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New and Emerging Plant Industries Three-Year RD&E Plan

January 2015 to June 2018

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by Michael Clarke

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What Is a Three-year RD&E Plan?

This Three-Year RD&E Plan outlines the new, emerging and other core funded plant industries' research, development and extension (RD&E) objectives from 1 January 2015 until 30 June 2018. These objectives have been shaped by the RIRDC Corporate Plan 2012–2017 which is available on the RIRDC website, www.rirdc.gov.au/about-rirdc.

In preparing this Three-Year RD&E Plan, the New and Emerging Industries National RD&E Strategy has been considered. The National RD&E Strategy sits under the Primary Industries Standing Committee RD&E Framework which aims to ensure more efficient and effective RD&E in primary industries, through better coordination and collaboration.

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Abbreviations

ABARES	Australian Bureau of Agricultural and Resource Economics and Sciences
AFIA	Australian Fodder Industry Association
AOP	Annual Operating Plan
ATGA	Australian Truffle Growers Association
ATTIA	Australian Tea Tree Industry Association
D&E	Development and Extension
EOPAA	Essential Oil Producers Association of Australia
GVP	Gross Value of Production
IP	Intellectual Property
KPI	Key Performance Indicator
MOU	Memorandum of Understanding
PHA	Plant Health Australia
R&D	Research and Development
RD&E	Research, Development and Extension
RDC	Research and Development Corporation/Company
RIRDC	Rural Industries Research and Development Corporation
SWOT	Strengths, Weaknesses, Opportunities and Threats
TALGA	The Australian Lavender Growers Association Inc
TTO	Tea Tree Oil

New and Emerging Plant Industries RD&E Program

Program Evolution and Coverage

The objective of the RIRDC Plant Industries RD&E Program 2015–18 is to conduct research, development and extension for new, emerging and other core funded plant industries that contribute to the profitability, sustainability and productivity of regional Australia.

The Program's objective directly aligns with Australian Government and RIRDC research priorities (see Appendix 7). 'New' refers to small plant industries that, thus far, have achieved limited growth. 'Emerging' plant industries have accelerating growth and can be small to medium in size (RIRDC 2012). 'Core funded' refers to RIRDC's investment in plant industries that do not have a levy mechanism in place to contribute matching funds for RD&E. Instead these industries rely, in the main, on budget allocated to RIRDC by the Australian Government.

In the past RIRDC has funded standalone RD&E programs for Tea Tree Oil; Essential Oils and Plant Extracts; Wildflowers and Native Plants; New Plant Industries; and Established Plant Industries that have not activated a levy (Figure 1). Recent funding constraints require a more targeted approach to funding non-levied programs as represented in Figures 2 and 3.

Figure 1. Historical Structure Non-Levy Funded Plant Investments

Plant Industries Funded from Core RIRDC Allocations							
Tea Tree Oil Program							
Essential Oils and Plant Extracts Program							
Wildflowers and Native Plants Program							
Fodder Crops Program							
Various New Plant Industries							
Native foods, e.g. Lemon myrtle	Extractive fibre crops	Cultural and world foods	Herbs, spices and beverages	Truffles, shitake mushrooms	Tropical fruit	Grains and pulses	Misc., e.g. seaweed, native grasses

Source: adapted from Garland Outcomes 2011

Figure 2 represents the pattern of investment over the life of the RIRDC Plant Industries Program 2015–18. RIRDC will support the endeavours of the Tea Tree Oil and Fodder Crop industries to establish separate sustainable funding mechanisms during the current plan period.

Figure 2. Proposed Structure Plant Industries RD&E Program 2015–18

Plant Industries Funded from Core RIRDC Allocations
Tea Tree Oil sub-program
Fodder Crops sub-program
Contestable Funds
Allocated to **new and emerging plant industries** that meet RIRDC public funding criteria

The next full Five Year RD&E Plan for New and Emerging Plant Industries covering the period 2018–23 will provide resources to new, emerging and developing plant industries on a contested basis (Figure 3).

Figure 3. Proposed 2018–23 New and Emerging Plant Industries Structure

Plant Industries Funded from Core RIRDC Allocations
Contestable Funds
Allocated to **new and emerging plant industries** that meet RIRDC public funding criteria

Research Informing Program Design

The design of this 2015–18 Plan is informed by a review of the New and Emerging Plant Industries Portfolio (Garland Outcomes 2011) which found that:

- The program has acted as an incubator and explorer of new and emerging plant industries and established cost effective governance and administrative arrangements to enable RD&E to occur.
- The Program was characterised by a large diversity of types of industries, stages of development, industry capability, maturity and ability to create opportunity in rural communities.
- The objective of the Program was not clearly understood and this exposed RIRDC to risks such as inconsistent implementation and an inability to effectively communicate the value of the portfolio.
- The Program had spread its efforts too thinly and there was a need to establish some customised **public funding criteria** to enable prioritisation of core funded plant investments.
- RIRDC could maximise impact by engaging industries along an industry-development path, i.e. a life-cycle approach to funding and ensure R&D projects align with life-cycle stage (see Appendix 8).
- For RD&E to be effective for industries in the new and developing stage there is a greater need to provide support for underpinning activities, such as connectivity to the R&D that will enable the industry to participate and further value RD&E.

An internal review conducted by Garland Outcomes (2011) established a number of industry success attributes and clarified the role of government when considering RD&E investment in new and emerging plant industries. Key points relevant to development of an RD&E Plan for New, Emerging and Other Core Funded Plant Industries included:

1. Successful industries understand their operating environment; have an RD&E culture; and link growth to profitability, sustainability and self-reliance.
2. Successful industries understand market need and work within natural resource capacity.
3. Feasibility testing is important for industry development and additional RIRDC support for feasibility testing may be required.
4. Industries need to have a realistic growth plan.
5. Government invests in new and emerging plant industries due to the limits of the R&D levy funding mechanism.
6. Some new and/or potential industries may not need a long-term Program, rather they may need catalytic research that may help them to understand their growth potential and requirements.

Funding Criteria

Guided by the Garland Outcomes (2011) and RIRDC management, the criteria used to allocate contestable Australian Government funds (core RIRDC funds) within the New and Emerging Plant Industries Program were developed and are summarised in Figure 4.

Figure 4. New and Emerging Plant Industries Funding Criteria

RD&E projects submitted by plant industries will need to demonstrate:
1. The feasibility of the area. A case, using the attached feasibility template (Appendix 9), should be the first step by the industry to determine or show the industry's operating environment, capacity to make use of RD&E, and its sustainability as an industry (profitability and environmental impact). Importantly, the potential for a return on taxpayer funds and public good outcomes needs to be highlighted;
2. The industry's ability to make financial contributions to **RD&E projects**, which is in line with new (0-25%), developing (25%-50%) and mature (50%) industry project contribution expectations;
3. If a particular industry is mature or established and has a number of projects, then a sub-program account will be negotiated with the industry, where the expectation will be for the industry to contribute to **program management costs** such as RIRDC management costs, travel costs, **as well as** the direct cost of RD&E on a 50% basis, to assist in the preparation of the development of alternative financial, long term RD&E arrangements;
4. The project is scientifically sound, will benefit the growth of the industry, intellectual property will not be held by a single company, entity or producer, and is a high priority as determined by the New and Emerging Advisory Panel.

Secondary criteria that should be considered are:

- A very strong financial case from the industry if it is expecting continuing, long term project commitments from RIRDC, such as a plant breeding program, where the continuity of budget income is an imperative for success in this area, rather than a stop start approach.
- Alignment with the relevant industry strategic plan to assist with the identification of constriction points and advantage points for the industry which are critical to the industry perceived progression.
- Agreement by the submitting research organisation to collect industry direct funding contributions.
- No access to other sources of R&D funds from other RDCs.
- A project logic assessment to determine benefits and appropriateness of a project across the triple bottom line and to provide insight on whether the proposed RD&E is appropriate for the industry's stage of development. RIRDC's Life-Cycle Approach to Investment (Appendix 8) provides a detailed explanation of how stage of development is determined.

These criteria will be used to assist the New and Emerging Plant Industries Advisory Panel to prioritise investment in a program where funds are eagerly contested by a number of industries at any one time.

Program Management

The New and Emerging Plant Industries Program will have a single RD&E Advisory Panel made up of independent experts appointed by RIRDC through an expression of interest process where selection is determined by expertise and experience, as well as the chairs from sub-programs who are selected by the relevant industry.

RD&E Plan Objectives 2015–18

Previous RD&E Plans

This Plan builds on a series of RIRDC RD&E and industry strategic plans prepared in the past five years including the:

- Tea Tree Oil RD&E Plan 2013–18
- Fodder Crops R&D Plan 2009–14
- Essential Oils and Plant Extracts RD&E Plan 2015–18
- Native Foods R&D Priorities and Strategies 2013–18
- Wildflowers and Native Plants R&D Plan 2008–13
- Australian Truffle Industry Priorities and Strategies for RD&E 2014–19
- Tropical Fruits Strategy 2012–15 (industry association priority setting document rather than an RD&E plan)

The Plans above required enormous industry effort and remain valid for each industry. This Plan acknowledges the effort made by these industries, but RIRDC can no longer commit to the funding support that was agreed to when these plans were approved. A summary of these RD&E plans for each of these plant industries are summarised at Appendices 1 to 6. Projects addressing the objectives of these plans will be assessed on a case by case basis, current level of RIRDC funding support for the particular industry and availability of funding.

