

FORMULARIO INFORME TECNICO



GIRAS DE INNOVACIÓN 2014

GIT-2014-0410

INNOVACIÓN, PRODUCCION Y COMERCIALIZACIÓN DE PRODUCTOS
ALIMENTARIOS FUNCIONALES CON SEMILLAS DE ACACIA EN AUSTRALIA
("WATTLE SEED")

19 AL 28 DE ENERO DE 2015

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Nombre de la gira de innovación
INNOVACIÓN, PRODUCCION Y COMERCIALIZACIÓN DE PRODUCTOS ALIMENTARIOS FUNCIONALES CON SEMILLAS DE ACACIA EN AUSTRALIA ("WATTLE SEED").
Código FIA
GIT-2014-0410
Fecha de realización de la gira
19 AL 28 DE ENERO DE 2015 (10 al 17/1)
Ejecutor
INFOR
Coordinador
PATRICIO ROJAS VERGARA
País (es) visitado (s)
AUSTRALIA
Firma del coordinador

Instrucciones:

- La información presentada en el informe técnico debe estar directamente vinculada a la información presentada en el informe financiero, y ser totalmente consistente con ella
- El informe técnico debe incluir información en todas sus secciones, incluidos los anexos
- Los informes deben ser presentados en versión digital y en papel (dos copias), en la fecha indicada como plazo de entrega en el contrato firmado entre el ejecutor y FIA

1. Identificación de los participantes de la gira de innovación

	Nombre y apellido	Entidad donde trabaja	Profesión,	Correo electrónico	Teléfono	Dirección
1	Patricio Rojas Vergara ✓	INFOR-GERENCIA METROPOLITANA	INGENIERO FORESTAL MSC			
2	Carlos Alberto Bobadilla Fernández ✓	SILVICULTURA ZONAS ARIDAS (SILVIZA)	Director			
3	Ignacio Vicente Aliende Larraín ✓	Fundo Santa María de Pullalli, s/n	Administrador			
4	Eduardo Francisco Collantes Méndez ✓	VISNAGAL S.A.	Gerente			
5	Alvaro Hernán Gonzalez Guerrero ✓	Gonzalez Y Compañía Limitada. ASEMAFOR	Gerente			

2. Itinerario realizado en la gira de innovación

Entidad (institución/empresa/ productor)	Ciudad y país	Describe las actividades realizadas	Nombre y cargo de la persona con quien se realizó la actividad en la entidad visitada	Temática tratada en la actividad	Fecha (día/mes/año)
Oz Tukka. Seasands Drive - Redhead ✓	New Castle. Siydney. Australia	<ul style="list-style-type: none"> Visita proceso de obtención de harinas de Acacia y líneas de producción de productos alimentarios Reunión para consultas técnicas sobre el proceso e información de la cadena de 	Supervisora Jo. Bente Saugbjerg (vía telefónica)	<ul style="list-style-type: none"> Proceso de producción Volúmenes y precios de semillas de Acacia y productos alimentarios de Acacia 	21.1.2015

		producción (volúmenes, precios)			
University of New Castle. School of Biomedical Sciences and Pharmacy ✓	New Castle Sydney Australia	<ul style="list-style-type: none"> • Presentación Proyecto FIA Harinas de Acacia saligna. • Presentación Alimentos Funcionales • Presentación del CRC: Centro Tecnológico de Alimentos Funcionales. 	DR. PETER HOWE Professor of Nutrition Research Director, Clinical Nutrition Research Centre	<ul style="list-style-type: none"> • Discusión sobre posibles proyectos conjuntos de I+D sobre alimentos funcionales en Acacia saligna. 	21.1.2015
Australian Functional Ingredients Pty Ltd - rear Kingsgrove Rd Kingsgrove ✓	Kingsgrove NSW. Sydney	Discusión proceso productivo de alimentos de Acacia de la empresa, proveedores, precios y volúmenes.	MR. VIC CHERIKOFF	<ul style="list-style-type: none"> • Proceso de producción • Volúmenes y precios de semillas de Acacia y productos alimentarios de Acacia 	22.1.2015
Export Promotion Bureau, Embassy of Chile. Clarence St.	Sydney www.prochile.gob.cl/int/australia	<ul style="list-style-type: none"> • Presentación Pro Chile nicho Wattle Seed en Australia • Presentación Proyecto FIA • Colecta de información sobre la cadena de producción del Wattle Seed en Australia. 	Silvana Gattini Senior Trade Commissioner. Gabrielle Hall. Senior Trade Advisor	<ul style="list-style-type: none"> • Nicho Wattle Seed en Australia • Cadena de producción 	23.1.2015
Grampians Farm. Melbourne	Grampians National Park, Melbourne, Australia	<ul style="list-style-type: none"> • Visita huerto de Acacias para la producción de semillas • Silvicultura y cosecha de semillas de Acacia 	Mr. Barry Clugston Dr. Peter Yates (U. of Darwin, WorldVision Consultant)	Prácticas silviculturales y cosecha de semillas para la producción de alimentos de Acacia.	26.1.2015

ROBINS Outback Spirit: Chester Rd - Altona - Victoria ✓	23-25 Chester Rd - Altona - Victoria. Sydney. Australia	Juleigh Robins Robins ? →	Visita a la planta industrial, proceso de elaboración de harinas y productos alimentarios con semillas de Acacia saligna.	reunión de posible intercambios de experiencias.	27.1.2015
"Victoria University College of Health and Biomedicine, Australia Victoria University ✓	Werribee Campus	Visita a los laboratorios de la Facultad y reseña de la investigación en alimentos funcionales.	Dr Todor Vasiljevic, PhD (U Alberta). Professor of Food Science and Leader, Advanced Food Systems Research Unit"	Posible intercambio científico con el Dr. Diego García de la U. de Chile. CREAS.	27.1.2015

2.1 Indicar si hubo cambios respecto al itinerario original

Se agregó al programa original una reunión técnica concertada con la oficina comercial de PROCHILE en Sydney en la cual se sostuvo una reunión con la Sra. Silvana Gattini Senior Trade Commissioner y la Srta. Gabrielle Hall, Senior Trade Advisor que proporcionaron valiosa información sobre el nicho de mercado Wattle Seed en Australia y su cadena de valor. Los documentos conseguidos que se incluyen en los Anexo son los siguientes:

1. Australian Functional Food a healthy choice for functional food investment. ✓
2. Australian Native Food Industry Stocktake. AUGUST 2012. RIRDC Publication No. 12/066 ✓
3. Native Foods R&D. Priorities and Strategies. 2013 – 2018 ✓
4. WATTLE SEED focus on Part of an R&D program managed by the Rural Industries Research and Development Corporation ✓



Se incluyó una visita a un barrio en Sydney de tiendas de alimentos funcionales en Oxford Street a sugerencia de la oficina de Prochile, donde se expenden sólo productos alimentarios orgánicos y con fines funcionales para la salud. Se encontraron algunos productos de Acacia. Así también se efectuó una visita a un productor forestal en la región de Grampians (Melbourne, Estado de Victoria) propietario de una plantación de varias especies de Acacias de 12 hectáreas destinadas exclusivamente a la producción de semillas con fines alimentarios, con una cosecha anual de una tonelada de semillas limpias. ✓



Finalmente se agregó una reunión con los directivos de WorldVision Australia para explicar los objetivos de la gira, agradecer los contactos hechos con los productores alimentarios que facilitó la gira, como también informar del taller final del proyecto en el tercer trimestre 2015, para evaluar la participación de un experto en el tema alimentario funcional.

3. Indicar el problema y/o oportunidad planteado inicialmente en la propuesta

Actualmente INFOR desarrolla con financiamiento de FIA el proyecto PYT-2013-0010 Productos alimentarios funcionales con semillas de *Acacia saligna* cuyo objetivo es la producción de :

- (a) un pan multicereal elaborado con harina 100% integral, harina de centeno, harina de acacia¹, con adición de semillas tales como *Acacia saligna*, sésamo, maravilla chía, linaza, quínoa, soya, calabaza, avena, sin colorantes artificiales y bajo contenido de sodio y
- (b) un galletón elaborado con harina de acacia, harina 100% integral, hojuelas de avena, sin incorporación de sacarosa, endulzado con stevia.

Existen 7.500 mil hectáreas de *Acacia saligna* en el secano de la Región de Coquimbo destinadas a la protección de suelos y marginalmente la producción de forraje, cuyas semillas pudieran ser procesadas para la producción de harinas funcionales y alimentos saludables. De acuerdo a los resultados del estudio de prefactibilidad existiría una disponibilidad de 100 toneladas de semillas susceptibles de ser cosechadas por temporada en la Región de Coquimbo, suficientes para abastecer una industria de harinas y alimentos funcionales. Existe información sobre el valor nutricional de las semillas de *Acacia* para fines comestibles cuyos productos derivados como galletones y saborizantes se destinan preferentemente a la industria de alimentos funcionales y nutraceuticos del bushfood en Australia, con alta rentabilidad para los productores de semillas. Este nicho de mercado incluye productos naturales

¹ La harina de *Acacia saligna* será un aditivo entre un 5 a 10% para ambos productos del Molino La Estampa.

con propiedades benéficas para la salud como alto contenido de proteínas, rico contenido en fibras de sus harinas y bajo índice glucémico. El propósito de la gira fue conocer la cadena de producción de harinas y otros alimentos del “Bush food” como también la comercialización y el estado de la innovación tecnológica de estos productos.

4. Indicar el objetivo de la gira de innovación

El objetivo de la gira de innovación consistió en conocer la cadena de producción de harinas con semillas de Acacia y empresas que comercializan productos alimentarios “Wattle Seed” en Australia, además de conocer el estado del arte de este segmento alimentario en dos universidades que desarrollan investigación en el tema.

Para este objetivo se contó con la colaboración del Dr. Peter Yates (Consultor de World Vision Australia) que sugirió las Universidades, productor forestal y las 3 empresas visitadas. Además de lo anterior se contactó a la oficina de PROCHILE en Sydney para recabar más información del nicho de mercado “Wattle Seed”.

5. Describa clara y detalladamente la o las soluciones innovadoras encontradas en la gira

A. SOLUCIONES INNOVADORAS

A1. Diversificación de especies como materia prima para la elaboración de productos alimentarios.

El actual proyecto del FIA de harinas de **Acacia saligna** está concebido como un aditivo (5-10%) en panes integrales y un galletón de una sola especie de Acacia existente en Chile en plantaciones.

En el caso de los productos alimentarios “Wattle seed”² visitados en las empresas australianas estos corresponden en algunos casos a harinas torrefactadas con un 100% de semillas de Acacia de textura fina y aroma similar a un café con distintas aplicaciones y en otros casos mezclas de extractos de Acacia con otras especies como Macadamia.

² Como “Wattle seed” se entienden varias especies del género que son comestibles.



Muffin Mix de Acacia y Macadamia

Las tres especies principales que se utilizan actualmente son ***Acacia victoriae*** (Elegant Wattle), ***A. pycnantha*** (Golden Wattle), ***A. retinoides*** (Silver Wattle) y ***A. murrayana*** (Sandplain Wattle) con ***A. victoriae*** siendo la más importante. También en las visitas a las empresas y productor forestal se informaron de otras especies de interés comestible como: ***Acacia baileyana***, ***A. becklerii***, ***A. microcarpa*** y ***A. coriacea***. Las semillas pueden ser almacenadas por largos períodos de tiempo, una vez cosechadas, son tostadas (sobre 100°C y molidas, siendo utilizados en panes especiales, chocolates finos, galletas y pasteles.

A2. Silvicultura para la producción de semillas de Acacia.

Las plantaciones para la producción de semillas de Acacia necesitan de un espaciamiento muy amplio, similar a aquellos usados en los huertos semilleros, que permiten una alta floración de los árboles. La plantación visitada fue establecida con subsolado y arado que permite un pequeño camellón con un espaciamiento de 9 x 4 metros (entre y dentro de la hilera). La plantación es multispecífica, compuesta al menos por cuatro especies de Acacia de semillas comestibles de forma que permite aumentar la ventana de floración y “rotar” en la producción de semillas para su cosecha.



Plantación de Acacias spp en visitada en Grampias (Melbourne, Victoria) para la producción de semillas con fines alimentarios. Espaciamiento de 9 x 4 metros (entre y dentro de la hilera). Rendimiento 83 Kg/ha/año. Superficie: 12 hectáreas.

El espaciamiento de la plantación está relacionado con la altura total que pueden alcanzar los árboles y el desarrollo del follaje. Algunas especies pueden alcanzar 8 a 10 metros de altura y las ramas cubrir una distancia de 10 a 15 metros. También esto se requiere para la mecanización de las faenas. El subsolado y el camellón permite captar el escurrimiento de las aguas lluvias. La silvicultura no considera fertilización, ni nutrición especial para la producción de yemas florales, frutos y semillas. Si considera un régimen liviano de podas en particular de las ramas bajas del árbol.

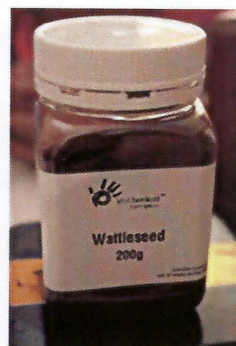
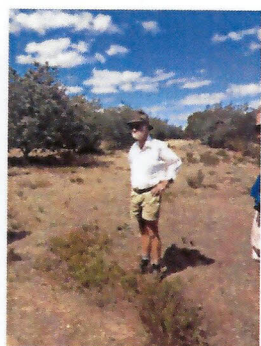
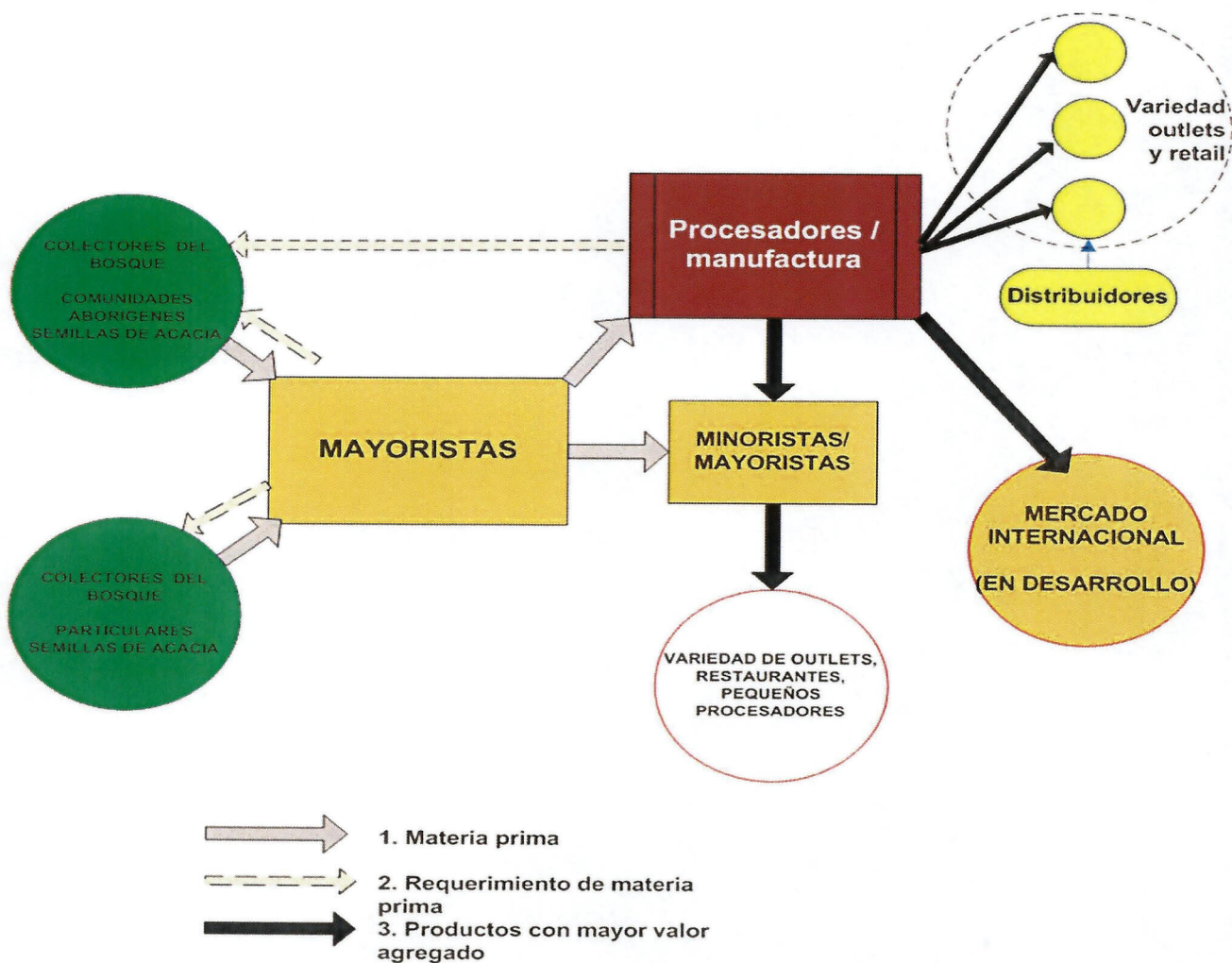
A3. Cosecha Manual vs “Shaker”. Tradicionalmente, las semillas de acacias ha sido recolectadas de árboles naturales por métodos manuales. El costo de colecta es alto por la cantidad de jornadas requeridas por kg. Este método de recolección manual sigue siendo predominante en el abastecimiento del mercado de alimentos. Debido a sus características de arbusto la actividad de cosecha es muy intensiva en mano de obra y en una escala comercial ofrece un coste significativo. Debido a los altos costos de mano de obra en Australia y la periodicidad en la producción de semillas anuales, la oferta y precios de las semillas es cíclica y variable entre años. Para este propósito se han desarrollado recolectores tipo “skaker” más eficientes y económicos para la producción de semillas de acacia a gran escala para bajar los costos de cosecha.

A4. Cadena de valor productos alimentarios “Wattle Seed en Australia”.

La cadena de valor está integrado por las comunidades aborígenes que colectan las semillas en el bosque o particulares, los mayoristas intermediarios que compran las semillas, las procesan como harinas, incluyendo diferentes regímenes de tostado y tipos de molienda y aquellos que dan valor agregado a los productos. En este último caso son empresas que agregan valor a un producto ancestral a través de procesos de producción y distribución de productos alimentarios con valor funcional. De forma general se visualizan los siguientes componentes de este nicho de mercado “Wattle Seed”, según la información proporcionada por PROCHILE Australia:

- a) Se cultiva ***Acacia victoriae*** en South Australia, Northern Territory y New South Wales. La producción comercial ocurre en zonas de estos estados y en Victoria.
- b) Se considera al Wattleseed como el 'héroe poco reconocido' de la industria australiana de cultivos indígenas.
- c) Se requiere mucho desarrollo del mercado si el producto quiere llegar a ser de consumo masivo y no de nicho, de esta forma, la producción aumentará con la demanda.
- d) El mercado que tiene potencial para crecimiento es el de la cerveza, existen 2 marcas realizadas con wattleseed y ya con alta tasa de ventas, en Sídney y South Australia.
- e) Tiene una alto periodo de conservación, 10 años.
- f) Mientras algunos venden las semillas crudas a los fabricantes, otros reconocen la importancia de valor agregado para hacer que la industria sea rentable.
- g) La inversión del gobierno australiano en proyectos para agregar valor a los cultivos indígenas corresponde al 66% de la inversión total, o sea, AU\$1,6 millones.
- h) La industria de cultivos indígenas da empleo entre 500 y 1000 personas, de las cuales la mitad es aborígen que vive en comunidades rurales.
- i) La mitad del wattleseed en la industria es cultivado por mujeres aborígenes en el centro de Australia.
- j) Algunas comunidades han informado que reciben precios más altos (hasta un 200%) para proyectos de reforestación de sitios mineros que en ventas a la industria alimenticia.
- k) Formación de la Australian Native Food Industry Ld, Asociación de Cultivos Nativos.

CADENA DE VALOR PRODUCTOS ALIMENTARIOS WATTLE SEED AUSTRALIA



Cosechadores del bosque de semillas de Acacia	Mayoristas	Procesadores	Productores del retail
<ul style="list-style-type: none"> • 0,5 – 5 toneladas /año (rango total entre todos los productores) • Venta por AU\$ 0,5 – 4,0 – 14,00/kg 	<ul style="list-style-type: none"> • Lo que se pueda obtener. Venta AU\$ 15-25/kg + flete (molido y tostado). • Ha llegado a precio tan alto como AU\$ 98/kg y tan bajo como AU\$ 8/kg) 	<ul style="list-style-type: none"> • 4 Kgs. – 200 Kgs/año dependiendo del tamaño del negocio. • Valor agregado del producto : margen del 15 a 25% 	<ul style="list-style-type: none"> • Número de unidades indeterminadas. • AU\$ 8,50 en los estantes a AU\$ 12,00 en tarros
\$250-\$2.000-\$7.000/kg semillas	\$7.500-\$12.500-\$49.000		\$4.000-\$6.000
Los rendimientos anuales de las semillas de Acacia en el bosque nativo con erráticas y en algunos años nulas. Los costos de cosecha son altos, cuando son efectuados en forma manual ya que esta se efectúan en veranos y los valores de HH en Australia son altos (AU\$ 20/hora).	Esto corresponde a las harinas 100% de varias especies de Acacia comestibles, principalmente A. victoriae, A coriacea.	Esto corresponde a alimentos con componente funcionales	Al igual que en Chile existen tiendas especializadas en alimentos funcionales “bushfood” como también la venta en supermercados.

Farm gate Value “Wattle seed” 2010³

³ PROCHILE Australia

Tipo	Volumen (anual)	Precio por kilo (AU\$) (semilla cruda)*	Valor Farm Gate (AU\$)
Silvestre	1-4 toneladas	15-30	25.000-100.000
Cultivada	3-4 toneladas	15-30	75.000-100.000
Total	4-8 toneladas		100.00-200.000

Listado de empresas y centros tecnológicos australianos relacionados con los productos alimentarios de Acacia en Australia :

A. EMPRESAS DE PRODUCTOS ALIMENTARIOS DE ACACIA EN AUSTRALIA

- 1) OZ Tukka <http://www.oztukka.com.au/spices.htm>
- 2) <http://www.bushfoodaustralia.com.au/wattleseed/>
- 3) www.outbackspirit.com.au
- 4) <http://www.anfil.org.au/contact-us/> National Association for native foods.
- 5) <http://cherikoff.net/> Vic Cherkoff
- 6) <http://www.outbackpride.com.au/>

B. CENTROS TECNOLÓGICOS DE ALIMENTOS FUNCIONALES EN AUSTRALIA

- 1) Newcastle University (200km north of Sydney):
http://www.newcastle.edu.au/Resources/.../nutrition%20food%20and%20health_web_2011.pdf
- 2) Victoria University (Melbourne) <http://www.vu.edu.au/research/research-focus-areas-expertise/research-focus-areas/food-sciences-nutrition>
- 3) CSIRO. <http://www.foodscience.csiro.au/functional-foods.htm>

INNOVACIONES TECNOLÓGICAS EMPRESA ALIMENTARIA OZ TUKKA



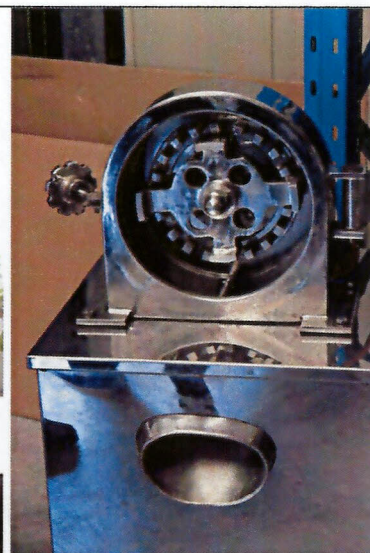
El nombre de la empresa surge de la jerga australiana “Oz” para designar a Australia y una derivación de la palabra “tucker” que significa comida, comida original de Australia. Ozz Tukka se especializa en sabores auténticos australianos también conocidos como “**bush food, bush tucker (Tukka)**” derivados de especies nativas australianas. La empresa produce una gama de productos únicos y múltiples galardonados que incluyen especies nativas del bush food, aceite de la nuez de macadamia, nuez de macadamia dukkah, mezclas de especies y libre de gluten, mezclas para muffins. Los productos están respaldados con recetas para todos los gustos, así como la adición de un sabor australiano distinto a cualquier cocina gourmet.



(a) Semillas de *Acacia coriácea*



(b) horno de tostado



(c) molino



(d) harinas



(e) sala de envasado



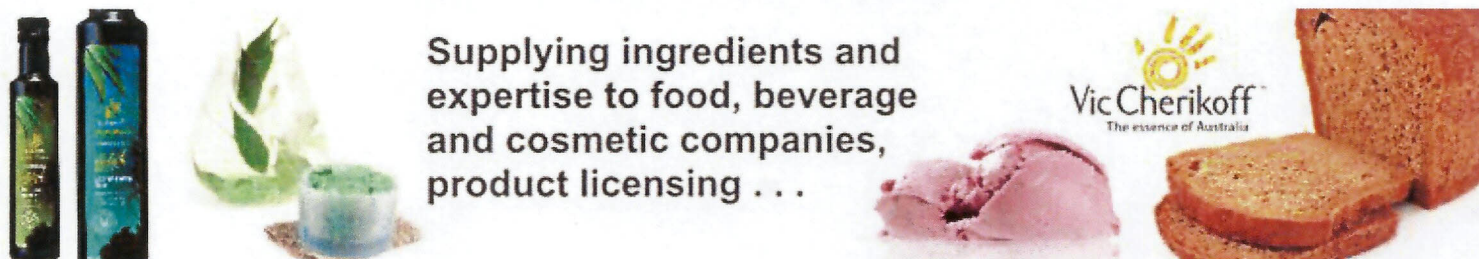
(f) display productos *Acacia*

La compañía es 100% propiedad australiana y fue fundada en 2003, basada en la curiosidad y pasión por la comida natural y el enorme aprecio por la naturaleza australiana. La empresa usa las semillas de Acacia para diferentes productos alimentarios. La supervisora en la planta mostró cómo se tuestan en los hornos las semillas y cómo se muelen, en diferentes tipos de molinos. Explicó también cómo las semillas se mezclan con otros ingredientes para hacer saborizantes. En la visita se probaron algunos de los productos fabricados en Oz Tukka con semillas de acacia como ingrediente. Estos vienen en frascos de 40g que contenían 100 % semillas de acacia molida. La especie preferida de acacia utilizada en Oz Tukka es *Acacia coriacea*, sobretudo porque es más fácil de tostar y es de mejor valor en el mercado. Oz Tukka también utiliza la especie *Acacia victoriae* pero a una escala mucho menor. También hubo mención de *Acacia pycnantha* por su fácil manejo debido al mayor tamaño de las semillas. La mayor parte de las ventas son en línea en internet y los compradores son tiendas de regalo y turísticas, otras de botánicos y parques nacionales, galerías de pueblos aborígenes, así como tenderos y carniceros.

En términos de volumen de semillas de acacia vendidos al año, Oz Tukka vendió alrededor de 20kg - 40kg a otros fabricantes y utiliza entre 60kg - 80kg en sus productos alimenticios. El precio de las semillas de acacia era de AU\$

65⁴/kg. El precio de un frasco de 40 g de condimento de Acacia es de AU\$ 8,50⁵. La empresa es pequeña con un mínimo de equipo usado para tostación, molienda, mezclado y almacenamiento de los productos alimenticios. Según la información de la supervisora, la pequeña planta es operada por dos persona, ella y la dueña.

AUSTRALIAN FUNTIONAL INGREDIENTS⁶ PTY. VIC CHERIKOFF



Antecedentes de la empresa.

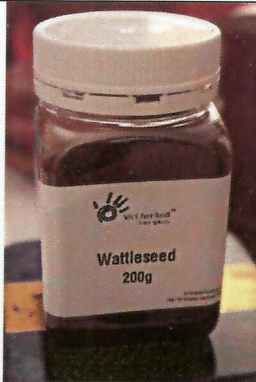


Vic Cherikoff⁷ propietario de la empresa está considerado como uno de los pioneros de la industria de los alimentos nativos de Australia y tiene casi 30 años de experiencia en la comercialización de especies silvestres comestibles, tomándolos de la naturaleza como bush tucker o busfood y convirtiéndolas en alimentos sofisticados y versátiles, auténticos alimentos naturales australianos, para bebidas y con ingredientes funcionales. Desde hace más de 6.000 años, los aborígenes australianos procesaron las semillas de acacias, las tostaron y las molieron, como harina gruesa para la elaboración de tortillas horneadas. Todo esto cambió en 1984, cuando un descubrimiento accidental de Vic Cherikoff generó el producto conocido hoy día como **Cherikoff Wattleseed**. Esto es más que un aroma (natural, por supuesto) a base a especies especialmente seleccionadas de acacias, cuidadosas y artísticamente horneadas, utilizando un régimen de temperatura especial para llevar a cabo un perfil maravilloso y específico de productos con sabor Maillard que amamos en el chocolate, alimentos horneados y nueces tostadas.

⁴ \$32.500

⁵ \$4.250

⁶ Ingredientes funcionales australianas son las especias, hierbas, frutas, semillas, frutos secos, salsas, condimentos, jarabes, aceites de infusión, extractos, concentrados y otros más. Se utilizan en las recetas australianas auténticas con sabores únicos.

