



Australian Sesame Strategic RD&E Plan (2021-2026)

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by Olivia L. Reynolds and Michael Robinson



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Australian Sesame Strategic RD&E Plan (2021-2026)

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Strategic RD&E Plan 2021-2026

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“ This report pulls together specific recommendations for future investment to support the long-term growth and competitive advantage of the Australian sesame industry ”

Michael Beer

Foreword

The opportunities for sesame are seemingly endless – a variety of food products including raw sesame seeds, oil, tahini, ground sesame; nutraceuticals; pharmaceuticals; cosmeceuticals; and sesame meal as stock feed. Add in the recent introduction of new high-quality, high-yielding, non-dehiscing sesame varieties that can be mechanically harvested and it is clear why there is newfound enthusiasm for the Australian sesame industry.

Sesame is a drought-tolerant crop with attractive domestic and international markets for an Australian industry. Over recent times, the enthusiasm towards this new and emerging industry has been growing in Australia. Those within the Australian sesame industry have demonstrated great passion and eagerness to drive significant growth within the industry over the next five years.

The development of a research, development and extension (RD&E) plan is a crucial first step in growth for a new and emerging industry. This RD&E plan will clearly identify opportunities and barriers to industry growth and subsequent RD&E priorities for the industry. RD&E plans for emerging industries are resources that can be used by industry to help drive investment and growth within their industry.

This report is the result of extensive desktop research and stakeholder consultation across the Australian sesame industry and pulls together specific recommendations for future investment to support the long-term growth and competitive advantage of the Australian sesame industry.

This report has been produced as part of AgriFutures Australia's Emerging Industries Program. It is an addition to AgriFutures Australia's diverse range of research publications and forms part of Arena 4, which focuses on new industries with high growth potential. Emerging animal and plant industries play an important part in the Australian agricultural landscape. They contribute to the national economy and they will be key to meeting changing global food demands.

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Executive summary

Sesame, *Sesamum indicum* L. (Lamiales: Pedaliaceae), is one of the oldest oilseed crops known to humanity (Bennett, 1998). It is widely cultivated in subtropical and tropical regions around the world and grows optimally within the 25° north and south latitudes.

Sesame is cultivated for its edible seeds, eaten as they are or added as an ingredient in meals, and for the oil used in cooking. Due to its antioxidant content among other benefits, it is also used in nutraceuticals and pharmaceuticals.

Australian and global demand for sesame continues to grow and opportunities for new markets and new uses are becoming evident. In 2018, the average world price of sesame reached US\$1 229/tonne (Rahman et al, 2019), with black sesame seed prices significantly higher than white, and black sesame oil prices much higher again.

A sesame industry in Australia previously failed to establish, due largely to the lack of suitable genetics and processing facilities. Recently, the sesame industry has re-emerged in Australia with the introduction of new high-yielding, non-dehiscing varieties with high quality and adaptation to Australian conditions, that can be mechanically harvested.

AgriFutures Australia funded the development of this Strategic Research, Development and Extension (RD&E) Plan to support the emerging Australian sesame industry. The Plan was developed through consultation with a Sesame Stakeholders Group (SSG) consisting of growers, industry, industry organisations, government and researchers. This has led to the establishment of an Industry Reference Board, now the Australian Sesame Industry Development Association (ASIDA), to lead the

growth and development of the industry and this Strategic RD&E Plan. Six thematic areas – Elite germplasm; Industry viability through agronomy; Post-harvest supply chain; Key capacity and capability; Community engagement and support; and Markets – have resulted in 38 activities, prioritised as very high (six), high (12), medium (15) and low (five).

The strong and ongoing increase in demand for sesame, both domestically and internationally, provides an opportunity for the commercial production of Australian sesame. Australia has significant areas of land suited to sesame production, and its competitive advantages of clean, green, high-quality production and high-productivity agriculture are supported by a culture of innovation and proximity to export markets. Australia has the capacity to develop domestic processing facilities and develop new and value-add products to service the domestic and international markets that desire high-quality produce, of known quality and provenance, and with a consistency of supply. Development of effective business strategies and enabling environments, supported by world-class RD&E and government programs, can result in a highly lucrative, economically viable and sustainable sesame industry in Australia.

Vision

Australian sesame is the product of choice for domestic and global markets, with the industry recognised for innovation and excellence in production systems and products.

Mission statement

The Australian sesame industry will:

- ▶ Be built on purpose-developed and/or adapted germplasm and genetics.
- ▶ Be an established, resilient, profitable and sustainable industry.
- ▶ Produce a substantial proportion of the world's traded sesame crops.
- ▶ Achieve world-leading yields and high-quality produce.
- ▶ Attract a wide grower base, forming a key component of flexible cropping systems across several regions.
- ▶ Process a range of high-quality, premium, value-add, innovative and accredited products and co-products for multiple domestic and international markets.

Strategic RD&E Plan outcomes

Before 2026, the sesame industry will have established itself in Australia as a viable crop option in northern farming systems. The industry will have exceeded \$10m GVP by having:

- ▶ Identified and secured elite germplasm.
- ▶ Established industry viability by resolving major agronomic and crop-protection issues, and demonstrated competitive and sustainable production.
- ▶ Produced high-quality sesame through the post-harvest supply chain.
- ▶ Established sesame industry key capacity and capabilities.
- ▶ Engaged and supportive communities.
- ▶ Established markets for Australian sesame.

Industry profile

Background

Sesame (*Sesamum indicum* L.) is one of the oldest oilseed crops known to humanity (Bennett, 1998). It is widely cultivated in subtropical and tropical regions across the world and grows optimally within the 25° north and south latitudes (Eskandari et al, 2015), however some varieties can be grown in frost-free temperate regions (Rahman et al, 2019).