Commonality between Previous RD&E Plans

The RD&E priorities expressed in previous core funded plant industry RD&E plans are summarised in Table 1. Table 1 shows that there is a high level of commonality between plans and that there are general targets that industries aim for with these plans. Plans target production and agronomy; market research and access; quality control and consistency; new plant products; and capacity building /communication. The commonality of the various plans and their consistency with the new Plan, means that most industry developed objectives remain relevant when compared to the objectives outlined in this new plan – see Figure 4.

Figure 4. Alignment of Objectives – Previous and New Plant Industries Plan

Previous RD&E Plans 2009–2019	Plant Industries RD&E 2015–18
Production and agronomy Market research / access Quality control /consistency	**Incubate industries**
New plant products	**Feasibility studies**
Capacity and communication	**Industry building**
	Cross sector support (NEW)

Table 1. Comparison of Objectives: RD&E Plans Now Incorporated in the Plant Industries Three-Year RD&E Plan 2015–18

Tea Tree Oil	Fodder Crops	Essential Oils and Plant Extracts	Native Foods	Wildflowers and Native Plants	Truffle Industry Strategic Plan	Plant Industries Three-Year RD&E Plan
2013–18	**2009–14**	**2015–18**	**2013–18**	**2008–13**	**2014–19**	**2015–18**
Production systems that lower cost and increase productivity	Crop agronomy: nutrition, disease, weed, pest and microorganism management	Improve production systems to improve productivity and control over quality	Support production research to lift productivity and supply consistency	Provide profitable and sustainable production and management systems	Productivity	Objective 2
Funding support for the tea tree breeding program	Plant breeding and germplasm evaluation					Objective 2
	Improved fodder quality			Improve product quality through postharvest care and quality standards	Quality and standards assurance	Objective 2
Market access through regulatory response, product efficacy and safety	–New markets and products –Processing, transport, biosecurity and environmental management to meet market needs	Secure new markets through the demonstration of product safety and effectiveness	–Systems that support value chain integrity –Invest in product information and market access to deliver market growth	Access and evaluate markets to improve commercial outcomes for the industry	Market access and understanding	Objective 2
Proof of concept innovative uses for TTO		Support new essential oil ideas	Investigate new species for potential to add to the appeal and profitability of industry	Improve existing products and develop new ones		Objective 2
Communication and industry capacity building	Industry communication and information flows	Improve industry and research capacity	Promote extension, communication, capacity building and partnerships	Enhance the human capital of the industry and consequent research knowledge and adaption	Communication and capacity building	Objective 3

Plant Industries Program Objectives 2015–18

Development of this Plan involved the following stages:

- Agreement on the scope of the Plant Industries RD&E Plan 2015–18 was determined in August 2014 and further refined throughout September and October 2014
- Review of previous plans, research papers and other relevant documents. Particularly relevant was the Review of the New and Emerging Plant Industries Portfolio (Garland Outcomes 2011) and New and Developing Plant Industry Program Strategy (Dr John de Majnik, RIRDC, 2014)
- Preparation of the Plan's introductory chapters. The Plan structure was to broadly align with the draft Animal Industries RD&E Plan 2013–18 prepared by Scott Williams and Russel Pattinson
- Preparation of summaries of six previous RD&E plans (Tea Tree Oil, Fodder Crops, Essential Oils and Plant Extracts, Native Foods, Wildflowers and Native Plants, and Truffles). Summaries were used to inform new plan objectives
- Formulation of objectives, strategies, key performance indicators (KPIs) and budget share for the Plant Industries RD&E Plan 2015–18
- Review of the draft Plant Industries RD&E Plan 2015–18 with the chair of the Advisory Panel and Managing Director of RIRDC in November 2014
- Review of the draft plan by the New and Emerging Plant Industries Advisory Panel in November 2014
- Feedback from plant industries
- Approved by the RIRDC Board in December 2014

RIRDC is committed to achieving significant benefits for industry and the Australian community within its available resources, through the implementation of **targeted** and **high-impact** RD&E projects. The plan development process highlighted a number of issues that the Plant Industries Program considers roadblocks to growth and development of new, developing, maturing and established plant industries. Of these impediments, those that can be addressed with targeted RD&E have shaped RIRDC's investment priorities for the three years to 2018. Whilst not every problem raised can be addressed, these priorities aim to achieve high-impact, far-reaching benefits for the industries included in this Plan and Australian agriculture more generally.

Objectives will be reviewed as part of RIRDC's Annual Industry Review process. Further consultation and feedback will be sought from stakeholders to adjust or amend objectives as the industries grow. It is important to note again that the funding support RIRDC committed to in individual industry plans will not be able to be maintained under RIRDC's new budget arrangements.

Allocation of funding to the New and Emerging Plant Industries Plan will be considered annually, as part of RIRDC's Annual Operating Plan (AOP). The AOP is available on the RIRDC website, https://risdc.infoservices.com.au/items/12-001.

Plant Industries Sub-program Objectives 2015–18

The Plant Industries Program 2015–18 includes two sub-programs for industries that make substantial funding contributions to RD&E. The two sub-programs are for Tea Tree Oil and Fodder Crops. The RD&E objectives for these sub-programs can be found in Appendices 1 and 2 of this Plan, and a summary is provided in Table 1.

Objective 1. Feasibility studies and industry literature reviews

Objective aims

This objective aims to support the gathering and interpretation of information to assist RIRDC and the industry to strategically plan required RD&E.

Plant industries establishing RD&E projects, or have a relationship with RIRDC, will be asked to complete the feasibility study template reproduced in Appendix 9. RIRDC may then have these feasibility assessments independently validated, or support literature reviews to assist an industry to assess and complete the feasibility template. The expectation is that the feasibility studies will be representative of the industry and have evidence showing that industry-wide consultation has occurred so that potential regional differences can be noted. These feasibility studies will then provide a sound basis for future RD&E investment and industry development.

Feasibility studies will provide one information source to assist the New and Emerging Plant Industries Panel in determining whether a plant industry should be supported, as well as highlight RD&E and other development priorities for the industry. It is hoped that from the completion of feasibility studies, a clearer picture will emerge as to whether the industry is being restricted by a lack of scientific knowledge or a value chain block such as the absence of a processing plant. If at the submission and assessment of the feasibility study the industry is selected to receive RD&E funds, it may be appropriate for RIRDC to establish a simple memorandum of understanding (MOU) with the industry to guide its development path (i.e. usher it along RIRDC's life-cycle approach to RD&E investment – Appendix 8).

Strategies

- Finalise the Feasibility Study Template for RIRDC New and Emerging Plant Industries (Appendix 9). Distribute the template to industries seeking RD&E funds, as well as current and past industries that have been supported by RIRDC funding
- Commission projects that create a pool of literature for industries that require feasibility study guidance
- Develop simple MOUs with industries that have completed feasibility studies and have been supported by the New and Emerging Plant Industries Advisory Panel
- Develop an online feasibility portal and review its contents. The feasibility portal provides a self-assessment of the status of an industry with critical assumptions detailed and the capacity to rework conclusions when updated data becomes available

Key performance indicators

- A template for the RIRDC feasibility studies completed and approved by early-2015
- Four feasibility studies are received each year for the three years to 30 June 2018. Feasibility studies are completed for plant industries for both new, as well as currently or previously funded industries
- By 30 June 2018 four industries have completed a literature review to assist with or augment the development of a feasibility study
- By 30 June 2018 simple MOUs are signed with three prospective industries that are eligible and prepared to meet RIRDC's co-funding criteria (Figure 4)

Impact and consequences

If this objective is delivered RIRDC will have a sound basis for its future investment in core-funded plant industry RD&E. RIRDC will be able to manage industry expectations and effectively communicate the value of the portfolio.

Indicative share of RD&E budget

An indicative 5% of the Program budget is allocated to Objective 1, i.e. $70,000 per annum in an indicative Program annual total budget of $1,400,000.

Objective 2. Incubate new and emerging plant industries, support breakthrough projects

Objective aims

This objective aims to grow new and emerging plant industries that have completed feasibility studies (see Objective 1) and provide high priority RD&E to the Tea Tree Oil and Fodder Crops sub-programs consistent with Appendix 1 and 2.

Engage in market research to identify or further define the market potential of a particular new plant industry; understand new product safety or regulatory requirements; invest in developing or evaluating a new technology that could allow the use of a plant that was otherwise uneconomic to produce in Australia; examine basic agronomy packages; or develop germplasm particular to Australia with caveats and an MOU around funding duration.

Focus emerging plant industry projects toward development and extension and on specific RD&E issues that will dramatically increase the size and value of the plant industry. Projects will deliver a greater understanding of both production systems and demand (RIRDC 2012).

Strategies – new plant industries

- Support research that more clearly defines new plant industry products
- Document and communicate the benefits of producing the new crop to farmers and regional Australia
- Research new plant industry market potential
- Investigate new plants with an Australian comparative advantage and carefully consider the public good benefits of projects that result in single company intellectual property ownership.