⁷ <http://cherikoff.net/>

Usos alimentarios	Propiedades funcionales	I+D+i
<p>Cherikoff Wattleseed es muy adecuado para una amplia gama de platos, salsas y condimentos. Ya sea en forma seca o como el extracto líquido, Wattleseed puede ser utilizado en alimentos horneados tales como panes, galletas, magdalenas y tartas y también en postres incluyendo budines, crepes, panecillos, bollos, panecillos o galletas saladas; también en los postres lácteos con helado. También puede ser usado en bebidas como espresso o hervida y colada (a diferencia del café, Wattleseed puede manejar temperaturas de ebullición). También puede ser combinado con la leche, ya que resalta su dulzura y redondea el sabor. Es bueno mezclado con café si se necesita el golpe de cafeína y hay empresas que ya comercializan el extracto Cherikoff Wattleseed para agregarlo a las cervezas con sabor suave.</p>	<p>Cherikoff Wattleseed tiene un índice glucémico bajo lo que significa que los hidratos de carbono se absorben lentamente y por lo tanto generar liberación rápida de azúcar. Wattleseed se puede incorporar en los alimentos para reducir el IG general o bien simplemente mejorar su valor nutricional o para hacer realidad algo de comida aceptable para las personas con diabetes no dependientes de insulina.</p>	<p>Nuevos extractos Wattleseed hechas con técnicas de dióxido de carbono líquido (CO₂ sub-crítico) de extracción. Estos nos dan sabores concentrados que se pueden utilizar en aplicaciones de baja humedad (confitería, chocolate, quesos, miel, etc.).</p>
		

Resumen de la visita.

En el 22 de Enero visitamos Vic Cherikoff de Australia Funcional Ingrediente Pty Ltd en Kingsgrove NSW. Vic Cherikoff es considerado como una autoridad en los alimentos nativos australianos y su industria asociada. Al igual que Oz Tukka, Functional Ingredients Australia Pty Ltd produce productos alimenticios con ingredientes funcionales. Vic nos mostró las máquinas utilizadas para secar, tostar y moler las semillas de acacias y nos dio un relato de su historia personal y experiencia con las semillas de acacias, incluyendo las distintas formas de recolectar las semillas y el impacto de los altos costos laborales en Australia sobre la

recolección de semillas de acacias.

Mencionó que en un momento de su carrera de 30 años vendió 1 millón de dólares con aromatizantes que utilizan el 3% mezcla de semillas de acacia. Actualmente un contenedor de 200 gramos de semilla de acacia se vende por \$24 o \$95 por kg. Vic no reveló las especies Acacia que utiliza, pero dijo que no utiliza las semillas de Acacia saligna, pero estaría interesado en su uso como harina. Se mostró interesado en muestras de harina de **Acacia saligna**.



Outback Spirit es el nombre comercial de Robins Foods Pty Ltd, una pequeña fábrica de procesamiento de alimentos de propiedad familiar empresa especializada en el procesamiento de legumbres y granos, tanto para los mercados nacionales y de exportación, con un fuerte compromiso con los productos nativos australianos. Los propietarios Ian y Juleigh Robins han estado haciendo comida durante 30 años en restaurantes, catering, empresas y también han desarrollado fabricación de alimentos. Ian y Juleigh son reconocidos pioneros de la industria de los alimentos nativos de Australia y han estado a la vanguardia desde su creación en 1986. Establecieron Robins Foods en 1997.

La visión de Juleigh es llevar alimentos indígenas al principal mercado de alimentos y su empresa es líder en este rubro bajo los productos Outback Spirits en supermercados a nivel nacional en Australia. En 2000 Ian y Juleigh decidieron formalizar sus relaciones con los proveedores indígenas de la empresa y establecer una cadena de suministro ético (precio justo) que también incluye Supermercados Coles como socio. Coles dio apoyo filantrópico de esta cadena de suministro a través de las contribuciones al Fondo de Alimentos Indígenas. Coles ha asegurado los beneficios de la venta de productos Outback Spirit que se remontan a los pueblos aborígenes, que a su vez están desarrollando sus propias empresas sobre la base de los alimentos nativos. Tanto Coles y Robins alimentos contribuyen por igual al Fondo Indígena Alimentos Coles.



Además Robins Foods estableció la Fundación Outback Spirit en 2008 y trabajó en estrecha colaboración con el Fondo Indígena de Alimentos Coles en proyectos a nivel comunitario. Robins Foods fabrica bajo el proceso sistemático preventivo para garantizar la inocuidad alimentaria (HACCP) (Análisis de Peligros y Puntos Críticos de Control) y comercializa una gran gama de productos alimenticios nativos australianos (que comprenden aproximadamente 50% de su gama de productos completa) a una amplia variedad de proveedores de servicios de alimentos nacionales. Coles en asociación con el Fondo Indígena Alimentos Coles y Woolworths han desarrollado puntos de venta en el extranjero en Estados Unidos y en el Reino Unido.

6. Indique la factibilidad de implementar en el país la o las soluciones innovadoras encontradas en la gira

a) De las innovaciones silvícolas

Será posible introducir las especies de *Acacia* con fines comestibles en Chile con aquellas con potencial alimentario visitadas en la gira, sugiriendo para su plantación condiciones de mayor disponibilidad hídrica como el secano de la VI, VII y VIII regiones. Para la introducción de las especies de *Acacia* desde Australia a Chile estas deberán ser evaluadas por el SAG.

También deberá formularse un programa de introducción de especies y procedencias al menos en 3 sitios para probar su adaptación y crecimiento.

Para efecto de las futuras plantaciones de ***Acacia saligna*** con fines de producción de semillas estas deberán ser efectuadas con espaciamientos amplios que permitan una mayor floración de los árboles, a su vez que permitan una menor competencia por nutrientes y agua.

b) De las innovaciones de los productos alimentarios

Además de la confirmación de las propiedades funcionales de las harinas de Acacia saligna, deberán investigarse en un proyecto de I+D+i los regímenes térmicos de tostado (torrefacción) y molienda para un producto similar al que producen las empresas alimentarias australianas. Deberá chequearse si no existe algún protocolo de patentamiento al respecto en harinas de Acacia.

7. Indique y describa los contactos generados en el marco de la realización de la gira de innovación

Nombre del contacto	Institución a la que pertenece	Descripción de su trabajo en la institución	Teléfono	Correo electrónico	Dirección
Bente Saugbjerg. Jo (supervisora)	OZ Tukka	Gerente			
Dr. Peter Howe	School of Biomedical Sciences and Pharmacy. University of Newcastle	Profesor			
Vic Cherikoff	Australian Functional Ingredients Pty Ltd -	Gerente y Propietario			
Silvana Gattini	PROCHILE AUSTRALIA. Export Promotion Bureau, Embassy of Chile. www.prochile.gob.cl/int/australia	Senior Trade Commissioner			
ROBINS Outback Spirit	Juleigh Robins	Gerente y Propietario			
PETER YATES	Visit to a Acacia Farmer GRAMPIER	Consultor. WorldVision			
Dr Todor Vasiljevic, PhD	Victoria University College of Health and Biomedicine, Australia Victoria ANFITRION (UALberta)	Professor of Food Science and Leader, Advanced Food Systems Research Unit			

8. Indique posibles ideas de proyectos de innovación que surgieron de la realización de la gira

- a) Proyecto de I+D sobre introducción de especies y procedencias de especies de Acacia con valor comestible en condiciones de secano (VI, VII y VIII Regiones)

- b) Estudio del régimen térmico y torrefactado para la producción de un café con componentes funcionales de semillas de *Acacia saligna*

9. Resultados obtenidos

Resultados esperados inicialmente	Resultados alcanzados
Silvicultura Acacia para la producción de semillas	Conocimiento de nuevas especies de Acacia para la producción de alimentos
Cadena de producción Wattleseed	Experiencias de 3 empresas líderes de Wattleseed australiana de sus procesos de producción y cadena de valor
Procesamiento de las semillas de Acacia para la producción de harinas comestibles	Conocimiento de un nuevo proceso de torrefactado para la obtención de un café con semillas de Acacia

10. Actividades de difusión de la gira de innovación

Fecha (día/mes/año)	Tipo de actividad (charla, taller de discusión de resultados y/o publicación)	Tipo de participantes (indicar hacia quien está orientada la actividad)	N° de participantes
30.3.2015	CHARLA DE LA GIRA DE INNOVACION. INFOR. SANTIAGO	PROFESIONALES DEL SECTOR FORESTAL (Investigadores), CENTROS TECNOLÓGICOS. PROFESIONALES DEL SECTOR ALIMENTARIO	35
7.4.2015	INIA. ILLAPEL	PROFESIONALES DEL SECTOR SILVOAGROPECUARIO. COMUNIDADES CAMPESINAS. PROPIETARIOS Y SILVICULTORES DE ACACIA	22

11. Indique cualquier inconveniente que se haya presentado en el marco de la realización de la gira de innovación

ANEXOS

- 1) Anexo 1: Documentos técnicos recopilados en la gira de innovación
- 2) Anexo 2: Material audiovisual recopilado en la gira de innovación
- 3) Anexo 3: Lista de participantes de la actividad de difusión, indicando nombre, apellido, entidad donde trabaja, teléfono, correo electrónico y dirección
- 4) Anexo 4: Material entregado en las actividades de difusión

i



crc

for Evidence-Based
Health Foods and
Supplements



A new and innovative pathway to

- optimal physical and mental wellbeing
- cost effective self-management of health
- growing Australia's food and supplement markets

Food and supplements for better health

The opportunity

Australia, like other western societies, faces a rapidly ageing population, increasing prevalence of chronic diseases and, consequently, a burgeoning health care budget. There is much evidence that whole of life health and wellness is influenced by diet and lifestyle factors. Consumers, in Australia and overseas are increasingly looking for self-management strategies and governments are seeking more cost effective methods for managing ageing populations.

Within these strategies good nutrition, delivered by innovative new food and supplement products, can play a pivotal role. However, for the food and supplement industries in Australia to respond on the scale and the diversity needed, a robust evidence base for the health benefits of these products is required to inform the consumer, to satisfy the regulatory requirements for health claims and to build lucrative differentiated markets for Australian producers and manufacturers, both domestically and overseas.

One impediment previously constraining these opportunities, has recently been reduced as a result of changes in the respective regulations for food and supplement claims. With health claims now permitted for both product categories to assist in marketing and the provision of consumer information, clear supporting evidence-based substantiation of health outcomes is required by the regulatory authorities.

The way is now open for Australian food and supplement companies to respond to the health and ageing challenge with a corresponding opportunity to build strong domestic and overseas markets. For the opportunity to be realised fully, however, the pathway will require products designed to optimally target specific health needs with scientifically substantiated health claims.

In summary, the intersection of consumer demand, regulatory alignment and advances in nutritional science promises a trifecta of benefits – better health for Australian's, lower health care costs for Australian governments and greater growth and profitability for Australian industries in local and export markets.

Professor Alastair Robertson
(Chair of steering committee)

What will the CRC do?

The Australian Government's CRC program supports medium to long-term end-user driven research collaborations to address major challenges facing Australia by pursuing solutions that are commercially focused, innovative, of high impact, and able to be effectively deployed by end-users.

The CRC for Evidence-Based Health Foods and Supplements will provide for the first time in our region an integrated research organisation with the requisite level of investment (in excess of \$60 million) and range of expertise to be internationally competitive in the development, clinical evaluation and delivery of new products to satisfy the rapidly expanding global market for health foods and supplements. It will:

- Identify and clinically characterise the health-protecting and promoting properties of natural plant components and exploit their commercial availability through the food and supplements industries.
- Add value to Australia's food and supplement industries by undertaking programs of strategic research to enable the development of new, value-added functional foods and supplements, utilising existing and new sources of bioactive nutrients.
- Unite Australia's academic and commercial capability in nutrition, health, food science and consumer science/marketing.
- Become an internationally networked centre of excellence and authoritative voice for the public, industry and regulators in relation to food claims and clinical substantiation.

World class multi-disciplinary partnership will provide the evidence base for consumer products with health benefits

What will the CRC focus on?

The CRC for Evidence-Based Health Foods and Supplements will focus on:

- Plant based vasoactive nutrients and other bioactive compounds to benefit:
 - Cardiovascular health
 - Metabolic (including bone, joint and genome) health
 - Cognitive health and brain function
 - Physical function and sports performance.
- Recognised bioactive nutrients in plant products ranging from fruits, vegetables, grains and nuts through to indigenous Australian plants and traditional Indian herbs.
- Working with industry partners to develop and evaluate clinically substantiated food and supplements with high consumer acceptability both in Australian and in overseas markets.
- A whole of value chain approach involving primary produce, formulated food products and supplements, consumer choice, final product bioavailability and clinical validation studies.

A unifying hypothesis-driven strategy

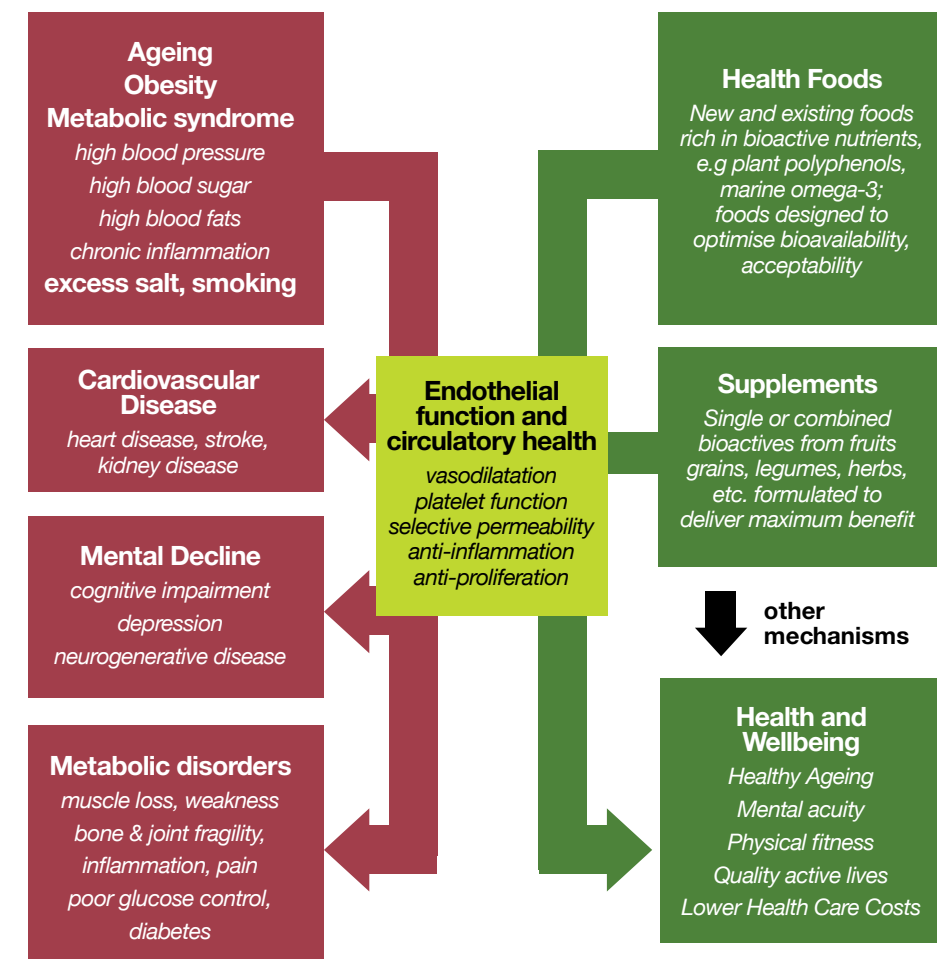
A central tenet of the *CRC for Evidence-Based Health Foods and Supplements* is the hypothesis that many age-related changes in health are due to progressive deterioration of the vascular endothelium (the inner lining of the entire circulatory system) resulting in a compromised blood supply and microvascular disease in all tissues. While other mechanisms are likely to play specific roles in the onset and development of chronic diseases, there is mounting evidence that this common overarching mechanism is not only implicated in cardiovascular disease but also in metabolic diseases such diabetes, inflammatory conditions affecting bone and joint health, in physical function and performance, and in brain function, including mood and mental energy, alertness, memory and cognitive performance.

Consequently, plant-derived vasoactive compounds delivered in foods and supplements can potentially provide wide-ranging health benefits, with numerous observations indicating that such compounds share common endothelial targets including regulation of vasodilatation, capillary permeability and transport through to prevention of platelet aggregation, systemic inflammation, arterial remodelling and atherosclerosis.

Building the primary focus of the CRC around this concept, with strict adherence to a rigorous innovation management framework, will create the cohesion and efficiency in the research effort to support a diverse range of age-related health issues critical to Australia. However, while effects on endothelial function will be a central focus for research, other well established modes of action of bioactives on health outcomes relevant to this proposal will also be evaluated and exploited.

Circulatory dysfunction is the key to many diet-related diseases; improving circulatory health is a common mechanism underlying diet-based treatments

There is strong consumer demand for foods and supplements to promote wellbeing – industry is ready to meet this demand!



Research and development plan

The CRC for *Evidence-Based Health Foods and Supplements* will operate across the value chain taking a systematic approach to plant bioactive identification, substantiation and incorporation into commercial food and health supplement products which are effective.

Sourcing and evaluating readily available plant bioactive compounds for which there is already a large body of supporting scientific evidence will be a focus in the early stages of the CRC. Longer term success, however, will be secured through investigating promising vasoactive compounds with potential but which require a more extensive evidence base. From the outset, research on existing and new sources of bioactives will be conducted with a view to securing regulatory approval.

By aligning research programs with product development processes and regulatory requirements, paths to commercialisation will be streamlined. Thus the CRC's research portfolio will encompass a **cycle of innovation**, progressing from evaluation of new sources of recognised bioactives, through quantification of their specific health benefits to their delivery in formulated foods and supplements with clinically substantiated health claims meeting regulations. Moreover, development of these products and their promotion in local and export markets will be guided by expert evaluation of consumer preferences.

The research activity of the CRC will be managed through two interactive research streams, as follows:

Program One: Nutrient sources, Product development and Promotion

Program Two: Evaluation of Human Health Benefits

These programs will build on the collective capabilities of Australia's leading experts in food science, crop development, consumer evaluation and marketing (Program 1) and in clinical evaluation of health benefits of bioactive nutrients (Program 2), together with international collaborators. This program structure provides flexibility to undertake shorter term projects with different entry points in this cyclical model.

Thus an existing product might be re-evaluated for a different health application. Alternatively, a product might be reformulated based on the availability of a new source for its bioactive ingredient(s) or on the assessment of consumer preferences. Program 1, where possible, will utilise the existing resources and expertise of end-user participants.



An integrated, coordinated research program across the value chain provides a logical innovation path for commercialisation of new technologies

Research providers and capabilities

The CRC harnesses individually competitive research expertise from universities and government institutions in Australia and internationally, including the:

- University of Newcastle (UoN, host institution)
- University of South Australia (UniSA)
- Swinburne University of Technology (SUT)
- NSW Department of Primary Industry (NSW DPI)
- Riddet Institute (NZ)
- National Institute for Pharmaceutical Education and Research (NIPER, India).

The collective expertise spans crop and food sources of bioactives (including traditional ethnic), pharmaceutical chemistry, nutrition in relation to physical and mental performance, human clinical intervention trials and the science of consumer choice.

Sources of Bioactives

- Novel bioactives, isolated from indigenous Australian plants and traditional herbs, fully characterised by food scientists at the University of Newcastle and our international research collaborator (NIPER)
- Established bioactives delivered in new crops cultivated by NSW DPI.
- Highly refined ingredients including synthetic nutrients from established international suppliers.

Product Development and Formulation

The CRC for *Evidence-Based Health Foods and Supplements* has expertise at UoN's Ourimbah Campus and Riddet Institute, NZ in designing suitable delivery formats for bioactives, including encapsulation, stabilization, improved physical functionality, targeted delivery systems in the gastrointestinal tract, incorporation of bioactives into foods and solving formulation and sensory issues. The CRC will use and has significant experience in, in-vitro and in-vivo studies to ensure bioavailability and retain the potency of bioactives in the formulated products.

Evaluating Health Benefits and Substantiating Health Claims

Comprising more than 20 nutritional scientists in three locations (UoN, UniSA and SUT) with proven track records in testing bioactive candidates against the range of health benefits targeted by the CRC, the Clinical Nutrition Research Centre represents the CRC's core capability in human health research. Its clinical trial teams have over 30 years of experience in designing and conducting intervention trials in accordance with International Conference on Harmonisation standards of Good Clinical Practice. Our expertise in nutritional biochemistry/physiology/psychology, translational research and clinical practice is second to none in our region and will ensure that CRC projects meet new FSANZ and TGA standards for

approval of health claims. Our clinical researchers have already contributed to successful health claim submissions to other international regulatory authorities.

Consumer Acceptability & Marketing

The development and delivery of new products with substantiated health claims will be guided at all stages from product formulation through to the market place by consumer and market intelligence provided by UniSA's Institute for Choice in conjunction with the CRC's commercial partners. Their expertise in the science of human choice behaviour and decision making will identify commercially critical elements of consumer choice that will drive business models.



A full work-up to consumer-ready products is available - from sourcing bioactives to meeting regulatory requirements for claims



Australian Food and Grocery Council



University of South Australia



Department of Primary Industries



Riddet Institute
FOOD | INNOVATION | HEALTH



THE UNIVERSITY OF
NEWCASTLE
AUSTRALIA



Examples of research projects

Some examples of potential research projects appear below. The inclusion of these and other proposed projects in the application will be based on preferences of essential participant end-user stakeholders.



Traditional medicines to counteract diseases of affluence

Traditional medicines offer a great variety of bioactives with the potential to counteract inflammation associated with a range of chronic diseases. Our collaborators are systematically identifying and characterising potential benefits of Indian, Chinese, European and Australian Indigenous herbal extracts in preclinical trials. Promising extracts will be tested in dose/response trials in humans with specific risk profiles. These will inform the formulation of foods and supplements. Specific health claims will be developed for individual products, based on evidence obtained in clinical trials with appropriate target populations. Products will be designed for both local and Asian markets.

Plant extracts for improved cognitive performance

In the absence of effective pharmaceutical treatment for age-associated cognitive decline, attention has turned to the polypharmacology afforded by plant extracts to improve neurocognitive function. Green tea, cocoa, soy, grapes, blueberries, etc. are dietary sources of flavonoids which have the potential to improve circulatory function and thereby increase alertness and cognitive performance. We will build on evidence from preclinical and early clinical trials to produce cognitive enhancers with known mechanisms of action. Guided by consumer choice, we will formulate foods, beverages and supplements utilising optimal combinations of flavonoids to deliver health claims targeting different market sectors from young executives to elderly with mild cognitive impairment.



Making pasta healthier

Choosing foods with lower Glycemic Index (GI) can lead to improvements in several aspects of health, including metabolic benefits and improved cognitive function. The GI of pasta could be reduced by utilising pulses in their formulation with careful manufacturing design to ensure consumer acceptability. Eating pasta with lower GI may help to control blood sugar and prevent diabetes; evidence to support such health claims will be obtained in human trials.

Foods for moods and minds

Poor mood (including stress) and fatigue have a profound negative impact on the Australian workforce. There is growing evidence that such effects may be ameliorated through nutritional interventions containing appropriate bioactives. This research stream will build on existing benchside assays (e.g. receptor binding) preclinical and clinical evidence for mood-enhancing bioactives delivered in supplements and foods. These methodologies will be used to develop evidence-based interventions appropriate to the self-management of optimum mood/energy.



Foods and supplements to get you moving

A range of fruits and vegetables are rich in the carotenoid lutein, and many companies have lutein available as a supplement for promoting eye health. CRC participants have recently obtained evidence that a lutein-supplemented beverage can increase physical activity in older adults and subsequent research in animal models has shown benefits for body composition and cardio-metabolic risk factors. These new health indications will be further evaluated in food products designed to maximise the bioavailability of lutein to increase physical activity and reduce chronic disease risk. At the same time, new sources of lutein will be exploited for existing health indications.



Commercial product opportunity - only limited by the imagination!

Participants and funding

All participants in a CRC must contribute resources, including cash and in-kind, tied and untied, which must at least match the amount of funding sought from the Federal Government over the funding period. The CRC will request approximately \$24 million in funding for a period of 8 years, with a total budget of \$66 million in cash and in-kind. Research providers will contribute mainly in-kind while end users will contribute predominantly cash.

Participation occurs at two levels:-

Essential participants: a substantial annual commitment (tied or untied cash and in-kind) for 8 years. (Interest in the CRC company will be based primarily on the level of cash contribution)

Other participants: a commitment to making a smaller cash or in-kind contribution for at least 3 years.

Benefits of participation include:

- Being at the cutting edge of R&D by working with leading scientists and industry innovators.
- Early access to new science and industry-ready graduates.
- Ability to direct CRC research focus and advance the industry's international competitiveness.
- End-user focused research that will deliver for industry partners.
- A broader network of contacts in government, industry and research.
- Leverage of Federal Government funds and research provider resources to boost your investment.
- Licencing rights for core partners, as well as royalties from product licencing and sales.
- Access to the Federal Government's tax incentive scheme which typically includes:
 - 45% tax refundable offset (equivalent to a 150% deduction) available to eligible entities with an aggregated turnover of less than \$20 million per annum.
 - 40% tax refundable offset (equivalent to a 133% deduction) available to all other eligible entities.

Entry after the successful establishment of the CRC will be at the discretion of existing participants and the Board of Directors.



Leverage provides the basis for substantial return on investment

Governance and IP management

In line with current accepted practice for CRC governance arrangements, the CRC will be established as a company limited by guarantee. A Board comprising an independent Chair, independent Directors and Directors representing Essential Participants will be appointed on the basis of their relevant skills and experience. The Board will have governance duties consistent with the Australian Securities and Investment Commission regulated obligations and CRC Program guidelines. The Board will be responsible for the strategic direction of CRC programs, consistent with the objectives stated in the Commonwealth Agreement. The Board will be advised on the scientific merit and commercial potential of research and educational activities by committees drawn from the participants. A CRC Executive (CEO and small team) will have day to day responsibilities for managing the CRC's research programs and associated activities.

The CRC will develop intellectual property (IP) which can be commercially exploited by participants. This will be achieved at

- 1) board level, through the input of Essential Participants, ensuring the strategic direction of research maintains a commercial focus;
- 2) management level, through ensuring Essential Participants can directly support specific research projects aligned with their individual innovation strategies;
- 3) operational level by
 - a. adopting procedures to maintain confidentiality of sensitive information, including within the CRC;
 - b. apportioning value to and ownership of IP equitably, based on research support and input;
 - c. protecting IP through appropriate patenting.

A priority of the CRC will be ensuring that participants have ample opportunities to keep secret and exclusively commercialise IP generated by the CRC. IP with no realisable commercial value will be disseminated for public good and social benefit.



Commercialisation - a central strategy - delivered by diligent governance

ENQUIRIES

Enquiries about participating in the CRC for Evidence-Based Health Foods and Supplements should be directed to
Professor Peter Howe (Interim CEO)
Natasha Baker (Administrative Officer)

Clinical Nutrition Research Centre, University of Newcastle,
CALLAGHAN

Australian Functional Food

a healthy choice for functional food investment

THE FUTURE
IS

here

Functional Food **Australia**



Australian Government

Invest Australia



a strategic destination for functional food industry investment

Commitment to quality and safety, investment in innovation, collaboration between industry and government, and a well-established food industry are among the many reasons why Australia is well-placed to develop the functional foods industry for domestic and export markets.

the australian advantage

Australia's and New Zealand's share of the global nutrition market is valued at around A\$2.9 billion

Internationally recognised for its clean natural resources and a sound food and safety legislation regime

Significant investment in innovation and collaboration between industry and government

Disease-free status and established food industry

Well-placed to take advantage of opportunities in dairy, meat, plant and grain-based products

Functional Foods are considered to be any food or food component that may provide demonstrated physiological benefits or reduce the risk of chronic diseases, above and beyond basic nutritional functions.

In 2003, US based Health Strategy Consulting (HSC) estimated that the Australian and New Zealand nutrition industry represented around 1.4 per cent of the A\$208 billion global nutrition market, valued at A\$2.9 billion.¹

The global market for bioactives is predicted to grow by 300 per cent in the next five years to be worth around A\$1.4 billion per year.² Australia is expecting to capture a significant share of this market.

quality reputation and proximity to global markets

Australia's food industry is synonymous with quality, with a strong reputation and capability to supply high quality foods and ingredients to target markets.

Australia's proximity to Asia, its disease-free status, commitment to research and development and strong track record make it a strategic choice for investment in the functional foods industry.

research and development

Australia is recognised for its commitment to research and development.

A\$12.4 million of seed funding is being invested over five years to establish two Centres of Excellence in Functional Foods, and Food Safety and Integrity.

The program is designed to build the scientific capability of Australia's research and development providers in these two key areas.

innovation

The National Centre of Excellence in Functional Foods is co-ordinating collaborative research in functional foods.

A partnership consisting of CSIRO, Health Sciences and Nutrition, Food Science Australia, Department of Primary Industries, Victoria and the Smart Food Centre of the University of Wollongong is undertaking the research.

The strategic research is focussed on macronutrients and includes the role of foods high in protein, the health benefits of antioxidants and the role of foods containing low GI carbohydrates.

[1] The San Diego-based Nutrition Business Journal (NBJ) estimated the global nutrition market as being valued at US\$150 billion in 2001. Of this, by its definition, functional foods accounted for 37%, vitamin and minerals (14%), herbs and botanicals (13%), sports nutrition (8%), natural and organic foods (20%), and natural personal care (8%) [2] Source: MLA media release "Productivity gains needed across red meat supply chain" on 19 November 2003.



functional foods | a growing industry

Consumers are increasingly concerned about debilitating illnesses such as Alzheimer's disease, cancer, diabetes, heart diseases and osteoporosis.

Public awareness of the link between diet and health has accelerated growth in the functional food industry.

Health authorities are increasingly acknowledging the importance of functional elements in food such as calcium, antioxidants and plant sterols, in improving health and preventing disease.

The San Diego-based Nutrition Business Journal (NBJ) estimated that the value of worldwide functional foods and supplement markets in 2001 was around US\$62 billion and US\$50 billion respectively.

High growth is expected in developing countries such as Latin America, Asia and Eastern Europe due to economic growth and increased disposable income.

The more mature but larger markets such as Japan, the US and Western Europe are also experiencing a strong demand for functional foods because of an ageing population, rising healthcare costs and concern for food safety and environmental impacts.

GLOBAL FUNCTIONAL FOOD MARKET (2001)

Country	Functional Foods US\$M	Supplement US\$M
Japan	19,520	7,590
Europe	18,560	14,010
US	18,500	17,760
Rest of Asia	2,210	5,770
Canada	1,650	1,280
Australia/New Zealand	700	560
Latin America	550	1,310
East Europe/Russia	310	940
Middle East	190	370
Africa	170	330
Global	62,360	49,920

SOURCE: NUTRITION BUSINESS JOURNAL

industry opportunities

Dairy-based products

Dairy products are a good source of valuable bioactive ingredients which are highly sought after in the functional foods market.