Sesame is reported to require annual rainfall of about 500-1100 mm (Terefe et al, 2012; Oplinger, 1990) for optimal growth. However, the crop has been successfully grown in Australia in regions with lower rainfall and may benefit from supplementary irrigation to avoid water stress (Trotter et al, 2020). Optimal sesame yields are obtained when the growing season has temperatures ranging 25-37 °C. Although medium-texture fertile soil is ideal for growth (Terefe et al, 2012), sesame can be grown on a variety of soil types (Tony Matchett pers. comm., 2021).

The sesame plant is typically 60 to 120 cm in height, and the fruit is a dehiscent capsule that shatters when ripe, to release small seeds. The level of dehiscence is a crucial trait for sesame varieties.

Sesame is cultivated for its edible seeds, confectionery purposes, edible oil, paste (tahini), cake and flour (Bennett, 1998; Bedigian, 2004). It is also used in nutraceuticals and pharmaceuticals (Rahman et al, 2019) due to its level of antioxidants and healthy fat content. Sesame seed is rich in calories, comprising about 50% fat, 23% carbohydrates, 18% protein including amino acids, and 12% dietary fibre (Cision PR Newswire, 2019; Eskandari et al, 2015; Pathak et al, 2014). The sesame seed oil content ranges from 42-55% and typically yields higher than other oilseeds, e.g., canola seed yields 44% oil (Hwang, 2005; Eskandari et al, 2015; Pathak et al, 2014). The international standard of oil content is 52%, 48% and 45% for first, second and third grades of sesame respectively. The allowable moisture content for all grades of sesame is 6-8% (Abebe, 2016).

The core of the seed is protected by a hull that is white, brown or black depending on the variety. Sesame is commonly categorised into two main market segments based on the seed coat colour, being white sesame and black sesame. The price of sesame seed varies based on its colour, quality (oil content grades), origin, moisture content and purity (admixture).

In the 1980s, sesame was first planted in Australia using genetics that were classified as highly dehiscent, or 'shattering', and required labour-intensive hand-harvesting, as mechanical harvesting caused most of the seed to shatter, thus leading to significant harvest loss. After the only Sesame Conference in Australia, held in 1995, a Strategic Plan for the Australian sesame industry for 1995-2005 was developed (Wood et al, 1995). However, the industry failed to establish, due largely to the unsuitable sesame genetics available at the time. Other contributing factors included the low commodity price, an inability for domestic producers to compete with imported products and a lack of supply chain options for suppliers and distributors (Trotter et al, 2020).

In Australia, the sesame industry has the potential to develop and grow. There is re-emerging interest with the introduction of new high-yielding, non-dehiscing varieties with high quality and adaptation to local conditions, that can be mechanically harvested. Equinom, an Israel seed technology business, is responsible for this advancement (Tony Matchett pers. comm., 2020).

Since 1966, Australia has been importing sesame, with the demand for sesame in the domestic market observing a gradual increase (FAO, 2019). In 2016, Australia imported about 6,740 tonnes of sesame, while in the same period it exported about 60 tonnes of sesame, with the major share going to New Zealand (FAO, 2019). Since then, Australia has increased import volumes, with more than 13,000 tonnes of whole sesame and sesame products imported in 2020 (Coriolis, 2021). The last time the Australian Bureau of Statistics recorded the land area under sesame was in 2011, at 402 ha (Melinda Haley pers. comm., 2021).

The global sesame market

The global market value of sesame was about US\$6.5b in 2018, with some expecting the market to be worth US\$17.7b by 2025 (Cision PR Newswire, 2019). Sesame is a US\$3.5b global market, growing at 10% per annum, and is the eighth-largest globally traded cereal crop by value (Coriolis, 2021). The global demand for sesame was ranked as 'high' for overall attractiveness using a quantitative growth criteria score (Coriolis, 2018). Much of the demand is primarily coming from China, other parts of Asia and the Middle East (Figure 1). The demand is driven by the variety of uses for sesame, including its recognition as a healthy 'superfood' – it is a good source of vitamins, minerals, fibre, protein and fats (Rahman et al, 2019). Africa and India supply the most world trade (Coriolis, 2021).

In 2018, the average world price of sesame seed was US\$1 229/tonne in international markets. Sesame seeds that have been hulled have a higher price than unhulled seeds, with the variation in price ranging 10-15% (Rahman et al, 2019). Sesame oil is of significantly higher value than the seed itself, fetching US\$3830/tonne.

Black sesame seed, which is a small minority of production, returns about 45% more than white sesame seed (Rahman et al, 2019). The reason for this is that white sesame is a bulk commodity used as a food condiment, while black sesame is used in higher-value markets for its oil, as a pharmaceutical component, and in value-added food products. Most seed is exported from the country of production (Coriolis, 2018). However, relatively little oil is traded across borders, with most oil consumed in the country of production (Coriolis, 2018).

Current global production and yield

There has been an upward trend in global sesame production over the last 50 years (FAO, 2019). While Tanzania, Myanmar, India, Sudan, Nigeria and China dominate global sesame seed production, most of the growth in long-term production is coming from Sub-Saharan Africa (Coriolis, 2018; see Figure 2). Production in the United States of America (US) appears relatively small in total volume (not in the top 20 producers; Coriolis, 2018) and is fully mechanised unlike many other sesame-producing countries. Sesaco and Equinom Corporation

The Australian sesame market

Australia imported \$57.25m worth of sesame and sesame products in 2020, comprising sesame seeds (A\$19.75m, 7,000 t), sesame oil (\$19.6m, 2,577 t) and tahini (\$17.9m, 3,600 t) (Coriolis, 2021). An earlier report indicated that the industry was growing at 4.5% (20-year compound annual growth rate; CAGR) (Coriolis, 2018). This total tonnage of 13,177 t surpassed previous forecasts. Earlier trends indicated ongoing growth of the domestic market, which was forecast to reach 9,800 t by 2025 (Rahman et al, 2019). This provides a significant opportunity for Australia to produce and market our own sesame.

