harvest, in kg) (Cunningham *et al* 2009).

Current industry farm gate value is estimated at $240,000 using an average price per kilo of $20 and an average annual volume Australia-wide of 12 tonnes. Kakadu Plum can be bought frozen online for between $40 and $70 per kilo. Online retail prices for processed powder vary from approximately $25 to $35 per 50g sachet.

**Supply status and trends**

Commercial supply of Kakadu Plum has been problematic and its supply status has varied over the last decade. In 2004, it was reported to be oversupplied (RIRDC 2004), but between then and 2008, demand increased and exceeded supply (Montreal PIGA 2008). Despite the expiry of a major international contract, the fruit remains very much in demand, though further market development is needed (Interviewee personal communication 2011).

For use as a food ingredient, demand has been steadily increasing, with the introduction and growth of product lines in mainstream supermarkets and increasing sales of Australian native food products in the tourism and food service industries.
Enterprise characteristics and profile

The Kakadu plum industry involves a range of individuals and enterprises across Australia including traditional owners, land councils, pickers, aggregators, processors, manufacturers and researchers. Harvesters include many Indigenous Australians who pick and sort, and often bag, freeze and deliver the fruit to aggregators. Processing occurs in the Northern Territory, in Broome, in Sydney and in Melbourne. Fruit which will be used for its functional properties must be a certain size and quality and frozen within 24 hours of harvest. Fruit is also sold onto manufacturers and occasionally processed by Indigenous communities into products such as jams and chutneys (Interviewees personal communication 2011).

Nearly all Kakadu plum is collected by wild harvest. In 2009, following concerns about the sustainability of some practice in the Broome area after the initial surge in demand, the Department of Agriculture and Food Western Australia supported the development of a video demonstrating how to pick gubinge ‘the right way’. For over a decade Kimberley TAFE has been promoting cultivation via practical training as a way to maximise the involvement of Aboriginal communities in a culturally appropriate commercial enterprise. A model of “enrichment planting” has been trialled, where trees are planted within existing areas of bush with minimal clearing and therefore supposedly reducing the impact on biodiversity and soil. In another enterprise, one Indigenous harvester reports a significant increase in the quality and amount of fruit obtained from lands that are managed according to traditional Indigenous land management practices.

A number of Indigenous communities have value-added by making products such as jams, chutneys and cordials, but this has been on a small scale to date. There are only a handful of aggregators who purchase from Indigenous communities. One of these, based in Broome was Indigenous Harvest Australia (IHA) which grew out of a local Community Development Employment Project (CDEP). IHA was an Indigenous-owned cooperative which was incorporated in 2006 in order to support local family groups to create a viable commercial enterprise. At that time, IHA had five family groups from the West Kimberley region which purchased shares in the cooperative and sold their fruit to the enterprise. Since then, one family has re-established an independent operation. In the Northern Territory, Wild Harvest NT purchases 300 – 400kg per annum from local Indigenous communities, as well as harvesting several tonnes from Crown land.

Processors / manufacturers of Kakadu Plum include:

- Robins Foods, one of Australia’s largest manufacturers of native foods, uses Kakadu plum in their Outback Spirit range as a food ingredient in sauces and rejuvenating waters.

- Coradji Pty Ltd – a small Sydney-based company which processes the fruit into a freeze-dried powder and frozen puree. Coradji purchased up to 12 tonnes per annum during their five year contract with an international dietary supplement manufacturer, Mannatech, but currently purchase minimal amounts while undertaking market development.

- Wild Harvest NT is a processor and wholesaler of Kakadu plum based in the Northern Territory where the company wild harvests 5 – 7 tonnes from Crown land and also purchases from Indigenous pickers (300 – 400kg per annum).

- Loving Earth is a Melbourne based company which sources cacao and other functional foods from around the world and manufactures food products according to their three key principles: healthy, sustainable and fair. The company sources many products from Indigenous communities around the world, including Kakadu plum (here called Gubinge), which is dried and processed into a powder. All profits go back to the local community from which they source supply.
Product supply chains and markets

The Kakadu plum supply chain starts with pickers who wild-harvest the fruit, sort it and deliver it to aggregators. Pickers are sometimes reliant on the availability of transport, perhaps from community rangers. The fruit is bagged and frozen by the harvester or aggregator, then transported for further processing, which can be complex and expensive. In the Northern Territory, the main harvester also processes the fruit and sells it wholesale either frozen whole or pureed, or in the form of a dried powder or a liquid extract. All products are certified organic and have HACCP and Freshcare accreditation. Another processor buys the frozen fruit and ships it to Sydney, where some processing occurs, then to Melbourne where it is freeze-dried, then back to Sydney for further processing. One manufacturer uses Kakadu plum in food products, another in beauty products, and several in health food supplements.

Markets and market trends

There is an enormous potential market for Kakadu Plum. Demand is growing for it as a food ingredient both in Australia and internationally, but many believe that the real potential lies in the increasing interest in its functional properties, particularly its extremely high levels of Vitamin C and antioxidants. However, further research and development is necessary before such an international commercial market can be realised, and a stable supply of large quantities of Kakadu plum year after year would be required - upwards of 15 or 20 tonne per annum. Such supply is not available at the present time.

The well-documented health properties of the Kakadu Plum have led to interest from major health and cosmetics companies globally. By 2008, prior to some of the recent research into Kakadu plum’s functional capacities, it had been reported that over 17 companies globally had identified *T. Ferdinandiana* as an ingredient in new product development (Cunningham *et al* 2009). The export of seeds and germplasm has created unease about the potential for product development, market share and profits to be lost to overseas enterprises, especially at the expense of Indigenous Australians (Cunningham *et al* 2009).

Indigenous participation

Wild harvest provides an opportunity for Indigenous communities to benefit economically and in other ways by participating in the industry (Cunningham *et al* 2009). But there are a number of challenges to the development of economically viable and environmentally sustainable enterprises including the need for joint ventures, branding and certification and the need to protect intellectual property rights (Cunningham *et al* 2008).

Relationships with Indigenous communities take time to develop and different enterprise models will work for different communities. In some areas, the community will only be interested in wild-harvest, whereas in others, enrichment planting might be appropriate and supported. Horticulture is not well-established as a way of proceeding in Indigenous Northern Territory, but plantings may be a possibility in some places (Interviewees personal communication 2011).

One of the key challenges facing the industry is how to maintain profitable Indigenous involvement and ownership while also supporting significant growth in supply to take advantage of commercial market opportunities.
SWOT

<table>
<thead>
<tr>
<th>Strengths</th>
<th>Weaknesses</th>
</tr>
</thead>
<tbody>
<tr>
<td>• Functional food properties</td>
<td>• Low volumes and large costs make wild harvest a marginal activity</td>
</tr>
<tr>
<td>• Strong name recognition</td>
<td>• Unstable supply, inconsistent market demand</td>
</tr>
<tr>
<td>• Increasing demand as a food ingredient in food service and retail industries</td>
<td>• Branding an issue for producers with no link to Kakadu World Heritage Area</td>
</tr>
<tr>
<td>• Time from seed to fruit less than five years, so lead time to increase production not too long.</td>
<td>• R&amp;D gaps - international market research and enrichment planting requirements.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Opportunities</th>
<th>Threats</th>
</tr>
</thead>
<tbody>
<tr>
<td>• Demand from multinationals within the health food, pharmaceuticals and cosmetics industries – strong potential growth</td>
<td>• Loss of intellectual property and plant rights to multinationals</td>
</tr>
<tr>
<td>• Involvement of Indigenous communities in culturally appropriate commercial enterprises</td>
<td>• Potential for overseas development of orchards, processing and markets</td>
</tr>
<tr>
<td>• Enrichment planting to improve density and cost efficiency</td>
<td>• Loss of Indigenous ownership and involvement</td>
</tr>
<tr>
<td>• RD&amp;E to support industry development</td>
<td></td>
</tr>
</tbody>
</table>

Research Priorities

RD&E is critical before potential growth in production to realise commercial market possibilities can occur. Trials are needed examining issues including:

- Best planting stock
- How best to germinate
- Enrichment planting
- Fertiliser requirements
- Production costs

Research priorities also include:

- Therapeutic uses of Kakadu Plum – clinical trials following up from work by Tan et al 2011
- Intellectual property issues and management strategies
- Market development
- Health and functional capacities of sap and bark of Kakadu Plum
- Enterprise models to support Indigenous involvement and ownership
- The potential for a carbon market associated with enrichment planting of Kakadu Plum
10. Muntries

Muntries (*Kunzea pomifera*) are found along Australia’s southern coast in Victoria and South Australia. They are also found in the Big Desert region of North West Victoria. In the wild, the shrub takes the form of ground cover, with radial branches spreading for up to three metres. Aboriginal names include Munta, Mantirri and Mantari, and muntries are also known as munterberries and munthari. Flowering occurs from late Spring to early Summer and fresh fruit is available in February and March and in some locations through to May. The berries are up to 1 cm in size, green to red in colour, with a purplish tinge appearing as ripening occurs. The flavour is spicy apple. Muntries can be eaten fresh, used in desserts and salads, or processed into a range of products (Page, 2004; Ryder *et al* 2008; Vincent 2009). Like many Australian native fruits, muntries have significantly higher antioxidant capacity than blueberries (Netzel *et al*, 2007).

**Production location**

In the wild, muntries grow along the coast with occasional inland extensions. They occur from Portland in Victoria to the Eyre Peninsula and Kangaroo Island in South Australia. In 2003, it was reported that most of the fruit that was reaching the market at that time was wild harvested (PIRSA 2006). Since then, cultivation of muntries has increased significantly, with nearly all commercially traded fruit now grown under cultivation. Production remains concentrated in the areas where muntries naturally occur, including at three Aboriginal communities in Meningie, Murray Bridge and Mt Gambier (Interviewees personal communication 2011).

**Product forms and uses**

Traditionally, muntries were highly valued by Aboriginal populations in Victoria and eastern South Australia. The fruit was eaten fresh or dried or baked into cakes for the winter. Muntries were traded with other tribes by theNarrungjeri people and used by early non-indigenous settlers in cakes and chutneys (ANFIL 2011).

Commercially, muntries are traded fresh, frozen or dried. They are used in salads or desserts or processed into a variety of products such as pies, juices, chutneys, jams, sauces, fruit straps and ice-cream (Schultz *et al* 2009; Interviewees personal communication 2011).

**Production volume and variability**

**Volume and value**

In 2010, total muntries production was between 6 and 10 tonnes, in line with reported total production a decade ago (CSIRO 2004). There is greater harvest capacity than is currently being realised as there are at least five thousand plants in the ground that are not being harvested. (Interviewees personal communication 2011).

Industry reports of current farm gate prices for muntries range from $12 to $25 per kilo. Industry farm gate value is estimated at $72,000 to $108,000 using an average price per kilo of $18.

At the retail level, frozen muntries are selling for $36 per kilo (standard) and $42 per kilo (premium). Some companies are charging up to $45 per kilo and $8.95 for 100g sachets.

**Variability**

Muntries supply has become more reliable and consistent with the shift from wild-harvest to cultivation over the fifteen years to 2010. However, some in the industry are concerned that one of the most popular cultivars is comparatively bland and better cultivars are needed (Interviewees personal communication 2011).
Supply Status and Trends

Muntries are oversupplied for the current market. Although some growers are selling all their fruit, others have been unable to do so and several report needing to value-add themselves in the absence of buyers (Interviewees personal communication 2011). All agree that further market development is needed.

Enterprise characteristics and profile

Ten years ago, wild harvest of muntries was reported to be the main source of supply (PIRSA 2006). Cultivation has since become the primary source of commercial supply for several reasons including the need for consistent levels of production and concern about the environmental impact of wild harvest. In addition, the quality achieved via cultivated, trellised plants is higher and more reliable, and toxicology is consistent (PIRSA 2006; Interviewees personal communication 2011).

By 2009, approximately 10,000 plants were being grown commercially in South Australia and Victoria by about 12 – 15 growers (Schultz 2009). These numbers have remained static or possibly decreased slightly, due to the lack of market growth.

Enterprises vary greatly in size and scale. At one end of the spectrum sit individual growers who produce a range of native foods, and undertake their own processing, sales and marketing. At the other end are larger commercial operations, some of which are vertically integrated.

Product supply chains and markets

Muntries are harvested by hand and sieved or winnowed to remove foreign matter. They are graded on farm for size and quality. They are packaged and once frozen can be stored for up to 24 months (Ryder 2008). Producers sell to wholesalers and processors, although some growers also process and value-add themselves on site, then sell their products online and at cafes, markets, specialty food stores and tourist outlets.

One of the native food industries largest commercial operations, Outback Pride, uses muntries in its products. Outback Pride is a grower, manufacturer and wholesaler of a wide range of native foods and value-added products. Their supply chain starts at the nursery where research and development, plant supply and scheduling based on market requirements is undertaken. Growing occurs on site at Reedy Creek nursery and in Aboriginal communities with whom growers agreements have been negotiated. Post-harvest activity also occurs back at Reedy Creek and includes grading, freezing and storage. Manufacturing occurs at a factory located next to the nursery at Reedy Creek and the whole supply chain is fully HAACP accredited from the nursery through to the end products. Marketing is undertaken via a network of distributors in each state and territory.

A Muntries Group was established by the South Australian Native Food Association (SANFA) in 2011. This group aims to promote the muntries industry and enable coordination and information sharing between members, as well as seeking support for research and market development (SANFA 2011).

Markets and market trends

The current market for muntries parallels that of many other Australian Native foods. There is consistent demand from the food service industry and processed products are sold via food speciality stores, tourist outlets, at markets and food events and increasingly online. Some muntries products have been exported to Canada, with interest in the pharmaceutical benefits (high levels of antioxidants) from a German company several years ago (Interviewees personal communications 2011). However, muntries are not used as widely throughout the industry as many other native foods.
The hoped-for surge in demand that led to significant increases in cultivation over the last 10 years has not yet occurred. Some growers report that value-adding is required to make growing muntries commercially viable. There is strong agreement among muntries growers and processors that significant market development is required for industry growth. A 2009 study which explored consumer acceptability of a range of muntries products found that muntries have broad consumer appeal, but that greater consumer awareness about muntries and their health benefits is needed before market demand will increase. The necessary investment in plant-improvement is unlikely to occur without this increased demand (Schultz et al 2009).

**Indigenous participation**

Muntries are cultivated by three Aboriginal communities under the Outback Pride project at Meningie, Murray Bridge and Mount Gambier.