Several Australian dairy companies have set up processes to manufacture functional ingredients such as lactoferrin, lactoperoxidase, glycomacropeptide, milk minerals, immunoglobulins and colostrum products. These ingredients can be used in infant formula and healthcare products.

Meat-based products

A growing international interest in bioactives presents significant opportunities for meat producers and processors.

By-products and waste streams, such as carcasses and bovine blood, contain bio-chemical ingredients which can be developed into high-value bioactives.

This includes nutraceuticals - such as chondroitin sulphate, which is extracted from beef or sheep cartilage - which are used in the treatment of arthritis.

Blood fractions are also being used in the pharmaceutical industry to help grow cell cultures to manufacture drugs and medical products.³

[3] Source: MLA media release "Productivity gains needed across red meat supply chain" on 19 November 2003.



recent projects

Plant-based products

Omega-3 oils and fatty acids traditionally come from fish sources.

Breads, dairy products and meats enriched in omega-3 fatty acids are being produced by adding fish oils or by feeding fish oils and other omega-3 feeds to livestock.

The potential benefits of omega-3 include reduced risk of cancer, heart disease, arthritis, eczema and fatigue.

Omega-3 oils for use in functional foods can potentially be derived through plant sources to replace declining fish sources and researchers are investigating this further.

Grain-based products

Hi-maize® has been added to white bread, pasta and breakfast cereals to increase their resistant starch content and help improve bowel health.

Hi-maize® is also applied to probiotic foods such as yoghurt to improve the effectiveness of beneficial bacteria.

Soy flour and linseeds have been added to breads and breakfast cereals to potentially reduce the risk of cancer.

Oat bran and barley bran have been added to grain-based foods for their cholesterol-lowering effect.⁴

meat and dairy bioactives for better health

The CSIRO Food Futures National Research Flagship has chosen two bioactives for development – dermatan sulfate from meat, which has anti-inflammatory properties, and glycomacropeptide (GMP) from dairy for its satiety effect.

New ways of isolating these bioactives efficiently and economically, and incorporating them back into foods, are being developed.

The research into these initial bioactives will provide the foundation for researching a further seven bioactives in the Flagship.

wallaby milk to improve human nutrition

Discovering the active ingredients in wallaby milk may enable scientists to increase the health-giving properties of cows' milk and improve human nutrition. In most mammals, the majority of early development occurs inside the womb with nutrients delivered through the placenta.

The tammar wallaby, however, has a brief pregnancy and it seems that all the factors (bioactives) required for growth are found in the wallaby's milk.

The CRC for Innovative Dairy Products is researching these bioactives in the hope of discovering similar substances in cows' milk to use in developing functional foods.

colostrum to reduce travellers' diarrhoea

Travellers' diarrhoea (TD) is the number one health problem in international travel in terms of frequency and economic impact, affecting up to half the travellers who visit high-risk areas such as Africa, Asia and South America.

Australian biotechnology company Anadis has created a unique medicine that reduces the risk of TD. The product, 'Travelan', is made using the colostrum of Australian dairy cows.

farmers best milk: creamy and healthy

Dairy Farmers' Farmers Best Milk was created for people who like the taste and creaminess of regular whole milk but need to reduce their intake of saturated fat and cholesterol.

It contains omega-3 and nine essential nutrients for good health, is 98 per cent fat free and contains no cholesterol. It is the first fresh milk to have almost all saturated fat replaced with heart-friendly monounsaturated and omega-3 fats obtained from vegetable oils.

[4] GRDC - http://www.gograins.grdc.com.au/grainsnutrition/ie/t3_1.html

grape extracts for heart health

Vinlife® natural Australian grape extracts are functional food ingredients with clinically proven heart health benefits.

Vinlife® extracts, developed and manufactured by Tarac Technologies in South Australia, have been successfully commercialised and a strategy for global distribution is in place.

low-caffeine green tea extracts

DSM Nutrition Products has developed a green tea extract (TEVIGO®) through a patented technology.

It contains 90 per cent of the most active catechin (EGCG) and has virtually no caffeine. The extract does not impart the bitter taste or colour of green tea. This allows greater flexibility as an additive for a wide range of food products.

sprout products and bioactive compounds

Opti-Grow produces fresh and dried sprout products grown in controlled growing environments designed to optimise the retention and availability of bioactive compounds.

Opti-Grow products include wheat and barley sprouts, broccoli, kale and alfalfa sprouts. Combination products include tomatoes (lycopene-optimised) and broccoli sprouts. An active R&D program supports ongoing product development.

Cows milk making brighter smiles

Recaldent™ is an ingredient derived from casein, part of the protein found in cow's milk.

It was discovered and patented by the School of Dental Science at the University of Melbourne. When used as an ingredient in chewing gum, it binds to tooth enamel and slowly releases calcium phosphate into the tooth, repairing damaged tooth enamel. Recaldent also promotes the incorporation of fluoride into teeth, increasing the tooth's resistance to decay.

wheat protein and starch to accelerate recovery

The Manildra Group has introduced in Australia and overseas health-promoting wheat protein- and starch-based ingredients which can be included in food and beverages.

GEMPRO HiQ is a refined wheat protein hydrolysate comprising more than 30 per cent glutamine (Q) which can help accelerate recovery from physical stress through exercise or trauma.

OLIGO-GEM can be used as soluble fibre in carbohydrate/energy-reduced foods. It contains non-digestible but fermentable oligosaccharides formed by enzyme transformation of digestible glucose oligomers.

GEMSTAR R70 is a cross-linked wheat starch providing 70 per cent resistance to digestive enzymes in the gastrointestinal tract. As a Type R4 resistant starch, it is currently utilised as a functional food ingredient in reduced-carbohydrate bakery and pasta foods.





CRC for Innovative Dairy Products

The Cooperative Research Centre (CRC) for Innovative Dairy Products is a seven-year \$90 million research project set up by the Australian Government and the Australian dairy industry. It is applying cutting-edge biotechnology research to develop new milk products.

www.dairycrc.com



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One of the largest research endeavours serving Australia's agriculture and food sector. Food Futures Flagship is a A\$28 million per annum partnership of leading Australian scientists, research institutions and commercial enterprises.

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National Centre of Excellence in Functional Foods

The National Centre of Excellence is an initiative of the National Food Industry Strategy and supported by the Australian Government Department of Agriculture Fisheries and Forestry.

The Centre is researching the functional benefits of foods which can be publicised and commercialised to enable consumers to make healthier food choices.

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DESERT KNOWLEDGE CRC

Value chain analysis of
bush tomato and
wattle seed products

Kim P. Bryceson

Report
40

2008



THE UNIVERSITY
OF QUEENSLAND
AUSTRALIA



Value chain analysis of bush tomato and wattle seed products

Kim P. Bryceson

2008

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Acknowledgements

Thanks are due to the many people who agreed to be interviewed for this project. An interviewee list can be found in Appendix 1.

Abbreviations/Acronyms

AFFA	Commonwealth Department of Agriculture Fisheries and Forestry, Australia
ANFIL	Australian Native Food Industry Limited
BT	Bush tomato (Akatjurra or desert raisin) (<i>Solanum centrale</i>)
DKCRC	Desert Knowledge Cooperative Research Centre
HACCP	Hazard Analysis and Critical Control Points
IAF	Indigenous Australian Foods
NCC	National Consortium of Colleges
QWFAP	Queensland Wild Foods and Products Inc
RIRDC	Rural Industries Research & Development Corporation
UQ	University of Queensland
WS	Wattle seed (<i>Acacia</i> spp, primarily <i>A. victoriae</i>)

Executive summary

This report outlines a market analysis of the Australian bush tomato (*Solanum centrale*) and wattle seed (*Acacia* spp) products. The project was commissioned to explicitly characterise and map the Australian bush tomato and wattle seed value chains from production through to domestic distribution and final consumption, and to identify and evaluate high value market segments that might be used to focus the business developments associated with these two products. The following criteria were investigated in some detail: Industry stakeholders and activities, product creation and delivery, financial conditions, information conditions, incentives, motivators and drivers, and governance conditions.

The analysis has shown that demand for bush food products in general has grown in the last two years, and that currently, bush tomato (BT) is in higher demand than wattle seed (WS). However, it was also found that while a viable and growing bush food industry exists that involves both products, there are considerable challenges to developing a sustainable industry around them, both from a production and from a market perspective. These include:

- **Supply issues** need to be addressed, such as raw product availability, quality and consistency of raw product, effective grading of product and appropriate inventory management of all components in the chain to minimise fluctuating demand/supply flows. Associated with supply is the question of sustainability and efficiency of wild-grown product and bush harvesting methods, which, while culturally extremely important, and should be fostered, are unlikely to be plausible as the only source of product in a commercially driven environment. Cultivation of BT in particular is being investigated through cultivation trials and with community involvement in an effort to address this issue.
- **Internal industry competition** for raw material supply in Australia is fierce when supplies due to drought or other considerations are poor. It was found that this is leading to monopolistic behaviours by some players, and these behaviours, plus some long-term infighting between people who have been involved for many years in the industry, creates a perception of a lack of professionalism which will increase the business risk of any of the bigger retail outlets dealing with any of the plethora of small players that are now coming into the industry.
- **Food safety and traceability.** This is a key area of concern. Poor food-hygiene practices were prevalent at the production stages, resulting in variable raw material quality. Additionally, there was very little record keeping or traceability generally other than in the two major chain models identified and described in this report. This situation must be addressed in the current food business environment for product to be sold effectively and within current food safety guidelines.
- **Consumers** do not know what most of the current marketed bush food tastes like, so are not actively demanding the products. Since the value-added products using bush tomato and wattle seed are sold mainly under the categories of jams, chutneys, sauces, bakery ingredients and sprinkles (dukkah) in the shops – with varying percentages of the raw product included – the questions arise as to how consumers differentiate bush products from all the similar products on the shelves, and do they want to? A significant consumer survey across various retail outlets would provide a clear understanding of what consumers would like, thus giving a better idea of demand, as well as enabling better targeted product-differentiation strategies to be put in place by individual businesses in the industry.

- **Business skills development needs.** Business development and knowledge creation, transmission and operational training are lacking. This situation needs to be addressed.

Providing recommendations on how to address the above issues was beyond the scope of this project, but it should be noted that ANFIL (Australian Native Foods Industry Ltd) was set up in 2006 as the new Peak Body Board for the Australian Native Foods Industry. Their broad objectives do cover some of the above issues including product definition, Aboriginal liaison, national communication, and developing national quality assurance and food safety guidelines.

1. Introduction

Supply and value chains are vertically integrated, strategic alliances between a series of independent businesses that have come together as a group to more efficiently capitalise on specific market opportunities (Cox 1999). The goal of a supply/value chain is to optimise performance in that industry using the combined expertise and abilities of the members of the chain. Successful chains depend on integration, coordination, communication and cooperation between partners with the traditional measure of success being the return on investment (O’Keefe 1998; Boehlje 1999; Dunne 2001, Bryceson & Kandampully 2004).

The project described in this report was to examine and map the Australian bush tomato and wattle seed value chains from production through to domestic distribution and final consumption, and to identify and evaluate high value market segments that might be used to focus the development of these two industries’ business and competitive strategies.

The project is part of work being undertaken in the Desert Knowledge CRC on Bush Products from Desert Australia which aims ‘to improve opportunities for the arid zone native foods industry’. A critical current issue identified for the industry is the disagreement about whether the industry is demand- or supply- driven. The current project is an independent study to map the bush tomato and wattle seed value chains and carry out an assessment of the current and future markets.

1.1 Agri-Industry/Agri-Food Chains

Bush tomato and wattle seed are amongst a wide range of wild/native bush plants which comprise the Australian bush foods industry. They can thus be thought of as part of the agri-industry (agri-food industry) sector. The agri-food industry sector worldwide is large and multifaceted, comprising businesses that create industry-specific agri-food chains that often exist across international boundaries. Businesses in such chains will normally include:

- Input suppliers (e.g. agricultural chemical and fertiliser companies such as Bayer and Cargill)
- Service providers (e.g. banks, R&D organisations, governments, consultants)
- Producers (e.g. growers, bush harvesters)
- Traders (e.g. Mitsubishi, Australian Wheat Board, Bohemia Nut Company, ConAgra, etc)
- Processors (e.g. Peanut Company of Australia, Flour Mills, Parmalat, etc)
- Manufacturers (e.g. food processing companies such as Kraft, Mars, Cadbury Schweppes, Unilever)
- Retailers (e.g. supermarkets such as Tesco, Carrefours, Woolworths and Coles, as well as smaller retail outlets)
- Logistics (e.g. Transport and storage companies).

Generically, industry chains are classified as either ‘supply’ or ‘value’ chains. In this report the following definitions within the general term ‘industry chain’ are used:

- A **supply chain** is taken to mean the physical flow of goods that are required for raw materials to be transformed into finished products.

- **Supply chain management** is about making the chain as efficient as possible through better flow scheduling and resource use, improving quality control throughout the chain, reducing the risk associated with food safety and contamination, and decreasing the agricultural industry's response to changes in consumer demand for food attributes (Dunne 2001).
- A **value chain** is taken to mean a group of companies working together to satisfy market demands. It involves a chain of activities that are associated with adding value to a product through the production and distribution processes of each activity. An organisation's competitive advantage is based on their product's value chain. The goal of the company is to deliver maximum value to the end user for the least possible total cost to the company, thereby maximising profit (Porter 1985).
- **Value chain management** is about creating the added value at each link in the chain and a sustainable competitive advantage for the businesses in the chain. How value is actually created is a major concern for most businesses. Porter (1985) indicates that value can be created by differentiation along every step of the value chain, through activities resulting in products and services that lower buyers' costs or raise buyers' performance. In much of the food production and distribution value chain, the value creation process has focused on commodities with relatively generic characteristics, creating relatively thin profit margins.

There are two major issues for agri-industry chains: first and foremost they are essentially 'food chains', that is, the raw product grown on farms (or in the wild, as is currently the case with most bush foods) is transformed through the chain to a processed food product bought by consumers on the shelves of a retail outlet. With increasingly competitive and quality-conscious global market-places for food products, governments and agri-industry chain members are beginning to recognise that food integrity and traceability is critical in answering consumer demand for safe, clean food with an emphasis on quality (USDA 2002). Further, the whole genetically modified (GM) product debate of the late 1990s and early 2000s has fuelled the necessity to focus on systems to deliver food safety and preserve the identity of products in terms of content, quality, method of production and point of origin (Foster et al. 2001).

Product tracking, or traceability, is the ability to track the inputs used to make a food product backwards to their source through different points in the supply chain. Traceability is established for an attribute when information about that particular attribute is systematically recorded from creation through to marketing. For example, for beef meat complete traceability would include the ability to identify the genetics (via DNA tracing), feed sources, animal husbandry techniques, method of slaughter, etc (Clemmens 2003). Any number of attributes about a product can be recorded in this manner.

Essentially then, traceability systems are about good record keeping and may be used either to segregate one crop or batch of ingredients from another, or as an Identity Preservation (IDP) system that identifies the nature of the crop or ingredient. These IDP systems require strict documentation to guarantee that certain qualities or traits are maintained in the supply chain (Strayer 2002). The requirement for traceability is a driving force in the need to adopt electronic enablement throughout agri-industry chains.

The second and most longstanding issue for agri-industries is that they deal in low margin commodities where competitive market forces have typically resulted in the cost of production being very close to the value created, thus leaving relatively thin profit margins (Boehlje 1999). In addition, unlike chains in other industry sectors the creation of the raw product through agronomic production is directly affected by climate and the resulting weather which can be highly variable

and often results in a variable supply of variable quality raw product (Miranda & Vedenov 2001). Commodity availability as a result of, for example drought, in turn has direct impact on commodity prices worldwide (O’Keefe 1998). Ensuring constant volume, high-quality product at the right time and price is a driving business force in domestic and international agri-industry chains. As a result, supply and value chain analysis of agri-industry chains has become a valuable tool in determining where added competitive advantage (for example, by increasing efficiencies and reducing costs) can be generated for these industries.

The key issues for successful industries are good information flows and good communication across the chain – and they are *demand* driven, not production driven.

2. Project objectives

- To examine and map the Australian bush tomato (BT) and wattle seed (WS) supply and value chains from production through to domestic distribution and final consumption
- To identify and evaluate high-value market segments that might be used to focus the development of the BT and WS industries’ business and competitive strategies
- To describe business models used in the BT and WS industries to maximise strategic competitive advantage, including an understanding of failure factors.

2.1 Required project outcomes

- A detailed qualitative and quantitative overview and understanding of the BT and WS value chains, including current and future potential markets and market segments
- Comparison of the effectiveness of business models used in the BT and WS industries.

2.2 Required deliverables

- BT and WS value chain maps with an associated report identifying markets and potential high-value market segments, including analysis of stocks and flows, driving forces, effectiveness, and potential failure factors.

3. Methodology

- Desk top research of current literature and other public domain data on the BT and WS industries to develop an overview of the regional and national industry sectors regarding volume, value and trends. This gave a general qualitative and quantitative description of the industry and the supply/value chains involved.
- Explicit characterisation, description and mapping of each of the two industry chains chosen, identifying domestic and export markets, drivers, barriers, the information supply chain, products, current value-add components and potential areas for new business development, as well as any significant changes occurring in the industry (see Table1).
- The primary data collection mechanism was a survey with representative stakeholders in the BT and WS chains via face-to-face and telephone interviews using a semi-structured questionnaire.

Table 1: Value chain issues addressed in analysis

Aspect	Definition	Task description
1. Industry stakeholders and activities	The set of processes or activities that create the attributes or products that will be demanded or used by the end user or consumer.	<ul style="list-style-type: none"> Identify the main categories of stakeholder/trader groups, stages and activities undertaken in the transformation of a raw input into a delivered product (or service) to the end consumer. The transformation stages may be linear and sequential but also can bypass or be in parallel with other stages. (i.e. value nets) Where different channels exist, their significance can be indicated by volume and value passing through each.
2. Product creation and delivery	The product flow features of the chain.	<ul style="list-style-type: none"> A summary-level description of the main stakeholders' activities undertaken and material volumes employed at each stage to allow an understanding of operations (and differences in operation) throughout the delivery channels. A critical issue in managing the product flow in a supply or value chain is managing slack or flexibility and supply chain interdependencies to accommodate unexpected interruptions or events. Consumer-based surveys (e.g intercept surveys)
3. Financial conditions	The financial or cash flow across the participants and processes.	<ul style="list-style-type: none"> A simple 'value analysis' to take some sample products and illustrate how value and costs are accumulated (and margin gained) throughout the transformation stages. Electronic funds transfer technology has improved the efficiency of financial and funds flows compared with earlier systems of billing and cheque writing.
4. Information conditions	The information flow across the chain.	<ul style="list-style-type: none"> Determine the information flows across the chain. Important elements are the accuracy of messages (whether messages are signals or noise), the strength of these messages, the cost of messaging, the speed of transmitting and receiving messages, and the openness to sharing rather than retaining critical information among participants. An additional element – and often a source of conflict – is the sharing of financial performance information across the stages and chain participants.
5. Incentives, motivators and drivers	The incentive systems that are in place to drive and reward performance and share risk.	<ul style="list-style-type: none"> Identify the underlying drivers of value and costs between the stages. Incentives systems might include price premiums, profit sharing, minimum pricing arrangements, window contracts, cash flow or financial assistance contracts, loan guarantees, qualified supplier recognition programs, cost-sharing arrangements, long-term commitments, and knowledge or market access.
6. Governance conditions	The chain governance/ coordination system. This significantly influences who has power and control in a value chain and how risks and rewards are shared.	<ul style="list-style-type: none"> Describe the type of governance or coordination systems accommodated within the industry between trading parties. This could include open-access markets, various forms of contracts, strategic alliances, joint ventures, franchising arrangements, networks and cooperatives, and vertical ownership.

Source: Bryceson 2003

4. Australian Bush Food Industry

The Australian Bush Foods industry is small, fragmented and in 2006/07, remains frequently under-capitalised, with wild/bush foods generally comprising only a small part of the overall business activity for many of those involved in the industry. Excluding macadamia nut, which has in recent years become commercially significant, the industry is worth an estimated \$14 million annually, including value adding (Robins 2007).

Bush harvesting is the dominant means of production with half a dozen species still wild-collected (Christensen & Beal 1998; Robins & Ryder 2004; CSIRO 2007). However, cultivation is expanding because of the demand for bush foods generally across the food production, processing and retail sectors, as well as in the restaurant trade. There is a growing tension between the production of native food by mainstream agricultural and horticultural methods and the traditional approaches to cultivation.

There have been few, if any, consumer surveys undertaken to determine whether current products are acceptable to mainstream food buyers, but the recent take-up of native food product by major supermarket chains, both locally and overseas, suggests increasing customer demand.

4.1 Industry stakeholders and activities

The industry is slowly developing nationally with a number of Aboriginal participants; however, overall the number of active participants remains small. As with other agri-food industries, there are a specific group or chain (network) of businesses involved, which include:

- Wild/Bush harvesters
- Nursery operators
- Commercial producers of raw produce
- Processors/Manufacturers of raw produce
- Distributors
- Retailers
- Food service operators, including restaurants
- Tourism and hospitality organisations.

These businesses operate as single-purpose enterprises, networks, vertically integrated operations and wholesale/merchandising enterprises. Only two or three of these businesses have an annual turnover of more than one million dollars (Ryder & Latham 2005).

As indicated earlier, only the BT and WS chains within the Australian bush foods industry are being reported on here.

4.2 The Bush Tomato (*Solanum centrale*)

The Australian bush tomato – also known as *Akatjorra* or desert raisin (*Solanum centrale*) – is a plant native to the more arid (150–300 mm rainfall) central parts of Australia. It has been used as a food source by central Australian Aboriginal groups for thousands of years (Cribb & Cribb 1974).

Like many plants of the *Solanum* genus, the bush tomato is a small, fast-growing shrub with thorns that fruits prolifically the year after fire or good rains. The fruits are 1–3 cm in diameter and yellow to orange in color when fully ripe. They dry on the bush and tend to then look like raisins. As with

many other *Solanum* species, green unripe fruits contain the toxin solanine, and the fruit must be fully ripened before consumption (Hely et al. 2006; CSIRO 2007). The fruits have a high concentration of Vitamin C and have a strong, pungent taste that makes them popular for use in jams, sauces, chutneys and condiments.

There are several edible species of *Solanum* found in the central Australian region. *Solanum centrale* is the most popular and is considered favourable for cultivation to satisfy western demands.

Cultural history: Traditionally, the bush tomato has been (and remains) very important to the Aboriginal people of central Australia where it is usually hand (bush)-harvested by women (Walsh & Douglas 2007) when the fruit have dried out on the bush. The fruit are further dried before being used as either a food or ground up as a paste.

Challenges: The challenges for industry development based around the bush tomato are sourcing quality product in viable quantities regularly and, more recently, traceability of product.

4.3 Wattle Seed (*Acacia* spp)

Wattle seed is the seed from the tall shrub and tree *Acacia* species and has been used as a food source by Aboriginal people for thousands of years. While there are many species of *Acacia* found in Australia, only a limited number are useful and/or are safe for human consumption (Maslin et al. 1998).

The three main species currently used are *Acacia victoriae* (Elegant Wattle), *A. pycnantha* (Golden Wattle), *A. retinodes* (Silver Wattle) and *A. murrayana* (Sandplain Wattle) with *A. victoria* being favoured in the main (Simpson & Chudleigh 2001; Cribb et al. 2005). Seed, which can be stored for long periods once harvested, is roasted and ground and used in speciality breads, fine chocolates, biscuits and cakes. New products such as wattle seed flavoured ice cream are also being trialled.

Cultural history: Traditionally, wattle seed has been harvested from naturally occurring trees by hand. This method of harvesting is still predominant in supplying the bush foods market. As bush harvest is very labour intensive and on a commercial scale provides a significant cost, Simpson and Chudleigh (2001) concluded that the development of an efficient and economic harvester for large scale plantation wattle seed production is a necessity in achieving low cost seed production.

Challenges: Simpson and Chudleigh (2001), in a detailed report to RIRDC, indicated that the key economic drivers of this industry were harvesting method and cost, possible yield and farm-gate price. However, as with bush tomato, the sourcing of quality product in viable quantities and, more recently, traceability of product are also challenges that need to be addressed.

5. Value chain and market analysis

While the fundamental concept of a value chain is not complex, explicit characterisation and mapping of the value chain is important for any subsequent performance measurement or comparison. Analysis of agri-industry supply chains has thus become a valuable tool in determining where added competitive advantage can be generated for the companies and/or industries involved (Beamon 1998, 1999). In reality, most supply chain analysis, including the Lean Chain approach of Lamming (1996) and Womack and Jones (1996) tends to focus on measuring stocks and flows of product, information and financial factors, and on how managing these in the most efficient

way enhances profitability, rather than providing the information necessary for developing good business strategies that lead to innovative value adding (Govindarajan and Trimble 2005), competitive advantage (Porter 1985), sustainability (Svensson 2007) or managerial education (Dunne 2004). In this study the following were specifically investigated in order to better understand these issues for the BT and WS chains, although a number of other issues such as trust development, power disparity in the chain, relationship development and relationship management (Batt 2003) became apparent during the project and were briefly looked at in situ as they pertained to the main themes:

- the set of processes or activities that would create the attributes or products that might be demanded or used by the end user or consumer
- the product flow features of the chain
- the financial or cash flow across the participants and processes
- the information flow across the chain
- the incentive systems that are/should be put in place to drive and reward performance and share risk
- the chain governance/coordination system.

Both BT and WS as products have similar, if not identical supply and value chains. Some points to note are:

- As with any ‘wild’ product, supply may be dependent on the weather, and this has created an erratic availability reflected in pricing
- Currently, BT is in high demand with demand significantly outstripping supply
- Currently, WS is *not* in high demand. There are large stocks of seed in storage despite some strong product promotion by some of the chefs and its use in high profile products such as those used by Qantas for in-flight snacks. No-one interviewed could give a reason for this situation.
- Generally, it was difficult to obtain figures on stocks and flows or financial data that were accurate or could be validated. This was partially due to:
 - the poor series of seasons prior to 2007, which had left all bush harvested products in short supply thus creating a genuine lack of data
 - a lack of good recording of information about bush harvested product
 - a definite reluctance on the part of interviewees to divulge this type of information in detail. This situation cropped up often enough to corroborate independent anecdotal evidence that very poor business information flows (equated to information hoarding) throughout the bush food chains generally is a serious underlying issue for the industry.
- Food hygiene issues were raised a number of times – mainly at the production/harvesting and wholesaler components of the chains.
- Governance questions arose in the form of queries from interviewees as to:
 - best practice management in the industry (what is best practice?)
 - relationship management needs (there is a lack of trust across the chain)
 - information sharing (or lack of)
 - payment of suppliers (some specific problems/names came up a number of times)
 - behaviour of the larger processing companies when sourcing product
 - raw material hoarding leading to a bull-whip effect of demand and supply, making it impossible for suppliers and processors to manage inventory levels

- Formal accreditation needs in relation to implementing food safety and traceability requirements both domestically and for overseas markets.

The generic form of the BT and WS value chain is shown in Figure 1. Stocks and flows for each product and associated financial information is shown in Tables 1 and 2.

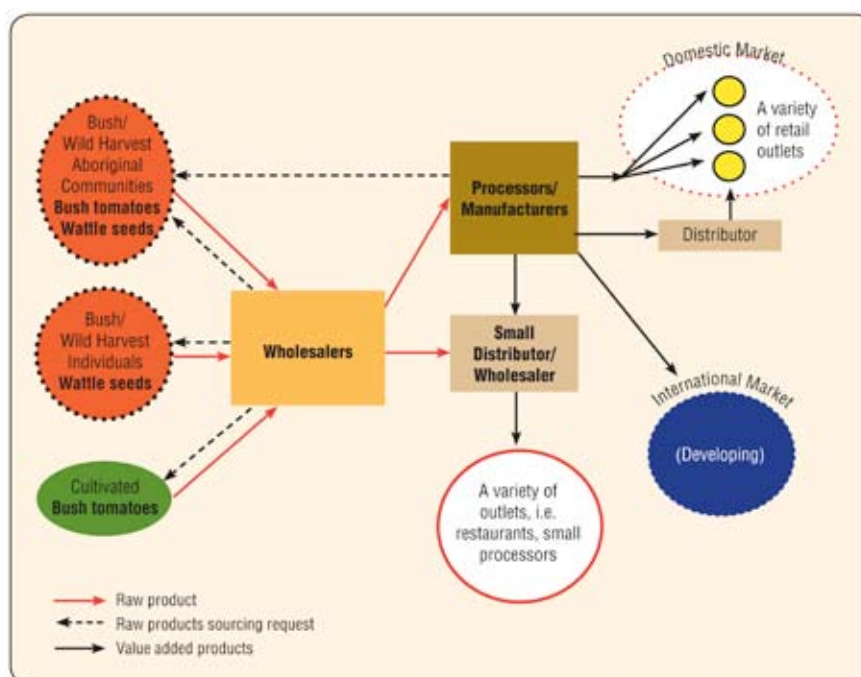


Figure 1: Generic BT and WS Supply Chain

Table 1a: BT generic chain stocks and financial flows

Bush harvesters	Wholesalers	Processors	Retail products
<ul style="list-style-type: none"> 15–20 tonnes/year (total across all harvesters) Sell at \$4–\$10/kg (cleaned and semi-dried) 	<ul style="list-style-type: none"> What they can get (e.g. one wholesaler quoted 8–10 tonnes in 2000/01 summer season, 400 kg in 2006/07 summer season, but in fact needed 4 tonnes) Sell at \$22–\$30/kg + freight (cleaned and dried) 	<ul style="list-style-type: none"> 4 kgs–5 tonnes/yr dependent on size of business Value add product – 15–20% margin 	<ul style="list-style-type: none"> Number of units unknown, but greater than 500 000 3–10 gm raw material per 250 gm product \$8.50–\$12.00 on shelf per 250 gm jar

Note: Numbers are very fluid for a variety of reasons (see text). Freight costs vary: Bus \$35 for 25 kg depot to depot, Australia Post \$8.80 for 3 kgs.