Strategies – emerging plant industries

- Support research into production systems that have the potential to dramatically lower cost and increase productivity and supply consistency
- Develop systems that support value chain integrity including quality standards and protocols for postharvest care
- Demonstrate the safety and effectiveness of emerging plant products and new uses for products from these plants
- Support industry stages across the RIRDC industry life cycle

Key performance indicators

- Two breakthrough projects are funded each year for the three years to 30 June 2018. Projects are generally completed for plant industries that have already invested in a feasibility study
- Subsequent economic evaluation of industry specific RD&E projects in 2019 reveals an average return on investment on RIRDC funds of at least 8:1
- All stages of the RIRDC industry life cycle have had a project supported by 30 June 2018 (see Appendix 8)

Impact and consequences

Delivery of selected projects as part of this objective will meet priorities identified by the Tea Tree Oil, Fodder Crops, Essential Oils, Native Foods, Wildflowers and Truffle industries as detailed in current and recently expired RIRDC RD&E plans.

Indicative share of RD&E budget

An indicative 55% of Program budget is allocated to Objective 2, i.e. $770,000 per annum in an indicative Program annual total budget of $1,400,000.

Objective 3. Industry building and connectivity

Objective aims

This objective aims to improve the ability of new and emerging plant industries to participate in the RIRDC RD&E process and mature as an industry.

This objective will focus on projects that can assist industries to develop, communicate and connect industry participants. These projects might be to: prepare a strategic RD&E plan; communicate and connect with members through a newsletter; and build industry leadership.

It is important to highlight the benefit of an industry self-assessment at various stages of development and plotting its own future – with RIRDC support. It is very beneficial for industry development, for members to know that they actually hold the reins to this progress. In the case of more mature plant industries, funds will be set aside under this objective to assist with the establishment of sustainable RD&E funding mechanisms.

Objective 3 will target industries that wish to work with RIRDC but do not currently meet all of the RIRDC funding criteria. Industry building assistance will be limited over the life of this Three-Year Plan, and will be negotiated on an industry by industry basis.

Strategies

- Assist prospective plant industries to prepare an industry strategic plan consistent with industry success attributes identified by Garland Outcomes (2011)
- Assist prospective plant industries to develop and deliver low cost and sustainable communication tools to improve information flow between members and other stakeholders
- Connect interested stakeholders to industry associations, other resources and RIRDC RD&E through the www.farmdiversity.com.au web site and other dedicated resources

- Build industry leadership capacity including participation in programs
- Work with maturing plant industries to develop sustainable funding mechanisms

Key performance indicators

Each year two industries are assisted with a strategic plan, communication tools, and an investment in capacity building or guidance on the development of a sustainable funding mechanism.

Impact and consequences

If this objective is delivered RIRDC will have shifted a small number of plant industries onto a more sustainable basis and built foundations for a more resilient, profitable and self-reliant industry culture.

Indicative share of RD&E budget

An indicative 20% of Program budget is allocated to Objective 3, i.e. $280,000 per annum in an indicative Program annual total budget of $1,400,000.

Objective 4. RD&E to generate benefit across several plant industries

Objective aims

This objective aims to deliver projects that are of benefit to several core funded plant industries. Projects might address cross industry solutions to: priority diseases such as myrtle rust; building cyclone resistance in new and emerging plant industries; securing access to agricultural chemicals through joint minor use permit applications; examining ways to increase the emphasis on traceability and label integrity; linking to large external projects to ensure relevance to smaller industries.

This objective will invest in projects that address common needs across multiple plant industries that do not have access to levy funding. It may also be possible to 'partner' with other levy-funded plant industries to leverage program funds and achieve benefits of some considerable scale for the Australian community.

Strategies

- Canvass priorities for cross industry projects in the feasibility assessment to highlight broad industry issue with commonality across smaller industries
- Fund a very limited number of the highest priority cross industry projects based on a ranking of plant industry association responses
- Keep informed of any emerging and high impact cross industry issues that might require an immediate RD&E response, e.g. incursion of a new pest or disease requiring urgent research

Key performance indicators

- One cross-industry RD&E project supported each year to 30 June 2018
- Cross-industry RD&E projects receive funding from multiple industries

Impact and consequences

If this objective is delivered, high priority cross-industry RD&E priorities will be addressed and the widest possible selection of plant industries will have contributed to a coherent RIRDC RD&E program.

Indicative share of RD&E budget

An indicative 20% of Program budget is allocated to Objective 4, i.e. $280,000 per annum in an indicative Program annual total budget of $1,400,000.

Indicative RIRDC Budget

A Program budget is not a requirement in the updated RIRDC RD&E Plan guidelines. An indicative Program budget (Table 2) has been included in this draft to aid Program review.

Table 2. Proposed Indicative Annual Budgets

Project Type	Indicative Annual Budget
Objective 1: RD&E strategic workshops, literature reviews, independent feasibility assessment	$70,000
Objective 2: Incubate and breakthrough projects	$770,000
Objective 3: Industry building and connectivity	$280,000
Objective 4: Cross industry benefit projects	$280,000
Total	**$1,400,000**

RIRDC proposes a negotiated funding cap on each individual industry so as to accommodate between five and seven supported industries at any one time. Generally, an industry will not receive more than $150,000 per annum between 2015 and 2018 in contestable funds. This also applies to sub-program funding.

RIRDC also expects industry co-contribution in alignment with the industry life-cycle stages (Appendix 8). Typically RIRDC would expect contributions as follows:

- New – 0%
- Developing – 5 to 50%;
- Mature – 50%
- Established – at least 50% + R&D sub-program + on-going financial RD&E arrangements other than RIRDC core funds.

Appendices for Sub-programs

Appendix 1. Tea Tree Oil 2013–18

Industry profile

Tea tree oil (TTO) is extracted from *Melaleuca alternifolia* grown in plantations and distilled via steam injection. Most plantations are located in the coastal region of northern NSW and the Atherton Tablelands of Queensland. Tea tree is tolerant of coastal acid sulphate soils and can be grown on inland cropping country. RIRDC's investment in the tea tree breeding program has resulted in the near doubling of plantation yield. RIRDC investment has also delivered additional efficiencies in harvesting, distillation, storage and marketable oil benefits.

TTO retails as either a single ingredient pure oil or in small quantities added to a wide range of personal health care, cosmetic and animal care products. TTO has anti-bacterial, anti-fungal, anti-viral and anti-inflammatory properties. The Australian TTO Industry has a GVP of $16.25 million based on an estimated annual production of 600,000 kg with a farm gate value of $32.50/kg. The supply chain includes growers, growers who are distillers, distillers, wholesalers, brokers, trader / exporters, manufacturers, retailers and end users. The industry is represented nationally by the Australian Tea Tree Industry Association (ATTIA).

Review of previous plan

The following overarching comments relevant to RD&E priority setting were provided by ATTIA members (RIRDC 2013):

- An agreed industry vision and leadership is needed to drive the next stage of industry's maturation
- There is a healthy debate within industry about whether it is better to invest research funds in increasing oil yields or Regulatory Risk Management or better use of the scientifically proven new use R&D to drive market growth
- The grower voluntary levy should be encouraged and should deliver more grower based research
- Increasing TTO demand is a high priority for growers and the industry

Sub-program RD&E objectives 2013-2018

The TTO Five-Year R&D Plan 2013-18 has four objectives:

1. Market access through regulatory response, product efficacy and safety research and its communication
2. Production systems that lower cost and increase productivity including the tea tree breeding program
3. Proof of concept innovative uses for tea tree oil
4. Communication and industry capacity building.

Key funding priorities within these objectives were identified by industry as being:

- Retention of support for the tree breeding program
- Access to new chemicals and pesticides
- Reduction in the cost of production
- Regulatory risk management including capacity to respond to threats with science as they emerge
- Communication of science to major overseas manufacturers and their subsequent support for Australian TTO (rather than low cost alternatives)
- A ‘big picture’ strategy to drive industry development and demand

Financial commitments

There is no statutory levy on TTO. Growers and product manufacturers have made voluntary financial contributions to RD&E on a project by project basis for many years while the balance of the Program has been funded from RIRDC’s Core allocation.

Since 2009 industry has funded approximately half of total RD&E project expenditure – $250,000 in a program total of $500,000 per annum. In 2012-13 industry commitment included: seed sales from the breeding program ($74,800), contributions from manufacturers and new product developers ($75,800) and ATTIA grower levies ($27,500).

This plan coincides with a transition of the tea tree breeding program to an independently run program of research.

Given TTO’s significant and growing commitment to RD&E funding, the drive towards an alternative funding model and shift from a project by project approach to a program approach, is timely. TTO will have stand-alone sub-program status for the period 2015–18. TTO projects that align with both its industry specific RD&E funding priorities and the Core Funded Plant Industries 3YP will be considered by RIRDC.

RIRDC funds will be negotiated with the industry for the three year period.

Appendix 2. Fodder Crops 2015–18

Industry profile

Fodder includes a wide range of crop and pasture species that are grown, harvested and lightly processed for both on-farm use and the domestic and export trade. Fodder production includes hay and silage of all types (pasture, cereal, lucerne, clover and others), chaff (coarsely chopped dried whole plants), vetch and pelletised feed.