Over the last decade there has been a shift from the wild-harvest of muntries to cultivated supply, driven by the variability of wild-harvest volume year to year. It has been reported that this shift has benefitted non-Aboriginal producers more than Aboriginal people (Cunningham et al 2008).

**SWOT**

<table>
<thead>
<tr>
<th>Strengths</th>
<th>Weaknesses</th>
</tr>
</thead>
<tbody>
<tr>
<td>• High levels of consumer acceptability when tasted</td>
<td>• No clear flavour advantage</td>
</tr>
<tr>
<td>• Significant antioxidant capacity.</td>
<td>• Oversupplied</td>
</tr>
<tr>
<td>•还需进一步的育种改良</td>
<td>• Need for further cultivar development</td>
</tr>
<tr>
<td>• 需要提升消费者对muntries的意识</td>
<td>• Lack of consumer awareness.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Opportunities</th>
<th>Threats</th>
</tr>
</thead>
<tbody>
<tr>
<td>• Clonal selection for colour and flavour</td>
<td>• lack of funding for long-term research required for develop a new cultivar</td>
</tr>
<tr>
<td>• Formation of SANFA Muntries Group.</td>
<td>• Lack of market development</td>
</tr>
<tr>
<td></td>
<td>• Some growers are struggling to contain a disease which is little understood and is referred to as ‘dieback’ by the industry.</td>
</tr>
</tbody>
</table>

**Research Priorities**

**R&D Value**

The industry expressed general awareness and support for RIRDC’s research. However, there was some concern that potentially significant research is not followed up with further work and that the three year funding cycle is not long enough to produce the outcomes which are required in some cases e.g. developing cultivars (Interviewees personal communication 2011).

**Future R&D Priorities**

- Market development
- New cultivars required for successful commercialisation - longer-term research than 3 year project
- Further work on toxicology and nutritional and health benefits
- Improve uniformity of yield, quantity and quality of produce (Ryder 2008)
- Research to lower cost of harvesting (mechanisation) would be useful
- Research into salinity tolerance of muntries (to enable muntries to be grown in degraded land)
11. Lemon Aspen

The name ‘lemon aspen’ has commonly been used in the native food industry to refer to two species: *Acronychia acidula* and *Acronychia oblongifolia* (RIRDC 2004). The latter is also known as southern lemon aspen or white aspen. The former, *Acronychia acidula*, has been described as the ‘true’ lemon aspen, and is increasingly accepted as such in the industry. Recent research has focused solely on the *acidula* species (Konczak 2009; Zhao 2007) and some wholesalers and suppliers list only this species on their product and price lists.

*Acronychia acidula* is a rainforest tree which grows to 15 metres in the wild. It is native to tropical north Queensland and the Atherton Tablelands where it is known locally as ‘pigeon berry,’ and produces small yellow fruit, about 1.5cm to 2.5cm in diameter, with a core much like an apple core, but shaped like a star. The fruit has a spicy, citrus aroma and a strong lemon and grapefruit flavour (PIRSA 2001). *Acronychia oblongifolia* is a slightly smaller tree that grows on the east coast from northern Victoria to southern Queensland in sub-tropical areas where rainfall exceeds 600mm. Its fruit is white to pale lemon in colour, and can be eaten whole as the core is softer and the flavour less intense (Ryder 2008; CSIRO 2005).

*Acronychia acidula* has higher anti-oxidant capacity than blueberries and is a very good source of folate and iron (Konczak 2009).

Production location

Lemon aspen is grown commercially on the Atherton Tablelands in far north Queensland, in northern NSW and in south east Queensland. Wild harvest has been an important source of supply (RIRDC 2004) but reliance on wild harvest is decreasing as cultivation increases. Production is dominated by a few Queensland producers (Interviewees personal communication 2011).

Product forms and uses

Lemon aspen is generally traded whole frozen or as a juice. It is used in an increasing range of value-added products. It is processed into sauces, dressings, jellies, chutneys and relishes, dried and ground for use in spice mixes, used as a flavouring for mineral water and cordial and also in a fruit wine. Lemon aspen in very popular in the food service industry.

Production volume value and variability

Volume and value

Total production of lemon aspen in 2011 was between 2.5 and 5 tonnes, a level similar to the volume reported for 2007 (Foster 2009). Farm gate prices varied quite widely in 2011, from $12 - $18 dollars per kilo for processing grade fruit to a high of $26 per kilo for premium grade. Based on an average farm gate price of $15 per kilo (as most fruit was sold for processing), the industry had a farm gate value of between $37,500 and $75,000 (Interviewees personal communication 2011).

Most lemon aspen is processed into value-added products or sold to the food service industry, but whole frozen fruit can be bought online for $27 - $36 per kilo.

Variability

One NSW grower reported that lemon aspen is susceptible to several of the bugs which attack macadamia trees, but in general supplies of both species are of consistent quality for its primary use as a processed product. Production is stable.
Supply status and trends

There is general agreement in the industry that lemon aspen is undersupplied in 2011 – a reversal of the situation in 2004 (RIRDC 2004). Many industry players report that supplies of lemon aspen can be difficult to secure and that demand is growing (Interviewees personal communication 2011).

Enterprise characteristics and profile

Wild harvest in the rainforests from central to northern Queensland was an important source of lemon aspen supply in the past (RIRDC 2004). However, wild harvest is gradually being replaced by cultivated supply. There are several commercial producers on the Atherton Tablelands. In south east Queensland and northern NSW, growers tend to have smaller plantings of lemon aspen as part of polycultural plantings.

Product supply chains and markets

On farm, lemon aspen is harvested by hand, sorted to remove any leaves or twigs, washed and refrigerated within 12 – 24 hours of harvest. It maintains colour and taste when frozen and can be stored for up to 24 months. Several of the larger producers of lemon aspen undertake processing on site, while other growers sell their fruit to restaurants, food service depots or processors.

Markets and market trends

Many players in the native food industry are excited about lemon aspen and its market potential, with growers reporting that demand outstrips supply and is growing fast (Interviewees personal communication 2011). Food service remains its primary market, although the number of value-added products which contain lemon aspen is increasing.

Indigenous participation

There are no known Indigenous producers of lemon aspen. A project supported by James Cook University and Innisfail TAFE aimed to enable the Ma:Mu community to develop superior cultivars of a variety of species including lemon aspen, and ultimately operate a plant nursery and orchard. At last report the project had been interrupted by Cyclone Yasi.

SWOT

<table>
<thead>
<tr>
<th>Strengths</th>
<th>Weaknesses</th>
</tr>
</thead>
<tbody>
<tr>
<td>• Appealing flavour</td>
<td>• Production constraints including the need for improved planting material and better cultivation methods</td>
</tr>
<tr>
<td>• Health benefits including anti-oxidant capacity, folate and iron</td>
<td>• Lack of industry capital</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Opportunities</th>
<th>Threats</th>
</tr>
</thead>
<tbody>
<tr>
<td>• Capitalise on growing popularity in the food service industry</td>
<td>• Inability to meet market demand due to lack of volume</td>
</tr>
<tr>
<td></td>
<td>• Pests, disease, hail and cyclones</td>
</tr>
</tbody>
</table>
Research Priorities

R&D Value
Lemon aspen growers were generally aware and very supportive of the RIRDC Native Foods Research and Development Program and several specifically mentioned the research which has been undertaken into the health benefits of native foods as particularly relevant and useful.

Future R&D Priorities
- Improved planting material
- Better cultivation methods
- Further product and market development
12. Desert Limes

Desert lime (*Citrus glauca*) is also known as bush lime, wild lime or native cumquat and is endemic to the semi-arid regions of south west Queensland, western NSW and South Australia. The desert lime has blue-grey leaves and prickled branches. However when the trees grow above the height of a large kangaroo - about 2 metres – it no longer grows thorns. Desert lime can grow to a height of 10m. But average height mature trees are likely to be about 5 metres. The small grape sized fruit can be picked green and have a pleasant, refreshing and tangy taste with a distinctive lime flavour. The fruit has a thin rind, is often seedless and can be used in cooking. Desert lime has excellent processing and culinary fruit qualities (ANFIL website, August 2011). Recent CSIRO analysis of desert lime indicates they have high levels of vitamin C, folate and antioxidants (Konczak et al 2009).

Production location

An industry based on desert lime was established in the early 1990s (Macintosh in RIRDC 2004). In 2011 desert lime production is dominated by a single south western Queensland plantation of 32 ha. The balance of production is wild harvest. Smaller ‘superannuation’ style blocks are being planted throughout the eastern states with grafted Plant Breeder Right (PBR) trees supplied by the dominant plantation.

Product forms and uses

Desert lime is an extremely versatile fruit. It can be used fresh or processed in any product or process where Tahitian limes are used. Desert limes differ from Tahitian limes in their smaller size and more intense flavour (Macintosh in RIRDC 2004). Typical desert lime uses are as per the table below.

### Table 12.1 Desert Lime Product Forms and Uses

<table>
<thead>
<tr>
<th>Processing Method</th>
<th>Desert Lime Products</th>
</tr>
</thead>
<tbody>
<tr>
<td>Canning</td>
<td>• Segments, slices, fruit salads</td>
</tr>
<tr>
<td>Preserving</td>
<td>• Preserves, brined peel, candied products, pickles</td>
</tr>
<tr>
<td>Pulp</td>
<td>• Bases for: soft drinks, preserves, confections, cakes, sauces/dressings</td>
</tr>
<tr>
<td>Juice</td>
<td>• Single strength juice, concentrates, syrups, dehydrated juice</td>
</tr>
<tr>
<td></td>
<td>• Bases for: soft drinks, preserves, confections</td>
</tr>
<tr>
<td>Essential oil</td>
<td>• Flavourings, chemicals</td>
</tr>
</tbody>
</table>

Source: Adapted from Macintosh in RIRDC 2004 and the ANFIL website, August 2011

On farm, desert limes are graded into three sizes prior to sale. Small fruit are graded for manufacturing (e.g. jams and chutneys); medium sized fruit are preferred by chefs and restaurants who use them whole; and large desert limes are bottled, preserved in syrup and retailed by the grower (Interviewees communication 2011).

Production volume, value and variability

**Volume and value**

In 2004 total desert lime production was estimated at 25 tonne per year (Macintosh in RIRDC 2004). In 2011 the harvest was 10 tonnes plantation grown. Historically wild harvest has contributed between 15% and 25% of total desert lime supply. Wild harvesters have not been able to secure a supply of desert limes since the mid-2000s. Wild harvest has been constrained by severe and widespread drought (Interviewees communication 2011).
At the farm gate, small desert limes sell for approximately $15/kg, medium for $18/kg; and large for $20/kg. Puree sells for $18/kg (Interviewees communication 2011). Desert lime prices are similar to those reported by the industry in 2004 and are forecast to erode as more plantation grown fruit becomes available and the industry shifts from ‘cottage’ to ‘commercial’ production.

Industry farm gate value is estimated at $225,000 per annum using an average farm gate price of $18/kg and an annual average production of 12.5 tonnes. Retail products containing desert lime are estimated to achieve domestic and export sales totalling more than $1.5 million per annum.

**Variability**

Production is variable. Wild harvest is dependent on seasonal conditions and even production from plantation grown desert limes is subject to water availability. Severe droughts limit irrigation water supply and hence desert lime harvest. Production variability is forecast to diminish as the supply base increases and becomes more diversified and reliance on wild harvest continues to decrease.

**Supply status and trends**

In 2011 desert lime is over supplied for the small boutique markets the industry has agreed to supply. The industry has refused to supply markets until it can guarantee product delivery. The industry’s major grower has puree in store. However, recent agreements to supply a major manufacturer are expected to change market dynamics. As this new contract matures desert lime will move from oversupply to undersupply and will remain in this state until new and planned plantations come into production. By 2016 annual production is forecast to double to 25 tonnes per annum.

**Enterprise characteristics and profile**

The single large enterprise of 32 ha is planted with 10,500 trees, approximately one third of which are currently bearing age. The plantation is trickle irrigated and water availability, rather than market potential, will ultimately limit expansion of this business. The plantation currently harvests desert limes by hand but there is potential for mechanical harvesting of manufacturing product (most of the industry’s output).

The plantation grows and markets its own desert lime products but outside of bottling it does not manufacture. Manufacturing is completed by contract processors. A number of specialist processors are currently marketing processed native citrus products including desert limes. The major processors include:

- Tuckeroo Food Service and Retail Products
- Australian Desert Limes Pty Ltd
- Australian Harvest Fine Foods Pty Ltd
- Byron Bay Native Produce Pty Ltd
- Cherikoff Food Services Pty Ltd
- Kurrajong Food Services Pty Ltd
- Rainforest Foods Pty Ltd
- Rainforest Liqueurs Pty Ltd
- Robins Australian Foods Pty Ltd
- Taylors Food Pty Ltd
- Tuckombil Native Foods Pty Ltd

Most of these companies operate at more than one level in the supply chain i.e. they manufacture, wholesale, retail and trade frozen desert lime and desert lime products.
Product supply chains and markets

On farm, product is harvested, washed, graded and frozen. Premium grades are sold in a frozen whole form. Medium and large blemish free fruit are sold to the restaurant trade or preserved in syrup. Small and second quality desert limes are sent to a processor for manufacture into puree. Puree is packed into 22kg bags for sale to the food and beverage industry. Desert lime sales are online, to retail and through farmer and other markets. Retail sales are the most cost effective to service. Small online orders are time consuming and only marginally profitable. Use of distributors to access delicatessens was tried but found not to be to be cost effective. EU exports are subject to import tariffs and are currently constrained by a high Australian dollar.

Markets and market trends

The desert lime industry is on the cusp of transition from niche to commercial production. Direct retail sales will continue to be important but the industry’s future appears to lie in the provision of reasonably priced puree for use in gourmet manufactured products. Intensely flavoured desert limes require only a fraction of the volume of other limes. Consequently manufacturers can afford to pay a premium for the cachet of a native, ‘desert’ fruit used in small volumes in a complex manufactured product.

Indigenous participation

The major desert lime grower has employed local Aboriginal people in his business and worked with local Aboriginal people to explore opportunities for plantation establishment of Aboriginal land. There are currently a number of Indigenous groups in both South Australia and Queensland exploring desert lime production (see for example http://www.outbackpride.com.au/communities/mimili). There are no known Indigenous producers or supply chain participants active in the industry at the current time.