Table 1b: WS generic chain stocks and financial flows

Bush harvesters	Wholesalers	Processors	Retail products
<ul style="list-style-type: none"> 0.5–5 tonnes/year (total across all harvesters) Sell at \$0.5–\$4.00–\$14.00/kg (dependent on whom you speak to) <p>Note: In 2007, most seed sold was from storage</p>	<ul style="list-style-type: none"> What they can get Sell at \$15–\$25/kg + freight (dried and roasted). <i>Has been as high as \$98/kg and as low as \$8/kg.</i> 	<ul style="list-style-type: none"> 4 kgs–200 kgs/yr depending on size of business Value add product – 15–20% margin 	<ul style="list-style-type: none"> Number of units unknown \$8.50–\$12.00 on shelf per 250 gm jar <p>Overseas markets (Germany) have a high potential</p>

Note: Numbers are very fluid for a variety of reasons (see text). Freight costs vary: Bus \$35 for 25 kg depot to depot, Australia Post \$8.80 for 3 kgs.

In practical terms, there are two major chain models in the industry that revolve separately around key champions of the Bush Food industry, as well as the generic form of the supply chain for BT and WS. In addition, there are numerous other more ad hoc approaches to getting various value-added products of BT and WS to market. While the two major models dominate, the industry is developing fast and a couple of the smaller players who source BT and WS from Central Australia are beginning to develop their own sourcing of raw material and value-added product market access models.

The two main chain models involved are those of Outback Spirit and Outback Pride. These are described below.

5.1 Outback Spirit Model

The Outback Spirit operational and community development model has been well documented in a review by Lisa Robins (2007) and will not be described in detail here; however, for the sake of completeness a brief outline in relation to the supply and value chain issues of this report will be given.

Interviewed were: Juleigh Robins, Ian Robins (Robins Foods); Callum Eddington (Ward McKenzie); Wayne Street (IAF), John Collyer (Chair of IAF); Chris Mara (Coles IFF).

Outback Spirit is the brand name of Robins Food Pty Ltd¹, a small family-owned food processing company based, as of June 2008, in Altona, Victoria, close to their 50% owning partner Ward McKenzie Pty Ltd.² Ward McKenzie is a substantial family-owned Australian business specialising in processing pulses and grains for both the domestic and export markets, with a strong commitment to Australian produce and ‘putting back’ into the community. Callum Eddington’s comments in relation to the Robins Food equity buyout were that Robins ‘needs a commercial attitude to be marshalled for the greater good’. He is also mindful of supply issues of bush-harvested produce and the need for appropriate grading criteria, but believes Ward McKenzie’s other products can act as a buffer for the company when bush harvested produce is in poor supply. Ward McKenzie has expertise in dry product handling, packaging and labelling, and also has good (export quality) cold chain facilities³.

¹ <http://www.robins.net.au/>

² <http://www.wardmckenzie.com.au/>

³ The cold chain refers to the transportation of temperature sensitive products along a supply chain and involves refrigerated packaging methods and the logistical planning to protect the integrity of the product. Cold chain facilities such as refrigeration are particularly required where perishable product is involved.

Robins also have a manufacturing relationship with Jensen's Choice Foods⁴ and Hela Schwarz⁵ for new product development.

Robins buys raw product from central Australian Aboriginal communities through an exclusive relationship with Indigenous Australian Foods Ltd (IAF), a not-for-profit procurement company that manages the supply of native foods from regional suppliers. However, there is enough anecdotal information indicating that Robins Foods does occasionally source directly, which has upset the status quo of local wholesalers. Indeed, there is some uncertainty as to who actually supplies Robins now – Janet Chisholm and the community on Napperby (Australian Aboriginal Food Company) have been the major suppliers in the past, with occasional supply coming through Peter Yates, who deals with the Ti Tree community; very rarely, through Rod Horner, who deals with the Utopia community; and, again rarely, through Lyle Dudley, from South Australia.

Robins Foods then manufactures (under Hazard Analysis and Critical Control Points (HACCP⁶) conditions) and markets a range of Australian native food products (which comprise approximately 50% of their full product range) to a wide variety of domestic food service providers, Coles (in association with the Coles Indigenous Food Fund) and to selected Woolworths, as well as to overseas retail outlets in America and in the UK in particular.

The Outback Spirit BT and WS Supply Chain is depicted in Figure 2.

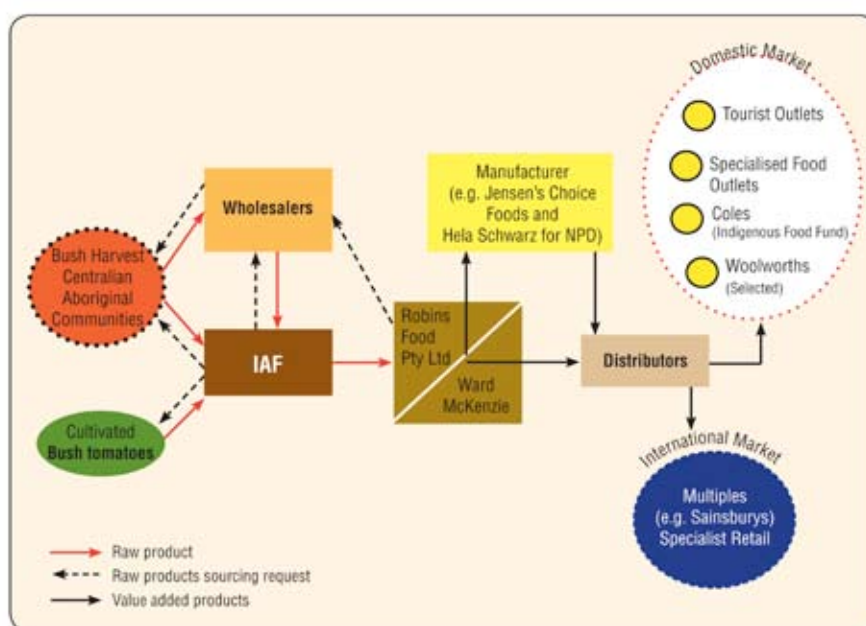


Figure 2: Outback Spirit BT and WS Supply Chain

⁴ <http://www.jensens.com.au/>

⁵ <http://www.helaschwarz.com.au/>

⁶ HACCP is a systematic preventive approach to food safety and pharmaceutical safety that addresses physical, chemical, and biological hazards as a means of prevention rather than finished product inspection.

5.2 Outback Pride/The Outback Café Model

The Outback Pride community development model is documented on their website, and as with the Outback Spirit model will only be described as it pertains to the requirements of this report.

Interviewed on site at Reedy Creek Nursery in South Australia were the owners of the nursery, Mike and Gayle Quarmby.

Reedy Creek Nursery in South Australia is a commercial wholesale propagating nursery that provides a range of bush food seedlings to eight to ten South Australian Aboriginal settlements involved in the Outback Pride Project.⁷ The Quarmbys have selected a series of seven specific clones of BT from some 300,000 seedlings, over eight years and from eight generations of breeding stock that they can grow up successfully: varieties that have better production, slightly more discriminate fruiting, larger fruit, good flavour, fewer prickles and that are fairly upright. They are supplying these to the communities to grow, and they buy back the product under a five-year grower and supply contract.

The Quarmbys have also set up two 5 ha commercial cropping plots for BT – one in the Flinders Ranges and one elsewhere in South Australia. These commercial areas are run by non-Aboriginal managers, as the management was not deemed by the Quarmbys to be efficient when run from within the associated settlements. Expected tonnage/ha of the plots was not obtained.

The Outback Pride Product range is made on site at Reedy Creek. Impressive new cold storage and processing facilities have been established in 2006/07 and a good record-keeping system has been implemented to record details from raw material product arrival onsite through to product distribution (including batch number and barcoding). Manufacturing is undertaken under HACCP conditions, but official HACCP accreditation was not evident. However, in 2008 they have entered a six-monthly HACCP certification audit program with the National Consortium of Colleges (NCC)⁸.

Outback Pride products are distributed by independent state distributors such as FineRange Foods in Queensland to retailers, tourism outlets and supermarkets as well as a comprehensive range of food service products to restaurants and manufacturers. An Aboriginal family business called Bookabee Australia handles the distribution for SA and NT.

The Outback Café⁹–labelled range (linked to *The Outback Café* TV program with chef Mark Olive) has been in Woolworths since April 2007 at around 60 000 units to start with, followed by a constant 5000 units/day as the usual production run. This is a good business move as Outback Pride will remain a specialist product in niche outlets, and The Outback Café range (which is the same product, relabelled) will be sold through the volume market and advertised through television.

As an example of the increasing maturity in their business operations, the Quarmbys have engaged a business broker to manage their relationship with The Outback Café and with Woolworths. Figure 3 shows the Outback Pride/Outback Café Chain.

⁷ <http://www.outbackpride.com.au/>

⁸ NCC Home Learning which is a home study organisation that represents the National Consortium of Colleges in the UK. It offers courses in food safety and HACCP.

⁹ <http://www.theoutbackcafe.com/>

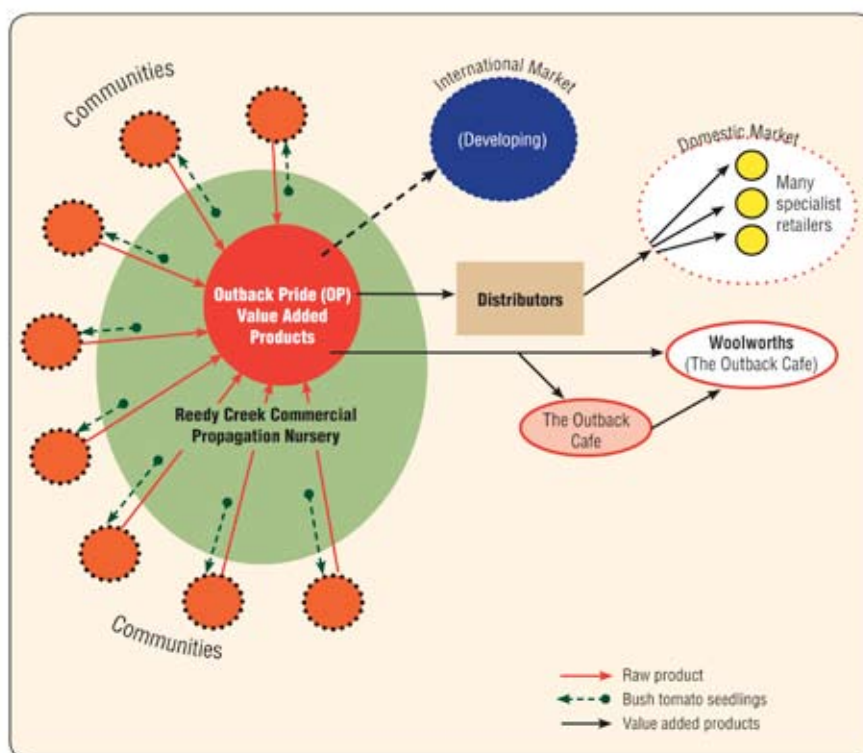


Figure 3: Outback Pride/Outback Café BT and WS Chain

5.3 Other chain models

Apart from the two main chains that have been described, there are numerous other paths along which raw BT and WS move into the retail sector as value-added products. Although dealing in low volumes, the majority of people involved in the bush food industry are actually involved at this level.

In the main (as illustrated in Figure 4), raw BT and WS are either value added to by growers or sourced by processors, chefs and/or retailers from around the country (e.g. Dillybag and Murrimagic in Queensland; Cherikoff Foods in Kingsgrove, NSW; Oz Tucker on the Central Coast of NSW; Kurrajong Foods in Sydney), either from small onsellors/distributors (e.g. Tannemara Bush Foods in South Australia) or directly through one of the local central Australian or South Australian wholesalers with connections into local Aboriginal settlements around Alice Springs (e.g. Peter Yates, Ti Tree community; Rod Horner, Utopia community; Frank Baarda, Yuendumu community; and Lyle Dudley from South Australia).

BT raw product is then mainly processed into jams, chutneys or sauces for sale at local markets or through specialist outlets, with WS being mainly used for biscuits, breads and dukkahs and sold in similar fashion.

Two specific examples of local Alice Springs–based businesses involved in bush food use and promotion are:

Desert Garden Produce: The business arm of Pwerte Arntarntarenne Aboriginal Corporation in Alice Springs was first established in 2002 by Max and Ruth Emery. They have concentrated on growing BT under horticultural conditions on a local block of land and believe that they now have a plant variety and appropriate horticultural methods to deliver a small but reliable source of fruit which they currently sell direct to processors in NSW and SA.

Kungas Can Cook: Rayleen Brown is an Alice Springs business woman who uses local bush food products, including BT and WS, in her catering business.

Nearly all companies contacted have, or are about to have, a web presence with an eCommerce facility to enable their products to be bought via the Internet.

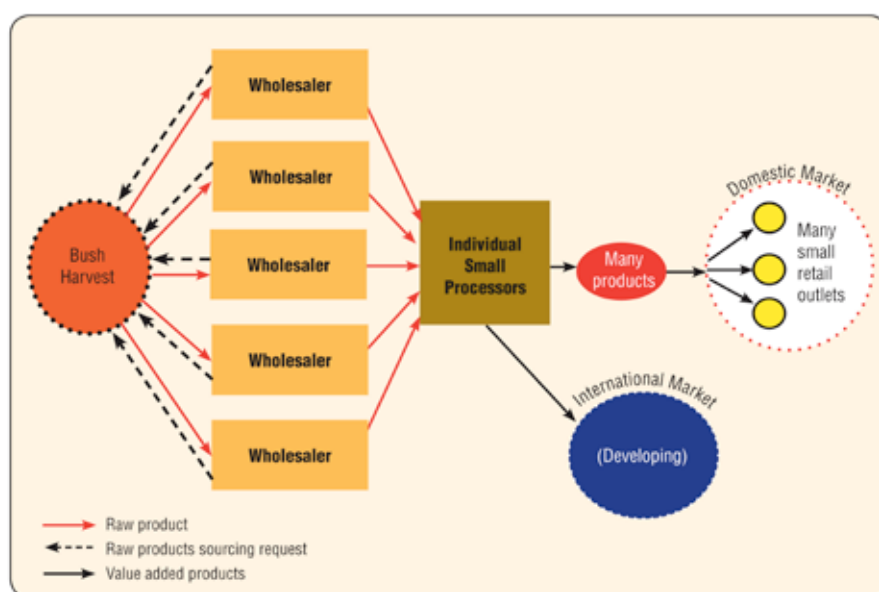


Figure 4: Small player BT and WS Chain

6. Discussion

The development of an industry based on a new or fledgling crop is fraught with difficulties – not least of which is the ‘chicken-and-egg’ question of what comes first: the development of a reliable production system for the crop so that there is a product to sell? Or the development of a market for the potential products associated with that crop?

Today, in this market-oriented world, the tide has turned away from production-driven industry development, to demand-driven industry development. Thus, when a product is flagged as a potential industry winner for whatever reason, it is important that the potential market for that product (and any potential value-added products) be evaluated before development monies get poured into something that may not have, or at best may only have a small, market potential.

There have been a number of studies of new industry development, the most comprehensive being by Woods et al (1994) where 35 industries were analysed with six key factors: production, marketing, processing, government, R&D and socio-environmental being highlighted as having major impact. Key (1998) identified five areas of main concern: marketing (awareness, alternative

products, alternative suppliers, future); production (ability to sustain supply, quality improvements, R&D, standards); finance (value adding, level of sales, profitability); infrastructure (distribution and storage capabilities, buying systems, spin-off industries) and management (knowledge, training, skills); while Lim (2003) provided a supply chain management perspective of new agri-food industry development and concluded that any type of new rural industry development can be successful and can create competitive advantage by simply using basic supply chain management strategies.

Where does any of this leave the BT and WS industries? Both BT and WS have been used for value-added product creation for a number of years using a wild crop. They therefore do not precisely meet a new crop or new industry classification. However, the main issues that have emerged from this study are that both BT and WS suffer from new crop and new industry issues, particularly in relation to supply chain issues (focusing on stocks and flows and the management of these) and value chain issues (what actually adds value and what is preventing further development).

In essence, the BT and WS chains are currently part *push* or production/product driven, and part *pull* or demand driven, which is not a viable long-term strategy.

6.1 Supply/demand chain issues

The general consensus of people interviewed is that demand is increasing for bush foods around Australia and overseas over the last two years, particularly for Desert Lime, Muntries, Ribberries and Black Mt Pepper. However, bush tomato is still the biggest requirement.

Unfortunately, there have been no rigorous and objective consumer investigations undertaken that enable figures to be put together on actual demand for raw or value-added products. Certainly there is no information available at a more detailed level in relation to understanding the consumer in terms of their ‘feelings’ about raw or value-added bush products (e.g. palatability, price thresholds, convenience in terms of obtaining or using the products) or ‘beliefs’ about the products (e.g. food safety and nutritional values), all of which contribute strongly to the consumers’ buying disposition towards the products and should be known in order to properly address the market.

A significant well-recognised problem is that supply of raw products is highly uncertain. Consistency of volume availability and product quality, good inventory management to minimise hoarding of raw material, and an appropriate grading of products is required in order to reduce the problem and make the chain more efficient.

The 2006–07 summer season was very difficult for BT; very little fresh raw product was available due to long-term drought conditions. WS supply was fairly static over the same time, but WS demand can be inconsistent, and there is currently a significant amount in storage.

For BT the industry really needs to look at the current source of raw materials, with the following questions being useful lines of investigation.

1. What can be done to help obtain a consistent product for which a consistent pricing strategy could be developed?
 - Is commercial-scale bush harvesting a possibility? If so, is this something the Aboriginal communities wish to do?

2. Would it be possible or allowable to GPS-locate bush plants producing quality fruit which would then allow a network analysis of issues associated with harvesting and distribution (e.g. the costs to communities and ease of harvest (distances involved, presence or absence of prickles, transport back to community, etc) to be undertaken to provide some inputs to a pricing strategy?
3. What is done by the bush harvesters to value add prior to supplying to wholesalers (e.g. washing, drying) and how do they get paid for this? Is there a need to formalise this in a pricing strategy?
4. What is the long-term viability of bush harvest versus (or additionally), cultivation? Consistency of volume and quality as well as palatability of product need to be ensured for a successful industry. This requires knowledge of, for example, which clone, what attributes, germination issues, agronomy, and mechanisation of harvest of the plants in order to create the necessary volume and consistency of supply. Without these issues being addressed, the BT industry cannot remain viable in the long term.
5. Chain structures: Is it a viable option for the industry in general to continue with two main and competitive chain models as the industry expands?
 - Are individual Aboriginal communities actually losing out on supply dollars by remaining individual suppliers to individual wholesalers?

For WS the situation is not so serious; WS is plentiful when there is no drought, although pastoralists consider the plant a weed, so some traditional places in SA have been cleared of it and it is thus getting marginally more difficult to find.

Other supply chain issues across both BT and WS chains:

1. There is a wide variation in margins being obtained, progressing upwards from production (12%–100+ %).
2. There is a wide variation in percentage content of BT and WS in value-added products (3%–20%).
3. Distribution: there are many distributors, but the type of demand and the style of ordering (e.g. ‘I need 10 kilos, now!’) generally involves quite significant costs and hassles to smaller wholesalers. Linked to this type of demand are supply quality issues and issues of safety in raw material handling issues, including cold chain handling requirements.

6.2 Value chain issues

The work outlined in this report indicates that the major value chain issues in the BT and WS product chains are around information flow up and down the chains (which involves trust development, communication issues and power disparities within the chain), governance issues, the development of business and entrepreneurial skills within the chain and the age old issue of managing human relationships.

As indicated in earlier sections, obtaining valid stock and flow information for BT and WS product is virtually impossible and there is great distrust within parts of the industry of individual players, particularly those who have been in the industry a long time or who might be or are regarded as ‘champions’ by non-industry onlookers.

Poor information flows in agri-food chains are nothing new and they have been targeted in a number of analyses of Australian commodities (Bryceson & Pritchard 2003, Bryceson 2003, Bryceson & Cover 2004a) as a major barrier to technology uptake and innovative market development. However, *information* as a commodity has not necessarily been isolated as a major

contributor to *failure* of an industry, although Gifford et al (1997) do mention reliable market intelligence and performance feedback as being important to *success*. Bryceson and Cover (2004b), in a paper documenting the Guar¹⁰ industry in Australia, suggested that a lack of appropriate, good quality, transparent information trickling down the chain about potential markets, products and prices resulted in variable strategies by various people in that industry's 'chain' that led to disastrous outcomes for that industry. Additionally, while agreeing with Hyde (1998) that industry/product champions are essential in developing new industries because of their ability to transfer their information, knowledge and entrepreneurial skills to the developing industry, they suggested that there was in fact a 'use-by' date for champions after which they actually foster a *lack* of transparency and an *information hoarding* situation as they start to feel threatened by up-and-coming other players.

In the case of the BT and WS industries, internal industry competition for raw material supply and poor information dissemination (information hoarding) is leading to monopolistic behaviours by the larger companies, however well intentioned they may have been in the initial stages of developing the industry. There is evidence of this from smaller players trying to get supply of raw product, particularly of BT. The players that are now entering the industry are product, consumer and business savvy – or have business mentors – so this type of behaviour will not, in the long term, be successful. The reality is that the market share for bush produce is very small in comparison with other non-Aboriginal foods; infighting within the industry gives rise to a perception of un-professionalism (which may be equated to a lack of safety) which will increase the business risk of the bigger retail outlets dealing with anyone in the industry.

As with other new and developing industries, business and entrepreneurial skills need to be developed throughout the chain from production through to retail. A suggested process could be a 'Walking the Chain' approach, pioneered by the Food Chain Centre (2005) in the UK.

The other main issue for the bush products industry in general is food safety and traceability. For BT poor hygiene at a production level has led to a variable quality and there is very little traceability and record keeping generally. For WS both the species used and the roasting quality makes a huge difference to taste and thus to consumer palatability, indicating that the quality and consistency of processing should be standardised around consumer requirements. The issue of food standards and traceability is a major one for the industry, and not only from the point of view of accepting that to provide a product, such standards and record keeping *must* be adhered to (FSANZ 2008) to sell it legally – both domestically and internationally – but also in terms of understanding both the actual costs of adhering to standards (e.g. microbiological testing costs) and the hidden costs involved (e.g. time involved and skilling up of management and staff) (C Mead [CEO Lynher Dairies, UK,] 2008, pers. comm. March).

These industry governance issues must be addressed if the industry is to remain viable and/or expand its domestic and international markets successfully. The new Peak Body, ANFIL¹¹, has indicated that these issues are among the first they will be addressing.

¹⁰ Guar (*Cyamopsis tetragonoloba*) is a legume often referred to as a cluster bean and was first introduced into Australia in 1910 from India (Jackson & Doughton, 1982).

¹¹ <http://www.cse.csiro.au/research/nativefoods/development/board.htm>

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Appendix 1: Interviewees

Note: those interviewed in relation to the Outback Spirit and Outback Pride chains are detailed under those sections earlier in the report.

- Tanemara Bush foods: Jenny Picket, wholesaler BT and WS, Adelaide.
BT in high demand – both ‘whole’ fruit and dried – difficult to get in the 2006–07 summer season.
- Lyle Dudley, by phone, collector, wholesaler of BT, but mainly WS, Flinders Ranges.
Problems over time with unscrupulous people in the chain, and with bills not being paid.
- Ron Horner, wholesaler, Alice Springs.
Deals primarily with bush harvesters from Utopia.
- Peter Yates and Jock Morse, wholesalers of bushfoods, Alice Springs.
Deal primarily with Ti Tree Community. Are attempting some horticulture at Ti Tree; there are difficulties with germination and getting community people to harvest what BT is grown.
- FGM Distributors, by phone, Adelaide.
Don’t deal in much product.
- CDEP Adelaide, by phone.
Working with Quarmbys in the main.
- Eddie Murri and Phil Baker from MurriMagic, by phone, Yepoon, Qld.
Value-added products, but also setting up a native plant nursery. Source BT and WS from whomever they can get; currently mostly from Lyle Dudley.
- Rayleen Brown, Kungas Can Cook, Alice Springs.
- Athol Wark, chef Wildfoods, Alice Springs, by phone.
Uses the location of central Australia as a selling point; consumers really are not aware of tastes and can be conservative
- Andrew Fielke, chef, Adelaide; Chair new ANFIL Board.
Uses WS quite a bit.
- Beat Keller, chef, Alice Springs.
Will use occasionally but consumers really are not aware of tastes; so while OK for tourists, not really for residents.
- Mark Olive, chef, The Outback Café TV series, Melbourne; very nice coffee table recipe book sold where products are sold; contractually linked with Quarmbys.
Uses different products on the shows, which are then reflected in the recipe book and in Woolworths.
- Sammy Ringer, Bush Foods magazine, The Awakening.
Strong overview knowledge of industry history and players.
- Ray Rogers, Bush Food Directory.
Retired and sold Tannemara bushfoods to Jenny Picket.
- Wendy Kirkbush, Outback Muster Café, Warrego Highway, Qld.
Buys Outback Pride products from FreeRange Foods; had a taste test session with three bus loads of travellers recently – the product ‘flew out the door’.
- Des Rogers, PepperedBLACK, Alice Springs.
Wants to set up an Indigenous hospitality college in conjunction with an Indigenous café.
- Afghan Food Traders, retail, Alice Springs.
Selling Peter Yates’ value-added products.

- Simons Butchers, Brisbane.
Has sold Outback Pride products; they go well with meat.
- Vic Cherikoff, Sydney, NSW, chef Cherikoff's Foods, value-add products, by phone.
Sources raw material from whomever he can get it and will on-sell raw materials when he can.
(Regarded by other players as a very expensive raw material source.)
- Oz Tukka, Lake Macquarie, NSW, by phone.
Smaller player, but in many outlets nationally
- Lee Etherington, Kurrajong Foods, Sydney, NSW, by phone.
High value, value-added products is the only way to go; much going overseas to Europe in particular.
- Dale Chapman, Dillybag, Eumundi, Value-added products.
Looking to set up a value chain of own. Martha Shepherd (producer of mainly ribberries and high value, value-added products. Qld and Australian Rural Businesswoman of the Year 2006 Communications Officer for ANFIL) is in the region and her distributed value chain encompassing other geographically distributed producers contributing to a specialised and high-value niche set of riberry products is being seen positively and perhaps as an example of what 'small' players can do when collaborating. An instigator with Sammy Ringer of the new Qld Wild Foods and Products Inc (QWFPI).
- Phillip Vernon, Paddemelon, by phone.
Could use about 4 tonnes of BT per year, at \$19–28 kg. Export about 60% of sauces to Europe (Germany).
- Doug Brownloe, Communications Officer ANFIL.
Excellent general information on history of the industry.

Unable to contact, or no reply

- Contacted Priam, Mahogany Ck, by email but no return contact
- FreeRange Foods in Brisbane
- Sybila Hess-Buchman

Appendix 2: Bush food value chain project business interview questions

The questions shown below were used as the basis for initiating a discussion during a face-to-face meeting or phone interview with business people in the bush food industry who have agreed to participate in the project.

1. The business
 - a. Company?
 - b. What is your core business?
 - c. What are your major products?
 - d. Do you currently regularly supply/buy bush foods products?
 - e. If (Y) - Which ones?
 - f. If (Y) - Who from/to?
 - g. If (N) - Reason?
 - h. If (N) - In the future would you be interested in supply/buying bush food products?
 - i. If (Y) - Why?
2. Supply chain - Suppliers/Market
 - 1) How would you describe your supply chain?
 - 2) What is the range of bush food products that you deal with?
 - 3) Is it easy to obtain bush food products?
 - 4) Who are your normal supplier/s of bush food products?
 - 5) What are your best selling bush food products?
 - 6) What is your typical supplier/customer? (please tick the appropriate space)
 - a. Company/Individual _____
 - b. If Individual Male _____ Female _____
 - 7) What do your customers buy the following bush food product for?
 - a. Bush tomato _____
 - b. Wattle seed? _____
 - c. Other bush foods you sell/supply _____
 - 8) What quantities do you purchase/supply of products
 - a. Bush tomato
 - b. Wattle seed
 - 9) What per kilo price do you supply/retail
 - a. Bush tomato
 - b. Wattle seed
3. Participant views on Australian bush foods
 - a. What Australian Bush Foods do you personally like to use?

 - i. Why? _____
 - b. How did you find out about bush food products?
 - c. Do your customers know about Australian bush foods:
In general? _____
Specifically: Bush tomato, Wattle seed? _____
In your opinion what has been the speed of product uptake (slow, fair, fast)
What are the competing products?
 - d. Have there been improvements in the quality of bush food products you receive/sell recently?

END OF QUESTIONNAIRE

DKCRC Partners



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GLUTEN FREE



Outback Spirit delivers to the home chef a wonderful selection of unique Australian chutneys featuring wonderful Australian Native Ingredients.

Outback Spirit Chutneys utilise wonderful fruits such as Bush Tomatoes from the Tanami Desert, Native Mint from East Gippsland, Mountain Pepper from East Gippsland and Tasmania, Lemon Myrtle and Wild Rosella from Queensland. They are a great addition to the pantry.

All Outback Spirit Chutneys are Gluten Free.

Unique Selling Points

- Unique and delicious Australian flavours
- Convenient, versatile and easy to use products
- Natural products with no preservatives, colours or flavours
- Philanthropic support to Indigenous Communities through sale of product

Quick Tips

- Delicious with all grilled, baked and BBQ meats, fish and poultry
- Ideal on hamburgers and vegetarian burgers
- Perfect with all cold cuts and cheeses
- A scrumptious spread for your favourite sandwich
- Makes a great flavour base for pizza
- Add to slow cooked dishes for extra flavour.