Australia produces between 6 million and 8 million tonnes of fodder per annum with a GVP of approximately $2 billion (Australian Fodder Industry Association website accessed 25 September 2014). On average 70% of this fodder is consumed on the farm where it is produced. Between 600,000 and 800,000 tonnes of hay and straw are exported each year. Key export markets include Japan, Korea, China and Taiwan. Domestically, fodder is consumed in the dairy, broad acre, horse, feedlot and horticulture sectors.

The fodder supply chain includes fodder producers, contractors, traders, exporters, machinery manufacturers, input suppliers, testing laboratories and consumers. The industry is represented nationally by the Australian Fodder Industry Association (AFIA).

Review of previous plan

The Fodder Crops R&D Program 2009–14 had seven objectives:

1. Markets, products and blue sky research
2. Plant breeding and germplasm evaluation
3. Crop agronomy and fodder production efficiency
4. Supply chain – harvesting, transport, traceability and relationships with allied industries
5. Improved fodder quality
6. Climate change, biosecurity and environmental management
7. Industry linkages, communication, information flows, forecasting and program evaluation

Sub-program RD&E objectives 2013–2018

The AFIA website (accessed 25 September 2014) identifies the industry's RD&E needs as being:

- Improved crop and pasture varieties
- Plant diseases, weed and pest control
- Harvesting and processing technologies
- Storage and handling methods
- Developing new markets

The point of delivery of the fodder voluntary funds is through fodder export companies.

The sub-program is maintained as the contributions support program activities as well as RD&E projects, and the industry is exploring alternative financial models for the required RD&E projects.

Financial commitments

There is no statutory levy on fodder crops. Fodder exporters make direct annual contributions of approximately $150,000 per annum and a further $75,000 per annum is received in hay royalties from the oat breeding program. Royalties received do not cover the cost of the oats for hay breeding program which is approximately $300,000 per annum. RIRDC makes core funding contributions of between $140,000 and $200,000 per annum.

The fodder crops industry has attempted to establish a statutory levy but concerns over single farmers paying multiple levies (e.g. a fodder crop levy would also be paid by those paying dairy, red meat and grains levies) and method of collection (e.g. 70% of production does not enter the market place) have stopped previous levy attempts.

RIRDC is committed to providing funds to the fodder crop industry and managing an RD&E sub-program until 30 June 2017. In the life of this current Program a sustainable funding mechanism for fodder crops is being pursued by the industry. If not found, investments will contract to something equivalent to a single project each year and RIRDC support for the industry will be reviewed annually.

RIRDC funds will be issued at $150,000 for 2014/15, $100,000 for 2015/16 and $50,000 for 2016/17.

During this plan, RIRDC funds will fall to $0 and RIRDC will work with the industry to implement alternative funding arrangements for their breeding programs, dependant on industry funding and RIRDC support.

Appendices Other Non-Levy Industries

Appendix 3. Essential Oils and Plant Extracts 2015–18

Industry profile

Essential Oils and Plant Extracts include a number of different industries and a wide variety of end uses. A common feature of all essential oils/plant extracts is that they require the growing of plants to harvest active ingredients. Active ingredients are used in the pharmaceutical, perfumery, industrial and food industries.

Major Australian essential oils include sandalwood ($14.7 million GVP at first point of sale), lavender ($1.3 million), eucalyptus ($1.3 million), boronia ($780,000) and peppermint ($750,000). Citrus and carrot oils are managed by Horticulture Australia. Major Australian plant extracts include pyrethrum ($1.1 billion), echinacea ($2 million), mountain pepper ($330,000) and ginseng ($100,000). The poppy and hops industries operate outside the RIRDC system.

Typically the essential oils and plant extracts supply chain includes growers, extractors, wholesalers and distributers, product formulators and retailers. The essential oils sector is represented nationally by the Essential Oil Producers Association of Australia (EOPAA), The Australian Lavender Growers Association (TALGA) and the Tasmanian Boronia Growers Association. The lack of a plant extract association makes it more difficult to define this sector.

Review of previous plan

The Essential Oils and Plant Extracts Five-Year R&D Plan 2008–13 had four objectives:

1. Improve production systems to raise productivity and control over product qualities
2. Support the demonstration of safety and effectiveness of Australian products and facilitate the satisfaction of regulatory requirements to enhance market access
3. Support new ideas that provide potential for growing the market for Australian product
4. Improve the industry and research capacity

Industry stakeholders interviewed as part of the development of this Plan indicated that these objectives remained relevant for the period through to 2018

RD&E objectives 2015-2018

RD&E objectives from the 2008-13 plan have been retained. Priorities within those objectives garnered through consultation include:

- The requirement for RIRDC to concentrate on initial ‘proof of concept’ investments – once the basic information is in place industry is then able to invest in further development
- Concentrate RD&E investments on native plants, capture plant breeder rights and secure the IP for Australia
- Screen mainland botanical resources for medical and cosmetic prospects – a successful project was funded by RIRDC for Tasmania and now needs extending to the mainland
- Distillation efficiency – investigate new and emerging technologies to improve extraction rates and lower distillation costs

- Understand the implications of EU REACH legislation across a broad range of essential oils and plant extracts

- Continue to develop myrtle rust solutions – this family of plants is the backbone of the essential oils and plant extracts industry

- Invest in research capacity building – researchers in this industry have retired and their programs have been wound back or discontinued

Financial commitments

There is no statutory levy on essential oils and plant extracts. Natural Plant Extracts of Tasmania is a grower cooperative and the only organisation in the industry that collects a voluntary research levy. For the five years 2009-13 essential oil and plant extract projects to the value of $4.6 million were managed by RIRDC, industry contributed 10% of total project cost.

For the plan period 2015-18 RIRDC funding to the Essential Oils and Plant Extracts industry will be on a competitive basis across New and Emerging Plant Industries. Preference will be given to projects that include matching funds from industry and preference will be given to projects that also align with New and Emerging Plant Industries RD&E Plan objectives.

RIRDC funds will be focussed on communication for the three year period, unless a strong case is made for specific projects and supported by the broader industry or makes a step change for the industry.

Appendix 4. Native Foods 2013–18

Industry profile

Australian native foods are sourced from trees, shrubs, herbs and other plants. Native foods include leaf used for teas and spice; oils for flavouring; and seeds, berries and fruits that are consumed as food ingredients.

The industry has identified thirteen priority native food species:

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 leuhmanii*
12 Davidson plum *Davidsonia spp.*
13 Lemon aspen *Acronychia acidula*

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. The industry is represented nationally by Australian Native Food Industry Limited.

Review of previous plan

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 (Clarke 2012), has included:

- Market access – secured for lemon myrtle in the EU through a RIRDC funded project
- Export preparedness investments benefiting mountain pepper
- Health benefits research – showing native foods have high vitamin and antioxidant levels
- Australian standards – for products such as lemon myrtle oil
- Emergency permits for the use of fungicides to control myrtle rust
- Myrtle rust control trials
- Packaging trials to improve product shelf life

- Food safety projects
- Product description work
- Production research to improve the cultivation of native foods
- Chef training package for TAFE colleges
- Raised general industry awareness

RD&E objectives 2013-18

The Australian native foods industry has identified five priorities for the period 2013-18:

1. Support production research to lift productivity and supply consistency
2. Develop systems that support value chain integrity and growth
3. Product information, product development and market access to deliver market growth
4. Investigate new species for their potential to add to the appeal and profitability of industry
5. Promote extension, communication, capacity building and partnerships

Financial commitments

There is no statutory levy on native foods. Over the five years 2007 to 1012, RIRDC-managed projects included cash and in-kind contributions from industry.

For the plan period 2015-18, RIRDC funding to the Native Foods industry, as with the other industries, will be on a competitive basis. This industry is well supported with RIRDC funds across a variety of different plant species and areas. The focus for the three year period will be to support current projects to a successful completion, delivery and adoption of the results. A strong case would be required to justify further support for more projects.

Appendix 5. Wildflowers and Native Plants 2008–13

Industry profile

Wildflowers is that sector of the Australian flower industry focussed on flowers and foliage native to Australia and South Africa, sometimes also called ‘hard flowers’. The industry is strongly aligned with the ‘fashion’ and ‘lifestyle’ sector where demand is fickle and can change quickly. Wildflowers account for most of Australia’s fresh flower exports. The total value of the industry is estimated at $50 million wholesale. Australia wide there are some 500 wildflower and native plant growers.

Review of previous plan

The Wildflowers and Native Plants 5 Year R&D Plan 2008-13 had five objectives:

1. Provide profitable and sustainable production and management systems
2. Improve product quality through postharvest care and quality standards
3. Assess and evaluate markets to improve commercial outcomes for the industry
4. Improve existing products and develop new ones
5. Enhance the human capital of the industry and consequent research knowledge and adoption

RD&E objectives 2013–18

New RD&E objectives have not been developed for the Wildflowers and Native Plants industry.

Financial commitments

RIRDC proposes to support current projects between 2015 and 2018 creating new plant types and a communications project to deliver the outputs from previous RIRDC research projects.

The Wildflowers and Native Plants industry will be able to apply for funding for individual proposals that will be judged on a case based around alignment with the New and Emerging Plant Industries RD&E Plan objectives, industry compliance with RIRDC industry lifecycle funding criteria and relevance to RIRDC funding support as opposed to HIAL cut flower or the nursery industry pot levy.