SWOT

<table>
<thead>
<tr>
<th>Strengths</th>
<th>Weaknesses</th>
</tr>
</thead>
<tbody>
<tr>
<td>• Minor use permits and registered chemicals are available for desert lime</td>
<td>• Long lead time after planting combined with inability to supply from wild harvest means that there is a supply bottleneck</td>
</tr>
<tr>
<td>• Desert limes last fresh for up to 6 months</td>
<td>• Sensitive to harvest time and post-harvest handling</td>
</tr>
<tr>
<td>• Readily hybridise with commercial citrus varieties to produce interesting new products</td>
<td>• Lack of market familiarity and understanding</td>
</tr>
<tr>
<td>• Desert limes have not been affected by many of the pests and diseases that afflict traditional commercial citrus orchards</td>
<td>• Tristeza virus presence in Qld citrus means that no citrus nursery stock can be sold interstate (but solutions in pipeline).</td>
</tr>
<tr>
<td>• Success in supermarket stocking</td>
<td></td>
</tr>
<tr>
<td>• Success in export sales – UK supermarkets, US, Germany and Canada.</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Opportunities</th>
<th>Threats</th>
</tr>
</thead>
<tbody>
<tr>
<td>• Mechanical harvesting possible for fruit destined for processing</td>
<td>• Loss of Australian IP if desert limes are allowed to be grown offshore e.g. Israel has requested desert lime trees.</td>
</tr>
<tr>
<td>• Further establishment of plantations and getting away from wild harvest to ensure consistent supply.</td>
<td></td>
</tr>
<tr>
<td>• Development of desert lime ‘co products’ including nutraceuticals.</td>
<td></td>
</tr>
</tbody>
</table>
Research Priorities

R&D Value
- Native Food R&D program has been useful. Key projects have included research on the health benefits of native foods.
- The flavour wheel research project was of no value / not accurate for desert limes. It is noted that flavour descriptors were targeted to the manufacturing market and sometimes didn’t sound terribly attractive as was the case for desert lime.

Future R&D Priorities
- Need an industry policy on allowing native food plants to be taken off shore e.g. Israel request for trees
- Map occurrence of desert limes in the wild – Jock Douglas, Australian Desert Limes has worked with researchers to scope a project
- Understanding desert lime pathogens and insect pests – Australian Desert Limes Pty Ltd has discovered new species of galling insects which are a pest of economic significance.
- Assistance with trialling new product ideas including nutraceuticals. Desert lime is a very good source of vitamin C, lutin, folate, potassium, vitamin E and antioxidants.
13. Finger Limes

The Australian finger lime (*Citrus australasica*) is one of six citrus species native to Australia. It occurs naturally in the border ranges of south east Queensland and northern New South Wales, where it grows as an understory shrub or tree in sub-tropical rainforest. The trees are thorny, grow to 6 m in height and produce finger-shaped fruit up to 12 cm long. Unlike other citrus, the finger-lime has separate pulp-vesicles, which are compressed inside the skin and burst out when it is cut open, resembling caviar in appearance. In the wild, finger limes are very diverse, with skin colour ranging from yellow-green to crimson, purple, and black, and the colour of the fruit inside also varies. Pulp colours of green, yellow, red and pink have all been recorded in the wild (Hardy *et al* 2010, Birmingham 1998).

### Production location

Finger limes’ natural distribution is from the Richmond River in NSW to Mount Tambourine in Qld, in the sub-tropical rainforests of the border ranges (Birmingham 1998). Commercial plantings occur mainly within this natural reach, although there are a few plantings along the coast, as far south as Sydney and one nursery is located at Bundaberg in Queensland (Hardy *et al* 2010, Interviewees personal communication 2011).

### Product forms and uses

Finger limes are traded fresh or frozen. Their attractive colours and caviar-like appearance make them popular as a presentation aid in restaurants, as a garnish with seafood and desserts, sprinkled on soups or added to salads. The pulp is also used in dressings, jams and sauces, and can substitute wherever ordinary lemon is used, including as a rind in cakes and muffins. Whole finger limes (or their pulp) can be snap frozen and thawed without loss of shape or flavour, so they are available all year round. Finger limes are also used in a range of beauty products (ANFIL 2011, Hardy *et al* 2010, Interviewees personal communication 2011).

### Production volume, value and variability

#### Volume and value

Total finger lime production in Australia in both 2009 and 2010 has been reported at 10 tonnes per annum. The industry continues to grow and production volumes for 2011 are estimated at 11 - 12 tonnes (Hardy *et al* 2010; Interviewees personal communication 2011).

In 2004, finger lime prices were reported to range from $25 - $80 per kilo (RIRDC 2004). Prices have fallen marginally over the last seven years as the industry has expanded, and may fall further as more fruit becomes available (Interviewees personal communication 2011). In 2011, prices vary according to the grade of the fruit, as shown in Table 13.1.

Given that over 50% of finger limes are currently exported, an average industry farm gate price per kilo of $35 is appropriate. This translates to an industry farm gate value of between $385,000 and $420,000 in 2011.

#### Table 13.1 Estimated Farm Gate and Retail Value of Finger Lime 2011

<table>
<thead>
<tr>
<th>Grade</th>
<th>Farm Gate per kilo</th>
<th>Retail per kilo*</th>
</tr>
</thead>
<tbody>
<tr>
<td>Premium/ Export</td>
<td>$45 - $55</td>
<td>$52</td>
</tr>
<tr>
<td>Domestic</td>
<td>$20 - $30</td>
<td>$42</td>
</tr>
<tr>
<td>Processing</td>
<td>$12 - $15</td>
<td>$32</td>
</tr>
</tbody>
</table>

*Retail values are based on sales within Australia. Retail figures for exports are not available.

Source: Hardy *et al* 2010; Interviewees personal communication 2011; Analysis of online retail prices
**Variability**

The volume and quality of finger limes are much more consistent than in the late 1990s. This is due to the move away from wild-harvest and the development of grafted cultivars which produce high quality, uniform fruit earlier and more consistently than seedlings. However, only some varieties are suitable for commercial production, and the Australian Finger Lime Growers Association has warned growers to seek advice when establishing plantations, as some varieties remain fresher for longer in cool storage. Volume can still be affected by weather conditions, and 2010 saw high losses due to wet weather (Hardy *et al* 2010, Interviewees personal communication 2011).

**Supply status and trends**

Both the Global Financial Crisis (GFC) of 2008-09 and ongoing economic uncertainty in Europe in 2011 have impacted on demand for finger limes. Access to US markets has not yet been attained.

Despite these factors, demand for finger limes continues to grow and demand for premium grade fruit outweighs supply for the predominantly restaurant and export markets currently accessed (Hardy *et al* 2010). Volumes are still small but are expected to rise over the next five years as the number of growers increases and fruit from new trees comes on line. By 2016 annual production is forecast to increase by 50% to between 15 and 20 tonnes per annum (Interviewees personal communication 2011).

**Enterprise characteristics and profile**

In 2011, all finger limes traded in Australia are cultivated. There is virtually no wild-harvest (Interviewees personal communication 2011). Like other commercial citrus trees in Australia, finger limes are propagated using budwood, not grown from seed (as trees grown from seed are not always true to type, grow more slowly and take longer to produce fruit). Over the last 20 years, a range of cultivars have been developed. One is protected by Plant Breeders Rights (PBR): *Citrus australasica var. sanguinea*. It is owned by A T Eyles and Sons and is available from their nursery in Kenthurst NSW, where they also propagate two other finger lime selections. Most other cultivars have been developed by Judy Viola, a finger lime grower and pioneer from the NSW north coast, who has registered five cultivars with the Australian Cultivar Registration Authority (NB: ACRA registration is not the equivalent of PBR) and has two more pending. These cultivars are available from the Judy Viola Citrus Nursery at Bangalow (Hardy *et al* 2010).

The industry estimates that there are around 25 finger lime growers in northern NSW and south east Queensland. One nursery and plantation is located at Bundaberg in Queensland. Most commercial plantations are between 100 and 300 trees, though there are some medium plantations of 500 - 1000 trees and a few large plantations with between 2500 and 5000 trees. Some growers produce finger limes along with other native foods; others grow finger limes as one of a range of both native and non-native citrus products. While some growers value add and sell directly at markets, to restaurants and online, many are also linked to one of two marketing groups: Wild Finger Lime (Citrus Caviar) or Finger Limeing Good (Limeburst). (Interviewees personal communication 2011).

The Australian Fingerlime Growers Association (AFGA) supports growers with information and advice, and represents their interests to state and federal governments, research institutions and the native food industry more widely.

**Product supply chains and markets**

Finger limes are very delicate and care must be exercised throughout the supply chain. On farm, harvest is done by hand, selecting fruit that is fully ripe, as finger limes do not ripen once off the tree. Harvest is repeated every 10 – 14 days over a period of 6 – 8 weeks, or for some cultivars for several months. As with other citrus varieties, fruit must not be picked wet, or oleocellosis may develop. Fresh
fruit has a shelf life of 4 – 5 weeks if stored correctly (cool room at 5° – 10°C) and can be snap frozen whole or as a pulp and stored for 3 – 6 months (Hardy et al 2010).

One of the main marketers of finger limes on the NSW north coast receives sorted fruit from other growers, which is then re-sorted, chilled and packed in HACCP accredited facilities. The fruit is transported in chilled-transport to sheds for distribution in Australia, or straight to the airport for export in logo-branded boxes designed for the international market. Another supplier in the region buys fruit that is less than premium grade from local growers and uses it in value-added products or sells it to local fish shops throughout the region (Interviewees personal communication 2011).

**Markets and market trends**

Over 50% of finger limes are currently exported to Europe and Asia, where demand is growing rapidly. In 2011, Limeburst Fingerlimes won the Fruit Logista Innovation Award which was announced at a major international trade fair for fruit and vegetable marketing in Berlin. Access to the United States market is currently being sought by the Australian Fingerlime Growers Association on behalf of the industry, and demand is expected to be strong (Interviewees personal communication 2011).

Domestically, finger limes are used in restaurants, fish shops and some fruit is sold to the major fruit markets in Sydney, Melbourne and Brisbane. One of Australia’s larger native food processors produces a finger lime curd and a finger lime marmalade which are available domestically and exported. Several growers produce and market jams, syrups and beauty products online and via tourist outlets and specialty stores. More value-added products are currently under development (Interviewees personal communication 2011).

**Indigenous participation**

Several indigenous communities in northern NSW have explored the development of commercial native food plantations over the last few years. However, these have not been established to date, and industry players are not aware of any other participation in the finger lime industry by indigenous Australians (Interviewees personal communication 2011).
SWOT

**Strengths**
- Appealing taste and appearance
- Retains shape and flavour when frozen so available all year round
- Hybridised with commercial citrus varieties to produce new products
- Not affected by many of the pests and diseases that afflict traditional commercial citrus orchards
- Success achieved in marketing overseas.

**Weaknesses**
- Sensitive to harvest time and post-harvest handling
- Internal industry politics including lack of information sharing and lack of cooperation by some players.

**Opportunities**
- Access to US market
- Further development of value-added products to use processing grade fruit
- Further development of Australian market and structured marketing opportunities
- Growth of industry cooperation and voice via Australian Finger lime Growers Association
- Growth of industry size and change to commercial operations to meet burgeoning international demand.

**Threats**
- Planting of varieties which are not suitable for commercial production
- Further global economic uncertainty or recession
- Climate change
- Lack of capacity of some industry players to make the leap to commercial-level farming from part-time small-scale hobby farming.
- Potential uptake by citrus growers overseas??

**Research Priorities**

**R&D Value**
- Varying views across industry regarding value of RIRDC research to date to finger lime industry. It is noted that finger lime has not been a ‘top 12’ research priority for the program but that this may well change in the future
- Some concern that cooperation with RIRDC requires lots of time and intellectual property from growers for little return
- Health benefits research very valuable

**Future R&D Priorities**
- Access to US and other international markets essential
- Potential for use of skin of finger lime – high oil content; research required into health benefits and other uses
- Health and beauty products
14. Quandong

The quandong (Santalum acuminatum) is a shrub or small tree, 2 – 6 metres high, with drooping branches and slender pale green leaves. Quandongs have a wide natural distribution throughout southern Australia from arid desert areas to coastal regions. They produce sharp tasting fruit, 2 – 3 cm in size, which has greenish pink through to cherry skin and white or cream flesh. The quandong is also known as desert peach, native peach or wild peach. Aboriginal names include Gudi Gudi, Gorti, Mangata and Wanjani (Ryder 2008; PIRSA 2006; ANFIL 2011).

The quandong is hemi-parasitic and produces an organ known as a haustorium on its roots, which attaches to the roots of other plants and extracts water and nutrients. In the wild, quandongs use many different host plants including acacias, bluebush and saltbush. Management of the host-plant relationship has been one of the challenges of quandong cultivation (PIRSA 2006). Quandongs were one of the first native foods to be commercialised, and CSIRO research into their horticultural potential commenced in the early 1970s. Quandongs have outstanding anti-oxidant capacity, high levels of folate, vitamin E and vitamin C and are good sources of magnesium, zinc and iron (Konczak 2009).

Production location

Quandongs grow wild in South Australia, Western Australia, New South Wales and Victoria and are found in smaller numbers in Queensland and the Northern Territory. Quandongs are tolerant of drought and salinity and prefer light and low relative humidity (PIRSA 2006; RIRDC 2004). In the Northern Territory, quandong populations have been in decline due mainly to the impact of feral camels, and the plant has been listed as vulnerable (PAWCNT 2006).

Commercial plantings have occurred in South Australia at Whyalla, Port Augusta, Quorn and the Riverland district, as well as the Eyre and Yorke Peninsulas. Plantations have also been established in desert communities in the centre and far North West of the state, and in coastal areas near Ceduna on the West Coast and at Tumby Bay. In NSW, orchards have been planted in the Broken Hill region, and in Victoria quandongs are grown commercially in the Wimmera and outside Mildura. Several small plantations have also been established near Alice Springs in the Northern Territory (RIRDC 2004; PIRSA 2006; Interviewees personal communication 2011).

Product forms and uses

Quandongs can be eaten fresh but are predominantly used as processed fruit. They are traded frozen or dried. The taste is tart and tangy, and sweetness varies greatly between trees. Quandongs are used in a wide range of products including pies, jams, chutneys, sauces, fruit cordial, ice-cream, liqueur and dried fruit straps or leathers. The kernel is also edible and very nutritious but is rarely used commercially. One processor has been trialling various methods of extracting kernel oil (Vincent 2010; Interviewees personal communication 2011).