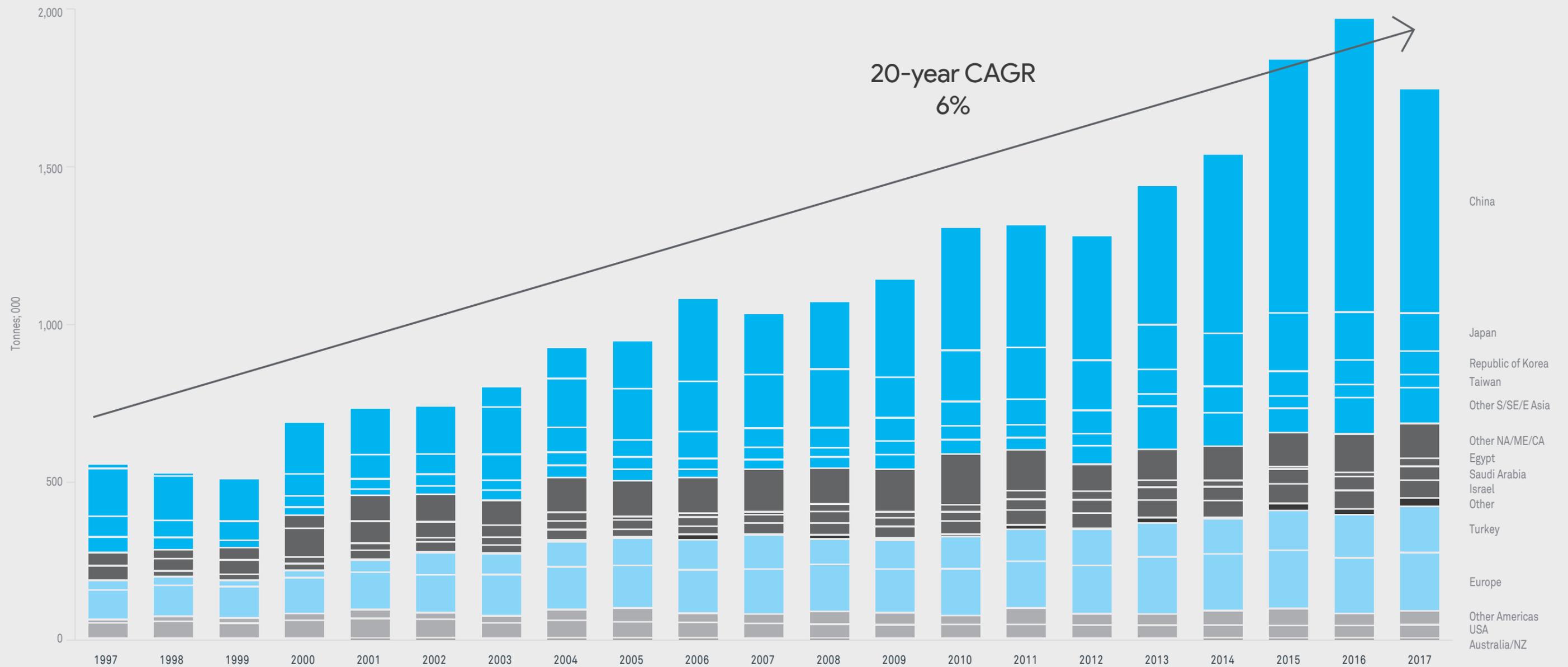
A more detailed discussion of markets, their growth and regional trends was provided by Coriolis (2018, 2021) and Rahman et al (2019).

dominate US production (Tony Matchett pers. comm., 2021), with the vast majority consumed domestically (Sesaco, 2021; AgMRC, 2021).

By 2025, the Asia Pacific is expected to dominate the sesame seed market, with anticipated production of more than 3.2 million tonnes (Cision PR Newswire, 2019).