Appendix 6. Truffles 2014–19

Industry profile

Truffles are the fruiting body of a subterranean fungus that is highly prised as an aromatic ingredient in gourmet cooking. The Australian truffle industry is based on the French black truffle and the first truffière, or truffle farm was established in Tasmania in 1992 with an inaugural harvest in 1999. In 2014 the industry is centred on Launceston Tasmania and Manjimup WA. There are also truffière in NSW, ACT and Victoria. In 2011 truffle production was estimated at three tonnes with a forecast of ten tonnes by 2016. GVP is currently estimated at $4 million per annum and there are a total of 160 Australian truffière. The industry is represented nationally by the Australian Truffle Growers Association (ATGA).

Review of previous plan

The Truffle Industry R&D Strategic Plan 2009–11 had five objectives:

1. Establish an action group to work with AQIS on import legislation covering Chinese or other identified truffle varieties

2. Understanding, strengthening and developing market analysis and market drivers for Australian truffles

3. Establishing a grading system for Australian truffles

4. Research into diseases with a focus on effects of rot in truffles

5. Consumer education, industry communication and engagement and advancement of accreditation standards for Australian truffles

The 2009–11 Plan served as a foundation for current RD&E objectives.

RD&E objectives 2014–19

The Truffle Industry identified four objectives for the period 2014–19:

1. Quality and standards assurance

2. Market access and understanding

3. Productivity

4. Communication and capacity building.

Financial commitments

RIRDC currently supports truffle projects.

If there is a call for projects in August 2016, the truffle industry will be eligible to apply for funding and individual proposals will be judged on their merit, i.e. alignment with Core Funded Plant Industries RD&E Plan objectives, RD&E objectives for the truffle industry 2014–19 and industry compliance with RIRDC Public Funding Criteria.

RIRDC funds will be negotiated with the industry for the three year period.

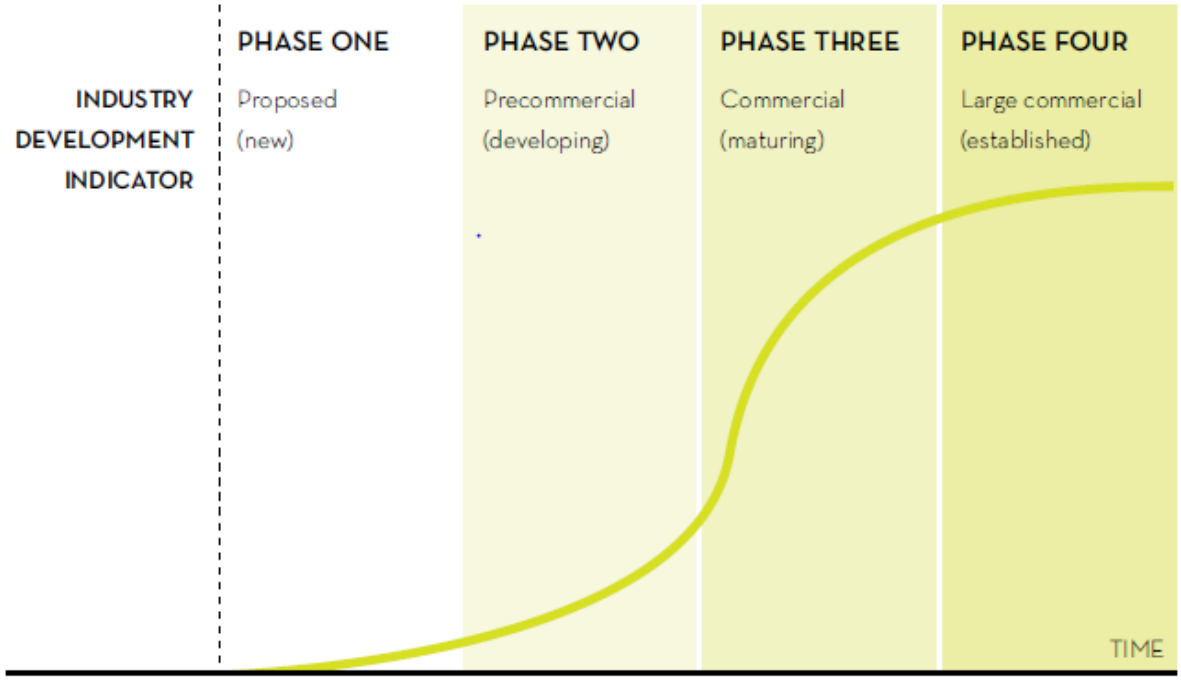
Appendix 7. Alignment of Program Objectives with Government Research Priorities and RIRDC Strategy

Strategic Research Priorities	Rural Research Priorities	RIRDC Strategies	Program Objectives and Strategies
Lifting productivity and economic growth	**Productivity and adding value**	Manage demand driven RD&E that meets industry needs Facilitate investments that deliver economic, social and environmental benefits for rural industries Increase knowledge about rural industry development options that offer regional economic development opportunities Adopt a lifecycle approach to investment in new, developing and established industries	Objective 1: Feasibility studies and industry literature reviews
	Supply chain and markets	Deliver analysis on issues of national importance to the rural sector and broader community Assess the feasibility, value and potential competitiveness of new plant and animal industry opportunities	Objective 2: Incubate new and emerging plant industries and support 'breakthrough' projects
Promoting population health and wellbeing	**Biosecurity**	Work collaboratively on cross sector issues that impact across industries	Objective 4: RD&E to generate benefit across several plant industries
Living in a changing environment	**Climate variability and climate change**	Work collaboratively on cross sector issues that impact across industries	
Managing our food and water assets	**Natural resource management**	Encourage the sustainable use and management of natural resources	
Securing Australia's place in a changing world	**Innovation skills**	Promote leadership, capacity, skills and pathways that create opportunities.	Objective 3: Industry building and connectivity
	Technology	Encourage research that fosters science and creativity	

Appendix 8. RIRDC's Life-Cycle Approach to Investment

RIRDC's commitment to new and developing industries is to support appropriate RD&E given their stage of maturity in the Australian market. RIRDC invests in such industries with a focus on supporting industries which demonstrate potential to contribute to Australian agricultural productivity growth and regional economic development.

RIRDC has identified four phases of growth for an industry. They are detailed in Figure 5 below.



Source: RIRDC Corporate Plan 2012 - 2017

Figure 5. Phased Growth Path of New Agricultural Industries

In this context, RIRDC will clearly define its role as an investor in industries based on their development phase and the unique attributes of that industry.

Recognising that industries grow through each of the phases represented in Figure 5, then each industry investment proposed to RIRDC can be assessed to determine where on the growth curve they sit at any point in time.

Following identification of the relevant development phase of an industry, RIRDC will apply criteria in consultation with industry proponents to provide guidance about the appropriate RD&E investment from RIRDC given the development stage of the industry.

Figure 6 identifies characteristics that will be used to define an industry's stage in the RIRDC life-cycle.

		NEW (PHASE 1)	DEVELOPING (PHASE 2)	MATURING (PHASE 3)	ESTABLISHED (PHASE 4)
Industry characteristics	**Growth**	Limited growth	Growth acceleration	Growth stabilisation	Growth stabilisation
	Size	Typically small (<$5M)	Can be small or medium ($2-$10M)	Typically >$5M	Typically >$5M
	Stakeholder profile	A few pioneers, very enthusiastic above a novel idea, starting their own research	Increasing number of farmers trying to develop the industry, mostly family business Very fragmented	Expansion of number of farmers involved and emergence of private investors Starting consolidation	Expansion of number of farmers involved and emergence of private investors Consolidated businesses and some vertical integration
	Industry organisation	No cohesion (no association/levies) Under development infrastructure	Emerging industry association and levies Emerging value chain Increasing participation in RD&E	Stronger industry cohesion with an established association and levies or sustained industry voluntary contribution to RD&E More established value chain	Strong industry cohesion, with an established association and levies An established value chain
Industry R&D needs	**R&D type**	Feasibility studies (review of possibilities, defining products, benefits to Australian producers, market potential for Australia, competitiveness with other producers)	Development and extension research focused on specific RD&E issues. Greater understanding of production systems and demand	Development and extension research focused on more specific RD&E issues. Well defined objectives Maintenance research for niche industries	Development and extension research focused on specific well defined RD&E issues Maintenance research Some exploratory and product development research
	R&D size	Limited RD&E cost per project, seeking to spend the least amount of money before going any further	Larger RD&E projects with larger investment	Larger RD&E projects with larger investment	Large RD&E projects with large investment
	RIRDC focus	Important, nurturing tand advising role Testing new industry options for Australia	Critical role supporting industry growth and development Assisting industry to appreciate role of RD&E and to identify needs	Supports niche industries (sustainability) Industry takes greater lead on RD&E needs and builds RD&E contribution to matching dollar for dollar	Industry sets RD&E priorities and RIRDC provides RD&E management support
RIRDC Industry examples*		Mulloway, new tropical fruits, cocoa, dates, native grasses, seaweed, stevia, wild rice	Truffles, hazelnuts, alpacas, herbs and spices, coffee, green tea	Tea tree oil, wildflowers, essential oils, native foods, alpacas, ducks, buffalo, fodder	Rice, chicken meat, honeybee, kangaroo, deer, horses, pasture seeds, olives

Source: RIRDC Corporate Plan 2012 - 2017

Figure 6. Types of RD&E and RIRDC Focus throughout Life-Cycle Stages

RIRDC will apply a live-cycle approach to making its RD&E investments for new, developing and established industries – Figure 7.