Production volume, value and variability

Volume and value
Quandong production has decreased significantly from its peak just over a decade ago. In 2001 total harvest was estimated at 25 tonnes, a third of which came from 26,000 trees in commercial plantings, and the remainder from wild-harvest. The farm gate value at that time was between $0.7 and $1.3 million, and increases in orchard production were predicted as more plantations were established and the market for quandongs grew (RIRDC 2004; PIRSA 2006).

Despite a series of research projects investigating horticultural methods, host plants and control of the quandong moth, increases in the production of cultivated fruit have not eventuated. Many quandong
orchards have struggled to be economically viable for a range of reasons including drought, quandong die-back, quandong moth, the low survival rates of plants during the establishment phase and difficulties managing the host-plant relationship. Many orchards are no longer maintained. At the same time, wild harvest has decreased significantly due to the impact of camels and drought (Interviewees personal communication 2011).

Despite these difficulties, small to medium sized plantations continue to be established (Interviewees personal communication 2011). Current volume is estimated at 5 - 7 tonnes per annum of fresh fruit, 90% of which is from cultivation. Farm gate prices vary according to the quality of the fruit and whether it is traded frozen or dried, as shown in Table 14.1.

Table 14.1 Quandong prices per kilo 2011

<table>
<thead>
<tr>
<th></th>
<th>Farm Gate</th>
<th>Retail</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Frozen</td>
<td>Dried</td>
</tr>
<tr>
<td>Premium</td>
<td>$30 - $40</td>
<td>$60 - $80</td>
</tr>
<tr>
<td>Second grade*</td>
<td>$25 - $30</td>
<td>$35 - $50</td>
</tr>
</tbody>
</table>

*Second grade fruit may have some moth damage and be less uniform in colour
(Source: PIRSA 2006; Interviewees Personal Communication 2011)

**Variability**
Like many native foods, quandong quality and volume vary depending on weather conditions. The quandong moth (*Paraepermenia santaliella*) is the crop’s most significant pest and the resulting fruit damage leads to a down-grading of fruit quality. While some growers have up till now used dimethoate (now no longer permitted by APVMA) to control the moth, others prefer a more natural production process and are keen to see the development of alternative control methods (Interviewees personal communication 2011).

The consistent production of large volumes of premium quality fruit has eluded the quandong industry. The majority of quandong trees under cultivation have grown from seedlings, so that colour, yield, size, taste and strength of skin can show significant variation. Some growers report that second grade fruit is appropriate for the quandongs main market as a processed product. But others argue that improved grafting techniques are required so that existing and new cultivars can be planted in sufficient numbers to ensure large volumes of premium quality fruit (Interviewees personal communication 2011).

**Supply status and trends**
Although some growers with established connections to restaurants and processors report no difficulty in selling their fruit, there is general agreement that manufacturing grade quandong is oversupplied for the current market. This is confirmed by reports of existing orchards that are not being maintained and by the closure of several value-adding businesses. However, a number of growers argue that with more efficient grafting techniques quandong has the potential to move beyond niche industry status and supply new premium markets. They report that premium quality fruit has different outlets and is undersupplied (Interviewees personal communication 2011).

**Enterprise characteristics and profile**
Quandong seedlings can be purchased directly from some growers, and from several nurseries including Aussie Food Plants at Reedy Creek and Arid Smart Nursery in Port Augusta. Most nursery purchases are for home garden use. One nursery which previously sold quandongs has ceased production due to difficulties with propagation (Interviewees personal communication 2011).
In 2011 the industry estimates that there are around 25 commercial quandong growers. There are several large enterprises of more than 1000 trees, but plantations tend to be small in size, with less than 500 trees. Most plantations are from seedlings - difficulties with grafting cultivars have prevented the planned establishment of large orchards using known cultivars (PIRSA 2006; Interviewees personal communication, 2011).

A typical quandong enterprise is now either part of a larger farming operation with other plants under cultivation, or a ‘weekend enterprise’. Quandongs require host plants, and these are sometimes also productive (e.g. *acacia* producing wattle seeds). Many quandong growers also value-add on site to increase economic viability (Interviewees personal communication 2011).

**Product supply chains and markets**

On farm, quandongs are harvested by hand and de-stoned and halved either manually or on cutting machines. Fruit is graded, sometimes vacuum packed and frozen, or dried. Drying occurs in the sun or in drying- machines, and most growers report a 5 or 6 to 1 reduction rate - including seed removal (Interviewees personal communication 2011).

Many growers value-add on site by processing the fruit into a range of products for sale either online, or at food service and tourist outlets or via distributors. Other growers sell to native food processors who manufacture products under their own label and distribute them both in Australia and overseas.

**Markets and market trends**

In the absence of significant development, the market for processed quandong fruit is expected to remain oversupplied through to 2016. Greater potential exists in the market for premium product, particularly overseas, with several growers reporting interest from major companies. However, without more efficient grafting techniques, the industry will continue to lack the capacity to meet the demand from these markets (Interviewees personal communication, 2011).

**Indigenous participation**

Indigenous communities participate in the quandong industry via the Outback Pride project, with quandongs being cultivated at five communities in South Australia: in the north-west of the State, the Flinders ranges, Ceduna on the south-west coast and at Port Victoria.

It has been reported that Indigenous Australians wild-harvest quandong (NRIA 2011), but there are no reports of communities’ trading wild-harvested fruit with the native food industry to any significant extent at the present time (Interviewees personal communication 2011).
**SWOT**

<table>
<thead>
<tr>
<th>Strengths</th>
<th>Weaknesses</th>
</tr>
</thead>
<tbody>
<tr>
<td>• High recognition and saleability for first class fruit</td>
<td>• Quandong moth still an issue for some growers; natural control methods needed</td>
</tr>
<tr>
<td>• Improved cultivars with more work required</td>
<td>• Difficult species to cultivate</td>
</tr>
<tr>
<td>• Co-planting with host species may provide a second revenue stream e.g. wattle seed.</td>
<td>• Lack of successful grafting techniques on a mass scale; seedlings will not produce consistent high-quality fruit</td>
</tr>
<tr>
<td></td>
<td>• Lack of market development, particularly for premium quality fruit</td>
</tr>
<tr>
<td></td>
<td>• Slow growing/ maturing tree</td>
</tr>
<tr>
<td></td>
<td>• Yield enormously variable</td>
</tr>
<tr>
<td></td>
<td>• Tendency to over sucker</td>
</tr>
<tr>
<td></td>
<td>• Pickers hard to get and expensive</td>
</tr>
<tr>
<td></td>
<td>• Australian Quandong Industry Association no longer operating</td>
</tr>
<tr>
<td></td>
<td>• Management of host/plant relationship can be problematic</td>
</tr>
<tr>
<td></td>
<td>• Lots of misinformation around</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Opportunities</th>
<th>Threats</th>
</tr>
</thead>
<tbody>
<tr>
<td>• The quandong is closely related to the fragrant sandalwood – potential opportunities for technology transfer and co-planting of the two species</td>
<td>• Lack of economic viability may lead to further business closures and lack of maintenance of existing plantings</td>
</tr>
<tr>
<td>• Quandong plantings in farm revegetation programs</td>
<td>• Lack of industry body resulting in difficulty in accessing appropriate information</td>
</tr>
<tr>
<td>• Overseas market for premium quality fruit</td>
<td>• Listed as vulnerable species in Northern Territory due to impact of feral camels.</td>
</tr>
<tr>
<td>• Reconstitution of then industry body.</td>
<td></td>
</tr>
</tbody>
</table>

**Research Priorities**

**R&D Value**

Some growers expressed support for existing quandong research reports, including information on the quandong moth and research regarding host-plant selection. Others reported that research to date has not been of sufficient depth and length to address key issues including grafting techniques (Interviewees personal communication 2011).

**Future R&D Priorities**

• quandong dieback
• grafting techniques and new cultivars to take industry to true orchard stage;
• non chemical solutions for quandong moth
• market development in Australia and overseas
• further research on host selection and management
15. Mountain Pepper

Mountain pepper or native pepper (*Tasmannia lanceolata* and other species) products include both pepper leaf and berry. Mountain pepper is naturally found in wet forests and shrublands of south eastern Australia. Mountain pepper grows best in cool sheltered environments, free from water stress, in neutral well drained and fertile soil. Both berries and leaf are hot, spicy and aromatic.

**Production location**

Most mountain pepper production currently derives from wild-harvested stands, mostly on previously disturbed sites where the plant flourishes as an early coloniser after removal of wet forest or rainforest canopies. Several stands on previously cleared land in Tasmania and Victoria supply most of the mountain pepper product market (Read in RIRDC 2004).

**Product forms and uses**

Berries are used fresh, air or freeze dried and milled as a spice or flavouring. Mountain pepper berries are an alternative to ‘normal’ pepper. Mountain pepper leaf is used dried and milled or as an essential oil extract. It can be used as a herb, food preservative or therapeautic ingredient.

Once harvested leaves are cleaned, stored and further processed for sale. Fresh leaves on sprig are suitable as a fresh herb, a garnish or in the manufacture of pastes and purees. Milled leaf powders – finely ground and screened are a strong flavouring agent which when stored at low temperature and away from direct sunlight will retain long term pungency. Leaf flakes (passing a 3mm screen) and leaf extract are also marketed. Lanceolata extract, prepared by solvent extraction of powdered dried leaf, is added to products as diverse as olive oils and confectionary.

Fresh pepper berries are available from March until mid July and stored at 1-2°C retain freshness for several weeks. Fresh fruit is dried at 30-45 °C using warm air dryers to produce a hard, pungent ‘pepper berry’ – spice suitable for grinding and crushing. Dried berries may be used milled to a consistency of espresso coffee. Fragrant and spicy – the fruity aroma is matched by the heat of volatile oils. Freeze dried berries, a premium product are light, retain natural colour and shape, highly flavoured and reconstitute well.

Pepper berries can be used as a novel garnish, a pickled berry or a spicy ingredient in flour mixes, relishes, sauces, mustards, soups and stews. They are used in cooked or preserved meats, flavoured pastas, pates and cheese. Pepper berries contain a strong red dye which adds colour when included in pale sauces.

Both mountain pepper leaf and berry contain a hot-tasting terpene compound, polygodial for which a wide range of biological activity has been demonstrated, including antibacterial, anti-fungal and insect anti-feeding properties. Mountain pepper is used for its antioxidant properties in humans and as a natural veterinary remedy.
Production volume, value and variability

Volume and value
Estimates of production are difficult to determine as the present market is small and dispersed. However, it would appear that the total market, domestic and export, is approximately:

- 2.7 tonnes of dry leaf; and
- 4.0 tonnes of dried berries.

Prices received for pepper products vary widely reflecting the range of product types, volumes purchased and the specific requirements of the customer, indicative ‘farm gate’ prices include:

- Dried and milled leaf $40-$80/kg; and
- Fresh and dried pepper berries $60-$120/kg.

Higher prices are charged for export product to cover export certification costs and risk.

As a rule of thumb pepper berry is ‘marked up’ 100% between farm gate and retail supply. Pepper leaf, which may only form a very small part of a final retail product, is ‘marked up’ around 500%.

Table 15.1 Estimated Farm Gate and Retail Value of Mountain Pepper Products ($)

<table>
<thead>
<tr>
<th></th>
<th>Farm Gate Value</th>
<th>Retail Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mountain pepper leaf – dried</td>
<td>120,000</td>
<td>600,000</td>
</tr>
<tr>
<td>Mountain pepper berry – dried</td>
<td>210,000</td>
<td>420,000</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>330,000</strong></td>
<td><strong>1,020,000</strong></td>
</tr>
</tbody>
</table>

In total, the industry has an estimated farm gate value of $330,000 and a retail value, including exports of approximately $1 million.

Variability
Production of this mainly wild harvest native food is highly variable and variation is caused by little understood interplay of seasonal conditions i.e. rainfall, temperature, frost, etc. Inventory management ensures a constant market supply.

Supply status and trends
In the early 2000s the existing small, mostly domestic market for mountain pepper products was under supplied (Robins in RIRDC 2004). Since that time, investment in harvesting, drying and milling equipment, and the identification of more potential production resource has more than outstripped market development (including export), so that, by 2011 there is an oversupply of production capacity. At this point in time there are no known plans to increase supply through either additional wild harvest or plantation production. The existing production base is able to routinely supply 10 tonnes of dry leaf and 4.0 tonnes of dried berry. With a modest increase in investment it would be possible to double this production i.e. 20 tonnes of dry leaf and 8.0 tonnes of dried berry.

Enterprise characteristics and profile
Mountain pepper production enterprises range from hobbyists with few overheads and no investment in production systems to a small number of more serious producers. Some of the more serious
producers have established small areas of plantation of up to 0.5ha or rely on natural regrowth on their own properties for a secure source of supply. Others source raw material under licence from state forestry organisations.

In most instances product is hand harvested and warm air dried. Wild harvest takes place between March and May and occurs without damage to the mountain pepper tree. Longer term, sustainable industry growth will necessitate further investment in plantations (Interviewees personal communication 2011).

No producers or product aggregators rely solely on mountain pepper to generate all of their on farm income. Larger producers may earn up to 50% of their income from mountain pepper. Mountain pepper harvesting and growing is estimated to employ between 20 and 30 individuals including enterprise owner operators.

Product supply chains and markets

The mountain pepper supply chain includes wild harvesters of leaf and berry; regrowth and small plantation operations; aggregators, manufacturers; traders; and retail. Wild harvesters include both small scale hobby operations that might collect up to 100 kg per annum to large scale wild harvesters whose yield might be up to 7 tonnes of raw material. Aggregators purchase from wild harvesters and those with regrowth or plantation. Aggregators are responsible for cleaning, drying, packing, meeting retailer quality and food standard requirements and marketing mountain pepper products. Manufacturers are part of the food industry and retailers include tourist and gourmet outlets.

An estimated 40% of pepper leaf production and 60% of pepper berry output is exported. Key markets include Germany, France and Switzerland (Interviewees personal communication 2011).

There have been major changes to market quality and safety requirements and most larger buyers of native pepper products now require some supporting analytical and microbiological data, guarantees of safe and consistent product and avoidance of pesticides in the production systems. While these changes have increased the costs of mountain pepper production and marketing they have also helped rid the trade of some unscrupulous operators and led to major increases in efficiency among the more serious producers (Interviewees personal communication 2011).