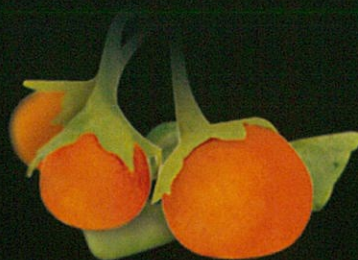
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Altona Victoria

AUSTRALIA

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Distributor:



Bush Tomato Chutney

EAN: 9321208 000762 TUN 1 9321208 000769

Bush Tomato Chutney is made from the Bush Tomato that is sourced through Indigenous Communities in the Tanami Desert region of Central Australia. Ideal served with Gourmet Burgers, meat pies, sharp cheddar cheeses and pate.

Outback Tomato Chutney

EAN 9 321208 001486 TUN 1 9321208000646

Outback Tomato Chutney is spiced with Mountain Pepper and Lemon Myrtle. A wonderful combination that is truly scrumptious. Ideal for cheeses, burgers and sausage rolls

Mango Native Mint Chutney

EAN 9 321208 000755 TUN 1 9321208000753

Mango and Native Mint Chutney is the perfect combination of ripe mangoes and the Native Mint from East Gippsland region. It is wonderful with all pork dishes, prawns, soft cheeses and sandwiches.

Wild Rosella and Cranberry Chutney

EAN 9 321208 001394 TUN 1 9321208 000554

Wild Rosella and Cranberry Chutney is not too sweet and has a pleasant sharpness. It is wonderful when served with grilled meats, such as lamb or pork.

Wild Lime Pickle

EAN 9 321208 000793 TUN 1 9321208000981

Wild Lime Pickle is a sensational pickle that features the Australian Native Desert Lime from Outback Queensland. This tiny fruit the size of a hazelnut has plenty of flavour. Wild Lime Pickle is wonderful folded through yoghurt, serve with pickled meats, corned beef and fantastic on a chicken burger.

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Outback Spirit

Outback Spirit have combined the unique flavours of Australian native foods with the best local ingredients and classic cooking techniques to create an exciting and delicious range of truly Australian condiments and sauces.

Our native fruits, herbs and seeds are sourced from the extremes of arid dessert, lush tropical rainforests, and alpine high country to the hinterland. Aboriginal communities harvest many of our ingredients from the wild in the traditional manner.

When purchasing Outback Spirit products, you are supporting the **Outback Spirit Foundation**.

Unique Selling Points

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- Convenient, versatile and easy to use products
- Natural products with no preservatives, colours or flavours
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Distributor:

Outback Spirit Hot Sauce Multi Pack 5 x 160 mL

EAN: 9321208002698

Outback Spirit Hot Sauces are a fiery selection of Hot Sauces uniquely Australian.

Outback Spirit makes hot and spicy cooking a breeze! Just open a bottle and pour...or marinade...or baste, rub or heat through! It's hot, it's happening, it's Outback Spirit! Gluten Free.

Wild Lime and Peri Peri Sauce

Wild Limes are tiny native fruits from Queensland's vast and arid outback. They are intensely flavoured. This zesty hot lime chilli sauce is perfect to use as a dipping sauce or marinade with chicken, beef or seafood.

Mango Curry Lemon Myrtle Sauce

Mango Curry Lemon Myrtle Cooking Sauce is a beautiful blend of Mangoes, Lemon Myrtle, Curry and Coconut. Wonderful to pour over satay chicken skewers, use as a dipping sauce with prawns or veggie burgers.

Hot Outback BBQ Sauce

Hot Outback BBQ Sauce smoke blended with a healthy dose of Mountain Pepper harvested from the Australian Alps, an ideal marinade or dipping sauce for BBQ Ribs or chicken wings, great with Angus Beef sausages or hamburgers.

Lemon Myrtle, Coconut and Chilli Sauce

Lemon Myrtle, Coconut and Chilli is a fiery sweet sauce with perfect balance of heat and flavour, with the difference of shredded coconut! Great with stir fry, over chicken or with seafood. Fabulous with chicken or fish cakes.

Wild Rosella Hot Chilli Sauce

A vibrant red sauce made from Wild Rosella, a Queensland fruit/flower. Use as a dipping sauce with garlic prawns or chicken skewers. A fantastic sauce with lamb or drizzled over ham on the bone before baking.

Outback Spirit Rib and Wing Sauce Multi Pack 2 x 250 mL

EAN: 9321208002711

Outback Spirit Wing and Rib Sauces are made by our chefs in the kitchen. Outback Spirit products combine the unique flavours of Australian native foods with the best local ingredients and classic cooking techniques to create delicious Australian Rib and Wing Sauces. Gluten Free.

Soy and Lime Wing Sauce

A superb soy marinade made with the tiny Wild Limes that are native fruits from Queensland's vast and arid outback produced in Australia. Soy and Lime Wing Sauce is the perfect chicken wing marinade for summer BBQ's or stir-fry. A sensational clean tasting marinade, simply pour over your meat, allow to marinade for 4 hours or overnight then bake in the oven or in the BBQ.

Original Sticky Rib Sauce

A fantastic Sticky Rib Sauce, made with a healthy dose of Mountain Pepper harvested from the Australian Alps as the name suggests it is ideal for marinating Beef or Pork Ribs or Chicken Wings. Marinade for 4 hours or more and then either bake in the oven or cook on the BBQ.

Outback Spirit Salad Dressing Multi Pack 2 x 250 mL

EAN: 9321208002728

Outback Spirit Salad Dressings are made by our chefs in the kitchen. Outback Spirit products combine the unique flavours of Australian native foods with the best local ingredients and classic cooking techniques to create delicious Australian Salad Dressings. Gluten Free.

Creamy Garlic and Mountain Pepper Dressing

A creamy style dressing that is smooth on the palate packed full of Garlic and Mountain Pepper harvested from the Australian Alps, serve over a fanned avocado, rocket and Parmesan salad or drizzle over grilled fish. Pour over a potato salad or coleslaw.

The combined flavour of Garlic and Mountain Pepper will excite the summer salads and tantalise the palate to a new level.

Wild Lime Dressing

A superb Wild Lime Salad Dressing made with the tiny Wild Limes that are native fruits from Queensland's vast and arid outback. A creamy

style dressing that is smooth on the palate with pronounced flavour of the Australian Wild Limes, a definite for all chicken or seafood salads. Wild Lime Dressing is a true pantry staple.

Outback Spirit 6 Sauce/Salad Dressing Multi Pack

EAN: 9321208001516

4 fantastic sauces and 2 superb salad dressings from the Outback Spirit range. Giving the customer a variety of products that are suitable as table sauces, marinades or salad dressings suited for most occasions. Use for red meats, poultry, fish and green leafy salads. This is truly a great selection. The sauces and salad dressings are Gluten Free.

Outback Spirit Chutney Multi Pack 3 x 285 g

EAN: 9321208002704

Outback Spirit Chutneys are made by our chefs in the kitchen. Outback Spirit products combine the unique flavours of Australian native foods with the best local ingredients and classic cooking techniques to create delicious Australian Chutneys. Gluten Free.

Mango Native Mint Chutney

The perfect partnership; sweetness of the mango coupled with the herbaceous minty flavour of the Native Mint, lends this chutney to prawns, fish and shellfish, ideal with all poultry and lamb. Serve with Camembert and Brie cheese. May be puréed and heated with a dash of chicken stock and white wine for an instant mango sauce.

Outback Tomato Chutney

Outback Tomato Chutney is a superb combination of ripe Australian Tomatoes cooked with Mountain Pepper and Lemon Myrtle. This delectable chutney is perfect with beef burgers, lamb cutlets, kangaroo, pâté and sharp cheeses such as aged cheddar.

Wild Lime Pickle

Wild Limes are tiny perfect limes and come from the semi arid Queensland outback. This delightful pickle is suited to Asian inspired dishes and curries. Serve with fish, chicken and pork. A great pickle to serve with traditional corned beef! Add to pan juices when cooking poultry or pork or add to cottage cheese for a delicious dip.

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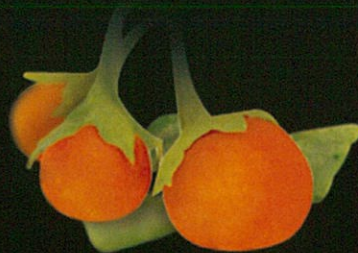
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Oz Tukka Australian Spices

Our range of first class rare Australian spices, are mostly wild harvested, or grown on chemical free farms in Australia.

Lemon Myrtle

Lemon aroma and piquancy. Equally superb with white meats and vegetables as it is with sweets like cheesecake and shortbread.

Wattle Seed

A multifaceted flavour related to hazelnut, coffee, walnuts and chocolate. Wild harvested. Use with chicken, fish and cream sauces: Adds a note of distinction to sweet dishes.

Tasmanian Pepper Berry

A robust hot and fruity pepper. Wild harvested. Grind over meats, in marinades, salads and dressings: slow cooking in casseroles and soups releases the full flavour of the berry while removing the heat. Delicious!

Tasmanian Pepper Leaf

Has a pungent herbal note, finished with a gentle peppery taste. Wild harvested. Goes well with subtle flavoured meats and vegetables. Wonderful in sauces and dips.

Bush Tomato

A wonderfully complex, bitter-sweet caramelised flavour. Wild harvested. Whole or ground, it boosts any tomato-based dish, and is great in marinades, sauces, and dips. Whole bush tomatoes look and taste great on a cheese platter.



Oz Tukka 5-Spice Gift Packet

Nicely presented in a gift box and retailing at around \$10.00, the 5-Spice Gift Packet is a unique Australian gift or a great starter pack to trial 5 great tasting Authentic Australian spices.

The packet is light, making it ideal for posting as a gift or for travellers as a unique souvenir.

Contains: Lemon myrtle, Wattle Seed, Bush Tomato, Tasmanian Pepper Leaf and Artesian salt. User information and recipes supplied inside pack.





Australian Government
Rural Industries Research and
Development Corporation



RURAL INDUSTRIES
Research & Development Corporation

Australian Native Food Industry Stocktake



AUGUST 2012

RIRDC Publication No. 12/O66



Australian Government
**Rural Industries Research and
Development Corporation**

In association with:



Australian Native Food Industry Stocktake

by Michael Clarke

August 2012

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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.rirde.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

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

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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 leuhmannii*
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 publically 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).
8. Draft report preparation, review of industry and RIRDC comments on the draft and final report preparation.

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

Strengths <ul style="list-style-type: none">• Commercial scale plantations• Easily grown species• Anti-fungal and anti-microbial properties• Market recognition of product and its health benefits.	Weaknesses <ul style="list-style-type: none">• No HS – internationally harmonised commodity description, coding system or GRAS (Generally Recognised as Safe).
Opportunities <ul style="list-style-type: none">• Promotion of lemon myrtle's functional food properties• Potential for use as a natural preservative• Potential for use as a cleaning agent (non-food use)• Facilitation of cooperatives for small to medium size growers.	Threats <ul style="list-style-type: none">• Myrtle rust is a major threat to supply• Lower cost overseas supply – lemon myrtle is grown in five other countries (RIRDC 2008)• Synthetic and substitute citral resources (RIRDC 2008)• Ongoing economic downturn, especially in Europe which is a major lemon myrtle market.

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 (Koneczak 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

	Farm gate	Wholesale	Retail
Dried and ground	\$27 - \$45	\$50 - \$60	\$60 - \$70
Essential Oil	\$130 - \$150	\$300 - \$400	\$400 - \$450*

*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, ribberries 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

Strengths <ul style="list-style-type: none">• Strong and unique flavour profile• Beneficial health properties	Weaknesses <ul style="list-style-type: none">• Very limited consumer awareness of anise myrtle• Lack of market development
Opportunities <ul style="list-style-type: none">• promotion of health benefits• Invest and track the market development pathway used by lemon myrtle	Threats <ul style="list-style-type: none">• myrtle rust (some growers report aniseed myrtle more susceptible)

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

Form	Volume	Price per kilo	Farm gate value 2010
Wild harvest wattleseed	1 - 4 tonnes	\$15 - \$30	\$25,000 - \$100,000
Cultivated harvest wattleseed	3 - 4 tonnes	\$15 - \$30	\$75,000 - \$100,000
Total	4 - 8 tonnes		\$100,000 - \$200,000

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 (Interviewees 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 (Interviewees 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 (Interviewees 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; Interviewees 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 <ul style="list-style-type: none"> • 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 <ul style="list-style-type: none"> • 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 <ul style="list-style-type: none"> • 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 <ul style="list-style-type: none"> • 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 (Koneczak 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 cleistoganum* (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

Wild-harvesters	Farm gate/ Aggregators	Wholesale	Retail price per kilo	Small volume retail sales per 100g
\$5 - \$15 / kg	\$30 - \$40 /kg	\$38 - \$50	\$55 - \$80	\$11 - \$19.50

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 Altierre-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 Altierre-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.

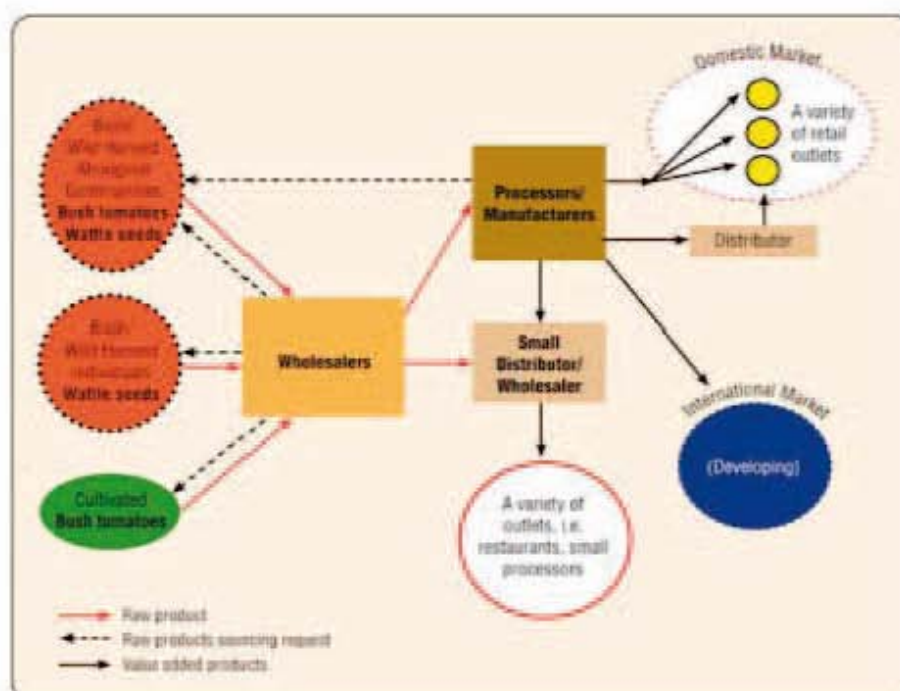
Product supply chains and markets

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

Strengths <ul style="list-style-type: none">• Unique flavour, well regarded by the food industry and popular with consumers• Relatively small ratios to total ingredients needed i.e. intensely flavoured food additive.• Rich source of iron and selenium• Low sodium to potassium ratio which may assist in lowering hypertension.	Weaknesses <ul style="list-style-type: none">• Wild-harvest supply highly variable• Lack of purpose built harvest and post-harvest technologies• Difficult to get regular hand harvest labour• Other species of similar appearance and the green form are poisonous• Cost and difficulty of establishing large-scale plantings and low yield of seed raised plants.• Lack of traceability along the supply chain
Opportunities <ul style="list-style-type: none">• Development of varieties that are easier to grow and more profitable• Improved harvest methods, education and awareness and market development• Enrichment trial planting.	Threats <ul style="list-style-type: none">• Loss of Indigenous participation, along with erosion of cultural and intellectual property rights• Internationalisation and homogenisation of the food industry• Mainstream supply base that is well researched and very low cost.

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

Davidson Plum Product	Farm gate price per kilo 2010
Whole Frozen	\$4 – 12
Frozen Deseeded Halves	\$13 - \$15
Frozen Puree*	\$11 - \$15
Dehydrated (90% reduction rate)*	\$180

*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

Strengths <ul style="list-style-type: none"> • Unique appearance and flavour profile • Very high antioxidant content • Branded as Australian native ensures interest and some market demand 	Weaknesses <ul style="list-style-type: none"> • Skills needed in product development and marketing to grow market demand • Oversupplied for cottage industry level but insufficient volume for commercial production • Lack of communication and cooperation in the industry hampering development
Opportunities <ul style="list-style-type: none"> • Previously abandoned orchards are being brought back into production • Need for improved production efficiencies and technologies plus post-harvest processing techniques • Greater adoption of the fruit in the food manufacturing sector • Need for grower brokerage or a cooperative to ensure supply quality and quantity in order to access higher volume markets • Netting: funding support from government (as for stone fruit) to deal with king parrot damage. 	Threats <ul style="list-style-type: none"> • Production pests including fruit fly, flying foxes and king parrot damage in some places • Extreme weather events including cyclones

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 leuhmannii*) is a lilly pilli that produces red purple ovoid or pear-shaped fruit of 12 mm to 15 mm in length. Riberry, also marketed as 'RainberryTM', 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, preserves, 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 8.1 Estimated Farm Gate, Wholesale and Retail Value of Riberry 2010 (\$)

	Farm Gate Value	Wholesale Value	Retail Value
Riberry – whole frozen	47,250	108,000	216,000
Riberry – pulp	54,000	126,000*	252,000
Total	101,250	234,000	468,000

* 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

Strengths <ul style="list-style-type: none">• Attractive flavour and colour• Versatile fruit that can be made into a range of sweet and savoury products• Good communication and cooperation across the supply base.	Weaknesses <ul style="list-style-type: none">• Soft fruit with a short shelf life requiring rapid processing• Requires improved planting material, cultivation methods, harvest methods, education, awareness and market development• Industry wide product and quality standards (NB: Galeru Pty Ltd is HACCP-certified)
Opportunities <ul style="list-style-type: none">• The big challenge is low volume/high value; the industry needs to get to high volume so that it can enter mainstream consumer markets.	Threats <ul style="list-style-type: none">• 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.• Control needed for flying fox in NSW orchards

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).

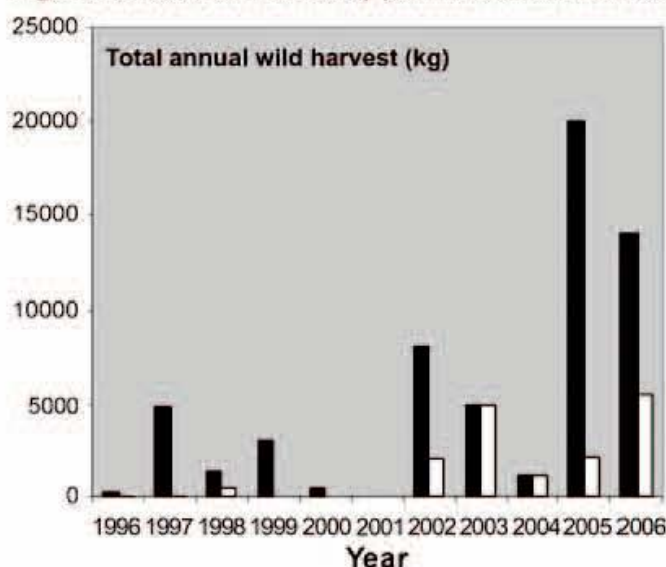
Volume and value

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



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 (Interviewees 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 – 400 kg 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

Strengths <ul style="list-style-type: none"> • Functional food properties • Strong name recognition • Increasing demand as a food ingredient in food service and retail industries • Time from seed to fruit less than five years, so lead time to increase production not too long. 	Weaknesses <ul style="list-style-type: none"> • Low volumes and large costs make wild harvest a marginal activity • Unstable supply, inconsistent market demand • Branding an issue for producers with no link to Kakadu World Heritage Area • R&D gaps - international market research and enrichment planting requirements.
Opportunities <ul style="list-style-type: none"> • Demand from multinationals within the health food, pharmaceuticals and cosmetics industries – strong potential growth • Involvement of Indigenous communities in culturally appropriate commercial enterprises • Enrichment planting to improve density and cost efficiency • RD&E to support industry development 	Threats <ul style="list-style-type: none"> • Loss of intellectual property and plant rights to multinationals • Potential for overseas development of orchards, processing and markets • Loss of Indigenous ownership and involvement

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 the Narringjeri 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 HACCP 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

Strengths <ul style="list-style-type: none"> • High levels of consumer acceptability when tasted • Significant antioxidant capacity. 	Weaknesses <ul style="list-style-type: none"> • No clear flavour advantage • Oversupplied • Need for further cultivar development • Lack of consumer awareness.
Opportunities <ul style="list-style-type: none"> • Clonal selection for colour and flavour • Formation of SANFA Muntries Group. 	Threats <ul style="list-style-type: none"> • lack of funding for long-term research required for develop a new cultivar • Lack of market development • Some growers are struggling to contain a disease which is little understood and is referred to as ‘dieback’ by the industry.

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 is 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

Strengths <ul style="list-style-type: none">• Appealing flavour• Health benefits including anti-oxidant capacity, folate and iron	Weaknesses <ul style="list-style-type: none">• Production constraints including the need for improved planting material and better cultivation methods• Lack of industry capital
Opportunities <ul style="list-style-type: none">• Capitalise on growing popularity in the food service industry	Threats <ul style="list-style-type: none">• Inability to meet market demand due to lack of volume• Pests, disease, hail and cyclones

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

Processing Method	Desert Lime Products
Canning	<ul style="list-style-type: none">• Segments, slices, fruit salads
Preserving	<ul style="list-style-type: none">• Preserves, brined peel, candied products, pickles
Pulp	<ul style="list-style-type: none">• Bases for: soft drinks, preserves, confections, cakes, sauces/dressings
Juice	<ul style="list-style-type: none">• Single strength juice, concentrates, syrups, dehydrated juice• Bases for: soft drinks, preserves, confections
Essential oil	<ul style="list-style-type: none">• Flavourings, chemicals

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 on line 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

Strengths <ul style="list-style-type: none">• Minor use permits and registered chemicals are available for desert lime• Desert limes last fresh for up to 6 months• Readily hybridise with commercial citrus varieties to produce interesting new products• Desert limes have not been affected by many of the pests and diseases that afflict traditional commercial citrus orchards• Success in supermarket stocking• Success in export sales – UK supermarkets, US, Germany and Canada.	Weaknesses <ul style="list-style-type: none">• Long lead time after planting combined with inability to supply from wild harvest means that there is a supply bottleneck• Sensitive to harvest time and post-harvest handling• Lack of market familiarity and understanding• Tristeza virus presence in Qld citrus means that no citrus nursery stock can be sold interstate (but solutions in pipeline).
Opportunities <ul style="list-style-type: none">• Mechanical harvesting possible for fruit destined for processing• Further establishment of plantations and getting away from wild harvest to ensure consistent supply.• Development of desert lime 'co products' including nutraceuticals.	Threats <ul style="list-style-type: none">• Loss of Australian IP if desert limes are allowed to be grown offshore e.g. Israel has requested desert lime trees.

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, lutein, 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

Grade	Farm Gate per kilo	Retail per kilo*
Premium/ Export	\$45 - \$55	\$52
Domestic	\$20 - \$30	\$42
Processing	\$12 - \$15	\$32

*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 <ul style="list-style-type: none"> • 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 <ul style="list-style-type: none"> • Sensitive to harvest time and post-harvest handling • Internal industry politics including lack of information sharing and lack of cooperation by some players.
Opportunities <ul style="list-style-type: none"> • 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 <ul style="list-style-type: none"> • 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 Wanjanu (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 (Koneczak 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

	Farm Gate		Retail
	Frozen	Dried	Dried
Premium	\$30 - \$40	\$60 - \$80	\$90 - \$120
Second grade*	\$25 - \$30	\$35 - \$50	\$60 - \$80

*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

<p>Strengths</p> <ul style="list-style-type: none"> • High recognition and saleability for first class fruit • Improved cultivars with more work required • Co-planting with host species may provide a second revenue stream e.g. wattle seed. 	<p>Weaknesses</p> <ul style="list-style-type: none"> • Quandong moth still an issue for some growers; natural control methods needed • Difficult species to cultivate • Lack of successful grafting techniques on a mass scale; seedlings will not produce consistent high-quality fruit • Lack of market development, particularly for premium quality fruit • Slow growing/ maturing tree • Yield enormously variable • Tendency to over sucker • Pickers hard to get and expensive • Australian Quandong Industry Association no longer operating • Management of host/plant relationship can be problematic • Lots of misinformation around
<p>Opportunities</p> <ul style="list-style-type: none"> • The quandong is closely related to the fragrant sandalwood – potential opportunities for technology transfer and co-planting of the two species • Quandong plantings in farm revegetation programs • Overseas market for premium quality fruit • Reconstitution of then industry body. 	<p>Threats</p> <ul style="list-style-type: none"> • Lack of economic viability may lead to further business closures and lack of maintenance of existing plantings • Lack of industry body resulting in difficulty in accessing appropriate information • Listed as vulnerable species in Northern Territory due to impact of feral camels.

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 therapeutic 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 (\$)

	Farm Gate Value	Retail Value
Mountain pepper leaf – dried	120,000	600,000
Mountain pepper berry – dried	210,000	420,000
Total	330,000	1,020,000

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

<p>Strengths</p> <ul style="list-style-type: none"> • The mountain pepper berry is a unique native food product and taste • Good QA and food safety systems in place for most of the industry's production provide buyers with product confidence • Established domestic and export markets. 	<p>Weaknesses</p> <ul style="list-style-type: none"> • Key: limited market development, education and awareness – dependent on the initiatives of a limited number of aggregators and traders • Production of the berry is highly variable and little is understood about the conditions or cultivation required to generate high yields • Lack of investment in managed production systems • Not all operators using best practice, some unlicensed wild harvesters • Real and nominal prices falling due to increased competition, a static market and improved production efficiency • Need improved harvesting techniques.
<p>Opportunities</p> <ul style="list-style-type: none"> • There appears to be plenty of genetic diversity in the species that would facilitate selection of improved farm lines • The mountain pepper leaf is a largely untapped resource with additional and alternative potential uses in nutritional supplement, cosmetic and food preservative applications • Mountain pepper presents opportunities for fostering irrigated cultivation • 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. 	<p>Threats</p> <ul style="list-style-type: none"> • Timber plantations eroding wild harvest areas • Loss of market to low cost producers in other countries, mountain pepper becomes a commodity. • Potential damage to markets by supply of poor quality, adulterated or contaminated product

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 (*Achrotiche 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 diphylostegia*, *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.
- 1. 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.
- 2. 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 17.1 Summary of Australian Native Food Industry Stocktake Findings

Species	Production Location	Source	Product Forms and Uses	Total Production Volume (t)	Unit Values (farm gate)	Total Value (farm gate)	Production Variability	Outlook for Supply	Currently Under or Over Supplied	Enterprise characteristics	Markets	Indigenous Participation	R&D Priorities
Lemon myrtle leaf	Qld coast and north coast of NSW	Cultivated	teas and spice	575-1,100 t	\$30/kg	\$15 M	Consistent production	Stable	Limited supply suitable for meeting large orders	Single large player dominates	More than 90% exported	Some indigenous participation post farm gate	Myrtle rust control solutions Understand emerging food labelling issues Lemon myrtle health benefits research Inter state trade post myrtle rust
Lemon myrtle oil	Qld coast and north coast of NSW	Cultivated	flavouring and essential oil	3-8 t	\$100/kg	\$500k	Consistent production	Stable	Limited supply suitable for meeting large orders	Single large player dominates	Domestic and export markets	Some indigenous participation post farm gate	As above
Anise myrtle leaf	Qld coast and north coast of NSW	Cultivated	teas and spice	6 - 10 t	\$36/kg	\$290k	Consistent production	Stable	Oversupplied for small producers	Grown as part of multi-species plantation	Growth potential in export markets	No known indigenous participation	As above
Anise myrtle oil	Qld coast and north coast of NSW	Cultivated	flavouring and essential oil	0.7 - 1 t	\$140/kg	\$120k	Consistent production	Stable	Oversupplied for small producers	Grown as part of multi-species plantation	Growth potential in export markets	No known indigenous participation	As above
Wattleseed	South Australia, NT and NSW	Wild harvest and cultivated	Flavouring ingredient - nutty / coffee notes	4 - 8 t	\$25/kg	\$150k	Variable production	Modest increase forecast	Oversupplied	Indigenous wild harvest and grown as a host plant or windbreak	Restaurants and leading chefs	Indigenous wild harvest and cultivation dominate supply	Models, profitable Indigenous participation Wattleseed health benefits Indigenous interest in commercial harvest Improved varieties and harvest techniques Traceability systems
Bush tomato	NT, South and Western Australia	Wild harvest and cultivated	Savoury spice or flavouring	15 t	\$36/kg	\$540k	Variable production	Modest increase forecast	Undersupplied	Indigenous wild harvest dominates supply	Included in supermarket mainstream	Indigenous drive wild harvest and cultivation at the present time	Plant varieties and cultivation techniques Harvest and post harvest technologies Enrichment planting trials Traceability systems Systems for supply chain cooperation Quality and food safety systems - wild
Davidson plum	Qld coast and north coast of NSW	Cultivated	Sweet and savoury food ingredient	8 - 10 t	\$10/kg	\$90k	Variable production	Modest increase forecast	Oversupplied for current markets	Small multi-species orchards dominate	Local sales maturing into city and export orders	Some indigenous participation post farm gate	Integrated pest management (IPM) Production agronomy incl chill requirements Fertiliser requirements Further product development work
Riberry	North coast NSW also SE Qld	Cultivated	Sweet and savoury food ingredient	4 - 5 t	\$10/kg	\$100k	Variable production	Strong growth forecast	In balance for current small niche markets	Small enterprises with a successful buying and selling cooperative	Farmers markets, distributors and online sales	Some indigenous participation post farm gate	Decreasing the cost of production Mechanisation research Tools to replace wild harvest Business models for financial success Agronomy of all native food species Initiatives to increase consumer awareness
Kakadu plum	Coastal NT and Kimberley WA	Wild harvest	Dietary supplement and health food	12 t	\$20/kg	\$240k	Variable production	Stable	Undersupplied	Wild harvest dependent on season and labour	Included in supermarket mainstream	Indigenous wild harvest dominates supply, some post harvest processing	Production research - stock, agronomy, etc Models, profitable indigenous participation IP protection and management strategies Market development
Muntries	Coastal South Australia and Victoria	Cultivated	Fresh or processed into food ingredients	6 - 10 t	\$20/kg	\$160k	Consistent production	Stable	Oversupplied	Mostly small with many species, some larger integrated operations	Sales to processors and local value added sales	Grown in 3 communities but shift from wild harvest generally not beneficial	Market development Long term cultivar research Health benefits Mechanical harvesting Use of muntries as a salt tolerant species
Lemon aspen	Atherton Tablelands, southern Qld, northern NSW	Cultivated	Processed food products, flavouring for mineral water	2 - 5 t	\$15/kg	\$50k	Consistent production	Stable	Undersupplied	Small enterprises growing more than one native food species	Increasingly popular in food service markets	Some involvement in cultivation, Innisfail Far North Qld	Improved planting material Better cultivation methods Further product and market development

Species	Production Location	Source	Product Forms and Uses	Total Production Volume (t)	Unit Values (farm gate)	Total Value (farm gate)	Production Variability	Outlook for Supply	Currently Under or Over Supplied	Enterprise characteristics	Markets	Indigenous Participation	R&D Priorities
Desert limes	South west Qld	Cultivated	Intensely flavoured alternative to Tahitian lime	10 - 15 t	\$18/kg	\$225k	Variable production	Strong growth forecast	Oversupplied for current niches. Undersupplied for potential scale opportunities	Single large plantation dominates supply	Large volume sales of puree manufactured premium products	Indigenous groups currently exploring plantation potential	IP protection and management strategies Map occurrence of desert limes in the wild Understand pathogens and insect pests New product development eg nutraceuticals
Finger limes	Qld coast and north coast of NSW	Cultivated	Pleasing citrus caviar appearance for garnish	10 t	\$35/kg	\$350k	Consistent production	Strong growth forecast	Undersupplied	Small enterprises who often supply larger marketing groups	Over 50% of production is exported. Restaurants also important	Northern NSW Aboriginal communities are exploring cultivation potential	R&D to support US market access Uses for fingerlime skin
Quandong	Semi arid SA, Victoria and NSW	Cultivated	Tart and tangy, mainly processing fruit	6 t	\$30/kg	\$180k	Variable production	Stable following a period of contraction	Second grade fruit is oversupplied	Small part time growers. Some larger growers have withdrawn	Potential to develop premium export markets	Indigenous owned cultivation as opportunities for wild harvest diminish	Quandong dieback Grafting techniques New cultivars Host selection and management Market development
Mountain pepper leaf	Tasmania and Victoria	Wild harvest	Fresh herb, essential oil or substitute for 'normal' pepper	3 t	\$60/kg	\$180k	Variable production	Modest increase forecast	Oversupplied	Part time collectors and full time aggregators who grow some of their own pepper	Domestic food service and export markets	Mountain pepper is used by indigenous chefs	Packaging and extension of existing R&D Understand pepper production variability Research gap analysis for all native foods Communication with the market
Mountain pepper berry	Tasmania and Victoria	Wild harvest	Spice suitable for crushing or grinding	4 t	\$90/kg	\$360k	Variable production	Ditto	Oversupplied	Ditto	Ditto	Ditto	Ditto

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.