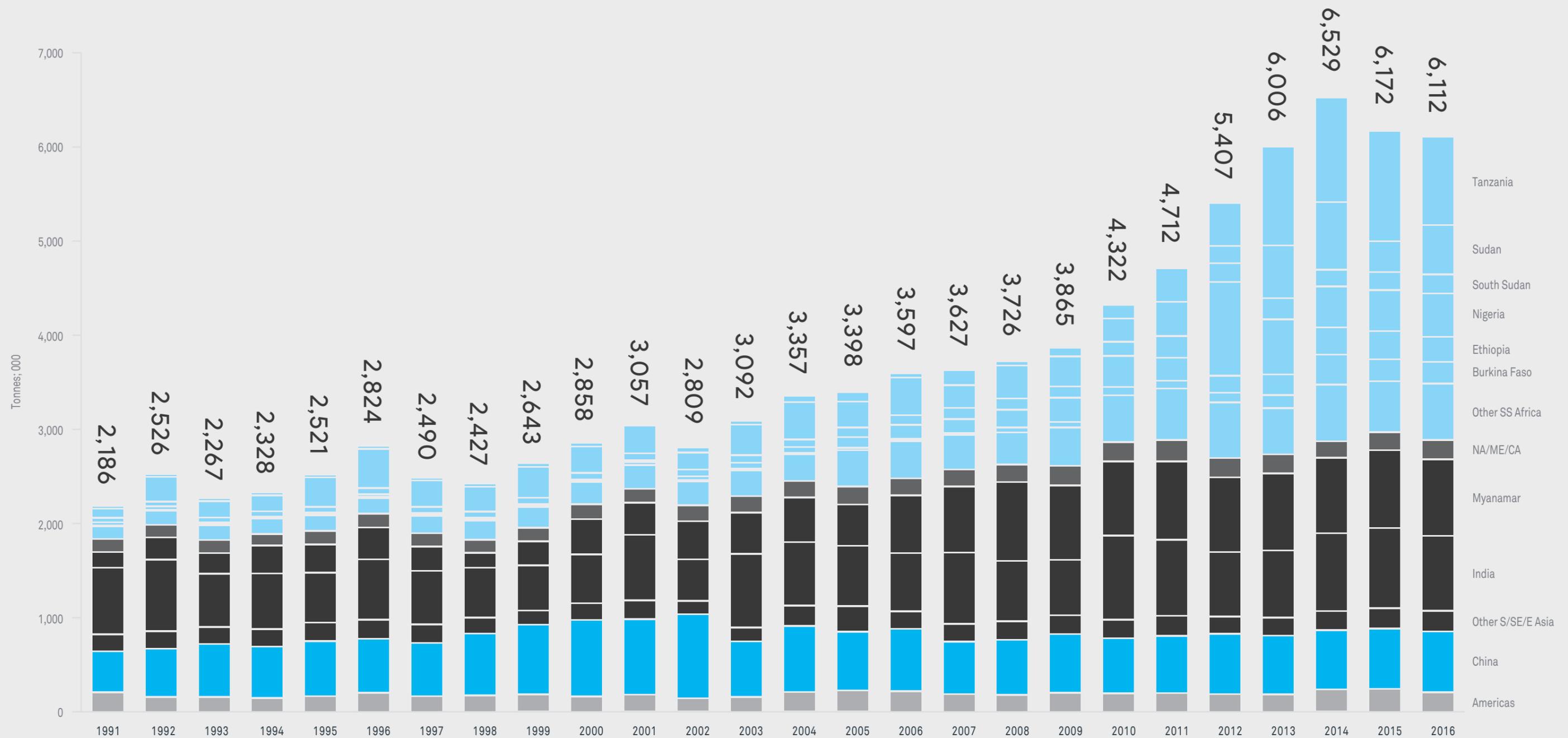
Global production data that differentiates white and black sesame varieties is absent from the literature.

Figure 1. Total global sesame seed import volume by country/region. Other S/SE/E Asia: South/South East/East Asia; Other NA/ME/CA: Other North America/Mexico/Canada. Coriolis, 2021. © The State of Queensland (through the Department of Agriculture and Fisheries) [2021] is acknowledged as the source.



Source: UN Comtrade; Coriolis classifications and analysis

Figure 1. Global sesame seed production by country/region. Other SS Africa: Sub-Saharan Africa; NA/ME/CA: North America/Mexico/Canada; Other S/SE/E Asia: Other South/South East/East Asia. Coriolis, 2018. © The State of Queensland (through the Department of Agriculture and Fisheries) [2018] is acknowledged as the source.



Note: Americas includes "other". Source: UN FAOSTAT; Coriolis analysis

The mean yield of sesame globally is 554 kg/ha (FAO, 2019), noting that all production is hand-harvested (except in the US). However, yield varies dramatically in different regions, with China the highest of the top 10 sesame-producing countries, at an average of 1400.7 kg/ha (Figure 3). Equinom trials in Australia with white sesame have produced yields of up to 2500 kg/ha with supporting irrigation, and 1000 kg/ha for rainfed; top commercial growers are achieving similar yields (Oron Gar pers. comm., 2021).

Market demand

Global sesame seed market demand was valued at US\$12.07b in 2017 and is projected to exhibit a CAGR of 4.9% from 2017 to 2025 (Cision PR Newswire, 2019). The growth may be attributed to the growing consumption of confectionary and baked goods and sesame's high content of unsaturated fats, in emerging economies such as China, Republic of Korea and Bangladesh. Further, the increasing use of sesame seed extract as an antioxidant in the pharmaceutical sector is expected to remain a positive factor in the market. The growth of bakery sectors in developed countries, including the US and Japan, because of new nutritional product developments is also expected to boost product demand. Increasing concerns regarding adverse effects associated with the consumption of synthetic pharmaceuticals on a global level is expected to expand the scope of herbal medicines, which is in turn expected to support incorporation of the product as an excipient for drug delivery (Cision PR Newswire, 2019).

Exporting and importing trends

In 2016, the global export volume of sesame was about 1.4 million tonnes (Rahman et al, 2019). The three largest exporters of sesame (Nigeria, Ethiopia and India) account for about 43% of global export. In recent years, steady export growth has been observed in other sesame-producing African countries.

China's sesame production has been falling since 2014, and in 2016 it was the largest importer to meet growing local demand (Rahman et al, 2019). However, in 2020, Japan became the biggest importer, accounting for 40% of global imports. With projected demand for sesame expected to increase in China over the next three decades, together with Japan, these countries could be excellent market opportunities for Australian sesame. Further, Australia has free trade agreements in place with the major markets of China, Japan and Republic of Korea (Rahman et al, 2019).

The world-leading sesame oil producers are Tanzania (33.3%), Myanmar (19.5%) and China (14.3%); while Japan, Mexico and China are the leading exporters; and the US, the United Kingdom and China are the leading importers of sesame oil (Tridge 2019). Sesame oil is widely used in pharmaceuticals and personal care products, including soaps, body wash and hair oils, and is expected to assist in driving growth in the future (Cision PR Newswire, 2019). Sesame oil's reported medicinal properties has led to its use to treat scalp dandruff and fungal infections, which is also expected to boost the market in the future (Cision PR Newswire, 2019).

The emerging Australian sesame industry

In recent years there has been renewed interest in sesame production in Australia. In 2020, only 525 ha of land was recorded as being used to produce both white and black sesame, relative to global production of 9.9 million hectares in 2017 (Rahman et al, 2019). Using new sesame lines, the crop has been trialled, but has not yet established commercial production. It is estimated that the current GVP of Australian sesame is less than \$1 million.