The Outback Chip Company supplies Wild Tomato & Pepper Leaf to Virgin Airlines and 7/11 Stores.

Markets and market trends

Key mountain pepper markets include:

- Domestic culinary dried – purchasing leaf and berry in milled and ground form;
- Domestic culinary fresh – smaller market purchasing fresh or frozen berries and fresh leaf;
- Food service manufacturers - use milled leaf in a range of prepared foods;
- Gift lines – retail gourmet products often packaged for the tourist industry; and
- Exports – well established markets in Europe supplying the gourmet food ingredient sector.

All of these markets are small and in aggregate they are mature. There is considerable ‘churn’ among users and some only purchase on a biannual basis. Export markets and markets supplying tourism in Australia are currently adversely affected by a strong Australian dollar.
Mountain pepper use in nutraceuticals for humans and in natural veterinary remedies is largely experimental.

**Indigenous participation**

There are no known Indigenous harvesters, aggregators or marketers of mountain pepper. A number of Indigenous chefs are using the product on a commercial basis. Wild harvest would appear to offer opportunity for Indigenous participation in the mountain pepper industry.

**SWOT**

<table>
<thead>
<tr>
<th>Strengths</th>
<th>Weaknesses</th>
</tr>
</thead>
<tbody>
<tr>
<td>The mountain pepper berry is a unique native food product and taste</td>
<td>Key: limited market development, education and awareness – dependent on the initiatives of a limited number of aggregators and traders</td>
</tr>
<tr>
<td>Good QA and food safety systems in place for most of the industry’s production provide buyers with product confidence</td>
<td>Production of the berry is highly variable and little is understood about the conditions or cultivation required to generate high yields</td>
</tr>
<tr>
<td>Established domestic and export markets.</td>
<td>Lack of investment in managed production systems</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Opportunities</th>
<th>Threats</th>
</tr>
</thead>
<tbody>
<tr>
<td>There appears to be plenty of genetic diversity in the species that would facilitate selection of improved farm lines</td>
<td>Timber plantations eroding wild harvest areas</td>
</tr>
<tr>
<td>The mountain pepper leaf is a largely untapped resource with additional and alternative potential uses in nutritional supplement, cosmetic and food preservative applications</td>
<td>Loss of market to low cost producers in other countries, mountain pepper becomes a commodity.</td>
</tr>
<tr>
<td>Mountain pepper presents opportunities for fostering irrigated cultivation</td>
<td>Potential damage to markets by supply of poor quality, adulterated or contaminated product</td>
</tr>
<tr>
<td>There are some (minor) income diversification opportunities for growers there appears to be a small market for the plant as an ornamental shrub and the tree is useful in land rehabilitation programs.</td>
<td></td>
</tr>
</tbody>
</table>
Research Priorities

R&D Value

- R&D successes for the industry include export preparedness investment, food analysis, nutrient benefits, flavour descriptors and production of recipes, preliminary study of food preservative and cosmaceutical applications studies of leaf extract composition and registration of extract with FEMA GRAS (generally recognised as safe) in the US in 2011. These initiatives have created a pool of knowledge that insulates the Australian industry from potential low cost overseas suppliers. This R&D work will help prevent the product from sliding into least cost commodity status.

Future R&D Priorities

- Communication of existing research outputs including packaging information into useful forms, development of extension tools, communicating with the market. Currently market communication is done on a volunteer basis by a relative few people (while the outputs are relevant to the whole native foods industry).

- Completion of a needs analysis to identify research gaps (relevant to the whole native foods industry).

- Addressing the variability of mountain pepper production – soil nutrition, fruit set, pollination. Will be a major priority in the future as the industry moves toward plantation production. Less pressing issue at the current time when supply exceeds demand.
16. Other Plants

Emerging native foods include *Syzygium* (other than riberry and anise myrtle), Warrigal greens (also known as New Zealand spinach), Tanami apples (*Solanum chippendalei*), bush banana (*Marsdenia*), saltbush (*Atriplex spp.*), river mint (*Mentha australis*), Strawberry gum (*Eucalyptus olida*) and cut leaf mint (*Prostanthera incisa*) (updated and adapted from RIRDC 2008).

Other species identified but yet to be developed to any great extent include native currants (*Achrotichie depressa*), passion berry (*Solanum cleistogamum*), samphire (*Salicornieae*), sea parsley (*Apium prostratum*), boabs (*Adansonia spp.*), native basil, native thyme, nitre bush, bunya nut and a promising group of root vegetables (including kulyu, meen, youlk) (updated and adapted from RIRDC 2008).

To these lists study participants added:

- Fibrous satinash (*Syzygium fibrosum*) a lilly pilly from Cape York which has larger fruit than riberry, is non-aromatic and tart in flavour.
- Native tamarind (*Diploglottis campellii*) also called native apricot. Fruit is related to the Chinese lychee, but ranges in colour from yellow to orange to deep red. There are five other edible *Diploglottis* species, including *D smithii*, *D diphyllostegia*, *D bracteata*, which is found primarily in far north QLD.
- Illawarra Plum (*Podocarpus elatus*) is smaller than Davidson plum, with an external seed. Takes between six and nine years to bear fruit, with male and female trees required for fruiting. Is understood that consumption is associated with human health benefits. Currently only wild harvest and there are opportunities to increase production in line with latent market demand.
- Weeping Pittosporum (*Pittosporum angustifolium*) also called gumby gumby by south western Queensland Aboriginal people. It is medicinal plant that is useful in the treatment of sore throats. Its potency seems to be influenced by where it is grown.
- Gargaloo (*Parsonsia eucalyptophylla*) – flowing vine with a very attractive sent producing slender edible seed pods. Native of south western Queensland.

These species are considered in the reporting of overall stocktake results, the setting of R&D priorities and industry strategy.
17. Summary of Stocktake Findings

The following chapter draws together findings from the species specific stocktake in order to provide an overall industry ‘snapshot’, insights from the research and data to facilitate strategy development.

Production Location and Source

Consistent with RIRDC 2004 commercial native food production takes place in all Australian states and territories outside of the ACT. There are an equal number of tropical or semi tropical ‘rainforest’ and arid or semi-arid ‘desert’ species in the ‘Top 13’. Outliers include Kakadu plum – tropical coastal; muntries – temperate coastal; and mountain pepper – temperate rainforest. Concern expressed by some industry stakeholders that R&D efforts and ANFIL attentions focus too heavily on ‘rainforest’ species may perhaps be overstated. It is also noted that production based projects in the RIRDC program require significant industry cash contributions. Other species have been included in all screening type projects.

Most species are now mainly sourced from cultivated supply. The remaining species where wild harvest dominates are mountain pepper, bush tomato, Kakadu plum and wattleseed. These last three species provide important opportunity for Aboriginal employment and evolution toward cultivation of these species may, in the absence of industry and government support, jeopardise Indigenous opportunity.

Product Forms and Uses

Overwhelmingly native foods are used as raw material for processed food products. This has implications for the price growers / wild harvesters are able to charge for their output. Innovation and productivity gains are critical to drive down the breakeven cost of supply. R&D that facilitates scale production, at lower cost, is a clear priority for this industry.

Industry Size – Volume, Value and Participant Numbers

Production across the thirteen species averages a modest eight tonnes per annum. The standout and only exception is lemon myrtle leaf which is the industry’s current ‘giant’ at an estimated annual production of between 575 tonnes and 1,100 tonnes. Lemon myrtle is susceptible to myrtle rust and myrtle rust research is another clear priority for this industry given that it affects multiple native food crops.

Industry farm gate value is estimated at between $15 million and $25 million in 2010 and value adding may increase this estimate by up to 500%. Estimated farm gate value excludes nursery production which takes place in many locations in enterprises that do not generally specialise or report data on native food species. Industry employment is estimated at between 500 and 1,000 persons including a large number of Aboriginal people living and working in remote communities. Comparison of these stocktake estimates with those from the literature show both consistency and ongoing modest growth:

- Farm gate value of $6.8 million and employment of 800 people (Foster and Bird 2009)
- Industry value – farm gate plus value adding of $14 million (Robins 2007)
- Industry value – farm gate plus value adding of $10 million (Cherikoff 2000)
- Industry value – farm gate plus value adding of $5 million (Phelps 1997)

Production Variability, Outlook for Supply and Demand

RIRDC 2004 and 2007 note that production variability is an issue for the industry – it is very difficult to commit to customers when production is available one year but not the next. In 2010 variable production is still an issue for eight of the thirteen priority species.
Producers were asked about the production outlook for their enterprise and their species as a whole as part of the stocktake survey. Most indicated that the supply outlook through to 2016 was either stable or that modest production increases were planned. The industry is likely to remain a niche producer for the foreseeable future.

Survey questions were also asked about supply and demand balance. Overwhelmingly native food producers concluded that production tended toward oversupply for current niche markets but that product was undersupplied for potential scale based opportunities. There are large scale markets for consistently supplied low cost native foods which are not being developed.

Large scale markets for native foods are not being developed for a range of reasons including missing technologies and reluctance to invest. Missing technologies are highlighted in the stocktake as potential research priorities. Reluctance to invest goes to the profile of current producers which includes semi-retired people who are looking for lifestyle rather than the maximisation of return and further investment in expensive peri-urban rainforest country. Models and case studies for profitable native food investment and their communication are identified as priorities for RD&E.

Enterprise Characteristics

Native food production enterprises were typically small, diversified and growing multiple crops. Often crops are a mix of native food and conventional tree or vegetable crop species. Successful producers have either value added their native foods, joined buying or marketing cooperatives or both in order to capture enough value to make a profitable business. Other producers have gone for scale and have linked in to mainstream processors and through them to major retailers. Both enterprise models are sustainable and service different native food markets.

Markets and Market Trends

Native food producers service farmers markets, online sales, processors, wholesalers and a range of domestic retailers. Noteworthy is the number and importance of export markets to the native food industry. Positive market developments for the industry include increased awareness and demand for the health giving properties of native foods and the willingness of mainstream consumers to pay for these attributes. Negative market developments include pressure on export sales, tourism and the economics of food manufacturing in Australia given the current and forecast high Australian dollar.

Indigenous Participation

Aboriginal involvement in the native foods industry is strongest in the wild harvest species - wattleseed, bush tomato and Kakadu plum. This involvement risks displacement as species move from wild harvest to cultivation. This is of concern to the broader industry that feels that Aboriginal participation brings authenticity and integrity to Australian native foods.

Considerable investment has been made by retailers and processors in Aboriginal production and value adding. Leaders and pioneers have included Juleigh Robin’s Robins Foods, Indigenous Foods Australia, Indigenous Harvest Australia, the Outback Pride Foundation and Coles Indigenous Food Fund. Successful cultivation projects have been established (e.g. the Laramba community’s bush tomato plantation partnership with Robins Foods and Coles Indigenous Food Fund) and while value adding in communities has been attempted, to date this goal has remained elusive.

Those involved with these and other Indigenous initiatives are critical of ‘tokenism’ and point out that it takes years of relationship building to develop trust and successful native food projects. The same is also true of engagement with Aboriginal people if meaningful RD&E is to be delivered. This process is a challenge for organisations such as RIRDC and ANFIL which have limited investment budgets.
Stocktake Summary