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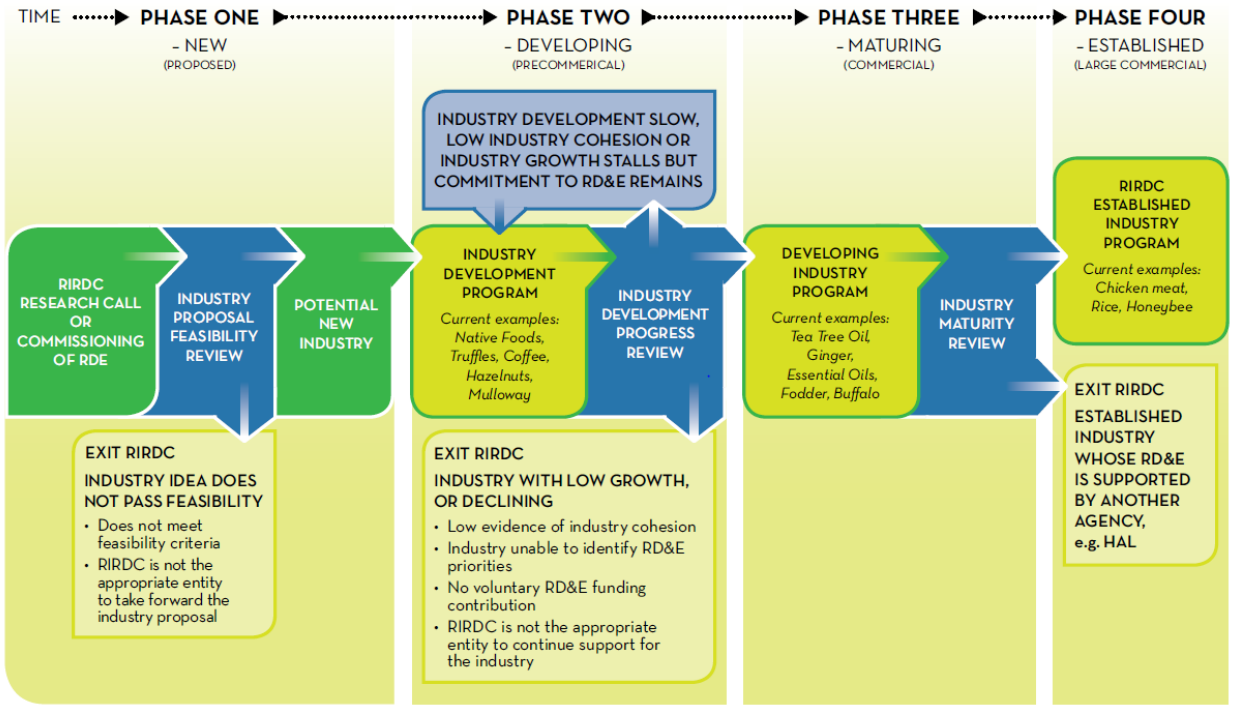

Figure 7. RIRDC Investment Aligns with Industry Life-Cycle Stages

Appendix 9. Feasibility Study Template

The following feasibility study template includes RD&E priorities and the industry feasibility opportunity.

1. Production of the new plant (single species only, not groups)

Consideration	Description
What is the product?	
Location and extent of production	For example, the extent of regional sensitivities.
Production systems and processes	
Environmental limitations and seasons (Climate, rainfall, temperature, soil type, production lag i.e. sow to harvest)	
Other limitations – access to inputs including researchers	
Other limitations – access to markets	
Are there any regulatory restrictions?	
Is your industry's entry on the RIRDC Farm Diversity website? Do you have any suggested edits?	

2. Customers and markets

Consideration	Description
Production volumes and values first point of sale	
Domestic markets	
Export markets	For example, the percentage of production, clean green marketability, quality assurance and traceability, access.
Imports	For example, sources, replacement potential, comparative quality, and off-season relevance.
Promotion and market development	
Description of supply chain(s) and processing requirements (prospective routes to market)	
What are the value add opportunities?	
What major trend is this following (health, Asian food export focus etc.)	

3. Competition and competitive advantage

Consideration	Description
Substitute products	
Export competitors	
Sources of competitive advantage	
Sources of competitive disadvantage (establishment costs, lack of knowledge on best management practice)	

4. Industry organisation

Consideration	Description
Industry organisation and fragmentation	Consider the industry structure and cohesion.
Industry communication	What methods of communication are used? What is the number of groups/individuals are reached? Are they registered producers or just newsletter recipients?
Industry funding	

5. Direct economic impacts

Consideration	Description
Gross value of production	
Industry profitability	
Direct employment	
Scalability and size (what potential timeframe for doubling the industry, what advantages / disadvantages of getting to a bigger industry)	

6. Indirect economic impacts

Consideration	Description
Potential value of downstream processing economic activity (poor, fair or good)	
Potential value of associated tourism or localised retail economic activity	
Potential value of inputs and services	
Potential value of indirect employment	
Potential economic value of providing diversification options for farmers	

7. Indirect environmental impacts

Consideration	Description
Carbon, weeds, pests, biosecurity, other	

8. Indirect social impacts

Consideration	Description
Potential health benefits from supply of product	
Potential for indigenous / cultural benefits	
Other	

9. RD&E and other needs

Consideration	Description
What are the knowledge gaps or resource gaps?	This may come from attempting the feasibility template, or a literature review may be required, or an R&D strategic workshop session.
What are the RD&E needs (priority order)	
Do RD&E priorities include any cross-sectoral needs (e.g. minor use chemicals, climate change adaption)	
What other priorities i.e. non-RD&E are important to this industry (e.g. lack of a processing facility) (priority order)	
Can the industry fund the RD&E without government assistance? If not why not?	

10. Conclusion on industry feasibility

Consideration	Description
Is the industry currently or potentially viable	
What is the concise value proposition for the industry?	
Recommendation on RIRDC engagement	

Appendix 10. Examples of the Completed Feasibility Study Template

The following examples have been completed by RIRDC. The intent is that the industries would complete these templates themselves and submit them to RIRDC. It is envisaged that this process may assist industries in determining and assessing RD&E priorities. It will assist RIRDC, and potentially broader stakeholders, of the industries potential.

The following feasibility studies are based the quinoa entry at www.FarmDiversity.com.au.

A new Australian industry – Stevia

1. Production of the new plant (single species only, not groups)

Consideration	Description
What is the product?	Stevia (*Stevia rebaudiana*) is a small bush native to Paraguay's jungles. Its leaves contain carbohydrate-based diterpene glycosides, compounds that are 200–300 times sweeter than sugar. These compounds cannot be digested and are therefore non-calorific. The plant has a long history of medicinal use by the Guaraní people of South America, and the leaves have been used for hundreds of years in both Paraguay and Brazil to sweeten local teas and medicines, as well as a 'sweet treat'. Stevia is grown commercially in China, Japan, South Korea and South America.
Location and extent of production (For example the extent of regional sensitivities)	There is no commercial production of stevia in Australia. Previous Australian trials have been reported as producing commercial yields in the range of 1.5–2.5 t/ha of dry leaf with glycoside content of 7-15%. Australian trials showed that the crop is suitable for mechanisation of both planting and harvest. Basic agronomy has been defined. More work is required to develop lines better suited to the Australian production environment, particularly in northern Australia. Potential northern production areas include inland Qld and the NT. Southern areas include coastal Qld and NSW, mild temperate areas of inland NSW and warmer cropping areas of Victoria, SA and WA.
Production systems and processes	Stevia is sown from seed imported from China. Seedlings are then transplanted into the field. Perennial stands are established and harvested. Harvested leaf, known as hay, is dried and transported to a processor that extracts the glycoside. Dried steviol glycoside is sold, often for blending with other sweeteners, to a range of markets. There is no stevia processor in Australia and this is a precondition of industry establishment.
Environmental limitations and seasons (Climate, rainfall, temperature, soil type, production lag i.e. sow to harvest)	Stevia has been successfully grown under a wide range of conditions. However, it is mainly grown in the subtropics at approximately 200-400m elevation. Stevia can withstand temperature extremes of -6 to 43^0C. Rainfall averaging between 1,500 and 1,800 mm is desirable and trickle irrigation to supplement rainfall deficit is preferred. Stevia grows in low areas on sandy acidic soils (pH 5-7) adjacent to

Consideration	Description
	swamps. It requires a wet root zone. Stevia will grow all year round in temperatures above 20^0C with 12 hours of sunlight. Significant establishment times are required for stevia which makes it a longer term production commitment for farmers.
Other limitations – access to inputs including researchers	Agronomic practices are not well documented for stevia, particularly in tropical conditions. Mechanical weeding techniques are yet to be developed. The crop is particularly susceptible to attack by fungus and there are no fungicides registered for stevia in Australia. There are few stevia researchers in Australia and a much wider worldwide pool.
Other limitations – access to markets	A stevia processor is required before the crop can be established as an industry in Australia. Worldwide research is required to deliver stevia of consistent quality.
Are there any regulatory restrictions?	Food Standards Australia New Zealand (FSANZ) approved stevia for use as a food additive in 2008.
Is your industry's entry on the RIRDC Farm Diversity website accurate? Do you have any suggested edits?	The RIRDC Farm Diversity website highlights its potential through northern Australia including Qld and the NT.