In December 2018, a report was completed for the Queensland Department of Agriculture and Fisheries (QDAF) titled "Sesame – The \$250m diversification opportunity in North West Queensland" (Coriolis, 2018). The report's conclusions, which are more broadly applicable to the wider sesame industry, included:

- Sesame is a drought-tolerant crop, grown successfully in hot, dry conditions, and is therefore attractive to Australian producers.
- The domestic Australian market is attractive for both seeds and oil.
- Sesame seeds are the main opportunity for export, followed by sesame oil.
- The opportunity for sesame in north-west Queensland alone is potentially worth \$250m.

A recent market analysis of sesame in Australia concluded there was a significant opportunity for an Australian sesame industry due to several crucial factors, including climate, proximity to Asian markets, market demand for quality produce and suitable land/cropping systems (Rahman et al, 2019).

Figure 3. Sesame yield (kg/ha) for the top 10 sesame-producing countries (FAO, 2019; in Rahman et al, 2019).

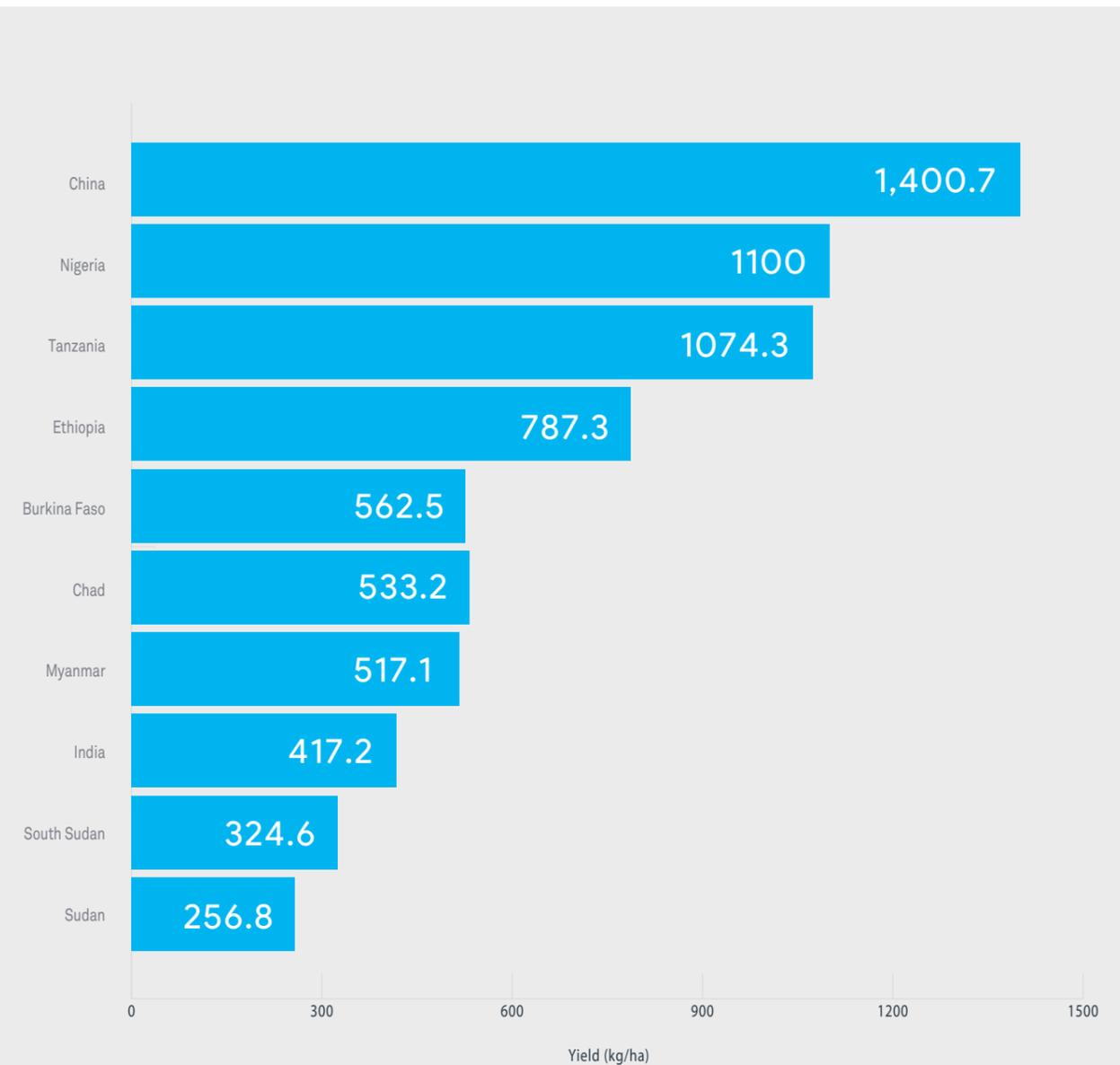


Figure 4. Potential sesame-growing regions, based on realised and potential cotton-growing regions of Australia (Matchett, 2018).

Where sesame can be grown in Australia

Sesame is a drought and heat-tolerant crop that can be grown across several soil types. In Australia, sesame is currently grown across northern parts of Queensland and Western Australia, and in the Northern Territory, but there is considerable potential for it to be grown across several states, territories and regions.



Opportunities for Australian sesame RD&E

Industry members

Limitations in Australia have been the lack of a sesame association or member-based structure to support the development and promotion of the industry, and the lack of a clear RD&E strategy that identifies growth opportunities or reduces entry barriers for the industry.

The formation of a sesame industry body will create a driving force and governance to ensure the investment priorities established within the Strategic RD&E Plan meet industry targets. The formal terms of reference established for the sesame Industry Reference Board (IRB), now the Australian Sesame Industry Development Association (ASIDA), will ensure that there is a strong underpinning process of establishing accountability and coordination of RD&E investments.