19. Implications for Industry Strategy

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 so 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

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

Thank you for your time, the stocktake report will be available on the ANFIL website

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ANFIL website www.anfil.org.au

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Australian Native Food Industry Stocktake

By Michael Clarke

Pub. No. 12/O66

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

Native Foods R&D Priorities and Strategies 2013 - 2018



JULY 2013

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Australian Government

**Rural Industries Research and
Development Corporation**

Native Foods R&D Priorities and Strategies 2013 - 2018

By Michael Clarke

July 2013

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Foreword

The Native Foods sub-program has developed as a cohesive set of projects within the RIRDC New and Developing Plants Program. This priorities and strategies document is consistent with the RIRDC Corporate Plan 2012 – 2017 and addresses Goal 2: Increase profit and productivity in rural industries.

Native Food R&D priorities target industry productivity, value chain development, market research and extension. A fifth objective includes a strategy to invest a small sum of money in new native species that fall outside current plan focus. Once again this is consistent with the RIRDC Corporate Plan which recognises the need to foster other new industries.

The priorities and strategies document focusses on four key objectives which are supported by a set of strategies and performance indicators. An indicative RD&E budget has also been proposed for each objective in order to guide investment priorities.

This priorities and strategies document has been prepared using findings from an earlier RIRDC project, Australian Native Food Industry Stocktake (RIRDC 2012) and a well-attended industry workshop.

The priorities and strategies document aims to assist the industry to build and develop its future.

RIRDC provides funding to the native foods industry consistent with its life cycle approach. Given many native foods are well progressed along the development pathway the industry is required to provide voluntary contributions of cash co-funding for all RD and E projects. The industry also makes significant in-kind contributions to these projects.

This document is an addition to RIRDC's diverse range of over 2000 research publications and it forms part of our New Plant Products R&D program, which aims to contribute to the program's first stated objective of 'Developing and supplying product information to support market access and market growth'.

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

Craig Burns

Managing Director

Rural Industries Research and Development Corporation

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Abbreviations

AGM	Annual General Meeting
ANFIL	Australian Native Food Industry Limited
BMP	Best Management Practices
CDEP	Community Development Employment Program
EOI	Essential Oils Industry
EU	European Union
FNQ	Far North Queensland
FSANZ	Food Standards Australia and New Zealand
FWPA	Forest and Wood Products Association
GVP	Gross Value of Production
IBA	Indigenous Business Australia
IPM	Integrated Pest Management
IP	Intellectual Property
KPI	Key Performance Indicator
NGO	Non-Government Organisation
NRIA	New Rural Industries Australia
QA	Quality Assurance
R&D	Research and Development
RD&E	Research, Development and Extension
RIRDC	Rural Industries Research and Development Corporation
SWOT	Strengths, Weaknesses, Opportunities and Threats
TAFE	Technical and Further Education
WA	Western Australia

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1. Introduction

This is the fourth Five Year Research, Development and Extension (RD&E) Priorities and Strategies report for Australia's native food industry. The first five year RD&E document was developed in 1995-96 following the sub-program's establishment in 1995.

This report builds on the previous plans with a focus on the areas of RD&E that are of greatest potential value to Australia's native foods industry and where there are capabilities to provide high quality RD&E.

The report was prepared in close consultation with the Australian Native Food Industry Limited (ANFIL), other industry members and researchers. ANFIL is the peak body for the Australian native food industry.

The priorities and strategies report was funded with RIRDC core funds provided by the Australian Government. The native foods industry does not have a compulsory levy but does make financial contributions to research on a project specific basis.

Preparation of the RD&E Priorities and Strategies Report

The R&D priorities and strategies report was developed through review of previous investments and literature, identification of R&D priorities, consultation and a workshop.

Specific tasks and their timing were:

- Finalisation of project scope with RIRDC and ANFIL (May 2012).
- Review of relevant literature including the Native Foods Stocktake (RIRDC 2012) and the current priorities document (RIRDC 2008).
- Review of performance against priorities set in the previous priorities document and those detailed in the 2012-2017 RIRDC Corporate Plan. This task was completed with the assistance of the RIRDC Senior Research Manager in July and August 2012.
- Preparation of a draft priority and strategy document in RIRDC format and presentation of this draft at the ANFIL Annual General Meeting (AGM) 12 November 2012. The ANFIL AGM included industry participants who were not ANFIL members, key researchers and Indigenous representatives who were involved in the industry (A list of workshop participants is included as Appendix 1).
- Finalisation of the priorities and strategies document 2013 – 2018 and other RIRDC reporting requirements (April and May 2013).

Alignment with Government and RIRDC Priorities

Native Foods R&D Priorities and Strategies 2013 – 2018 align with national research priorities and the RIRDC Corporate Plan 2012 – 2017:

Table 1.1 Priorities Hierarchy in which the RIRDC Native Food Sub-program Fits

Priority	Relevant 'Fit'
National Research Priorities	An Environmentally Sustainable Australia Promoting and Maintaining Good Health Frontier Technologies for Building and Transforming Australian Industries
Rural R&D Priority	Productivity and Adding Value: Improving the productivity and profitability of existing industries and supporting the development of viable new industries.
RIRDC Corporate Goal 2	Increase profit and productivity in rural industries.
RIRDC Strategies	2.1 Manage demand driven RD&E that meets industry needs. 2.2 Facilitate investments that deliver economic, social, environmental benefits for rural industries. 2.3 Adopt a life-cycle approach to investment in new, developing and established industries.
RIRDC Program	New and Developing Plant Industries
RIRDC Sub-program	Native Foods

Source: RIRDC Corporate Plan 2012 – 2017

The native foods sub program also contributes significantly in cross-sectoral areas as it responds to biosecurity issues such as myrtle rust and it investigates indigenous opportunities in remote and northern Australia.

2. Native Food Industry Profile

Australian Native Food Production

Australian native foods are sourced from trees, shrubs, herbs and other plants. The sector is not concerned with animal products. Native foods include leaf used for teas and spice; oils for flavouring; and seeds, berries and fruits that are consumed as food ingredients.

There is a wealth of current and potential Australian species from which native foods can be sourced. This document focusses on a subset of species identified by the industry as being the twenty key crops, starting with the twelve priority species plus finger limes.

Key species identified by RIRDC which are the focus of this plan are:

1. Lemon myrtle *Backhousia citriodora* (leaf and oil)
2. Mountain pepper *Tasmannia lanceolata* (leaf and berry).
3. Bush tomato *Solanum centrale*
4. Anise myrtle *Backhousia anisata* (leaf and oil)
5. Finger limes *Citrus australasica*
6. Kakadu plum *Terminalia ferdinandiana*
7. Desert limes *Citrus glauca*
8. Quandong *Santalum acuminatum*
9. Muntries *Kunzea pomifera*
10. Wattleseed *Acacia victoriae*
11. Riberry *Syzygium leuhmannii*
12. Davidson plum *Davidsonia spp.*
13. Lemon aspen *Acronychia acidula*

The focus is on RD&E priorities and strategies that maximise the food production potential of these native plants. Collaboration with other RIRDC and external RD&E programs (e.g. RIRDC Essential Oils RD&E sub-program) will also be brokered.

Product Forms and Uses

Typical native food products include condiments, sauces, biscuits and ice cream. Overwhelmingly native foods are used as a 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. R&D that facilitates scale production at lower cost is a clear priority for this industry.

Location, Structure and Indigenous Participation

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, wattlesseed, bush tomato, and Kakadu plum.

Native food production enterprises are typically small and grow a range of crops. Often enterprises are a mix of native food and conventional tree or vegetable 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 serve different native food markets. In some parts of the industry there is tension between commercial production and more ecological approaches.

Supply chain segments within the industry include:

- Nursery operators
- Cultivators and wild harvesters
- Commodity traders and value adders – retail and food service
- Marketers – food service and retail, domestic and export.

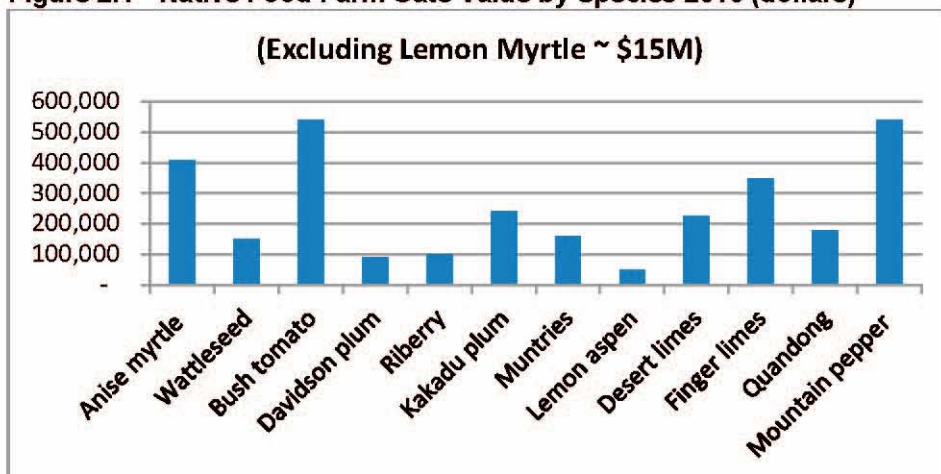
The involvement of Indigenous people in the native foods industry is strongest in the wild harvest species – wattlesseed, bush tomato, and Kakadu plum. Care is needed to ensure that this involvement is not displaced as species move from wild harvest to cultivation. This is a concern to the broader industry that feels indigenous participation brings authenticity and integrity to Australian native foods.

Industry Size

Production across twelve of the thirteen key native food species averaged 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 is vulnerable to myrtle rust and ongoing myrtle rust research is a clear priority for the native foods industry given that rust affects multiple native food crops (i.e. lemon and anise myrtle and ribberries).

Farm gate values by species for 2010 are shown in Figure 2.1.

Figure 2.1 Native Food Farm Gate Value by Species 2010 (dollars)



In 2010 gross value of production (GVP) 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.

Industry growth since inception in the 1980s has been steady with GVP estimates increasing over time:

- 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).

With no existing production systems, agronomy, plant material (variety and yield), market or consumer knowledge, as recently as a generation ago, native foods have proved difficult to commercialise.

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 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.

Native Food Industry Outlook

Use of native foods as a raw material for processed foods 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 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 (RIRDC 2012). 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 ‘lifestyle’ orientation of many current industry participants.

3. Key Challenges for the Native Food Industry (SWOT)

A species specific strengths, weaknesses, opportunities and threats (SWOT) analysis was completed as part of the Australian Native Food Industry Stocktake (RIRDC 2012). Results are summarised in Table 3.1. Data presented focusses on each species attributes as a native food.

Table 3.1 SWOT by Native Food Species

Species	Strengths / Opportunities	Weaknesses / Threats
Lemon myrtle	<ul style="list-style-type: none"> • Easily grown • Commercial scale plantations • Anti-fungal, anti-microbial properties • Functional food properties recognised • Natural food preservative 	<ul style="list-style-type: none"> • Myrtle rust is a major threat to supply • Lower cost overseas supply • Availability of synthetic alternatives • No international commodity description or safety recognition
Anise myrtle	<ul style="list-style-type: none"> • Strong and unique flavour profile • Functional food properties • Promotion of health benefits • Learn from lemon myrtle market development paths and successes 	<ul style="list-style-type: none"> • Very limited consumer awareness • Lack of market development • Myrtle rust – need to understand differences in varietal susceptibility
Wattleseed	<ul style="list-style-type: none"> • Taste is popular with consumers • Functional food properties • Aboriginal wild harvest provides positive social and cultural outcomes • Market development work required • Educate on poor taste of imports • Linkages to mine rehab opportunities 	<ul style="list-style-type: none"> • Variable yield and total production • Planting techniques needed • Hand harvesting too expensive • Limited supply chain traceability/trust • Varieties best suited to roasting • Competition from low cost imports
Bush tomato	<ul style="list-style-type: none"> • Taste is popular with consumers • Intense flavour, small 	<ul style="list-style-type: none"> • Variable yield and total production • New varieties needed

	<ul style="list-style-type: none"> • volume needed • Functional food properties • Large plantings, industry maturing • Aboriginal wild harvest provides positive social and cultural outcomes • Enrichment trial opportunities 	<ul style="list-style-type: none"> • Hand harvesting too expensive • Large scale plantings expensive to establish and low yielding • Limited supply chain traceability/trust • Wild harvest needs QA systems
Davidson plum	<ul style="list-style-type: none"> • Unique colour and flavour • Functional food properties • Development of IPM essential 	<ul style="list-style-type: none"> • Production efficiencies needed • Subject to damage by native flora • Undersupplied for volume markets • Lack of cooperation, communication
Riberry	<ul style="list-style-type: none"> • Attractive colour and flavour • Versatile, sweet and savoury products • Good cooperation across supply base • Oversupplied for niche products, undersupplied for mainstream commercial opportunities 	<ul style="list-style-type: none"> • A soft fruit, needs rapid processing • Needs new varieties/planting material • Cultivation and harvesting techniques • Awareness and market development • Industry wide quality standards
Kakadu plum	<ul style="list-style-type: none"> • Functional food properties • Strong name recognition • Increasing demand in food service • Opportunities for Aboriginal people • Enrichment planting and Carbon • Sap and bark health markets • Aboriginal enterprise models 	<ul style="list-style-type: none"> • Wild harvest marginally profitable • Name not relevant to some producers • Unstable supply, inconsistent demand • Production costs too high • IP clarification and management

Muntries	<ul style="list-style-type: none"> • Taste appeals to consumers • Functional food properties • Salt tolerant 	<ul style="list-style-type: none"> • No clear current flavour advantage • Clonal selection for colour and flavour • Oversupplied • Lack of consumer awareness • New disease known as ‘dieback’ • Hand harvesting expensive
Lemon aspen	<ul style="list-style-type: none"> • Appealing flavour • Functional food properties • Increasingly popular in food service 	<ul style="list-style-type: none"> • Clonal selection • Cultivation knowledge • Lack of industry capital
Desert limes	<ul style="list-style-type: none"> • Supermarket and export sales • Robust fruit, long shelf life • Hybridise with other citrus • Few pests and diseases • Mechanical harvesting possible • Growth through plantation • Opportunities for Nutraceuticals 	<ul style="list-style-type: none"> • Supply bottleneck • Sensitive to harvest time and handling • Market unfamiliar with the product • Local viruses inhibit trade
Finger limes	<ul style="list-style-type: none"> • Export sales success • Appealing taste and appearance • Frozen form available all year • Hybridise with other citrus • Few pests and diseases • Opportunities include value added products and US market access 	<ul style="list-style-type: none"> • Sensitive to harvest time and handling • Planting of inappropriate varieties • Lack of industry cooperation • Lack of capacity to transit from part time to commercial production
Quandong	<ul style="list-style-type: none"> • Good market for first class fruit • Improved cultivars available • Co-planting revenue (e.g. wattleseed) • Technology transfer, 	<ul style="list-style-type: none"> • Quandong moth • Difficult species to cultivate • Slow growing/maturing tree • Yields highly variable • Grafting techniques needed • Pickers hard to get and

	sandalwood <ul style="list-style-type: none"> • Link in with farm revegetation 	expensive <ul style="list-style-type: none"> • Market development needed
Mountain pepper	<ul style="list-style-type: none"> • Unique product and taste • QA and food safety systems in place • Established local and export markets • Genetic diversity for new farm lines • Opportunities to develop leaf market • Explore irrigated production • Ornamental and rehab markets 	<ul style="list-style-type: none"> • Market development • Agronomy missing • Improved harvesting techniques • Best practice not always used • Real and nominal prices are falling • Competition from timber plantations • Risk of losing sales to low cost imports

Source: RIRDC 2012

Table 3.2 sets out the SWOT analysis for the native foods industry garnered from the species specific analysis, the previous priorities and strategies document and industry consultation. The industry SWOT analysis has a strong emphasis on ‘researchable’ issues and is divided into:

- Production – growing the native food
- Post-harvest – processing, food safety and quality assurance (QA)
- Markets – product information and market access
- Industry building – communication, capacity building, extension and industry analysis.

Table 3.2 Native Food Industry SWOT Analysis

STRENGTHS	WEAKNESSES
<p>Production</p> <ul style="list-style-type: none"> • Well suited to Australian production conditions • Farm income diversification potential • Opportunities for sustainable enterprises <p>Post-harvest</p> <ul style="list-style-type: none"> • Partnerships with major food companies • Partnerships with major retailers <p>Markets</p> <ul style="list-style-type: none"> • Unique products and sought after flavours • Offer health / functional food benefits to consumers <p>Industry building</p> <ul style="list-style-type: none"> • An effective peak industry body in ANFIL • History of successful R&D • RIRDC and state government support 	<p>Production</p> <ul style="list-style-type: none"> • Yield and production variability • High production costs • Lack of production chemicals and IPM • Reliance on wild or unimproved varieties • Labour intensive growing and harvest techniques • Agronomy - essential elements missing for all crops <p>Post-harvest</p> <ul style="list-style-type: none"> • Use as raw ingredient limits price processors can pay • Traceability and food safety systems often missing <p>Markets</p> <ul style="list-style-type: none"> • Oversupply for niche products, undersupply for mainstream commercial opportunities <p>Industry building</p> <ul style="list-style-type: none"> • Industry growth has been slow since the 1980s • Under capitalisation of the industry • Lack of profit – producers and processors

OPPORTUNITIES	THREATS
<p>Production</p> <ul style="list-style-type: none"> • Demand supports shift to scale production • Enrichment trials for Aboriginal engagement • Carbon sequestration potential • Facilitation of grower cooperatives <p>Post-harvest</p> <ul style="list-style-type: none"> • Techniques and systems to maximise product quality • Invest in product development • Increase supply chain cooperation and trust <p>Markets</p> <ul style="list-style-type: none"> • Market development and consumer awareness • Nutraceuticals and mine rehab to boost profitability <p>Industry building</p> <ul style="list-style-type: none"> • Materials to increase participation (e.g. case studies) • Business models for financial success • Indigenous participation models • Foster partnerships with additional funding groups • Export sales to multinational food companies 	<p>Production</p> <ul style="list-style-type: none"> • Myrtle rust – lemon myrtle, anise myrtle, riberry <p>Post-harvest</p> <ul style="list-style-type: none"> • Emerging food labelling and safety issues • Loss of IP if relevant systems are not put in place (eg genetic material goes off shore) <p>Markets</p> <ul style="list-style-type: none"> • Low cost and synthetic imports • Interstate trade restrictions post myrtle rust • Internationalisation, homogenisation of food industry <p>Industry building</p> <ul style="list-style-type: none"> • In the absence of industry contributions to research, RIRDC reallocates Native Foods R&D budget. • Positive initiatives needed to ensure sustained and meaningful Aboriginal participation

SWOT shows there is a major opportunity for R&D to address production weaknesses and lower the cost of supply.

4. Research Directions

To guide native food R&D priorities and strategies 2013 – 2018 a review of previous investments and their performance was completed.

R&D Investments 1999 - 2006

Priorities and strategies developed by the industry in 1998 were:

- Understanding, strengthening and developing markets
- Improving existing products and developing new ones
- Enhancing the ability of the industry to meet appropriate safety and food standards
- Improving production efficiency while maintaining ecological integrity
- Enhancing the human resources of the industry

Between 1999 and 2006 RIRDC invested \$1.65 million in thirty three R&D projects – see Table 4.1.

Table 4.1 R&D Expenditure by Major Categories 1999/00 – 2006/07 (7 years)

	Total Investment	Share RIRDC %
Capacity for research	12,470	64
Food safety	347,808	48
Industry development	574,842	55
Marketing	112,814	52
Novel uses	998,327	32
Production systems/issues	1,927,667	40
Total	3,973,928	42

Source: RIRDC 2008

Projects completed in this tranche included support for the development of the industry peak body ANFIL. Most investment addressed production constraints and novel uses for Australian native foods. Food safety R&D was also a priority. RIRDC contributed 42% of program expenditure, research organisations 35% and industry 23%. Industry contributions were mainly through in-kind project support.

R&D Investments 2007 - 2012

Native food R&D priorities and strategies established in 2006 along with their forecast share of budget were:

- Developing and supplying product information to support market access and market growth (50%)
- Improving production (growing) efficiencies (35%)
- Investigating new species for their potential to add to the industry appeal and profitability (10%)
- Building industry relationships and improving the communication of R&D opportunities and impacts (5%)

**Table 4.2 R&D Expenditure by Major Categories 2007/08 – 2011/12
4 years)**

Priority and Share of Actual Budget	Number of projects	Total Investment	Share RIRDC %
Product information (26%)	9	649,414	44
Growing efficiencies (56%)	5	1,386,539	23
New species (10%)	2	239,847	17
Capacity and communication (8%)	11	193,261	38
	27	2,469,061	29

Source: RIRDC database August 2012

NB: Excludes relevant projects funded under the Essential Oils Program

Major projects funded under the 2007 – 2012 priorities and strategies document are shown in Table 4.3. Major projects are defined as those with a total budget greater than \$50,000.

Table 4.3 Major Native Food Projects Funded 2007/08 – 2011/12 (4 years)

Priority and Total Number of Projects	Major Project
Product information (9 projects)	<ul style="list-style-type: none"> • Preparing native foods industry for national and global challenges • Health benefits of native foods • Physiological activity native fruits • Native foods stocktake
Growing efficiencies (5 projects)	<ul style="list-style-type: none"> • Improving harvest quality in native food crops • Changes in bioactivity (quality) during storage
New species (2 projects)	<ul style="list-style-type: none"> • Nil – one smaller project on new root crops for Western Australia and the other on <i>Platysace deflexa</i> (a specific root crop)
Capacity and communication (11 projects)	<ul style="list-style-type: none"> • Nil – all smaller projects which is appropriate for this priority

Source: RIRDC database August 2012, NB: Excludes relevant projects funded under the Essential Oils Program

Growing efficiency which received 56% of total budget, including contributions from researchers and industry, dominated the most recent suite of native foods R&D. An assessment of performance of the sub-program 2007 – 2012 is provided in the section below.

Performance Assessment

The performance assessment includes a review of native food investment by government research priority, stage of R&D, key performance indicators (KPIs) achieved, delivery of expected outputs, risk/return, timeliness, partnerships formed, producer and public benefits, and the value placed by industry on R&D.

Analysis by Government Research Priority

Analysis of native foods sub-program investment against Australian Government Rural Research priorities is shown in Table 4.4.

Table 4.4 Native Food Investment by Australian Government Rural Research Priority

Govt Rural R&D Priority	Number of Projects	Total Native Food Investment	Percentage of Total Investment
Productivity and value adding	19	1,621,899	66
Supply chains and markets	5	626,915	25
Natural resource management	0	0	0
Climate variability and change	1	188,847	8
Biosecurity	0	0	0
Innovation skills	2	31,500	1
Total	27	2,469,061	100

Source: RIRDC database August 2012

NB: Excludes relevant projects funded under the Essential Oils Program

Productivity, value adding, supply chains and markets dominate delivery of Government Rural Research Priorities. There were no native foods sub-program investments in natural resource management and biosecurity. However, the native foods sub-program was a non-funding partner in relevant Essential Oils sub-program natural resource management and biosecurity investments. These included ‘Management of postharvest diseases using Australian essential oils’, ‘Investigating control options for myrtle rust in native foods’, ‘Determination of residues in native foods treated for myrtle rust’, ‘Discovery of genetic resistance markers to myrtle rust in Myrtaceae’ and ‘Monitoring myrtle rust in a lemon myrtle provenance trial’.

Analysis by Stage of R&D

Stage of R&D undertaken in the project also sheds light on portfolio balance and resource allocation. R&D can be thought of as a three-stage process:

- Stage 1 represents fundamental or basic research. It may be scientific in nature, for example exploring molecular composition, or it can be economic, for example looking at the potential returns on an activity before it is pursued. The distinguishing characteristic of this research stage is that its outputs are usually inputs into further research or a decision process, rather than leading to a final outcome.
- Stage 2 R&D usually aims to deliver a specific output that can be used in production in some way, including the production of further research. While often applied, strategic R&D can also be in stage 2.
- Stage 3 categorises projects at the other end of the research cycle, and are largely focussed on promoting adoption of R&D and development of the industry.

The native foods R&D portfolio was split between applied research and extension with many applied research projects included an extension component i.e. stages 2 and 3. No projects were fundamental or pure research activities (stage 1) and this is appropriate for a small industry focussed RD&E sub-program.

KPIs Achieved

Eight key performance indicators (KPIs) were described in the 2007 – 2012 R&D priorities and strategies document. All KPIs have been addressed (Table 4.5).

Table 4.5 Realisation of Native Food R&D Sub-program KPIs

R&D Program KPI	Achievement
Objective 1: Product information	
1.1 Develop a standard set of information on safety, nutrition and post-harvest handling	<p>KPI addressed</p> <ul style="list-style-type: none"> • Traditional use of native foods and FSANZ requirements • Information for FSANZ Nutritional Panel Calculator • Requirements of the EU Novel Foods Act • Specific physiological activity of native foods • Antioxidant capacity and phenolic compounds • Screening of native foods for their health benefits • Changes in bioactivity (i.e. quality) during

	storage
1.2 Develop a common set of flavour and aroma descriptors	KPI addressed <ul style="list-style-type: none"> Defining the unique flavours of native foods Native food 'flavour of the month' profiles
1.3 Develop product standards	KPI addressed <ul style="list-style-type: none"> Changes in bioactivity (i.e. quality) during storage
Objective 2: Growing efficiencies	
2.1 Sharing of best management practice information between growers	KPI addressed <ul style="list-style-type: none"> Native Foods Flavour of the Month Web Profiles included available production information
2.2 Trouble shooting for grower identified problems	KPI addressed <ul style="list-style-type: none"> Improving harvest quality of native food crops Understanding the cropping behaviour of riberry Davidson plum productivity constraints in FNQ Davidson plum reproduction and genetic distinctions (EOI) Initiating a major Kakadu plum collection Managing post-harvest disease with essential oil (EOI) Monitoring myrtle rust in lemon myrtle (EOI) Control options for myrtle rust in native foods (EOI) Determining myrtle rust chemical treatment residues (EOI)

Table 4.5 Realisation of Native Food R&D Sub-program KPIs (continued)

Objective 3: New species	
3.1 Support new species that are agronomically viable, have market potential and comply with regulatory frameworks	KPI addressed <ul style="list-style-type: none"> New root vegetable crop for southern WA (<i>Platysace deflexa</i>)

Objective 4: Capacity and communication	
4.1 Support ANFIL in the development of an industry plan	KPI addressed <ul style="list-style-type: none"> • R&D priorities workshop October 2007 • Australian native food stocktake March 2012 • R&D priorities and strategies for 2013-2018
4.2 Develop criteria / standards for laboratories used for testing and native food property analysis	KPI addressed <ul style="list-style-type: none"> • Native Foods Compositional Data for FSANZ Nutritional Panel Calculator
General Communication Activities	<ul style="list-style-type: none"> • Industry attendance at relevant conferences • Native food curriculum for chefs

Source: Senior Research Manager Survey and Analysis of Sub-program records
EOI = Essential Oils Industry (R&D Program) funded

KPIs receiving less attention included development of product and laboratory standards along with sharing best management practices between growers.