Data for all thirteen priority species, including species with more than one harvestable product, is summarised in Table 17.1.
<table>
<thead>
<tr>
<th>Species</th>
<th>Source</th>
<th>Production Location</th>
<th>Form and Uses</th>
<th>Total Production Volume (t)</th>
<th>Unit Values (farm gate)</th>
<th>Total Value (farm gate)</th>
<th>Production Variability</th>
<th>Outlook for Supply</th>
<th>Currently Under or Over Supplied</th>
<th>Enterprise Characteristics</th>
<th>Markets</th>
<th>Indigenous Participation</th>
<th>R&amp;D Priorities</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lemon myrtle leaf</td>
<td>Cultivated</td>
<td>Qld coast and north coast of NSW</td>
<td>Ras and spice</td>
<td>575-1,100</td>
<td>$10/kg</td>
<td>$15 M</td>
<td>Limited supply</td>
<td>Stable</td>
<td>Suitable for large orders</td>
<td>More than 90% exported</td>
<td>Domestic and export markets</td>
<td>Some Indigenous participation post farm gate</td>
<td>Myrtle rust control solutions</td>
</tr>
<tr>
<td>Lemon myrtle oil</td>
<td>Cultivated</td>
<td>Qld coast and north coast of NSW</td>
<td>Flavouring and essential oil</td>
<td>3-8 t</td>
<td>$10/kg</td>
<td>$500k</td>
<td>Limited supply</td>
<td>Stable</td>
<td>Suitable for large orders</td>
<td>Single large player dominates</td>
<td>Domestic and export markets</td>
<td>Some Indigenous participation post farm gate</td>
<td>As above</td>
</tr>
<tr>
<td>Arise myrtle leaf</td>
<td>Cultivated</td>
<td>Qld coast and north coast of NSW</td>
<td>Ras and spice</td>
<td>6 - 10 t</td>
<td>$36/kg</td>
<td>$290k</td>
<td>Stable</td>
<td>Oversupplied for small producers</td>
<td>Grown as part of multi-species plantation</td>
<td>Growth potential in export markets</td>
<td>Some Indigenous participation post farm gate</td>
<td>As above</td>
<td></td>
</tr>
<tr>
<td>Arise myrtle oil</td>
<td>Cultivated</td>
<td>Qld coast and north coast of NSW</td>
<td>Flavouring and essential oil</td>
<td>0.7 - 1 t</td>
<td>$140/kg</td>
<td>$120k</td>
<td>Stable</td>
<td>Oversupplied for small producers</td>
<td>Grown as part of multi-species plantation</td>
<td>Growth potential in export markets</td>
<td>No known Indigenous participation</td>
<td>As above</td>
<td></td>
</tr>
<tr>
<td>Wattleseed</td>
<td>Wild harvest and cultivated</td>
<td>South Australia, NT and NSW</td>
<td>Flavouring ingredient - nutty / coffee notes</td>
<td>4 - 8 t</td>
<td>$25/kg</td>
<td>$150k</td>
<td>Variable production</td>
<td>Modest increase forecast</td>
<td>Oversupplied</td>
<td>Indigenous wild harvest and cultivation dominate supply</td>
<td>Restaurants and leading chefs</td>
<td>Indigenous wild harvest and cultivation dominate supply</td>
<td>Models, profitable Indigenous participation, Wattleseed health benefits</td>
</tr>
<tr>
<td>Bush tomato</td>
<td>Wild harvest and cultivated</td>
<td>NT, South and Western Australia</td>
<td>Savoury spice or flavouring</td>
<td>15 t</td>
<td>$36/kg</td>
<td>$540k</td>
<td>Variable production</td>
<td>Modest increase forecast</td>
<td>Undersupplied</td>
<td>Indigenous wild harvest dominates supply</td>
<td>Included in supermarket mainstream</td>
<td>Indigenous drive for wild harvest and cultivation at the present time</td>
<td>Plant varieties and cultivation techniques</td>
</tr>
<tr>
<td>Davidson plum</td>
<td>Cultivated</td>
<td>Qld coast and north coast of NSW</td>
<td>Sweet and savoury food ingredient</td>
<td>8 - 10 t</td>
<td>$10/kg</td>
<td>$90k</td>
<td>Variable production</td>
<td>Modest increase forecast</td>
<td>Oversupplied for current markets</td>
<td>Small multi-species orchards dominate</td>
<td>Local sales maturing into city and export orders</td>
<td>Some Indigenous participation post farm gate</td>
<td>Integrated pest management (IPM), Production agronomy incl chill requirements, Fertiliser requirements, Further product development work</td>
</tr>
<tr>
<td>Riberry</td>
<td>Cultivated</td>
<td>North coast NSW also SE Qld</td>
<td>Sweet and savoury food ingredient</td>
<td>4 - 5 t</td>
<td>$10/kg</td>
<td>$100k</td>
<td>Variable production</td>
<td>Strong growth forecast</td>
<td>In balance for current small niche markets</td>
<td>Small enterprises with a successful buying and selling cooperative</td>
<td>Farmers markets, distributors and online sales</td>
<td>Some Indigenous participation post farm gate</td>
<td>Decreasing the cost of production, Mechanisation research, Tools to replace wild harvest</td>
</tr>
<tr>
<td>Kakadu plum</td>
<td>Wild harvest</td>
<td>Coastal NT and Kimberley WA</td>
<td>Dietary supplement and health food</td>
<td>12 t</td>
<td>$20/kg</td>
<td>$240k</td>
<td>Variable production</td>
<td>Stable</td>
<td>Undersupplied</td>
<td>Wild harvest dependent on season and labour</td>
<td>Included in supermarket mainstream</td>
<td>Indigenous wild harvest dominates supply, some post harvest processing</td>
<td>Production research - stock, agronomy, etc</td>
</tr>
<tr>
<td>Muntries</td>
<td>Cultivated</td>
<td>Coastal South Australia and Victoria</td>
<td>Fresh or processed into food ingredients</td>
<td>6 - 10 t</td>
<td>$20/kg</td>
<td>$160k</td>
<td>Consistent production</td>
<td>Stable</td>
<td>Oversupplied</td>
<td>Mostly small with many species, larger integrated operations</td>
<td>Sales to processors and local value added sales</td>
<td>Grown in 3 communities but shifted from wild harvest generally not beneficial</td>
<td>Market development, Long term cultivar research, Health benefits, Mechanical harvesting, Use of muntries as a salt tolerant species</td>
</tr>
<tr>
<td>Lemon aspen</td>
<td>Cultivated</td>
<td>Atherton Tablelands, southern Qld, northern NSW</td>
<td>Processed food products, flavouring for mineral water</td>
<td>2 - 5 t</td>
<td>$15/kg</td>
<td>$50k</td>
<td>Consistent production</td>
<td>Stable</td>
<td>Undersupplied</td>
<td>Small enterprises growing more than one native food species</td>
<td>Increasingly popular in food service markets</td>
<td>Some involvement in cultivation, forecast for Far North Qld</td>
<td>Improved planting material, Better cultivation methods, Further product and market development</td>
</tr>
<tr>
<td>Species</td>
<td>Production Location</td>
<td>Source</td>
<td>Product Forms and Uses</td>
<td>Total Production Volume (t)</td>
<td>Unit Values (farm gate)</td>
<td>Total Value (farm gate)</td>
<td>Production Variability</td>
<td>Outlook for Supply</td>
<td>Currently Under or Over Supplied</td>
<td>Enterprise characteristics</td>
<td>Markets</td>
<td>Indigenous Participation</td>
<td>R&amp;D Priorities</td>
</tr>
<tr>
<td>---------------</td>
<td>---------------------</td>
<td>-----------------</td>
<td>----------------------------------------------------------------------------------------</td>
<td>----------------------------</td>
<td>-------------------------</td>
<td>-------------------------</td>
<td>-----------------------------------</td>
<td>-------------------------------</td>
<td>--------------------------------</td>
<td>---------------------------------</td>
<td>---------------------------------</td>
<td>---------------------------------</td>
<td>-----------------------------------------------------------------------------</td>
</tr>
<tr>
<td><strong>Desert limes</strong></td>
<td>South west Qld</td>
<td>Cultivated</td>
<td>Intensely flavoured alternative to Tahitian lime</td>
<td>10 - 15 t</td>
<td>$18/kg</td>
<td>$225k</td>
<td>Variable production</td>
<td>Strong growth forecast</td>
<td>Oversupplied for current niches</td>
<td>Undersupplied for potential scale opportunities</td>
<td>Large volume sales of puree manufactured premium products</td>
<td>Indigenous groups currently exploring plantation potential</td>
<td>IP protection and management strategies Map occurrence of desert limes in the wild Understand pathogens and insect pests New product development eg nutraceuticals</td>
</tr>
<tr>
<td><strong>Finger limes</strong></td>
<td>Qld coast and north coast of NSW</td>
<td>Cultivated</td>
<td>Pleasing citrus caviar appearance for garnish</td>
<td>10 t</td>
<td>$35/kg</td>
<td>$350k</td>
<td>Consistant production</td>
<td>Strong growth forecast</td>
<td>Undersupplied</td>
<td>Small enterprises who often supply larger marketing groups</td>
<td>Over 50% of production is exported. Restaurants also important</td>
<td>Northern NSW Aboriginal communities are exploring cultivation potential</td>
<td>R&amp;D to support US market access Uses for fingerlime skin</td>
</tr>
<tr>
<td><strong>Quandong</strong></td>
<td>Semi arid SA, Victoria and NSW</td>
<td>Cultivated</td>
<td>Tart and tangy, mainly processing fruit</td>
<td>6 t</td>
<td>$30/kg</td>
<td>$180k</td>
<td>Variable production</td>
<td>Stable following a period of contraction</td>
<td>Second grade fruit is oversupplied</td>
<td>Small part time growers. Some larger growers have withdrawn</td>
<td>Potential to develop premium export markets</td>
<td>Indigenous owned cultivation as opportunities for wild harvest diminish</td>
<td>Quandong dieback Grafting techniques New cultivars Host selection and management Market development</td>
</tr>
<tr>
<td><strong>Mountain pepper leaf</strong></td>
<td>Tasmania and Victoria</td>
<td>Wild harvest</td>
<td>Fresh herb, essential oil or substitute for 'normal' pepper</td>
<td>3 t</td>
<td>$60/kg</td>
<td>$180k</td>
<td>Variable production</td>
<td>Modest increase forecast</td>
<td>Oversupplied</td>
<td>Part time collectors and full time aggregators who grow some of their own pepper</td>
<td>Domestic food service and export markets</td>
<td>Mountain pepper is used by Indigenous chefs</td>
<td>Packaging and extension of existing R&amp;D Understand pepper production variability Research gap analysis for all native foods Communication with the market</td>
</tr>
<tr>
<td><strong>Mountain pepper berry</strong></td>
<td>Tasmania and Victoria</td>
<td>Wild harvest</td>
<td>Spice suitable for crushing or grinding</td>
<td>4 t</td>
<td>$90/kg</td>
<td>$360k</td>
<td>Variable production</td>
<td>Ditto</td>
<td>Oversupplied</td>
<td>Ditto</td>
<td>Ditto</td>
<td>Ditto</td>
<td>Ditto</td>
</tr>
</tbody>
</table>
18. R&D Priorities

Data from the stocktake includes information on the extent industry values R&D and possible research priorities that might be incorporated into a future R&D program.

Industry Values R&D

R&D already completed by RIRDC on behalf of the native food industry is valued. Industry believes that research funded by RIRDC and others has prevented Australian grown native foods from sliding into a least cost commodity status from which producers would not be able to compete. Commercially important work funded by RIRDC, and identified by stakeholders during the study, has included:

1. Market access – secured for lemon myrtle in the EU through a RIRDC funded project
2. Export preparedness investments benefiting mountain pepper
3. Health benefits research – showing native foods have high vitamin and antioxidant levels
4. Australian standards – for products such as lemon myrtle oil
5. Emergency permits for the use of fungicides to control myrtle rust
6. Myrtle rust control trials
7. Packaging trials to improve product shelf life
8. Food safety projects
9. Product description work
10. Production research to improve the cultivation of native foods
11. Chef training package for TAFE colleges
12. General industry awareness raising.

Opinions were divided on the value of other RIRDC R&D investments including the Australian native foods ‘flavour wheel’ with some suggesting it has been a useful tool while others believed it either poorly describes the attributes of their particular species or provided no new information.

Several groups of stakeholders were concerned about RIRDC’s relationship with ANFIL indicating that it was ‘too close’ and that RIRDC investment priorities should be informed by other bodies. They felt that at the current time the R&D program is too focussed on the east coast rainforest and that there was not nearly enough support for Indigenous communities through the program.

Analysis of the data presented in Chapter 17 would indicate that RIRDC and ANFIL have been balanced in their priority setting between species and again it is noted that Indigenous engagement is difficult for modestly budgeted organisations.

R&D Priority Setting Considerations

From the stocktake the following points are relevant to R&D priority setting:

1. Each species is somewhat unique – synergies from joint R&D, across species are not always available. Therefore RIRDC focusses on industry’s who support research with partial funding.
2. It is important to retain the focus of R&D investments on priority species for at least the next five years – the program has too few resources that are too easily dissipated.
3. The program should retain a focus on foods and not be distracted by toiletries, bush regeneration, salinity control, and so on. Functional foods can be accommodated within a ‘food only’ focus.
4. Production research will remain a priority for all species – the program will need to be strategic and fund only those species and projects with the best ‘triple bottom line’ prospects.
5. Mechanisation of production would be valuable to this industry but is very resource intensive.
6. The belief was expressed in the R&D Plan 2007 – 2012 that market research and marketing are better driven through cooperatives than through R&D.
7. Processing research generates commercial outcomes therefore it is less suitable for RIRDC public good funding.
8. The sustainability of wild harvest was not explored as part of the current R&D plan. Nor is the mapping of the wild harvest resource.
9. Indigenous cooperation is valuable, goes to the heart of what native foods is about but is resource intensive.
10. The program must remain tightly focussed with a limited number of objectives and strategies.
11. Big picture trends in R&D include a focus on fewer, larger investments and this trend should also guide the native food R&D program.
12. Macro trends relevant to this industry include a poor medium term outlook for tourism, food manufacturing, exporting and an aging population with an interest in healthy native foods.

Possible R&D Priorities

Emerging from the above analysis, possible R&D priorities for the native foods industry might include:

Production
- Decreasing the cost of production – all species
- Myrtle rust control solutions (joint projects with other industries e.g. native forestry, tea tree)
- Minor use chemical permits and ‘soft’ chemical alternatives for pests and diseases
- Integrated Pest Management (IPM) for native food plants
- New cultivars – all native food species (high cost of this research is noted)
- Improving planting material and harvest techniques – all native food species
- Agronomy for all native food species
- Mechanisation research especially harvesting – all species (expensive R&D to complete)
- Techniques / varieties to replace wild harvest
- Understanding the wild resource – mapping wild genetic diversity (expensive)
- Indigenous interest in supplying commercial quantities of wattleseed, bush tomato, Kakadu plum
- Enrichment planting trials for Aboriginal engagement
- Understanding production variability – all species but especially mountain pepper
- Carbon potential

Post-harvest, food safety and QA
- Harvest and post-harvest technologies to maximise product quality
- Understanding emerging food labelling and safety issues and their impact on native food supply
- Workable supply chain traceability systems for wild harvest and cultivated native foods
- Systems to increase supply chain cooperation and trust
- Quality and food safety systems for wild harvest product
- IP protection and management strategies
- Market access R&D including finger limes to the US
Product information and market access
- Health benefits for consumers - all species
- Overcoming interstate trade restrictions post myrtle rust establishment
- Market development – all species
- Development of nutraceuticals and co-products to assist with the profitability of production
- Packaging and communication of existing R&D results

Communication, capacity building, extension and industry analysis
- Production of material to encourage participation (e.g. case studies, enterprise models)
- Business models for financial success
- Models for profitable Indigenous participation that respect culture and IP
- Initiatives to increase consumer awareness and demand
- Fostering of partnerships with other potential funding groups e.g. RIRDC Indigenous Rural Development program and the mining industry (rehabilitation / carbon offset research)
- Must consider NF R&D that occurs within the EOI, and indigenous programs at RIRDC

The above long list of possible priorities needs to be refined with industry in the knowledge that the R&D Plan 2007 to 2012 invested approximately $400,000 pa of which $150,000 pa was provided by RIRDC.
The stocktake has also generated material to inform industry and ANFIL strategy. Future ANFIL strategic plans might embrace:

1. The communication of stocktake findings to government including farm gate value and employment estimates to ensure Australian native foods are recognised in policy formulation and resource allocation decisions.

2. Allocate resources to communication to ensure this activity is not reliant on the goodwill of volunteers.

3. Develop and implement strategies to increase ANFIL membership which now stands at approximately 60 in an industry with between 500 and 1,000 individuals. Increasing paid membership will provide a revenue stream that can be used to fund communication and assist with uptake of R&D outputs.

4. Foster relationships with those who currently perceive themselves to be outside ANFIL and RIRDC’s sphere of influence including but not limited to ‘desert’ producers, Indigenous communities and commercial scale manufacturers.

5. Address perceptions that ANFIL and the RIRDC R&D program do not give enough attention to ‘desert’ species or provision of Aboriginal opportunity.

6. Develop strategic alliance for the funding of research projects including alliances with other RIRDC programs (e.g. Aboriginal and Torres Strait Islander Rural Development R&D Program) and funding sources (e.g. mine rehabilitation and carbon initiatives).

7. Capitalise on state and territory government interest in native foods – at a time when state governments are withdrawing support for primary industries it has been reported that there is interest in developing sustainable native food industries.