Domestic processing

Australia currently has limited ability to process sesame domestically. Based in Kingaroy, Queensland, Proteco Oils has a refinery equipped with highly specialised production units for complete oil processing, specifically for almond, macadamia, peanut and sunflower oils. However, they can also process sesame (Coriolis, 2017). Proteco Oils has previously pressed sesame, sourced from both Australian and internationally grown sesame seeds, however they have not pursued this in recent years (Sean Riley pers. comm., 2021). Savannah Sun Foods is currently establishing small-scale facilities in Cairns, Queensland to enable the dehulling and pressing of sesame oil that will use only Australia-grown sesame seeds (Tony Matchett pers. comm., 2021).

The business management systems in the sesame-producing developing countries of Asia and Africa are not as mature as developed countries and provide an opportunity for Australia to be significantly more efficient through the supply chain. It is envisaged that an Australian domestic processing capability will open a range of other markets and product lines for sesame in Australia.

Value-add

Sesame has a diverse range of uses, from direct consumption as a food and in food products, through to its use in nutraceuticals and pharmaceuticals including cosmetics, and in paint (Rahman et al, 2019). Despite value-added sesame products being economically more profitable than raw sesame seed due to their high price in international markets, they have not received as much emphasis (Pathak et al, 2014).

New sesame varieties that increase yield per hectare, and quality traits including non-dehiscence of sesame, makes growing sesame a more attractive option than it has previously been (Rahman et al, 2019). Value-adding from production innovations, such as non-dehiscence of sesame, can be achieved through collaboration models, financial models and transportation models. Health-conscious consumers and increasing environmental awareness have meant organic sesame has emerged as a strong market (Munyua et al, 2013). Organic sesame production can increase the value of products by up to 30% in the international market (Rahman et al, 2019).

Sesame oil extraction is the most common value-adding activity and attracts good premiums. Oil is extracted by pressing raw sesame seed. Sesame seeds' high-quality oil is rich in polyunsaturated fatty acids and the natural antioxidants sesamin, sesamol and tocopherol homologues (Brar, 1979). These bioactive components enhance the stability and keeping quality of sesame oil (Pathak et al, 2014). Sesame oil contains 39% polyunsaturated fatty acids (Bhaskaran et al, 2006). The oil has a long shelf life because of the presence of antioxidants and is excellent when used as a frying oil (AgMRC, 2021). Toasted sesame oil, which provides a lovely aroma, is used as a flavouring agent in cooking (Rahman et al, 2019). Sesame is also gluten-free for those with an intolerance, or who would simply prefer this option.

The bioactive components of sesame also provide numerous health benefits (Pathak et al, 2014; Elleuch et al, 2011; Shivhare and Satsangee, 2012). Sesame's use in nutraceuticals has stemmed from the activity of these

bioactive components, for example it purportedly inhibits cholesterol production (Pathak et al, 2014). In addition to healthy fats, sesame is a good source of plant protein and is an alternative plant-based source to animal-derived proteins and fats in human diets. Sesame is also a good source of vitamins, minerals and fibre (Elleuch et al, 2011; Zebib et al, 2015). Sesame's use in cosmetics is due to the beneficial effect of its components, including vitamin E and myristic acid, on the skin (Pathak et al, 2014; Shivare and Satsangee, 2012). It is also used in a range of soaps, perfumes and bath oils (Rahman et al, 2019). Pharmaceutical applications of sesame have arisen as the oil is naturally antibacterial and has anti-inflammatory agents (Singh et al, 2015). When used in pharmaceutical applications, the oil is extracted from high-quality seed and is more refined than normal edible oil. The perceived health benefits of sesame as an antioxidant and as an ingredient in pharmaceutical products have supported the expansion of sesame markets (Rahman et al, 2019).

Food innovations that develop new products, such as sesame milk and Tahini, a dip made from toasted sesame, have also contributed to the growing demand for sesame seed (Rahman et al, 2019). The residue of high-grade sesame oil extraction is a high-protein-containing meal that has multiple uses, including as flour for baking. Sesame meal contains a crude protein content of 47.1% to 52.9%, with the amino acid composition similar to that of soybean meal (Deyab et al, 2009). Lower-grade sesame meal is superb as feed for poultry and livestock (Rahman et al, 2019).

Ground sesame seed is used in soup (African cuisine), sweets (in the Middle East) and in a variety of curries (Indian subcontinent). Use of roasted black sesame for dressing meals, such as salad, rice or meat, is common in Japan, Republic of Korea, Taiwan and China. Black sesame ice cream is now available in many countries, including Australia. Sesame seed toppings on breads, sausage rolls and other bakery products is also observed worldwide, including in Australia.

Overall, the strong and ongoing growth in demand, both domestically and internationally, provides an opportunity for the commercial production of Australian sesame. Australia has competitive advantages, with clean, green, high-quality production and high-productivity agriculture, which are supported by a culture of innovation, and proximity to export markets. The industry has the capacity

to develop domestic processing facilities and develop new and value-add products to service the domestic and international markets craving high-quality produce, of known quality and provenance, and with a consistency of supply. Development of effective business strategies and enabling environments supported by world-class RD&E and government programs can result in a highly lucrative and sustainable sesame industry in Australia.

Sesame logistics and transport in Australia

For the emerging sesame industry, the selection of locations for growth must carefully consider available transport and logistics opportunities and the associated challenges, including competing needs (Alexander Paz pers. comm., 2021). Transport agencies are very interested in selecting projects that result in the best-possible impact for local communities and the economy (Queensland Freight Strategy, 2019). The introduction of new products such as sesame, which could replace less-profitable crops, is likely to influence where and what is done with the roadway network. However, corresponding coordination and strategic decision-making is required, as well as the development of mechanisms that support the associated activities (Alexander Paz pers. comm., 2021).