2. Customers and markets

Consideration	Description
Production volumes and values first point of sale	There is no commercial production in Australia. World production of stevia was estimated at 3,500 tonnes in 2010 with a forecast of 11,000 tonnes for 2014. Global value is estimated at US$285 million. In 2012, stevia hay was estimated to be worth about $1,000/t and powdered steviol glycoside $50/kg. As at 2013, worldwide sales of stevia were reported to be over 4,000 tonnes, at a value of US$304 million. This figure is a 6.5% increase on 2012 sales, and growth is expected to continue with imminent approval for use of stevia in Indonesia and India. Stevia has only been approved as a food additive in most western countries since 2005.
Domestic markets	Products and extracts from stevia can be used in a wide range of foods, as a calorie-free alternative to sugar and also used in conjunction with other sweeteners. Up to 25% of consumers report an unpleasant taste associated with stevia necessitating its blending with other sweeteners. Varietal selection will need to be mindful of consumer feedback.
Export markets (For example the percentage of production, clean green marketability, quality assurance and traceability, access).	Stevia is rapidly becoming an internationally-traded commodity and there is no reason why, with the establishment of appropriate varieties, agronomy, harvest and processing, that Australia could not share in its export success. Major beverage companies Coca-Cola and Pepsi are researching and using stevia in their products.

Consideration	Description
Imports (For example sources, replacement potential, comparative quality, and off-season relevance).	Australia's stevia demands are currently met by imported product mainly sourced from China. Australian imports of stevia currently approach $1 million per annum and have grown rapidly since FSANZ approval of stevia as a food additive. Ability to supply the northern hemisphere out of season does not appear to be an advantage for stevia. The product has a long shelf life.
Promotion and market development	Promotion and market development is premature in the absence of a processor and commercial growers.
Description of supply chain(s) and processing requirements (prospective routes to market)	The Sugar Research Institute has undertaken preliminary investigations regarding the food processing technology and equipment that could be used in establishing a stevia mill. Some parties have expressed an interest in taking equity in a future mill. Existing overseas mills have also expressed an interest in establishing Australian mills if leaf supply could be assured. Processing constancy has troubled overseas processors and supply chains.
What are the value add opportunities?	Value adding is reliant on the establishment of an efficient mechanised processing mill in Australia. Once processed into steviol glycoside the product would be available for addition to mainstream food and beverages. Stevia would substitute for other sweeteners rather than create a new range of value added products.
What major trend is this following (health, Asian food export focus etc.)	Increased stevia consumption is linked to the health trend – substituting calorific sugar for a natural plant based and calorie free sweetener. The trend is consistent with worldwide obesity concerns.

3. Competition and competitive advantage

Consideration	Description
Substitute products	Substitute products include natural sugar and a range of chemically derived artificial sweeteners. The presence of ready substitutes will mean that stevia will need to be cost effective against consistent quality established alternatives.
Export competitors	Globally, stevia is produced and exported by China, Japan, South Korea and South America, with increasing interest and production in India, Thailand, Egypt, Kenya, Columbia and the US.
Sources of competitive advantage	No obvious competitive advantages for Australia. It has been suggested that organic production may provide Australian stevia with a marketing edge that would be difficult for China and South America to emulate as would quality assured product certified by an Australian third party.
Sources of competitive disadvantage (establishment costs, lack of knowledge on best management practice)	Export competitors have established industries and a significant cost of production advantage over Australia. Cost of production advantage is most pronounced in China, the world's largest stevia exporter.

4. Industry organisation

Consideration	Description
Industry organisation and fragmentation (Consider the industry structure and cohesion).	No Australian stevia industry organisation or association exists. It is noted that the World Stevia Organisation organises an annual world convention.
Industry communication (What methods of communication are used? What is the number of groups/individuals are reached? Are they registered producers or just newsletter recipients?)	No formal grower communication channels have been established.
Industry funding	There is no mechanism established for the ongoing funding of stevia industry RD&E.

5. Direct economic impacts

Consideration	Description
Gross value of production	There is no Australian commercial production of stevia. However, it is worth noting that the Australian artificial sweetener market was valued at $44.5 million in 2013 and retail sugar sales were $186.3 million in the same year.
Industry profitability	The profitability characteristics for commercial scale production of stevia in Australia are yet to be determined.
Direct employment	No direct employed in 2014.
Scalability and size (what potential timeframe for doubling the industry, what advantages / disadvantages of getting to a bigger industry)	Stevia is a longer term prospect for up-sizing. Research and processing investment is required to deliver a commercial prospect. Once this is available, further time is required to identify growers, establish shrubs and have them reach harvest maturity.

6. Indirect economic impacts

Consideration	Description
Potential value of downstream processing economic activity (poor, fair or good)	Good – a commercial-scale processing operation would be a significant investment possibly similar in scope to a sugar mill.
Potential value of associated tourism or localised retail economic activity	None identified.
Potential value of inputs and services	Modest and similar to other perennial foliage harvesting crops e.g. tea tree.
Potential value of indirect employment	A commercial scale processing operation may employ 50 to 100 FTE.
Potential economic value of providing diversification options for farmers	Stevia offers considerable scope for farmer diversification and incorporation in existing crop rotations, especially for growers with established irrigation infrastructure.

7. Indirect environmental impacts

Consideration	Description
Carbon, weeds, pests, biosecurity, other	Stevia will require irrigation. Disease management will include registration and use of fungicides. No known impacts on biosecurity.

8. Indirect social impacts

Consideration	Description
Potential health benefits from supply of product	Substitution of artificial calorie free sweeteners for a natural one may encourage additional consumption of products that help fight obesity, diabetes and other weight related diseases.
Potential for indigenous / cultural benefits	None identified.
Other (e.g. community support)	None identified.

9. RD&E and other needs

Consideration	Description
What are the knowledge gaps or resource gaps? (This may come from attempting the feasibility template, or a literature review may be required, or an R&D strategic workshop session).	RIRDC is presently funding Central Queensland University (CQU) research into factors influencing/controlling the flowering of stevia, glycoside accumulation and yield performance to assist with the selection of plants suitable for seed production. Knowledge and resource gaps relevant to a potential Australian stevia industry include suitable varieties, agronomy to manage the varieties, efficient mechanical harvesting and processing research and investment.
What are the RD&E needs (priority order)	Varieties including varieties suitable for Australian conditions and varieties that eliminate 'off-tastes' reported by consumers. Agronomy including identification and registration of appropriate pest and disease controls and the high cost of plant establishment using transplants. More efficient mechanical weeding and harvesting technologies Processing efficiency and consistency R&D.
Do RD&E priorities include any cross-sectoral needs (e.g. minor use chemicals, climate change adaption)	There are no fungicides registered for stevia and shared minor use applications may be appropriate. Lessons for mechanical weeding and harvesting may be available from the saltbush industry – both are Chenopods. Stevia might be appropriate for inclusion in northern Australia research programs.
What other priorities i.e. non-RD&E are important to this industry (e.g. lack of a processing facility) (priority order)	Potential grower networks. Establishment of a processing facility.
Can the industry fund the RD&E without government assistance? If not why not?	There is no industry in Australia in 2014 and it is unlikely that other parties could be identified to fund RD&E.

10. Conclusion on industry feasibility

Consideration	Description
Is the industry currently or potentially viable	The industry is not viable in the absence of processing capacity and further variety and agronomy work.
Risks	Investment in processing technology may not create a profitable opportunity for growers.
What is the concise value proposition for the industry?	Stevia is a natural non-calorific sweeter that has the potential to displace artificial alternatives. The crop could be integrated into existing irrigation enterprises.
Recommendation on RIRDC engagement	RIRDC to consider further RD&E funding targeting stevia cost of production in light of successful CQU research and or a credible approach from a potential investor in processing mills.