8. Work through the R&D program to develop strategies that lift small scale production to a commercial critical mass so that the industry is able to capitalise on larger food manufacturing opportunities.

9. Establish and have adopted an Australian native foods Intellectual Property export policy so that export of material is not ad hoc but in the industry’s and Aboriginal Australia’s long term interest. This may include new and sustainable revenue streams from overseas partners. If such a policy already exists assist with its communication to ANFIL members.

10. Encourage information recording and sharing amongst industry members to that there are benchmarks to measure future business and industry performance.

11. Give consideration to strategy and communication that allows the industry to work in partnership with natural resource managers. Native foods indigenous to local areas is a worthwhile goal that both ANFIL and others concerned with environmental outcomes can embrace.

12. Work with RIRDC to shape research possibilities identified in this stocktake into industry owned and supported priorities for the period 2012 to 2017.
20. Study Conclusions

The stocktake reveals a small, vibrant and diverse industry that is strategically important in providing farm income diversification opportunities and scope for Indigenous people to generate additional income streams on Aboriginal owned land. Future R&D priorities have been identified and these centre around initiatives to lower the cost of native food production and capitalise on scale based manufacturing opportunities. Strategy should focus on communicating industry importance to government policy makers. Tools have been provided to allow the industry to update the stocktake in the future.
Appendix 1: Survey Questionnaire

The Australian Native Food Industry Limited (ANFIL) and the Rural Industries Research and Development Corporation (RIRDC) are working together to prepare a stocktake of the Australian native foods industry – what is produced, who is producing it, how is it marketed and what is it worth. The stocktake will be used to demonstrate the industry’s economic, social and environmental contribution and establish priorities for future development. Table 1 below summarises best available data which we hope to update and expand through this survey. Information will be treated as commercial in confidence and only aggregate data for key native food species will be reported in the stocktake.

Contact and Business Name: _________________________________________________________

1. Describe your role in the native food industry (eg part time hobby, wild harvester, full time grower, etc)

________________________________________________________________________________

2. What native food species do you grow (consultant to complete a separate questionnaire for each species)?

________________________________________________________________________________

Where do you get your planting stock from and do you know its exact origin

3. Under what type of business structure do you operate (eg grower sole trader, cooperative, etc)?

________________________________________________________________________________

4. In what form do you sell most of your product (eg fresh, frozen, dried, milled, ‘simple processed’ or processed with other ingredients added’), is this typical for this native food species?

________________________________________________________________________________

5. What range of prices do you currently achieve for your product ($/kg)? 3a. What trends?

________________________________________________________________________________

6. What does a typical enterprise (or the range of enterprises) look like for this species (eg wild harvest, area of plantation, other crops grown, employment created, etc)? ______________________

________________________________________________________________________________

7. What is your current production volume (kg/year)? 5a. How variable is this volume (%), why?

________________________________________________________________________________
8. What will be your production of this species in 5 years time (potential production)?

________________________________________________________________________________

9. Is this species undersupplied or oversupplied at the current time (comments on why)?

________________________________________________________________________________

10. What share of total industry production do you think you currently produce (%)?

________________________________________________________________________________

11. What total farm gate value would you place on your crop nationally? 9a. What about final retail value? 9b. Other key points in the supply chains (specify)?

________________________________________________________________________________
________________________________________________________________________________

12. Without divulging commercially sensitive information please describe your supply chain (eg wild harvesters, nurseries, growers, distributors/wholesalers, processors/value adding, retailers, online sales, restaurants, export, associations (eg research groups or marketing alliances)

________________________________________________________________________________
________________________________________________________________________________
________________________________________________________________________________

Where would an average consumer be able to gain access to your particular native food commodity (not necessarily your own) and do you think they would have the material to know what to do with it?

13. Who else should we talk to in relation to your native food species, why?

________________________________________________________________________________

14. To your knowledge, are Indigenous Australians involved with this species, any relevant contacts?

________________________________________________________________________________

15. What are the key issue / limiting resource for your species over the next 5 years (SWOT)?

________________________________________________________________________________

16. Are you aware of the native foods R&D program, how useful is the research completed by RIRDC for the native food industry and your enterprise in particular? Examples?

________________________________________________________________________________
17. What future research priorities can you suggest?
________________________________________________________________________________
________________________________________________________________________________

18. What species other than those in Table 1 should ANFIL/RIRDC invest in, why?
________________________________________________________________________________

19. Are you ok to have name included in an industry directory (if yes confirm key contact details)?
________________________________________________________________________________

Table 1 Key Data Requiring Update

<table>
<thead>
<tr>
<th>Species</th>
<th>Unit Values (farm gate)</th>
<th>Total Production</th>
<th>Under/Over Supply</th>
<th>Major Markets</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lemon myrtle leaf</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Lemon myrtle oil</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Anise myrtle leaf</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Anise myrtle oil</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Wattleseed</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Bush tomato</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Davidson plum</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Riberry</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Kakadu plum</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Muntries</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Lemon aspen</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Desert limes</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Finger limes</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Quandong</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Mountain pepper leaf</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Mountain pepper berry</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Thank you for your time, the stocktake report will be available on the ANFIL website.
### Appendix 2: Industry Database