The Australian inland transport system used to support the agriculture industry is primarily reliant on a limited and low-capacity network of roadways. There is a significant need to expand this network and provide a more competitive and efficient transport and logistics system (Queensland Freight Strategy, 2019). Considering climate change and the vulnerability of the existing transport system to natural disasters, freight planning must consider resilience measures, including a multimodal network with alternative connectivity (Queensland Freight Strategy, 2019). However, transport agencies worldwide have limited resources to maintain, operate and expand their networks (Queensland Transport and Roads Investment Program, 2020). Quality freight data is required to inform policy, planning and investment decisions (Queensland Freight Strategy, 2019) to ensure resources are well-targeted.



Strengths, weaknesses, opportunities, threats

Strengths	Opportunities	Weaknesses	Threats
<ul style="list-style-type: none"> Sesame is highly heat and drought-tolerant, and is suited to the climate of many regions across Australia (similar to cotton). Strong biosecurity systems will protect the Australian sesame industry, minimising supply and market access disruptions. Australia has a well-earned clean, green reputation with high-quality agricultural production and processing systems. Australia has a highly skilled and innovative agricultural labour force and stakeholders. There is local/domestic market demand, especially for quality and nutritional products. Australia has good transport systems in most regions. Proximity to key Asian markets – demand on our doorstep and several free trade agreements (FTAs) already in place. Australian Government willingness to generate FTAs and export protocols as required. Availability of new, non-dehiscent varieties that can be mechanically harvested. Sesame can be used as a summer crop in rotations, offering flexibility. Greenfield opportunity – a new industry means fresh eyes can optimise production systems from industry establishment. There is strong interest from consumers in health, healthy foods and cosmetics where sesame can be marketed. The creation of the Australian Sesame Industry Development Association (ASIDA) means there is an industry body in place to drive implementation of the Strategic RD&E Plan and overall industry growth. 	<ul style="list-style-type: none"> A new RD&E Strategic Plan to be implemented. A strong innovation system and culture that can be applied to sesame. Ability to scale quickly from early trials to commercial production. Can develop value-added products, e.g., health products (pharmaceutical/nutraceutical), Potential to develop purpose-built sesame domestic processing facilities. Market demand for quality product, food safety, traceability, and corporate social responsibility (CSR) certification, especially for domestic markets. Potential to produce organic sesame. Systems flexibility – can be grown as a cover crop, rotational crop, dryland option. Climate may permit two crops per year. Quality extension capability, capacity, and systems/structures to support growers. Accredited agronomists. Expanded planting windows, particularly in northern areas due to favourable Australian climate. Identification of effective chemistry for weed, disease and pest control. Supportive government/s for development of new export markets. Potential to develop Agricultural Production Systems sIMulator (APSIM) model for sesame to assist growers. Linkages with universities to establish postgraduate projects to address RD&E challenges. 	<ul style="list-style-type: none"> Lack of medium-to-long-term experience with sesame (all aspects from planting to harvest, storage, markets, extension and accreditation). Lack of suitable germplasm for all conditions. Knowledge of extent of growing range and suitability on heavy soils. Weed prevalence/competition, especially at establishment. Unknown input costs. Lack of export protocols to some key potential markets, including known maximum residue limits (MRLs). Higher cost of production (labour) compared to some other producer countries. Lack of knowledge on potential pests and diseases, effective control options (especially under Australian conditions), and registered products for management. Specialist/skilled labour availability (due to the COVID-19 pandemic or otherwise). Current limited postgraduate and student capacity. Transport distances and optimised logistical systems limited in some areas. Lack of specific domestic sesame infrastructure (i.e., processing facilities). Variable and extreme climate; extreme weather in northern Australia, e.g., rain can delay planting. 	<ul style="list-style-type: none"> Biosecurity incursions. Trade politics. Price fluctuations. Competition, especially from established and/or mechanised suppliers (US). Community acceptance – social license and knowledge of opportunity. Lack of risk management options. Competition for R&D funds. Potential geographic spread of industry, increasing costs and/or inefficiencies.

Research

There are several sesame research and development projects either underway or recently completed in Australia.

Current and completed Australian RD&E projects

1 Soil-borne pathogens of sesame

Timing
2021
8m

Research provider/s Savannah Sun Foods and University of Southern Queensland (USQ)

Funding body Savannah Sun Foods and USQ

Seeds Equinom

Description Research study determining the effect of some of the most common soil-borne pathogens in Queensland that could potentially affect sesame, namely *Macrophomina* spp., *Pratylenchus* spp., and arbuscular mycorrhizal symbiosis. Machine-harvested.

2 Australian Sesame Strategic RD&E Plan

Timing
2020-2021
7m

Research provider/s Susentom (lead), Savannah Sun Foods, Scientific Leadership Services and Cesar Australia

Funding body AgriFutures Australia

Description The key outputs include the development of this Strategic RD&E Plan, establishment of an Industry Reference Board (IRB) and an associated terms of reference (ToR), and the identification of insecticides to manage the sesame leaf webber (*Antigastra catalaunalis*).

3 Sesame emergence in dryland production

Timing
2020-2021
2yr

Research provider/s Queensland Department of Agriculture and Fisheries (QDAF)

Funding body QDAF

Description Scoping study looking at planting and emergence strategies for dryland production on the cracking clays of the Flinders catchment. Hand-harvested.

4 Root diseases of sesame

Timing
2020-2021
1yr

Research provider/s USQ

Funding body QDAF Broadacre Cropping Initiative

Description The project will produce a comprehensive literature review outlining the potential occurrence and impact of major disease threats to sesame in Queensland; and undertake small-plot research using 'trap crop plots' to capture root diseases in sesame when planted in summer crop-growing areas in Queensland.