An emerging Australian industry – Quinoa

1. Production of the new plant (single species only, not groups)

Consideration	Description
What is the product?	Quinoa (*Chenopodium quinoa*) is an 'ancient grain' of the South American Andes. Regarded as a cereal and labelled a 'superfood' quinoa is high in protein, calcium, iron, vitamins and is gluten free. The plant typically grows to heights of 0.2-3 m displaying a range of colours from red through to purple. The plant produces small dense flowers, and upon fruiting produces a grain that can reach 2.7 mm in diameter. Worldwide five significant varieties of quinoa have been identified as suited to a diverse range of climate conditions.
Location and extent of production (For example the extent of regional sensitivities)	Australian quinoa production remains experimental, the first commercial crop was grown in Tasmania in 2007 and quinoa has since been planted in Narrogin WA as part of a RIRDC funded, UWA delivered, project aimed at determining highest yielding varieties. In 2014 there was a single commercial grower and domestic production area totalled 50 ha.
Production systems and processes	Quinoa is grown and harvested in the same way as other cereals. Specialised machinery is not required nor is specialised infrastructure.
Environmental limitations and seasons (Climate, rainfall, temperature, soil type, production lag i.e. sow to harvest)	Quinoa grows well in a variety of climates. However, optimal growing of traditional varieties occurs at higher altitudes of between 2,500 m and 4,000 m. Quinoa has a high degree of water stress tolerance and will produce a commercial yield with as little as 100 mm of rainfall and will grow in areas averaging up to 800 mm of rain. Quinoa has the capacity to grow in a variety of temperatures ranging from -4^{O}C to 38^{O}C. Quinoa does not require good quality soils and is well suited to alluvial soils with poor drainage. Crops planted in Tasmania are generally sown in early spring and harvested in early autumn. Quinoa is an annual crop germinating after four to five days and harvested between 90 and 120 days from planting.
Other limitations – access to inputs including researchers	No special inputs are required. However, a viable industry will be dependent on locally suitable varieties and effective agronomic packages that include pest and disease control.
Other limitations – access to markets	No market access restrictions affect quinoa. Domestic demand is strong and reliant on imports. There is opportunity for domestic production to displace imported product. Quinoa is an annual crop and growers may be able to supply opportunistically.
Are there any regulatory restrictions?	A specific regulatory challenge for the quinoa industry is sourcing seed from overseas which is subject to quarantine regulations. Seed sourced from overseas can be contaminated with weeds from the *Chenopodium* family and so related to *Chenopodium quinoa.*

Consideration	Description
Is your industry's entry on the RIRDC Farm Diversity website accurate? Do you have any suggested edits?	The RIRDC website notes the importance of developing seed processing machinery and difficulties with importing seed.

2. Customers and markets

Consideration	Description
Production volumes and values first point of sale	In 2012 Australia produced 45 tonnes of quinoa. In the same year world production was 80,000 tonnes. The world quinoa price (FOB port) has risen from US$500/tonne to US$1,300/tonne before falling back slightly in late 2014. Consequently farm gate price is likely to be higher than mainstream cereals. Significant price premiums also exist for organic quinoa.
Domestic markets	In 2012 the Australian domestic market consumed 934 tonnes of imported quinoa plus 43 tonnes of domestic production.
Export markets (For example the percentage of production, clean green marketability, quality assurance and traceability, access).	In 2012 Australia exported 2 tonnes of quinoa. Clean green marketability, organic certification, quality assurance and traceability are all potential sources of export marketing advantage if the industry moves to a commercial footing.
Imports (For example sources, replacement potential, comparative quality, and off-season relevance).	In 2012 Australia imported 934 tonnes of quinoa valued at $3.1 million. Product that is grown organically commands a price premium (US$3.60/kg compared to US$2.30/kg for conventional production). Quinoa can be stored for several years and this negates any potential for counter-season arbitrage.
Promotion and market development	Industry development will be at least partially reliant on effective marketing of Australian grown quinoa, given the strong connotations South American sourced product has with 'ancient grain' properties. Being an 'ancient grain' is a major source of consumer affiliation with quinoa and may challenge Australian marketing.
Description of supply chain(s) and processing requirements (prospective routes to market)	Grain is harvested either manually with a sickle, or by mechanical means. After harvest, the cut portion of the plant is stacked for drying. The plant is then 'threshed' and 'winnowed' to loosen the edible part of the grain. The grain can be stored for several years. Further processing, into flour or pasta for example, is then possible.
What are the value add opportunities?	Value adding potential exists for processing the raw grain into flour, cereals, breads, pastas, biscuits, snack foods and other baked products. Quinoa can also be used in cosmetics because of its emollient properties.
What major trend is this following (health, Asian food export focus etc.)	Quinoa is part of the health trend. Superfood qualities include 'ancient', 'balanced nutrition' and 'gluten free'.

3. Competition and competitive advantage

Consideration	Description
Substitute products	Substitute products include mainstream grains including grains that are low in gluten with known health properties (e.g. oats) and alternative superfoods such as amaranth, buckwheat and chia seeds.
Export competitors	South American countries such as Peru and Bolivia have both a cost of production and an 'authentic product' marketing advantage over Australia. These two countries supply 90% of world quinoa production. Other quinoa growers include Europe, the US, Canada and Ecuador.
Sources of competitive advantage	Local clean and green production of an ancient grain. Furthermore Australian quinoa does not have the 'food miles' associated with South American product.
Sources of competitive disadvantage (establishment costs, lack of knowledge on best management practice)	South America seen as a provider of authentic and 'ancient' quinoa and this is a major source of consumer affiliation with the grain. South America has a production cost advantage over Australia. Little is known about the location and varieties best suited to Australia. Little is known about quinoa pests and diseases. Australian yield is less than that achieved in South America.

4. Industry organisation

Consideration	Description
Industry organisation and fragmentation (Consider the industry structure and cohesion).	In 2014 a small number of stakeholders were exploring quinoa production in different parts of Australia including Tasmania and in the Ord Valley of Western Australia. At this stage no industry body for Australian quinoa has been established.
Industry communication (What methods of communication are used? What is the number of groups/individuals are reached? Are they registered producers or just newsletter recipients?)	The extent to which different stakeholders are communicating and sharing knowledge at present is unknown.
Industry funding	There is no mechanism in place for industry funding.

5. Direct economic impacts

Consideration	Description
Gross value of production	Estimated at $160,000 in 2012.
Industry profitability	The profitability characteristics for commercial scale production of quinoa in Australia are yet to be determined.
Direct employment	Small – one commercial grower and a total production area of 50ha would require <1FTE.

Consideration	Description
Scalability and size (what potential timeframe for doubling the industry, what advantages / disadvantages of getting to a bigger industry)	Identification of suitable varieties through UWA research funded by RIRDC has the potential to quickly create a commercial industry. There are advantages in a larger industry. These include import replacement and additional export potential.

6. Indirect economic impacts

Consideration	Description
Potential value of downstream processing economic activity (poor, fair or good)	The potential value of downstream processing is assessed as fair. Value-add may include packaged grain, flour and baked products. However, this activity may simply substitute Australian grown quinoa for imported quinoa or other grains.
Potential value of associated tourism or localised retail economic activity	No tourism or localised retail economic activity envisaged.
Potential value of inputs and services	Inputs and services would be similar to other Australian broadacre crops and the area of quinoa grown may simply substitute one set of purchases for another.
Potential value of indirect employment	Quinoa has limited potential to generate additional indirect employment.
Potential economic value of providing diversification options for farmers	Significant – quinoa grows in marginal cropping areas and does not require good quality soils. Quinoa is an annual that can be incorporated into existing crop rotations and used as a diversification option.

7. Indirect environmental impacts

Consideration	Description
Carbon, weeds, pests, biosecurity, other	Quinoa may be a viable alternative to crops which are more water reliant especially in drought/below average rainfall years. Quinoa has no known biosecurity implications.

8. Indirect social impacts

Consideration	Description
Potential health benefits from supply of product	Quinoa is high in protein, calcium and iron and is a relatively good source of vitamin E and several of the B vitamins. Quinoa is gluten free which appeals to those with gluten intolerance. Australian grown quinoa will substitute for imported quinoa and is therefore less likely to result in a net health benefit to Australia.
Potential for indigenous / cultural benefits	None identified.
Other (e.g. community support)	Australian quinoa growers may be seen as unfairly disadvantaging South American smallholders.

9. RD&E and other needs

Consideration	Description
What are the knowledge gaps or resource gaps? (This may come from attempting the feasibility template, or a literature review may be required, or an R&D strategic workshop session).	Knowledge and resource gaps relate to varieties, agronomy, industry organisation and the marketing of Australian product. Internationally, research has been conducted into soil salt tolerance, emollient qualities and nutritional profiling. The FAO promoted 2013 as the international year of quinoa.
What are the RD&E needs (priority order)	Research into suitable varieties for Australia (UWA). Research into alternative growing regions outside WA and Tas. Field trials and development of agronomic packages that include pest and disease management strategies.
Do RD&E priorities include any cross-sectoral needs (e.g. minor use chemicals, climate change adaption)	Potentially quinoa, a dry climate grain, could be part of a package of industries and recommendations aimed at providing options for adaptation to climate change. RD&E would be required to prepare this information package.
What other priorities i.e. non-RD&E are important to this industry (e.g. lack of a processing facility) (priority order)	Identification of a champion or group of potential growers that might form an association and advance a quinoa industry in Australia. Creation of a strategy to address South America's advantage in the supply of authentic and 'ancient' quinoa.
Can the industry fund the RD&E without government assistance? If not why not?	There is no mechanism in place for industry funding. The 'industry' does not have a grower base which might be targeted for RD&E contributions.

10. Conclusion on industry feasibility

Consideration	Description
Is the industry currently or potentially viable	The industry is potentially viable. Presently there is strong demand for the grain and provided suitable varieties and Australian agronomic practices can be developed, a niche industry should be possible.
Risks	Quinoa is a short lived 'superfood' fad. Growers in other parts of the world increase production, lower price and make the grain non-viable for Australian farmers. Marketing fails to develop a 'selling point' for Australian quinoa. Research fails to identify higher yielding varieties.
What is the concise value proposition for the industry?	High-value, in-demand, grain that can be grown in dryer areas with poor quality soils.
Recommendation on RIRDC engagement	RIRDC to review its commitment to quinoa in light of UWA research on identification of high yielding varieties suitable for Australia.

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