<table>
<thead>
<tr>
<th>Organisation</th>
<th>Name</th>
<th>Contact Details</th>
<th>Role</th>
</tr>
</thead>
<tbody>
<tr>
<td>Aboriginal owned Yuendumu Mining Company (YMC)</td>
<td>Frank Baarda</td>
<td>Yuendumu via Alice Springs Yuendumu NT 0872 Phone: 08 8956 4040</td>
<td>YMC’s activities include the buying and selling of wild harvest bush tomato and wattle seed.</td>
</tr>
<tr>
<td>Andrew Fielke Enterprises</td>
<td>Andrew Fielke</td>
<td>5 George St., Glengowrie SA 5044 <a href="mailto:info@andrewfielke.com">info@andrewfielke.com</a> <a href="http://www.andrewfielke.com">www.andrewfielke.com</a></td>
<td>Full time distributor of raw and value added native foods</td>
</tr>
<tr>
<td>Australian Arid Lands Botanical Garden</td>
<td>Tania Danylycha</td>
<td>Port Augusta Arid Smart Nursery: (08) 8641 0711</td>
<td>200 quandong seedlings propagated per annum for sale</td>
</tr>
<tr>
<td>Australian Finger Lime Company</td>
<td>Fred Durham</td>
<td><a href="mailto:info@australianfingerlime.com">info@australianfingerlime.com</a> <a href="http://www.australianfingerlime.com">www.australianfingerlime.com</a></td>
<td>Grower, packer and marketer: Ozlime brand</td>
</tr>
<tr>
<td>Australian Fingerlime Growers Association (AFGA)</td>
<td>Bob Gibson President</td>
<td>Email: <a href="mailto:president@fingerlimegrowers.com.au">president@fingerlimegrowers.com.au</a> Website: <a href="http://www.wildfingerlime.com/association/">www.wildfingerlime.com/association/</a></td>
<td>Grower and President of AFGA</td>
</tr>
<tr>
<td>Australian Desert Limes</td>
<td>Jock Douglas</td>
<td>PO Box 320 Roma Qld 07 46268100 <a href="mailto:jock@australiandesertlimes.com.au">jock@australiandesertlimes.com.au</a></td>
<td>Desert lime pioneer</td>
</tr>
<tr>
<td>Australian Rainforest Products Pty Ltd</td>
<td>Gary Mazzorana</td>
<td>106 The Channon Rd Lismore NSW 2480 Phone: 02 6688 6164 <a href="mailto:Gary@australianrainforestproducts.com">Gary@australianrainforestproducts.com</a></td>
<td>Grow, process and market lemon myrtle and anise myrtle for the food, cosmetic and pharmaceutical industries</td>
</tr>
<tr>
<td>Australian Native Lemon Myrtle Farms (ANLMF)</td>
<td>Brian Milgate</td>
<td>PO Box 125 Airlie Beach Qld 4802 Australia Ph: 07 4947 3595 <a href="mailto:info@lemonmyrtlefarms.com.au">info@lemonmyrtlefarms.com.au</a></td>
<td>Large grower, processor and exporter of both lemon myrtle and anise myrtle</td>
</tr>
<tr>
<td>Australian Native Bush Foods</td>
<td>Mark Lucas</td>
<td>Phone: (08) 8595 5144 <a href="mailto:MLucas1@hotkey.net.au">MLucas1@hotkey.net.au</a></td>
<td>Grower and processor of wattleseed</td>
</tr>
<tr>
<td>Barbushco</td>
<td>Bruce and Barbara Barlin</td>
<td>50 Gills Rd LORNE NSW 2439 Phone: 02 6556 9656 Email: <a href="mailto:barlinb@bigpond.com">barlinb@bigpond.com</a> Web: <a href="http://www.barbushco.com.au">www.barbushco.com.au</a></td>
<td>Growers, value-adders and marketers of lemon myrtle, aniseed myrtle, cinnamon myrtle, dorrigo pepper and lemon scented tea tree, Davidson plum, ribberries and brush cherries.</td>
</tr>
<tr>
<td>Basically Wild Pty Ltd</td>
<td>Sabine Wienand</td>
<td>388 Corks Pocket Road Reesville via Maleny QLD 4552</td>
<td>Distributor, producer of product lines,</td>
</tr>
<tr>
<td>Name</td>
<td>Contact Person</td>
<td>Address</td>
<td>Description</td>
</tr>
<tr>
<td>-------------------------------------</td>
<td>---------------------------------</td>
<td>----------------------------------------------</td>
<td>-----------------------------------------------------------------------------</td>
</tr>
<tr>
<td>Biofields Organic</td>
<td>David and Sandy Cohen</td>
<td>1476 Tin Can Bay Road Goomboorian QLD 4570</td>
<td>Mainly organic vegetable growers. Their Riberry is just coming into production</td>
</tr>
<tr>
<td>Brushtail Bushfoods, Victoria</td>
<td>Terry and Leonie Parker</td>
<td>07 5486 5767</td>
<td>They have a small mixed operation, using planted pepper trees, and their own drying equipment</td>
</tr>
<tr>
<td>Bushfood Australia</td>
<td>Lyle Dudley</td>
<td>PO Box 104 Wilmington SA 5485</td>
<td>Grower, wild-harvester, wholesaler, processor of wattleseed, quandong, bush tomato, mountain pepper and lemon myrtle.</td>
</tr>
<tr>
<td>Byron Bay Native Produce</td>
<td>Erika Birmingham</td>
<td>PO Box 232 Bangalow NSW 2479</td>
<td>Desert limes</td>
</tr>
<tr>
<td>Charles Darwin University</td>
<td>Julian Gorman</td>
<td><a href="mailto:Julian.Gorman@CDU.edu.au">Julian.Gorman@CDU.edu.au</a></td>
<td>Research Fellow at CDU and Wildlife Enterprise Facilitator for Northern Land Council (Kakadu Plum)</td>
</tr>
<tr>
<td>Coradji Pty Ltd</td>
<td>Robert Forbes Quentin Blades</td>
<td><a href="mailto:info@coradji.com.au">info@coradji.com.au</a></td>
<td>Processor of Kakadu Plum</td>
</tr>
<tr>
<td>Diemen Pepper Products</td>
<td>Chris Read</td>
<td>PO Box 194 Woodbridge Tas 7161</td>
<td>Large scale, aggregator, small scale grower and marketer of native pepper products</td>
</tr>
<tr>
<td>Desert Garden Produce Aboriginal Corporation</td>
<td>Ruth and Max Emery</td>
<td>Near Rainbow Valley, 110 kms south of Alice Springs</td>
<td>Bush tomato producer, sales and consultancy</td>
</tr>
<tr>
<td>Eden Bush Foods</td>
<td>Doug &amp; Kath Brownlow</td>
<td>Camp Mountain Queensland 4520</td>
<td>Growers of lemon myrtle, aniseed myrtle, riberry, lemon aspen, Davidson plums, round limes, burdekin plums, warrigal greens and blue almond.</td>
</tr>
<tr>
<td>Fields Farm</td>
<td>Dennis Field</td>
<td>Kingston</td>
<td>Muntries grower</td>
</tr>
<tr>
<td>Name</td>
<td>Contact Information</td>
<td>Description</td>
<td></td>
</tr>
<tr>
<td>-----------------------------</td>
<td>------------------------------------------------------------------------------------</td>
<td>-----------------------------------------------------------------------------</td>
<td></td>
</tr>
</tbody>
</table>
| Finger Limeing              | James Boyd  
Northern Rivers NSW  
Phone: 02 6689 7444  
Email: info@fingerlime.com  
Website: www.fingerlime.com | Commercial finger lime producer: network of orchards                        |
| Footeside Farm              | Peter and Linda Hoffman  
PO Box 27  
Eudunda SA 5374  
Phone: 08 8581 1373  
Email: info@footesidefarm.com  
Website: www.footesidefarm.com | Growers and marketers of lemon myrtle, wattleseed, quandong, saltbush and bush tomato. |
| Galeru Pty Ltd              | Martha Shepherd  
(Rus Glover and the Cohens are also partners in this business)  
PO Box 438, Cooroy QLD 4563  
T: 07 5442 5945  
F: 07 5442 5946  
info@galeru.com.au  
martha@galeru.com.au  
www.galeru.com.au | ANFIL Director  
Ready-to-use shelf-stable foodservice products using riberry. |
| Green Farmhouse             | Annette Green  
PO Box 92  
Millicent SA 5280  
Phone: 08 8735 2043  
Email: gfh@seol.net.au | Manufacturer of native spices and salts using muntries, wattleseed, kurrajong seed, saltbush, lemon myrtle, seaweed and native pepper. |
| IQ Agribusiness             | Hugh Macintosh  
PO Box 2055  
Toowong, Qld 4066  
07 3870 2080  
hugh@IQAgribusiness.com | Industry analyst especially desert limes                                    |
| Judy Viola’s Citrus Nursery | Judy Viola  
725 Friday Hut Rd  
Binna Burra NSW 2479  
Phone: 02 6687 1626 | Nursery; Pioneer of Fingerlimes                                              |
| Kimberley TAFE Western Australia | Kim Courtenay  
kim.courtenay@kimtafe.wa.edu.au  
Ph (08) 9192 9100  
0416 440575 (after hours) | Researcher and horticultural trainer (Kakadu Plum)                          |
| Kurrajong Australian Native Foods | Lee Etherington  
Unit 1 & 2 Industry Road  
McGraths Hill NSW 2756  
Phone: 02 4577 8711  
Email: wow@bushtuckershop.com  
Website:  
http://www.bushtuckershop.com | Manufacturer, marketer, exporter of native food products including Finger lime jam and finger lime curd |
| Laramba Community           | Janet Chisolm Napperby Station  
Phone: 08 8956 8777 | Coles Indigenous Food Fund has provided support for establishment of 10,000 plants at Larramba |
| Muntrie Magic Native Bush Foods | Glenn Denis  
PO Box 256  
Mount Pleasant SA 5235  
Phone: 08 8568 2355 | Growers, suppliers, value-adders and marketers                              |
<table>
<thead>
<tr>
<th>Company Name</th>
<th>Contact Name</th>
<th>Address</th>
<th>Phone Numbers</th>
<th>Email Addresses</th>
<th>Additional Information</th>
</tr>
</thead>
<tbody>
<tr>
<td>Murdering Point Winery</td>
<td>William Berryman</td>
<td>161 Murdering Point Rd Silkwood QLD 4857</td>
<td>07 4065 2327</td>
<td><a href="mailto:muntriemagic@dodo.com.au">muntriemagic@dodo.com.au</a></td>
<td>Producers of a range of fruit wines including Lemon aspen and Davidson plum.</td>
</tr>
<tr>
<td>Ooray Orchards</td>
<td>Kris Kupsch</td>
<td>28 Plumtree Pocket Burringbar NSW 248</td>
<td>02 66771466</td>
<td><a href="mailto:ooray-orchards@iinet.net.au">ooray-orchards@iinet.net.au</a></td>
<td>Former wild-harvester and cataloguer of Davidson plums; grower; researcher; and advisor.</td>
</tr>
<tr>
<td>Pepper Berry</td>
<td>Russell Langfield</td>
<td>Kimberly in Northern Tas Ph 03 6497 2002</td>
<td></td>
<td><a href="mailto:rlangfie@skymesh.com.au">rlangfie@skymesh.com.au</a></td>
<td>Offers pepper berries for sale on the net</td>
</tr>
<tr>
<td>Pipers Creek Grove</td>
<td>Jules and Liza</td>
<td>Dondingalong NSW 2440</td>
<td>02 6562 5462</td>
<td><a href="mailto:jules@piperscreekgrove.com">jules@piperscreekgrove.com</a></td>
<td>Growers and manufacturers of Dondingalong Organic Bushfoods. Species include blood limes, lemon myrtle, aniseed myrtle, cinnamon myrtle, Illawarra and Davidson plum.</td>
</tr>
<tr>
<td>Plant Business Research Project</td>
<td>Dr Slade Lee</td>
<td></td>
<td></td>
<td><a href="mailto:slade.lee@scu.edu.au">slade.lee@scu.edu.au</a></td>
<td>Researcher</td>
</tr>
<tr>
<td>Quorn Quandongs</td>
<td>Ian Powell</td>
<td>Brabardy Rd Mylor SA 5153</td>
<td>(08) 8388 5456</td>
<td><a href="mailto:tupelogrovenursery@gmail.com">tupelogrovenursery@gmail.com</a></td>
<td>Tupelo Grove Nursery now main business but has been growing quandongs for many years.</td>
</tr>
<tr>
<td>Quandong grower</td>
<td>Craig Elix</td>
<td>(08) 8865 2312</td>
<td><a href="mailto:centfarm@yp-connect.net">centfarm@yp-connect.net</a></td>
<td><a href="mailto:centfarm@yp-connect.net">centfarm@yp-connect.net</a></td>
<td>Quandong Farmer</td>
</tr>
<tr>
<td>Quandong grower</td>
<td>Greg Reghenzani</td>
<td>(08) 8088 4664</td>
<td><a href="mailto:welcomestranger@myacn.net.au">welcomestranger@myacn.net.au</a></td>
<td></td>
<td>Grower/ wild-harvester</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Cottage industry</td>
</tr>
<tr>
<td>Quandong grower</td>
<td>Steve Vlassopoulos</td>
<td><a href="mailto:astech@astech.com.au">astech@astech.com.au</a></td>
<td>0418 803 509 (08) 8270 5235</td>
<td></td>
<td>Producer/ Processor</td>
</tr>
<tr>
<td>Quandong grower</td>
<td>Matthew Koop</td>
<td>Property north of Nhill</td>
<td></td>
<td></td>
<td>Grower and marketer</td>
</tr>
<tr>
<td>Name</td>
<td>Contact Info</td>
<td>Organisation/Role</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>-----------------------------------</td>
<td>---------------------------------------</td>
<td>----------------------------------------------------------------------------------</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Victoria</td>
<td>Phone: 03 9525 7204 Email: <a href="mailto:niniwell@optusnet.com.au">niniwell@optusnet.com.au</a></td>
<td>of quandong and muntries</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>SANFA</td>
<td>Maarten Ryder PO Box 1152 Aldinga Beach SA 5173 Phone: 0409 696 360 Email: <a href="mailto:ryderresearch@chariot.net.au">ryderresearch@chariot.net.au</a></td>
<td>President SANFA Convenor of Muntries Group Researcher</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Playing with Fire</td>
<td>Rebecca Barnes and Gus Donaghy Playing with Fire 5/79 Southern Cross Drive Ballina NSW 2478 Phone: 02 6687 9245 Email: <a href="mailto:ozberries@hotmail.com">ozberries@hotmail.com</a> <a href="http://www.playingwithfire.com.au">http://www.playingwithfire.com.au</a></td>
<td>Growers, suppliers and manufacturers of a range of native food products. Species grown include lemon myrtle, anise myrtle, riberries and Davidson plums.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Rainforest Bounty</td>
<td>Margo Watkins 199 Old Boonjie Road Topaz Atherton Tablelands QLD Phone: 07 4096 8026 Email: <a href="mailto:info@rainforestbounty.com.au">info@rainforestbounty.com.au</a></td>
<td>Joint venture value-adding business between two native fruit growers. Producers of savoury and sweet condiments made using lemon aspen, Davidson plum, native tamarind and lillypillys.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Rainforest Foods</td>
<td>PO Box 1929 Byron Bay NSW 2481 Phone: 02 6680 8199 Email: <a href="mailto:info@rainforestfoods.com.au">info@rainforestfoods.com.au</a></td>
<td>Producer of many value added products including Lemon Aspen Jelly</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Rainforest Foods</td>
<td>Greg Trevena Managing PO Box 2288 Byron Bay NSW 2481 Phone: 02 6685 8097 <a href="mailto:rainforest@rainforestfoods.com.au">rainforest@rainforestfoods.com.au</a> <a href="http://www.rainforestfoods.com">www.rainforestfoods.com</a></td>
<td>Desert limes</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Rhyne Horticulture Finger Lime Nursery</td>
<td>Simon Manson Bundaberg, Qld Phone: 0428620585 Email: <a href="mailto:info@gourmetlimes.com">info@gourmetlimes.com</a> Website: <a href="http://www.gourmetlimes.com">www.gourmetlimes.com</a></td>
<td>Nursery; Orchard establishment and management services</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Robins Foods Pty Ltd (Outback Spirit Products)</td>
<td>Juleigh Robins Managing 23 - 25 Chester Road Altona, Victoria 3018 Australia (03) 9398 1088 <a href="mailto:admin@robins.net.au">admin@robins.net.au</a></td>
<td>Manufacturer of a wide range of products and provider of industry advice</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Sandy Grove</td>
<td>Robyn and Ashley Clark Pinks Beach Road PO Box 27 Kingston SA 5275 Phone: 08 8767 2722 Email: <a href="mailto:sandygrove@rbm.com.au">sandygrove@rbm.com.au</a></td>
<td>Grower and manufacturer of products including muntries, strawberries, blackberries,</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Company Name</td>
<td>Contact Person</td>
<td>Contact Details</td>
<td>Description</td>
<td></td>
<td></td>
</tr>
<tr>
<td>------------------------------------</td>
<td>---------------------------------</td>
<td>------------------------------------------------------</td>
<td>-------------</td>
<td></td>
<td></td>
</tr>
<tr>
<td>The Dilly Bag</td>
<td>Ms Dale Chapman</td>
<td>07 5458 1126 0402 616 056 <a href="mailto:dale@thedillybag.com.au">dale@thedillybag.com.au</a></td>
<td>Indigenous chef, and educator</td>
<td></td>
<td></td>
</tr>
<tr>
<td>The Otway Agroforestry Network, Victoria</td>
<td>Marianne Stewart</td>
<td><a href="mailto:marianne.stewart@oan.org.au">marianne.stewart@oan.org.au</a></td>
<td>Have a long term plan to produce pepper</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Tumbeela Native Bushfoods</td>
<td>Ewa and Warren Jones</td>
<td>Tumbeela Adelaide Hills Phone: 08 8388 7360 Email: <a href="mailto:info@tumbeela.com">info@tumbeela.com</a> Website: <a href="http://www.tumbeela.com">www.tumbeela.com</a></td>
<td>Growers and marketers of a range of products. Species include lemon and anise myrtle, bush tomato, wattle seed, mountain pepper, ribberries and quandong</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Twin Lakes Cultural Park</td>
<td>Bruno Dann Cynthia Edwards Marion Manson</td>
<td><a href="mailto:twinlakesculturalpark@gmail.com">twinlakesculturalpark@gmail.com</a> PO BOX 5306 Cable Beach WA 6726 08 9192 3825 0416 257386 (no reception at Twin Lakes)</td>
<td>Land Managers Harvesters Processors Wholesale Retail online (Kakadu Plum)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Vic Cherikoff Food Services Pty Ltd</td>
<td>Vic Cherikoff</td>
<td>Rear 167 Kingsgrove Road Kingsgrove NSW 2208 Australia (02) 9554 9477 <a href="mailto:info@cherikoff.net">info@cherikoff.net</a></td>
<td>Manufacturer Wholesaler Online Retailer (Kakadu Plum)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Wild Fingerlime: Citrus Caviar</td>
<td>Georgie MacDougall</td>
<td>Blackbutt Ridge Burringbar NSW 2483 Ph 0421 649 700 Email: <a href="mailto:info@wildfingerlime.com">info@wildfingerlime.com</a> Website: <a href="http://www.wildfingerlime.com">www.wildfingerlime.com</a></td>
<td>Sales and Marketing (past President of AFGA)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Wild Harvest NT</td>
<td>David Boehme</td>
<td><a href="mailto:wholesale@kakaduplum.com.au">wholesale@kakaduplum.com.au</a> <a href="http://www.kakaduplum.com.au/0488">http://www.kakaduplum.com.au/0488</a> 205 652</td>
<td>Kakadu Plum Processor Wholesaler Retail online</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Woolgoolga Rainforest Products</td>
<td>Rus Glover</td>
<td>PO Box 12 Woolgoolga NSW 2456 Phone: 02 6656 2338 Email: <a href="mailto:rusglover@westnet.com.au">rusglover@westnet.com.au</a></td>
<td>Growers and suppliers of ribberries, aniseed myrtle, lemon aspen, small-leaf tamarind, rosella, Davidson plum.</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
References

ANFIL website www.anfil.org.au


75


McCombie Helen (2003) Interview with Brian Milgate on Business Sunday on 3 August 2003


Morse, J. and Terri Janke & Company (2010) Know your rights to your Aboriginal plant knowledge: A guide for Aboriginal Knowledge holders on recording and commercialising Aboriginal plant knowledge Aboriginal Bush Traders: Darwin


Parks and Wildlife Commission Northern Territory (PAWCNT) 2006 Threatened Species of the Northern Territory Quandong Santalum acuminatum Department of Natural Resources, Environment and the Arts: Darwin

Phelps, DG (1997) Feasibility of a Sustainable Bushfood Industry in Western Qld. RIRDC Canberra

Primary Industries and Resources South Australia (PIRSA 2006) “Australian Native Citrus – wild species, cultivars and hybrids” Fact Sheet No. 7/03 Last updated March 2006.

Primary Industries and Resources South Australia (PIRSA 2006) “Muntries Production” Fact Sheet No. 13/03 Last updated March 2006.
Primary Industries and Resources South Australia (PIRSA 2001) “Miscellaneous Native Food Crops - Davidson and Illawarra Plums” Fact Sheet November 2001

Primary Industries and Resources South Australia (PIRSA 2001) “Wattleseed Production” Fact Sheet November 2001

Primary Industries and Resources South Australia (PIRSA 2001) “The Native Food Industry in South Australia” Fact Sheet November 2001

Rainforest CRC (2006) Project 7.3 Technical education and training and participatory domestication of native food plants with the Ma:Mu community

Read, C (undated) Diemen Pepper Product Range brochure

RIRDC (2000) Marketing the Australian Native Food Industry, BUS-1A (00/61)


Rural Diversity – News from RIRDC Issue No. 3 Autumn 2009

Rural Diversity – News from RIRDC Issue No. 4 Summer 2010


South Australian Native Food Association (SANFA) Newsletter No 43, June 2011, SANFA: www.sanativefoods.org.au


Australian Native Food Industry Stocktake

By Michael Clarke
Pub. No. 12/066

The Australian Native Food Industry is maturing away from wild harvest and R&D is playing an increasingly important role in developing viable cultivation and post-harvest management systems. Particularly pleasing is the increasing interest shown by mainstream food manufacturers and retailers in Australian native foods.

The Australian native food industry offers farm income diversification opportunities and scope for Indigenous people to generate additional income streams on Aboriginal owned land.

The purpose of this stocktake was to provide a first ever situation assessment for the Australian native foods industry; to analyse stocktake findings and determine implications for R&D and strategy; to deliver a survey questionnaire that could be used in the future to update the stocktake; and to develop a simple industry database of willing and publically available contacts.

RIRDC is a partnership between government and industry to invest in R&D for more productive and sustainable rural industries. We invest in new and emerging rural industries, a suite of established rural industries and national rural issues.

Most of the information we produce can be downloaded for free or purchased from our website <www.rirdc.gov.au>.

RIRDC books can also be purchased by phoning 1300 634 313 for a local call fee.

Rural Industries Research & Development Corporation

Phone: 02 6271 4100
Fax: 02 6271 4199
Bookshop: 1300 634 313
Email: rirdc@rirdc.gov.au
Postal Address: PO Box 4776, Kingston ACT 2604
Street Address: Level 2, 15 National Circuit, Barton ACT 2600

www.rirdc.gov.au