Delivery of Expected Outputs

Twenty of twenty seven projects funded under the current priorities and strategies document have been completed. Nineteen of these have delivered all expected outputs and the final project, 'Developing an industry based on *Platysace deflexa*' (a Western Australian native that produces an edible tuber) may yet deliver planned outputs.

Risk/Return Mix

Fourteen of twenty projects were assessed as low risk, five were assessed as medium risk and a single project 'Initiating the Australian Bush Plum (*Terminalia ferdinandiana*) collection' was assessed at proposal stage as a high risk. The single high risk project has delivered expected outputs.

Timeliness

All projects completed during the current strategies and priorities period were delivered on time.

Promoting Partnerships

New partnerships were formed as a result of the program bringing together researchers, industry members, consumers and those in other industries (Table 4.6).

Table 4.6 New Partnerships Formed by the Native Foods Sub-program Since 2007

Project	Nature of the Partnership
Preparing the native food industry for national and global challenges	<ul style="list-style-type: none"> Partnership formed between the industry and FSANZ and CODEX
Health benefits of Australian native foods Native Foods Compositional Data for FSANZ Nutritional Panel Calculator	<ul style="list-style-type: none"> Partnership strengthened with FSANZ
Novel Foods meeting and conference	<ul style="list-style-type: none"> Partnership development with European regulators
Defining the unique flavours of Australian native foods	<ul style="list-style-type: none"> Partnership formed with Australian food manufacturers
Antioxidant capacity and phenolic compounds of selected ethnic Australian foods	<ul style="list-style-type: none"> International researchers introduced to native foods
Improving harvest quality Understanding riberry cropping behaviour Changes in bioactivity during storage Davidsonia domestication, FNQ Australian bush plum collection	<ul style="list-style-type: none"> Partnerships developed with growers and regional communities
Development of new root crop in WA	<ul style="list-style-type: none"> Partnerships developed with growers, the market and regional communities
Native foods curriculum project	<ul style="list-style-type: none"> Partnerships developed between industry, educators and the food service sector
National native foods conference:	<ul style="list-style-type: none"> Partnerships between industry and the public
Fair Trade scoping study	<ul style="list-style-type: none"> Partnerships between Fair Trade Australia and other NGOs
Attendance at myrtle rust workshop	<ul style="list-style-type: none"> Access to a coalition of parties and industries with an interest in myrtle rust
Management of post-harvest diseases Revision lemon myrtle essential oil standard Bioactive extracts for personal care industry Control options for myrtle rust Determination of native food residues Monitoring myrtle rust	<ul style="list-style-type: none"> Strong alliance formed with the RIRDC Essential Oils Sub-program

Source: Senior Research Manager Survey

Industry and Public Benefits

The Senior Research Manager was asked to assess the number of projects that will deliver producer economic benefits and those that will deliver community social and environmental benefits (Table 4.7).

Table 4.7 Benefits by Stakeholder and Investment without RIRDC

Indicator	Number of Projects 'YES'	Number of Projects 'NO'	Percentage of Total 'YES'
Industry economic benefit	26	1	96%
Community social benefit	18	9	67%
Community environmental benefit	4	23	15%
Project funded without RIRDC investment	0	27	0%

Source: Senior Research Manager Survey

The analysis shows an orientation toward projects that deliver both an industry economic benefit and a community social benefit. Fewer projects are directed toward generation of environmental benefits and this suggests there may be additional opportunity to explore the creation of environmental outputs such as mine rehabilitation using native food species, carbon offset and enrichment planting trials. All projects in the sub-program were thought to require at least catalyst funding from the RIRDC R&D sub-program.

Industry Value Placed on 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 Australian producers would not be able to compete. Commercially important work funded by RIRDC, and identified by stakeholders during the Australian Native Food Industry Stocktake (RIRDC 2012), 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 RD&E 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.

Lessons Learned from Review of Research Directions

The following lessons are relevant to setting directions for native food RD&E priorities and strategies 2013 – 2018:

- The sub-program is consistent with Australian Government and RIRDC Corporate priorities. It is applied research and extension driven.
- Investment has been focussed on improving production (growing efficiency) and increasing market awareness (e.g. provision of product information).
- There has been no direct investment in natural resource management or biosecurity, the industry has partnered with the Essential Oils industry to addresses these government priorities.
- Research gaps remain in relation to product standards and laboratory criteria / standards. Investment in Australian standards for lemon myrtle oil, the industry's largest sector, is acknowledged. These outputs are set to be delivered once the project PRJ-005135: 'Changes in quality of native foods during storage' and its subsequent project has been completed.
- There is scope in the RD&E sub-program for additional investment in 'sharing of best management practices between growers'.

5. Industry and RIRDC Commitment

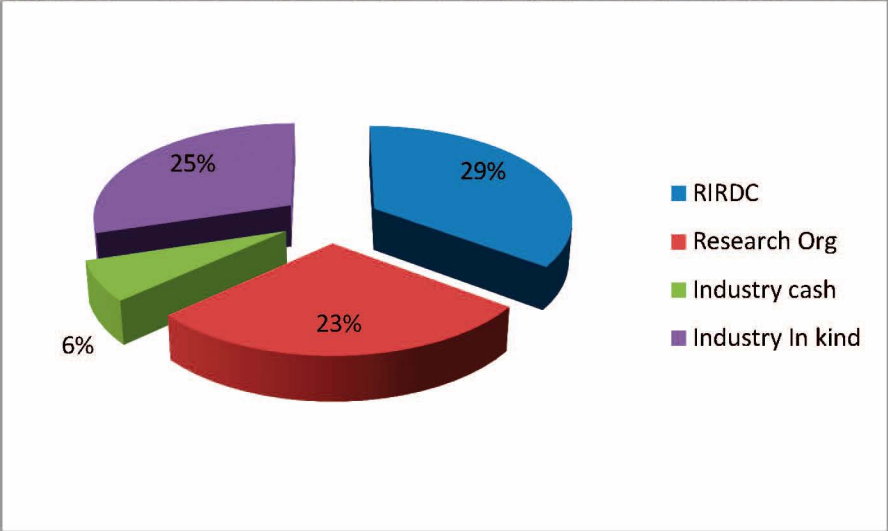
The Native Foods Sub-program is funded through RIRDC's core allocation provided by the Australian Government.

The sub-program is managed within RIRDC by a Senior Research Manager and a Program Coordinator with input from an R&D Reference Panel. The R&D Reference Panel includes ANFIL Board members who are growers and marketers and a research provider. The R&D Reference Panel provides industry with the opportunity to give their views on R&D priorities.

Projects funded through the sub-program need to be consistent with the priorities and strategies document and in the case of production and extension based projects need to include a significant industry cash contribution. Consistent with the life cycle approach, as the Native Food industry matures, RIRDC will look to industry will be asked to provide an increasing share of the R&D investment. In time a statutory levy may be appropriate. Further development of the voluntary levy managed by ANFIL may be a useful 'halfway house'. This evolution in funding is consistent with the RIRDC Corporate Plan 2012 – 2017, where every industry RIRDC supports is assessed against their development progress to ensure RD&E is appropriate to the industry stage of development and the industry is making contributions consistent with its stage of development.

Industry has always been strongly committed to the RIRDC R&D sub-program. In the 1999 – 2006 period industry contributed 23% of program expenditure (cash and in-kind dominated by in-kind). By 2007-2012 industry contribution was 31% made up of 6% cash and 25% in-kind. Total industry contribution 2007 – 2012 exceeded those provided by RIRDC (see Figure 5.1).

Figure 5.1 Share of Total Project Funding by Stakeholder 2007 to 2012



Source: AgEconPlus analysis of RIRDC Sub-program data records
Priorities and strategies budget 2013 – 2018 (Chapter 8) has been prepared under the assumption that 25 to 50% of sub-program cash funding is sourced from industry.

6. R&D Priority Setting Considerations

From the Australian Native Food Stocktake (RIRDC 2012) the following points are relevant to RD&E priority setting:

1. Each species is somewhat unique – synergies from joint RD&E, across species are not always available. Therefore RIRDC focusses on industry's that support research with industry cofunding.
2. It is important to retain the focus of RD&E investments on priority species for at least the next five years – the sub-program has too few resources that are too easily dissipated.
3. The sub-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 sub-program will need to be strategic and fund only those species and projects with the best 'triple bottom line' prospects.
5. The sub-program may need to consider longer term research commitments if new varieties are to be developed (i.e. plant breeding). Significant industry co-funding would be needed for this to occur.
6. Mechanisation of production could be valuable to this industry.
7. The belief was expressed in the 2007 – 2012 priorities and strategies document that market research and marketing are better driven through cooperatives than through RD&E.
8. The 2007 – 2012 priorities and strategies document adopted a provision of product information focus to encourage market demand – this is a sound strategy and is also reflected in the 2013 – 2018 document.
9. Processing research generates commercial outcomes therefore it is less suitable for RIRDC public good funding.
10. The sustainability of wild harvest was not explored as part of the current RD&E document. Nor is the mapping of the wild harvest resource.
11. Indigenous cooperation is valuable, goes to the heart of what native foods is about but is resource intensive.
12. The program must remain tightly focussed with a limited number of objectives and strategies.
13. Big picture trends in RD&E include a focus on fewer, larger investments and this trend should also guide the native food RD&E sub-program.

14. 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.

7. RD&E Program 2013 - 2018

The native food sub-program vision and mission 2013 – 2018 reflect those of the previous priorities and strategies document. Objectives, strategies and KPIs are driven by knowledge garnered from the Australian Native Food Industry Stocktake (RIRDC 2012) and advice received at an industry workshop held in Brisbane 12 November 2012.

Vision

Consumers in Australia and around the world enjoying, sharing and valuing the authentic Australian flavour experience; enabling a profitable and sustainable Australian industry for this growing market.

Mission

To provide RD&E 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 supply of consistently high quality and safe food and flavour additives
- Solving production problem that threaten reliability
- Recognising the contributions of Indigenous culture, food practices and value of involvement in the industry.

Objectives

The following objectives drive RD&E investment in the 2013 – 2018 RD&E sub-program. Target investment levels as a proportion of total investment are shown in brackets:

1. Support production research to lift productivity and supply consistency (40% of budget reflecting latent excess demand and limited profitable supply)
2. Develop systems that support value chain integrity and growth (25% of budget)
3. Invest in product information, product development and market access to deliver market growth (15% of budget reflecting the success of past R&D investment in creating market 'pull')
4. Investigate new species for their potential to add to the appeal and profitability of industry (10% of budget)
5. Promote extension, communication, capacity building and partnerships (10% of budget)

Objectives should be regarded as complementary, with flexible boundaries to enable key issues to be addressed either simultaneously or sequentially through several components of the program.

Strategies

Strategies indicate specific research areas that will contribute to achieving the objectives. Strategies have been defined at a level that gives research providers guidance on where RIRDC is intending to target its investment over the period 2013 – 2018 and are intended to contribute to the longer term planning requirements of those providers. Strategies will be complemented with more specific research priorities published annually that provide more detailed guidance about the project areas that RIRDC is seeking to fund in the coming year.

Key Performance Indicators

Key performance indicators are provided to assess whether the research strategies have contributed to the RD&E objectives. Where possible, performance indicators have been linked to benchmarks for previous native food industry performance and are quantitative in nature.

Objective 1 Support production research to lift productivity and supply consistency

Background

This objective addresses two key native food industry weaknesses – the high cost of producing native food and insufficient and inconsistent supply. Supply inconsistency means large scale food manufacturers are less likely to engage with the industry. Strategies are grouped into investments to lift production productivity and investments to increase consistency of supply. There is a preference for industry co-funding of this objective as it helps ensure both project relevance and eventual adoption.

Strategies

Increasing production productivity

- Encourage the production and sharing of best management practice (BMP) information between growers – including development of a methodology and template for harnessing information on the crop, its cost of production, yield and range of potential product prices. Communicate this information to current and potential native food growers.
- Use BMP information to invest in initiatives to lower the cost of native food production. BMP information will reveal target areas for cost reduction when compared to a range of similar mainstream crop gross margins. Targets may include labour usage, pest and disease control, low yielding varieties, etc.

- Where appropriate, use BMP research findings to prioritise industry mechanisation research especially mechanisation to facilitate harvesting. R&D addressing this strategy would be confined to the low cost adaptation of existing mainstream harvest technologies to a native food application.
- Myrtle rust – build on research already completed, understand differences in varietal susceptibility and consider joint projects with other industries (e.g. native forestry, tea tree and essential oils). This strategy is relevant to lemon myrtle, anise myrtle and ribberries.
- Invest in minor use chemical permits, ‘soft’ chemical alternatives and organics for native food pests and diseases of significance. In the first instance target pests and diseases relevant to more than one native food crop.
- Scope a longer term research investment in Integrated Pest Management (IPM) for native food crops. Again, target programs that may be relevant, with minor adjustments, to more than one native food species.
- If substantial industry funding support is available consider a longer term investment in the development of new native food cultivars and varieties (i.e. plant breeding). New more productive and higher yielding varieties are relevant to all thirteen priority native food species.

Addressing inconsistent and insufficient supply

- Develop a better understanding of the wild resource with a view to developing cultivation systems. This strategy is relevant to mountain pepper, wattle seed, Kakadu plum and bush tomato.
- Investigate Indigenous interest in supplying commercial quantities of wattleseed, bush tomato, Kakadu plum. Consider the development of ethical harvesting guidelines.
- Seek out partners with an interest in funding enrichment planting trials and poly-cultures with Aboriginal communities.
- Understand the science behind production variability. This is important for all thirteen native food species but most especially for mountain pepper.
- Prepare and distribute models of profitable participation in the native foods industry including case studies, enterprise models, models for financial success (e.g. marketing cooperatives), etc. The aim of these materials is to encourage industry participation by new producers.

Key Performance Indicators

- If this strategy is delivered successfully industry productivity will have increased and supply variability will have dropped and two new mainstream food processors (domestic or international) will be using native foods in their mainstream product range by 2018 (establish by survey of ANFIL members)
- Profitability will have improved and knowledge of opportunity associated with native foods will have been communicated to existing and potential growers. Consequential success will be measured through mine rehabilitators and mainstream farmers adopting native food production as an enterprise diversification opportunity (measure through a survey of ANFIL members in 2018)

Objective 2 Develop systems that support value chain integrity

Background

This objective is about ensuring the native food supply chain receives Australian product of consistent high quality; that products have integrity; and systems are in place to support value chain growth.

Strategies

- Support the continued development of post-harvest technologies to maximise the quality of native foods including their bioactive attributes. Support for this strategy will deliver ongoing improvement in product consistency and help fight off challenges from low cost overseas grown supply.
- Further develop and assist with the implementation of low cost QA systems suitable for wild harvest product originating from remote areas. The success of this strategy will be dependent on securing support from ‘first point of sale’ purchasers of wild harvest product.
- Develop an understanding of any significant outstanding food labelling and safety issues and their impact on native food supply. Communicate this understanding to industry. (NB: this strategy was well supported under the previous R&D priorities and strategies document and there is limited scope for investment in the period 2013 – 2018).
- Invest in the further development of workable supply chain traceability systems for both wild harvest and cultivated native foods.
- Investigate Intellectual Property (IP) protection and management strategies. Develop consistent industry policies relevant to the sale of IP overseas. Have representatives from IP Australia attend a relevant industry meeting.
- Consider development of systems to increase supply chain cooperation and trust and in so doing provide product critical mass for mainstream food manufacturers. Examine the role of producer supply cooperatives (similar to the Riberry cooperative Galeru)
- If funding partners with cash can be identified, investigate the feasibility of wild harvest cooperative supply networks. Projects may address better communication and provide a critical mass for negotiation.
- If funding partners with cash can be identified, invest in generic processing research. RIRDC is able to support manufacturing research. A limited exclusivity period would need to be negotiated with the co-funding manufacturer after which time R&D outputs would revert to the public domain.

Key Performance Indicators

- Steady increase in the demand for native food raw materials in the absence of food integrity issues that discourage food industry purchase (measured through a survey of manufacturers supplied by ANFIL growers).

Objective 3 Invest in product information, development & market access to deliver market growth

Background

The native foods industry has a history of investing in RD&E to create market demand for its products. This objective recognises the importance of creating ‘demand pull’ for what are essentially new products and investment in this space is a priority for ongoing industry success.

Strategies

Product information

- Continue to develop common descriptors (product standards) that industry can use to define and differentiate native food products and lift market awareness.
- Update and distribute relevant product information materials (this is also an extension activity).

Product development

- Invest to further understand the human health properties of native foods drawing from science and Indigenous knowledge. Communicate this knowledge to the food market. Investment in this strategy will require cash support from industry.
- Investigate new uses for native foods in the fast growing food service and manufactured food sectors.

Market access and understanding

- Work to address any domestic market access restrictions. Domestic market access restrictions might include the need for additional product information or restrictions in inter-state trade following pest or disease incursions such as myrtle rust.
- Secure access to new international markets e.g. access to lucrative USA citrus market for Desert limes and Finger limes.
- Where external funding support is provided participate in consumer research to understand what buyers want from native food products.
- Invest in market research to better understand highest and best use for each of our native food products. Research to address this category would include identification of product uses, the size of individual markets and their capacity to pay.

Key Performance Indicators

- New or updated product information materials prepared and distributed through relevant channels (eg opinion leaders such as leading chefs).
- Two new mainstream food manufacturers (either here or overseas) using priority native food species in their product range.
- Access to two new markets secured (domestic or international). Measured through relatively informal survey of ANFIL members in 2018 (e.g. ‘what if any new markets has your business secured since 2012?’)

Objective 4 Investigate new species for potential to add to the appeal and profitability of industry

Background

Uniqueness is always an important feature of any cuisine and even Australian native foods, where there are many new taste sensations, is no exception. While it is important for the industry to consolidate the position of existing crops, new crops are seen as complementary to this objective. A small share of budget is reserved to be able to explore the potential of new crops that have been identified by enthusiastic growers, processors or users.

Strategies

- New species to be considered on the basis of being agronomically viable (already grown under conditions that can be replicated or improved upon in commercial production); have market potential (there is a feature that complements other native foods or supports the development of a market for the product); and are likely to comply with regulatory frameworks for their intended use.
- To identify these species it is suggested that ANFIL members and researchers be canvassed on what might be possible. Research completed in 2012 on Kakadu plum's seafood preservative potential is a great lateral thinking example.
- While research on the human health attributes of native foods has produced useful outcomes, it is noted that RIRDC has limited funds for delivery of this strategy in the period through to 2018. Available funds need to be focussed at the 'proof of concept' stage and be supported by industry partners.

Key Performance Indicators

- By 2018 one new plant species or novel use will have been explored.

Objective 5 Promote extension, communication, capacity building and partnerships

Background

The Native Foods R&D Reference Panel has effective linkages with industry, the research community, relevant community groups and government departments. These linkages are important for the efficient management of native food research – defining objectives, developing priorities, evaluating results, applying research findings as well as promoting extension, communication, partnerships and capacity building.

Strategies

Extension, communication and capacity building

- Ensure native food RD&E outputs are in a form that is suitable for internet delivery and incorporation in relevant newsletters.
- Prepare and distribute an easily digested compendium of recently completed and current sub-program projects.
- Provide sponsorship and travel grants for relevant conferences.
- Fund one or more industry scholarships.
- Inform the public and policy makers about the sub-programs findings.
- Support initiatives to increase native food industry players business and leadership skills.

Partnerships and funding

- Form mutually beneficial partnerships to increase the effectiveness and resources available to the sub-program. Priority partnerships include business partners such as Coles or a major food manufacturer that might contribute financially to the sub-program in order that it meets RIRDC's Corporate Plan target for increased industry funding.
- Other potential partners include Indigenous interests (Indigenous Business Australia, CDEP or its replacement), mining interests (mine site rehabilitation, carbon offset research, etc.) and other linked R&D programs (e.g. ACIAR, Essential Oils R&D program, Forest and Wood Products Association plantation research).
- Consider the preparation of a business case for voluntary or even statutory levy arrangements.

Key Performance Indicators

- Extension, communication materials and capacity building activities delivered in line with the above strategies.
- Increase in industry contributions from 29% to 50% by 2018 via retention of Coles as a corporate partner together with the addition of one other significant new retailer or food manufacturer partner.
- An assessment of the feasibility of some type of levy arrangement by 2018.

8. Proposed Budget

The budget below has been prepared on the basis of a historical contribution by RIRDC of up to \$200,000 per annum together with a clear corporate objective expressed through the RIRDC Corporate Plan 2012 – 2017 of industry needing to meet an increasing share of R&D investment costs through the life cycle approach. RIRDC expects 25-50% of cash invested for each project to be sourced from industry. In-kind contributions from industry are also encouraged.

RIRDC funding is subject to the industry funding commitments being achieved. In the absence of industry funds RIRDC will direct these proposed funds to other new and developing plant industries.

Table 8.1 Native Foods RD&E Program Proposed Budget 2013 – 2018 (\$'000)

	2013 - 14	2014 - 15	2015 - 16	2016 - 2017	2017 - 18
Revenue					
RIRDC funding	150	125	100	75	75
Industry (cash)	50	55	60	65	75
Total Revenue	200	180	160	140	150
Expenditure					
Obj1 Production research	102	90	78	66	72
Obj 2 Value chain integrity	26	23	20	17	18
Obj 3 Market growth	26	23	20	17	18
Obj 4 Extension and partnerships	17	15	13	11	12
RD&E Total	170	150	130	110	120
Program Administration	30	30	30	30	30
Total Expenditure	200	180	160	140	150

9. Communication/Adoption / Commercial Opportunities

Purpose and objectives

The Native Foods Sub-program will facilitate the communication and adoption of its outputs through objective 4 of this plan: Promote extension, communication, capacity building and partnerships. Commercial opportunities will be identified, and pursued where appropriate, for specific projects through the preliminary research proposal, financial research proposal and as each project progresses.

Target audience and communication tools

The target audiences for Sub-program outputs, and the primary communication tools through which they will be reached, are:

1. Native food producers - cultivation and wild harvest (who are mostly early or mainstream adopters) – ANFIL communications (newsletters and website), New Rural Industries Australia (NRIA) (newsletters, website and conferences) and RIRDC publications including media releases and research reports.
2. Parliamentarians (who are early adopters) – briefings on any specific issues as appropriate.
3. Agencies of government – State and Commonwealth (who are mostly early or mainstream adopters) – RIRDC media releases and research reports.

Expected key messages from program outputs

The key messages from the Sub-program are expected to include:

1. How to reduce production cost.
2. Opportunities for participation in Australian native food production.
3. Consuming native foods is good for you because...

Industry networks

To ensure the Sub-program outputs are communicated to industry stakeholders, information will be provided to peak bodies such as ANFIL, NRIA and bodies representing each of the thirteen native food priority species.

Major industry events

The Sub-program outputs will be communicated through a range of industry events including annual conferences, the ANFIL AGM and various project specific workshops.

Key influencers

The native food industry has found that working with chefs is an excellent way of communicating sub-program outputs and this is expected to continue through the life of the new priorities and strategies plan.

Key Media / Websites

RIRDC's website will be the key portal for the Sub-program. Other important sites are the ANFIL website and potentially the NRIA website.

Commercialisation and IP

Research projects and project outputs will be managed consistent with RIRDC's commercialisation and intellectual policy policies.

References

Foster, M. & Bird, J. (2009) National Research, Development and Extension Strategy for New and Emerging Industries: Industry Overview RIRDC Publication No. 09/138: Canberra

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RIRDC (2008) Native Foods R&D Priorities and Strategies 2007 – 2012.

RIRDC (2008a) RIRDC Evaluation Framework, Version 1.0 May 2008.

RIRDC (2012) Australian Native Foods Stocktake, report prepared by AgEconPlus for RIRDC and ANFIL, Project No PRJ-005855

RIRDC (2012a) RIRDC Corporate Plan 2012-2017

Robins, L (2007) Outback Spirit Bush Foods: A learning model in marketing and supply chain management RIRDC Publication No. 06/037 RIRDC: Canberra

Appendix

Attendees ANFIL Workshop and AGM

The following individuals were provided with opportunity to comment on the draft strategies and priorities at the ANFIL AGM

Name	Affiliation
Martha Shepherd	Galeru
Chris Read	Diemen Pepper
Rus Glover	Woolgoolga Rainforest Products
Andrew Fielke	Chairman - ANFIL
Sabine Weinand	Basically Wild
Jude Mayall	Outback Chef
Vickie Shina	Marvick Farms WA
Pat Torres	Mayi Harvests - Broome
Gerry Noon	Moonshadow Native Foods
Marianne Stewart	Otway Agroforestry VIC
Amanda Garner	Otway Agroforestry VIC
Doug Brownlow	Eden Bushfoods
Sheryl Backhouse	QLD Bushfood Assoc
Graeme White	QLD Bushfood Assoc
John King	QLD Bushfood Assoc
Mary King	QLD Bushfood Assoc
Sheryl Rennie	Wildfingerlimes
Gary Mazzorana	Australian Rainforest Products
Melissa Mazzorana	Australian Rainforest Products
David Haviland	Galeru
David Boehme	Wild Harvest NT
Lorraine Williams	Aboriginal Bush Traders - Darwin
Raylene Brown	Kungkaskan Cook - Alice Springs
Dale Chapman	Coolamon Food Creations
Andrew Normoyle	Murri Munchies Ltd
Geoff Johnson	Murri Munchies Ltd
Kalvin Mitchel	Murri Munchies Ltd
Uncle Wiley Broome	Murri Munchies Ltd
Tarin Smuith	Murri Munchies Ltd
Jeff Smith	Murri Munchies Ltd
Jane Smith	Murri Munchies Ltd
Slade Lee	Southern Cross University
Kevin Williams	CRC-Remote Econ Participation
Sathira Hirun	University of Newcastle

Yasmina Sultanbawa	QAAFI/UQ
Smita Chaliha	Q-DAFF
Sarah Meibusch	QAAFI/UQ- Deputy Director
Michael Clarke	Ag Econ Plus
Alison Saunders	RIRDC
Lydia Coleborn	ANFIL
Geraldine McGuire	Rainforest Bounty - FNQ
Peter Entwistle	Myrtle Rust researcher

Native Foods R&D Priorities and Strategies 2013 - 2018

By Michael Clarke

Pub. No. 13/O23

The Native Foods sub-program has developed as a cohesive set of projects within the RIRDC New and Developing Plant Industries Program.

Native Food R&D priorities target industry productivity, value chain development, market research and extension. A fifth objective includes a strategy to invest a small sum of money in new native species that fall outside current plan focus.

The priorities and strategies document aims to assist the industry to build and develop its future.

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>.

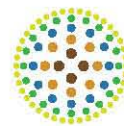
RIRDC books can also be purchased by phoning 1300 634 313 for a local call fee.



RURAL INDUSTRIES
Research & Development Corporation

WATTLE SEED

Acacia victoriae



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Part of an R&D program managed by the Rural Industries Research and Development Corporation



Overview

While there are hundreds of species of wattle found in Australia, few have the intensity of flavour and large, easily processed seed of the elegant wattle, which is the most commonly used for commercial purposes. Other species with good potential include *Acacia murrayana*, *pycnantha*, *retinodes*, *rivalis*, *saligna*, *microbotrya* and *jennerae* (Maslin et al 1999).

The flowers of this evergreen, multi-stemmed tree are cream coloured and occur from August to December, depending on the growing area. The round seeds mature between November and January and are borne in papery, oblong pods on the outside of the tree canopy.

Wattles grow all over Australia and are harvested both commercially and in the wild.

Wattle seed has been a mainstay in the diet of Indigenous Australians for more than 40000 years. It can survive tough weather conditions, so was a valuable source of protein and carbohydrates when other food sources were scarce. The women would collect the ripe pods, then parch the seeds with fire before grinding them to a flour consistency to be mixed with water and made into cakes.

Today, wattle seed is primarily used as a flavour enhancer. The roasted and ground seed is used to flavour breads, muffins, desserts, muesli and pancake batter. The essence is used to flavour sauces and even beer and ales. Wattleseed is also used in cosmetics as an exfoliant.

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.

Wattle seeds on tree

The most popular wattle seed in the food industry is *Acacia victoriae*, or elegant wattle, which has a broad geographic range throughout the Central Desert region and into South Australia, Western Australia and New South Wales.

Wild harvest remains a key source of supply, with hundreds of Aboriginal women from communities across South Australia and the Northern Territory participating in the industry, as well individuals on private land.

Cultivation has increased over the past decade, particularly around the Riverland, SA; the western districts of Victoria; and Junee in NSW. It's estimated some four tonnes per annum are produced from plantations.

The low costs of production and high value of wattle seed suggest there is potential for production to be a profitable farming alternative, if it can transition from the boutique to mainstream market. Typically, wattle seed growers currently use it to diversify or as an additional income stream in times of drought.

Growing conditions

Elegant wattle likes hot, low rainfall areas on a broad range of soil types, and is a very resilient and adaptable species as well as being salt and drought tolerant. It is important to note there can be large variation between individual trees.

Wattles require little water compared to many introduced crops, although the volume of wild harvest wattle seed can vary considerably depending on environmental conditions. Yields can be higher with irrigation, but even under cultivation damage can be caused by bushfires, high winds, heavy rain and hail.

The species is used for the mitigation of dryland salinity and in mine rehabilitation, creating both competition for seed and opportunities for additional supply.

Wattles grow easily from seed, although need to be soaked in just-off-boiling water before planting due to the hard outer seed case.

Harvesting

Harvesting of wattle seed occurs during the summer months.

Whether cultivated or wild harvested, the seeds are mostly collected by hitting the trees with sticks. Some growers do operate mechanical tree shakers that use vibration to release the pods.

The seed is then separated from the twigs and leaves, before threshing and sieving to clean and prepare it for commercial sale.

While wattle seed yields can vary considerably, the seed has a shelf-life of up to ten years, which helps to even out supply.

Food Uses

Once wattle seed is harvested it is usually roasted and can be ground or sold whole. Roasting the seeds brings out the nutty flavour and if roasted longer it produces a chicory flavour.

Described as the 'unsung hero' of the Australian Native Food Industry, it is a very versatile food ingredient which can be used in a number of sweet and savoury products, from ice cream and cakes to casseroles and curries.

Some distributors are marketing the roasted seeds as a caffeine-free coffee alternative, with wattle seed cappuccino becoming popular in parts of Australia.

The extracted essence from the roasted wattle seed is used as a flavour enhancer in a range of products such as balsamic vinegar, and even in beer and ales. Varieties of wattle seed-flavoured beer have won awards in the International Beer Awards held in Melbourne.

Health benefits

Wattle seed is a rich source of protein and since the 1970s some species have been grown in Africa to provide a food and fuel source to drought-affected populations. This has been well integrated and is successful, with trees producing heavy seed crops within two years of planting.

Wattle seed has been certified as a low glycaemic index (GI) food. Low GI foods have been shown to be beneficial for diabetics as the slow release of sugars does not produce sudden rises in blood glucose levels.

Other uses

The proteins contained in wattle seed have excellent emulsifying and emulsion stabilisation properties which could potentially be exploited in processed foods.

FLAVOUR PROFILE

“...Aroma of toasted coffee grounds, sweet spice, raisin and chocolate

Dominant **nutty, coffee [flavour]** and roasted aromas with a slight bitterness

GROWING REGIONS



Source: www.farmdiversity.com.au



Wattle flowers

NUTRITIONAL INFORMATION

(per 100 grams dry weight)		(per 100 grams dry weight)	
Energy	1183 KJ	Zinc (Zn)	3.105 mg
H ₂ O	1.7 g	Magnesium (Mg)	255.1 mg
Protein	20.3 g	Calcium (Ca)	434.4 mg
Total fat	6.1 g	Iron (Fe)	10.90 mg
Total saturated fatty acids		Selenium (Se)	31.7 µg
Carbohydrates	10.5 g	Phosphorus (P)	227.5 mg
Sugar (total)		Sodium (Na)	43.90 mg
Fibre	54.2 g	Potassium (K)	1147.6 mg
		Manganese (Mn)	2.955 mg
		Copper (Cu)	0.836 mg
		Molybdenum (Mo)	25.1 µg
		K : Na	26.1



Old Aboriginal grinding stone with black wattle seeds (left) and ground (right)
Source: Outback Chef http://www.outbackchef.com.au/blog/archive_08_12



For more information

This fact sheet is one of a series summarising Native Foods R&D from 2007 to 2012. In a partnership between government and industry, the Rural Industries Research and Development Corporation (RIRDC) and Australian Native Food Industry Limited (ANFIL) are working towards an innovative, profitable and sustainable Native Foods industry.



Australian Native Food Industry Limited (ANFIL) was formed in 2006 and is the peak national body which represents all interests in the rapidly growing Australian native food industry. ANFIL has taken the lead in working with industry, governments and other organisations to determine and prioritise research and market development strategies to progress the industry.

web: www.anfil.org.au

Australian Native Food Industry Ltd
3866 Channel Highway
Woodbridge Tasmania 7162 Australia

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The Rural Industries Research & Development Corporation (RIRDC) is a statutory authority established to work with industry to invest in research and development for a more profitable, sustainable and dynamic rural sector.

Rural Industries Research & Development Corporation

web: www.rirdc.gov.au

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Pub. No. 14/122

REGISTRO PARTICIPANTES

Actividad:	Charla técnica Gira de Innovación Tecnológica Australia, GIT201-0410 "Productos Alimentarios Funcionales con Semillas de acacia "Wattle Seed"		
Lugar:	Illapel "Auditorio del Centro Experimental del Choapa, INIA, Illapel"	Región	IV Región
Coordinador	Patricio Rojas V.	Fecha:	07 abril 2015.

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8	Juan Cerda Oros				
9	Paulo Oyarzo Cuche				
10	CHRISTIAN NAVARRO LIBANA				
11	RAUL PUEN ROJAS				
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15	TEGAR VALMQUE U.				

Importante:
Enviar a:

El Responsable del evento debe asegurarse que la información manuscrita sea legible y completa o traspasar a planilla excel

REGISTRO PARTICIPANTES

Actividad:	Charla técnica Gira de Innovación Tecnológica Australia, GIT201-0410 "Productos Alimentarios Funcionales con Semillas de acacia "Wattle Seed"		
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30					

Importante:
Enviar a:

El Responsable del evento debe asegurarse que la información manuscrita sea legible y completa o traspasar a planilla excel




CHARLA DE DIFUSIÓN ALIMENTOS FUNCIONALES CON SEMILLAS DE ACACIA

30 DE MARZO - Patricio Rojas



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Juan José Aguirre	CONSULTOR				
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Patricio González	INFOR	Investigador			
Marlene González	INFOR	Gerente de Sede			
Milza López	INFOR	Investigadora			
Daniel Soto	INFOR	Investigador			
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Oscar Peña	INFOR	Investigador Sede Valdivia			
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Geraldine Huerta	MOLINO LA ESTAMPA				


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focus on
WATTLE SEED
Acacia victoriae

Part of an R&D program managed by the Rural Industries Research and Development Corporation

RURAL INDUSTRIES
Research & Development Corporation



GIRAS DE INNOVACIÓN 2014
GIT-2014-0410
INNOVACIÓN, PRODUCCIÓN Y COMERCIALIZACIÓN DE PRODUCTOS ALIMENTARIOS FUNCIONALES CON SEMILLAS DE ACACIA EN AUSTRALIA ("WATTLE SEED")
19 AL 28 DE ENERO DE 2015



PARTICIPANTES

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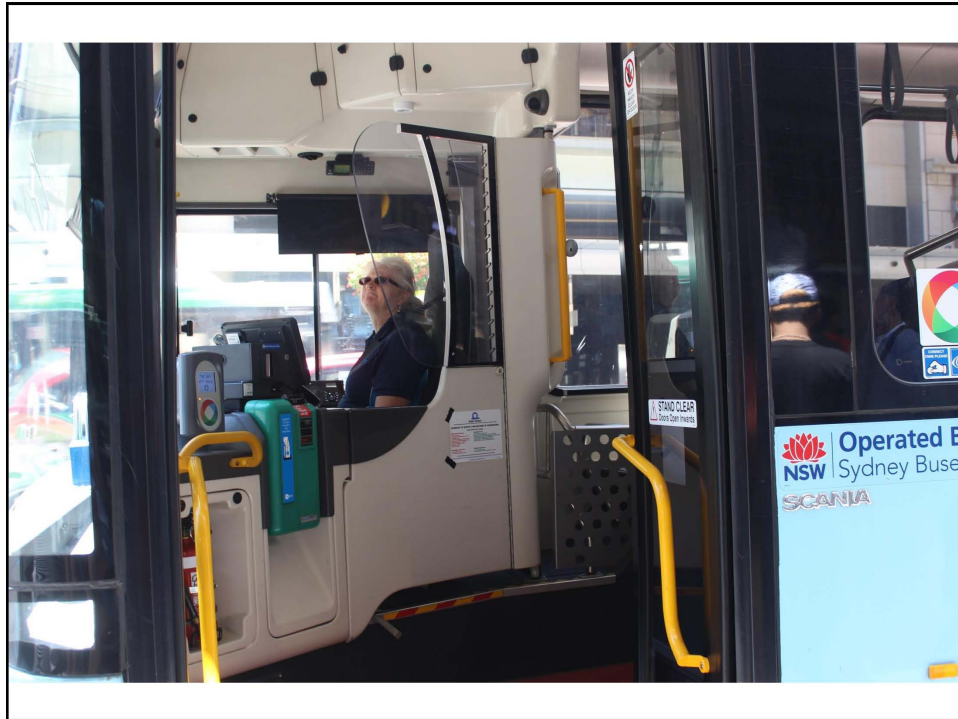
Comparación Chile Australia

	Australia	Chile
Población	23,5 millones	17,7 millones
PIB (2014) est	\$1.561 trillion mil millones*	\$277,2 mil millones*
PIB tasa de crecimiento (2014)est	2,7%	4,1 %
PIB per cápita ppp(2014) est	\$46,631*	\$23.165*
Fuerza de Trabajo (2013)	11,6 millones	7,9 millones
Desempleo (2013)	6,2%	6,1%
Tasa de Inflación (2013)	3,0%	4,4 %
Exportaciones (2013-14)	\$331,2 mil millones*	\$ 78,8 mil millones*
Importaciones (2013-14)	\$338,0 mil millones*	\$ 79,5 mil millones*

* cifras en dólares estadounidenses. Fuente: DFAT /ABS / INE / WTO

Rankings Internacionales	Fuente	Nro. de Participantes	Posición de Chile	Posición de Australia
Índice del Desarrollo Humano 2014	United Nations Development Program	186	41	2
Índice de Libertad Económica 2013	Heritage Foundation, Wall Street Journal	177	7	3
Índice del Desempeño Ambiental 2014	Yale University-Colombia University	178	29	3
Índice del Ambiente de Negocios 2014	Economist Intelligence Unit	82	13	5
Índice de la Competitividad Global 2013-14	World Economic Forum	140	34	21
Índice de la Seguridad Alimentaria 2014	Economist Intelligence Unit	109	27	15
Índice de la Desigualdad Genérica 2014	OECD Better Life Index	36	19	25









**Productos Alimentarios Funcionales con semillas de
Acacia saligna
proyecto FIA PYT-2013-0010**

AGRICOLA VISNAGAL S.A.



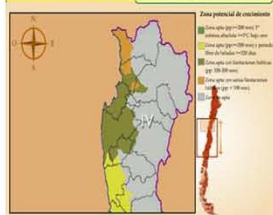
***A. saligna* fue introducida en 1960 como *A. cyanophylla* for para el control de dunas en la Region de Coquimbo.**



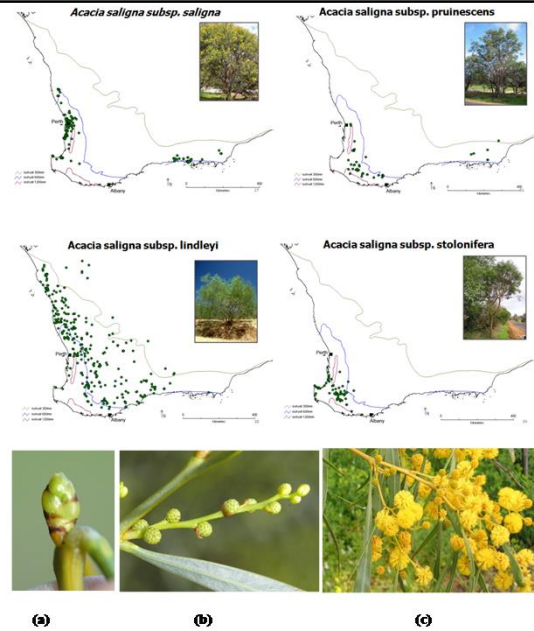
Posteriormente a partir de los 70 (D.L. 701) de bonificación forestal se plantaron 15.000 has. en la IV Región principalmente para forraje



Areas Potenciales de plantaciones con *A. saligna* en la Region de Coquimbo
415.129 has (Urquieta et al., 2000).



- ✓ Leguminosa muy tolerante a la sequia.
- ✓ No requiere riego.
- ✓ No compite con otros cultivos alimentarios.
- ✓ Actualmente usado como forraje ganado caprino
- ✓ Crece con rangos de pp. anual < 100 mm



Wattleseeds I+D+i

**semillas comestibles de Acacia y
alimento tradicional de los
aborígenes australianos**

- consumidas en verde (y cocinadas)
- molidas como harinas para hacer un tipo de pan.

**productos alimentarios de Acacia
recientemente ha ganado
popularidad en Australia debido**

- . alto contenido nutricional
- . bajo índice glucémico,
- . alimentos para diabéticos



INNOVACION TECNOLÓGICA

- “ Procesar semillas de *Acacia saligna* como materia prima para la producción de harinas funcionales en forma pura o en premezclas con harinas convencionales (5-15%).
- “ Mejorar la rentabilidad social, ecológica y económica del recurso.
- “ Mayor valor agregado de las plantaciones.
- “ Seguridad alimentaria. Búsqueda de nuevas fuentes de proteínas y componentes funcionales en leguminosas tolerantes a la sequía.

Objetivo

Obtener harinas pre mezclas y alimentos funcionales con semillas de *Acacia saligna*

Pan integral
Galletón
Diabéticos







Harinas de *Acacia saligna*


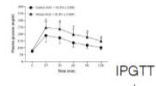
	Harina Integral	Tangue	Dunas	Caracas	Mincha	Huentelauquen
Energía (Kcal/100 g)(a)	344	419,6	401,5	390,7	401,6	404,1
Proteína	12,30%	27,5%	28,2%	28,9%	26,6%	31,5%
Grasa total	2,38%	20,0%	19,1%	17,9%	19,6%	19,3%
Ac. Grasos saturados	21,63%	13,8%	11,8%	11,9%	12,8%	11,6%
Ac. Grasos monoinsaturados	14,28%	23,0%	25,4%	25,0%	26,7%	21,5%
Ac. Grasos poliinsaturados	58,40%	63,2%	62,8%	63,2%	60,4%	66,9%
Fibra total	13,90%	12,4%	15,2%	16,6%	17,5%	14,9%
Fibra Soluble	2,50%	3,6%	4,8%	5,2%	4,9%	4,2%
Fibra insoluble	11,40%	8,8%	10,4%	11,4%	12,6%	10,7%
Hidratos de carbono disponible (b)	71,42%	32,4%	29,2%	28,5%	29,7%	26,1%

Fuente : CREAS, Dra. Carmen Soto, 2015



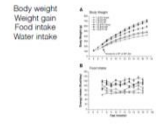
Acacia Saligna
In vivo trial




60 days

End of trial determinations





DEPARTAMENTO
DE NUTRICIÓN

Dr. Diego García, Fac. Medicina UCH

Djenkolic Acid

- Djenkol bean is a traditional medicine for type II diabetes in South-East Asia.
- Malaysian research also suggests that chronic exposure to djenkol bean may also affect liver, pancreas and heart tissue. (Shukri, Mohammed et al 2011)
- The same research showed that low doses of djenkol bean slow organ damage in diabetic rats
- It is likely, though not certain that the active compound in this study is djenkolic acid.

Dr. Peter Yates, U. of Darwin, Australia

End of trial determinations

- Final body weight, Final weight gain
- Tissues weight and isolation: Fat depots (subcutaneous, mesenteric, retroperitoneal, epididymal), muscles (EDL, soleous, gastrocnemius), liver, kidney, spleen, heart, brain...
- Glucidic profile (glucose, insulin, HOMA index)
- Lipidic profile
- Inflammatory profile
- Hepatic profile
- Histological exams





Oz Tukka 
Authentic Australian Flavours



(a) Semillas de Acacia coriácea



(b) horno de tostado



(c) molino



(d) harinas, café?



(e) sala de envasado



(f) display productos Acacia





“ Sabor increíble relacionado con avellanas, café, nueces y chocolate.
100% semillas de Acacia.

“ Este sabor único es producto del proceso de secado y tostado de las semillas.

“ Después de tostar las semillas se muelen para el uso conveniente.

“ Se utilizan en postres, pasteles y pan y le da un delicioso sabor a los platos de carne, pollo, pescado y salsas de crema.

“ Añadir a la mezcla para panqueques, pastel o helados.



AUD 8,5 \$4.250



“ Auténtica delicia única de Australia, con sabor

“ Muffins, livianos, deliciosos elaborados con nueces de Macadamia australianas naturales y el rico sabor de wattle seed

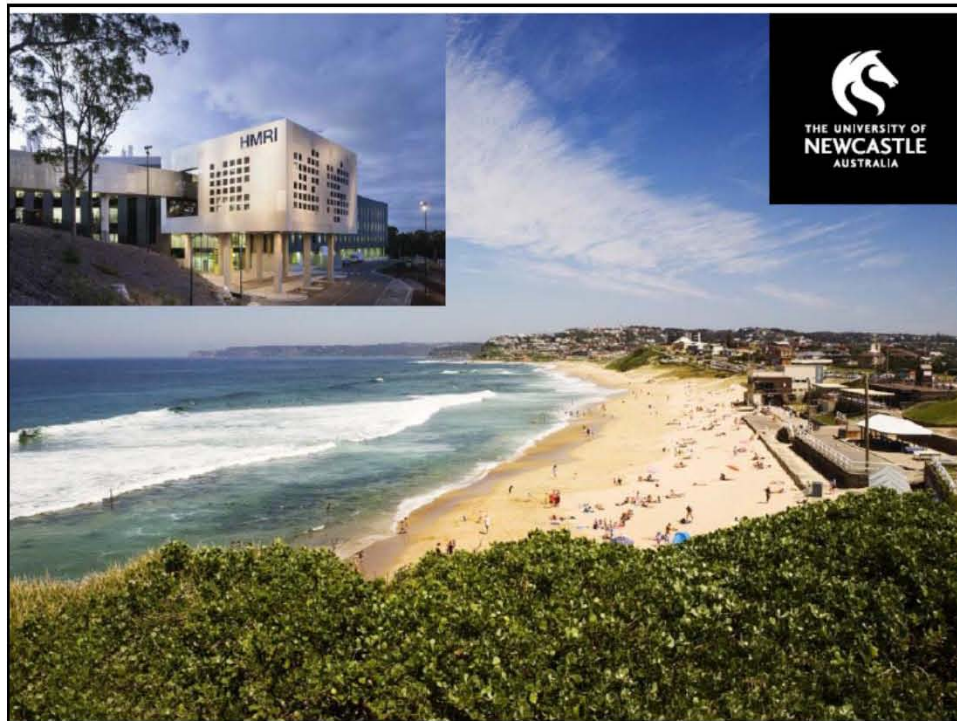
“ Recién llegado de su propia cocina; Listo en menos de 30 minutos!

“ Sin gluten

“ Libres de preservantes



AUD 5,75 \$ 2.875



CLINICAL NUTRITION RESEARCH CENTRE

Evidence-based functional foods and nutritional supplements (nutraceuticals)

Professor Peter Howe

Clinical Nutrition Research Centre
University of Newcastle, Australia

21st January, 2015



A role for functional foods and nutraceuticals

What is a Functional Food?

Functional foods provide health benefits *beyond basic nutrition*

What can functional foods do for us?

Areas where functional foods have health potential are

- Foods that afford **cardiovascular** protection
- Foods with benefits for the **digestive system**
- Foods designed to **protect against certain cancers**
- Foods with **sugar or fat alternatives**
- Foods with **optimal fat ratios** for the elderly, people with diabetes, those at risk of heart disease, and those with inflammatory disease
- Foods to better combat **allergenicity**
- Foods designed for **athletes and recreation**
- Foods that improve **mood or cognition**

- *AFGC Fact Sheet*

CLINICAL NUTRITION
RESEARCH CENTRE

Examples of Research Projects

Some examples of potential research projects appear below. The inclusion of these and other proposed projects in the application will be based on preferences of essential participant end-user stakeholders.



Traditional medicines to counteract diseases of affluence

Traditional medicines offer a great variety of bioactives with the potential to counteract inflammation associated with a range of chronic diseases. Our collaborators are systematically identifying and characterising potential benefits of Indian, Chinese, European and Australian Indigenous herbal extracts in preclinical trials. Promising extracts will be tested in dose/response trials in humans with specific risk profiles. These will inform the formulation of foods and supplements. Specific health claims will be developed for individual products, based on evidence obtained in clinical trials with appropriate target populations. Products will be designed for both local and Asian markets.

Plant extracts for improved cognitive performance

In the absence of effective pharmaceutical treatment for age-associated cognitive decline, attention has turned to the polypharmacology afforded by plant extracts to improve neurocognitive function. Green tea, cocoa, soy, grapes, blueberries, etc. are dietary sources of flavonoids which have the potential to improve circulatory function and thereby increase alertness and cognitive performance. We will build on evidence from preclinical and early clinical trials to produce cognitive enhancers with known mechanisms of action. Guided by consumer choice, we will formulate foods, beverages and supplements utilising optimal combinations of flavonoids to deliver health claims targeting different market sectors from young executives to elderly with mild cognitive impairment.



Making pasta healthier

Choosing foods with lower Glycemic Index (GI) can lead to improvements in several aspects of health, including metabolic benefits and improved cognitive function. The GI of pasta could be reduced by utilising pulses in their formulation with careful manufacturing design to ensure consumer acceptability. Eating pasta with lower GI may help to control blood sugar and prevent diabetes; evidence to support such health claims will be obtained in human trials.



Research Programs

The CRC will support the development of new, value-added functional foods and supplements, utilising existing and new sources of bioactive nutrients.

It will provide clinical substantiation of health claims for both new and existing products to meet local and international regulatory requirements.

This matrix denotes research themes and targeted health outcomes:-

INNOVATION MATRIX	Sourcing bioactives	Evaluating human health benefits of bioactives	Formulating products for optimal delivery of bioactives	Substantiating health claims of final products	Consumer acceptability and Marketing
Cardiovascular metabolic and genome health					
Cognitive health and mental performance					
Physical function and sports performance					

Vic Cherikoff

propietario de la empresa está considerado como uno de los pioneros de la industria de los alimentos nativos de Australia y tiene casi 30 años de experiencia en la comercialización de especies silvestres comestibles, tomándolos de la naturaleza como bush tucker o busfood y convirtiéndolos en alimentos sofisticados y versátiles, auténticos alimentos naturales australianos, para bebidas y con ingredientes funcionales.

Ventas US\$ 1M





Great in desserts,
sauces, breads ...



[Click to order on-line >>](#)



Extracto 200 ml. AUD 23,5 \$11.750



“ panes, galletas, magdalenas y tartas y también en postres incluyendo budines, crepes, panecillos, bollos, panecillos o galletas saladas; también en los postres lácteos con helado.

“ También puede ser usado en bebidas como café expreso

PROCHILE AUSTRALIA (Sydney)

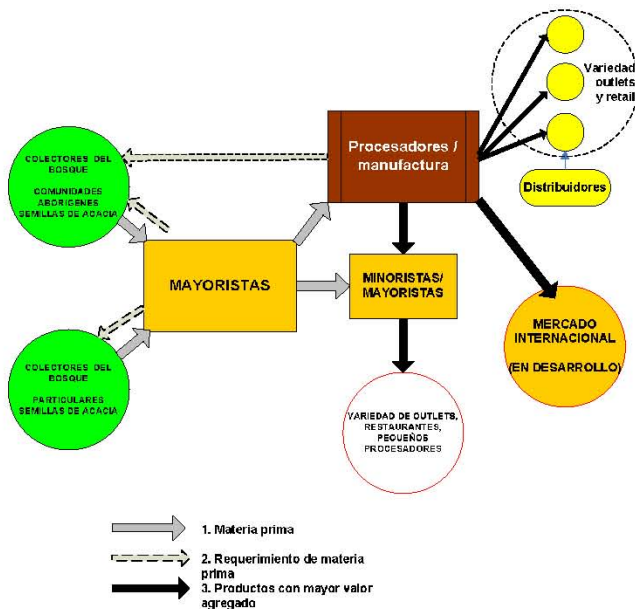


1. Australian Functional Food a healthy choice for functional food investment.
2. Australian Native Food Industry Stocktake. AUGUST 2012. RIRDC Publication No. 12/066
3. Native Foods R&D. Priorities and Strategies. 2013 – 2018
4. WATTLE SEED focus on Part of an R&D program managed by the Rural Industries Research and Development Corporation

Wattleseed

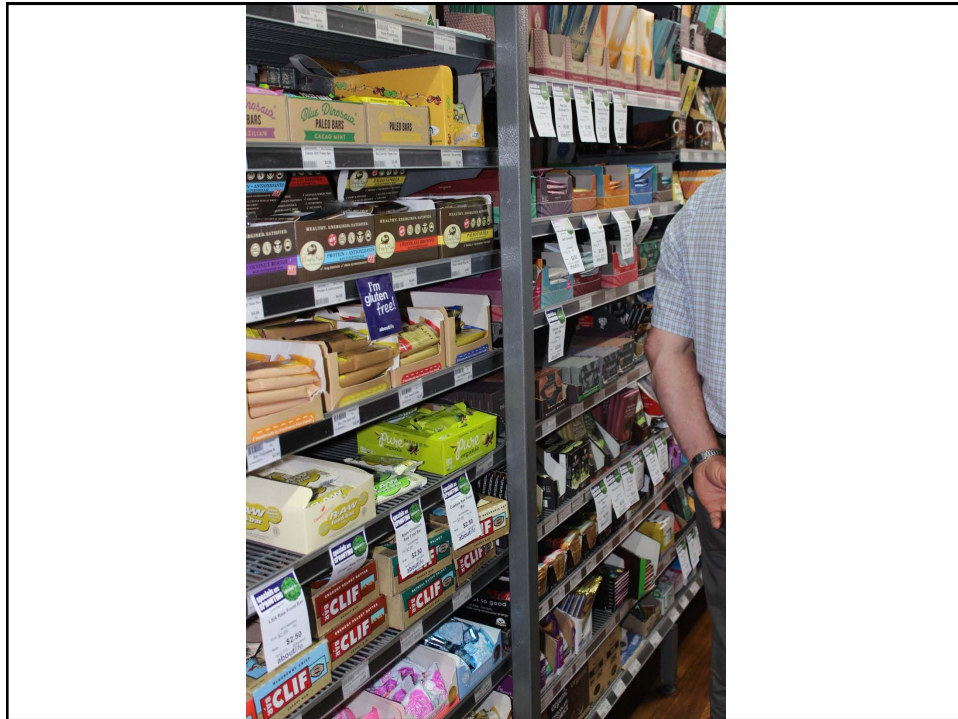
- ~ En Australia se cultiva *acacia victoriae*. el cultivo silvestre ocurre en South Australia, Northern Territory y New South Wales.
- ~ La producción comercial ocurre en zonas de estos estados y en Victoria.
- ~ Se considera al Wattleseed como el héroe poco reconocido de la industria australiana de cultivos indígenas.
- ~ Se requiere mucho desarrollo del mercado si el producto quiere llegar a ser de consumo masivo y no de nicho, de esta forma, la producción aumentará con la demanda.
- ~ El mercado que tiene potencial para crecimiento es el de la cerveza, existen 2 marcas realizadas con wattleseed y ya con alta tasa de ventas, en Sidney y South Australia.
- ~ Tiene un alto periodo de conservación, 10 años.
- ~ Mientras algunos venden las semillas crudas a los fabricantes, otros reconocen la importancia de valor agregado para hacer que la industria sea rentable.
- ~ La inversión del gobierno australiano en proyectos para agregar valor a los cultivos indígenas corresponde al 66% de la inversión total, o sea, AU\$1,6 millones.

Cadena de Valor Wattleseed



Cosechadores del bosque de semillas de Acacia	Mayoristas	Procesadores	Productores del retail
<ul style="list-style-type: none"> 0,5 – 5 toneladas /año (rango total entre todos los productores) Venta por AU\$ 0,5 – 4,0 – 14,00/kg 	<ul style="list-style-type: none"> Lo que se pueda obtener. Venta AU\$ 15-25/kg + flete (molido y tostado). Ha llegado a precio tan alto como AU\$ 98/kg y tan bajo como AU\$ 8/kg) 	<ul style="list-style-type: none"> 4 Kgs. – 200 Kgs/año dependiendo del tamaño negocio. Valor agregado del producto : margen del 15 a 25% 	<ul style="list-style-type: none"> Número de unidades indeterminadas. AU\$ 8,50 en los estantes a AU\$ 12,00 en taros
\$250 - \$2.000- \$7.000/kg semillas	\$7.500 - \$12.500- \$49.000		\$4.000-\$6.000
Los rendimientos anuales de las semillas de Acacia en el bosque nativo con orquídeas y en algunos años nulas. Los costos de cosecha son altos, cuando son efectuados en forma manual ya que esta se efectúan en veranos y los valores de HH en Australia son altos (AU\$ 20/hora).	Esto corresponde a las harinas 100% de varias especies de Acacia comestibles, principalmente A. victoriae, A. coriacea.	Esto corresponde a alimentos con componente funcionales	Al igual que en Chile existen tiendas especializadas en alimentos funcionales "bushfood" como también la venta en supermercados.







OUTBACK SPIRIT



- “ Robins Foods estableció la Fundación Outback Spirit en 2008 y trabajó en estrecha colaboración con el Fondo Indígena de Alimentos Coles en proyectos a nivel comunitario.
- “ Robins Foods fabrica bajo el proceso sistemático preventivo para garantizar la inocuidad alimentaria (HACCP) (Análisis de Peligros y Puntos Críticos de Control)
- “ comercializa una gran gama de productos alimenticios nativos australianos (que comprenden aproximadamente 50% de su gama de productos completa) a una amplia variedad de proveedores de servicios de alimentos nacionales. Coles en asociación con el Fondo Indígena
- “ Alimentos Coles y Woolworths han desarrollado puntos de venta en el extranjero en Estados Unidos y en el Reino Unido.



OUTBACK SPIRIT™



AUD 8,5 \$ 4.250

- “ Wattleseed es cosechado a mano en la región del desierto central de nuestros socios proveedores aborígenes
- “ las semillas son tostadas y molidas generando un ingrediente extremadamente versátil y se puede utilizar en platos salados como pasta, pan y como un condimento para carnes
- “ También en alimentos dulces, galletas, pasteles, magdalenas, helado, mousse . Wattleseed tiene un sabor fuerte, ampliamente descrito como nuez con matices de café.

Silvicultura y diversificación de especies de Acacia



Plantación de Acacias spp en visita en Grampias (Melbourne, Victoria) para la producción de semillas con fines alimentarios. Espaciamento de 9 x 4 metros (entre y dentro de la hilera). Rendimiento 83 Kg/ha/año. Superficie: 12 hectáreas.

Las tres especies principales que se utilizan actualmente son Acacia victoriae (Elegant Wattle), A. pycnantha (Golden Wattle), A. retinoides (Silver Wattle) y A. murrayana (Sandplain Wattle) con A. victoriae siendo la más importante.



Ideas de Proyectos

- a) Proyecto de I+D sobre introducción de especies y procedencias de especies de Acacia con valor comestible en condiciones de secano
- b) Estudio del régimen térmico y torrefactado para la producción de un café con componentes funcionales de semillas de Acacia saligna