5 White sesame variety trials in Kununurra

Timing
2020
1yr

Research provider/s Northern Australia Crop Research Alliance (NACRA)

Funding body AgriNatura

Seeds Equinom

Description A commercial evaluation trial was performed in Kununurra WA to evaluate five Equinom sesame varieties for wet-season planting. Machine-harvested.

6 Seed increase trials utilising Equinom black sesame non-shattering genetics

Timing
2020-2021
2yr

Research provider/s Savannah Sun Foods

Funding body Savannah Sun Foods

Seeds Equinom

Description This trial evaluated black sesame as a potential oilseed crop for northern Australia and production of seed for future trials and commercial production. Machine-harvested.

7 Agronomy trials

Timing
2020-2021
2yr

Research provider/s	Savannah Sun Foods, NACRA, QDAF and Central Queensland University (CQU)
Funding body	AgriFutures Australia
Seeds	Equinom
Description	Herbicide screening (targeting broadleaf weeds) to assess effectiveness, growth and impact on sesame, and variety x environment x time of sowing x plant density trials to assess yield across northern Western Australia, and north and central Queensland. Machine- and hand-harvested.

9 Developing a broadacre cropping sector in North Queensland – Sesame line yield trials phase II

Timing
2020-2021
2yr

Research provider/s	QDAF
Funding body	Cooperative Research Centre for Developing Northern Australia (CRCNA) and Grains Research and Development Corporation (GRDC)
Seeds	Equinom
Description	Sesame lines were planted at Forest Home Station, Georgetown in 2020 and 2021. 2020 – two white-seeded and four black-seeded sesame lines planted. They failed to establish, and the trial was abandoned. 2021 – two white-seeded and two black-seeded sesame lines planted on 17 December 2020, and a second planting on 21 January 2021. The 17 December planting was impacted by weed competition and post-planting rainfall. Hand-harvested.

8 Sesame establishment and performance on clay soils in the Flinders River catchment

Timing
2020-2021
1yr

Research provider/s	QDAF
Funding body	Department of State Development, Infrastructure, Local Government and Planning
Seeds	Equinom
Description	The 2020 planting at Hopevale Station, Maxwellton, failed to establish due to lack of follow-up rainfall during the very dry wet season in 2020. The trials this year have established reasonably well but ongoing dry conditions since then are impacting crop performance. Hand-harvested

10 Spicing up the North

Timing
2019-2022
3yr

Research provider/s	CQU
Funding body	AgriVentis, CRC Northern Australia (CRCNA)
Description	Field trials assessing black shattering sesame varieties for seed yield, yield stability, and oil contents. Trials are currently located in Biloela, Rockhampton, Ayr and Tully (Queensland); Katherine and Coastal Plains (Northern Territory); and Kununurra (Western Australia). Yields of up to 3.3 t/ha were produced when harvested manually, with variation between varieties and location (Trotter, 2020). The CRCNA/CQU research team concluded from their early trials on black sesame that while the early results were encouraging, there remain several challenges to enable mature production. These include weed control, optimisation of mechanical harvesting, and providing robust agronomic information, especially concerning optimum planting times in the different regions and density of planting (Trotter, 2020). Hand-harvested.

11 Queensland Government's Blueprint for the North West Minerals Province (NWMP)

Timing
2019-2022
3yr

Research provider/s	Coriolis
Funding body	Department of State Development, Infrastructure, Local Government and Planning
Description	This project sits as part of the North West Queensland Economic Diversification Strategy Implementation Plan 2019-2021. It aims to identify high-potential buyers of sesame who may be able to collaborate with emerging NWMP growers to realise and fast-track the opportunity for sesame grown in the North West. Hand-harvested.

12 White sesame variety trial

Timing
2019
1yr

Research provider/s	Savannah Sun Foods
Funding body	Savannah Sun Foods
Seeds	Equinom
Description	6855 was the highest-yielding variety, with machine harvest yield of 1141 kg/ha. No variety was prone to shattering at harvest. Sesame webworm, <i>Antigastra catalaunalis</i> , was problematic throughout the growing season. Based on 2019 prices (US\$1500-1600/Mt), yields need to be 2 t/ha or above to be attractive for commercial production in the Ord River Irrigation Area, Kununurra, Western Australia. This should be explored through wet season plantings, varietal selection and plant populations. Machine-harvested

13 Sesame, a new and emerging industry for Australia

Timing
2018-2022
4yr

Research provider/s	Savannah Sun Foods
Funding body	Equinom and AgriVentis
Seeds	Equinom
Description	Agronomy trials on new sesame genetics from Equinom (white) and AgriVentis (black) to assist in developing management practices for growers to commercially adopt sesame production in Australia, including mapping of heat units throughout Australia to identify optimum planting windows. Machine-harvested

14 Sesame line yield trials phase I

Timing
2018-2019
2yr

Research provider/s	QDAF
Funding body	QDAF
Seeds	Equinom
Description	Sesame lines were planted at Forest Home Station, Georgetown in 2018 and 2019. 2018 – four white-seeded sesame lines planted (hand-harvested; yields ranged between 1.77 and 2.01 t/ha – yield differences not significant). 2019 – two white-seeded and two black-seeded sesame lines planted (hand-harvested; yields ranged between 2.23 and 2.64 t/ha – yield differences not significant). Hand-harvested.

15 White sesame variety trials in South East Queensland

Timing
2017-2020
4yr

Research provider/s	Eurofins Toowoomba
Funding body	Equinom
Seeds	Equinom
Description	Equinom's variety trials to evaluate and select the most suitable varieties for South East Queensland. Two varieties were selected for commercialisation – 6855 and 6859.

Current postgraduate RD&E projects

1 Assessment and extraction of bioactive compounds from black sesame products and by-products

Timing
2021-2023
2yr

Research provider/s	Elena Hoyos, Master's degree candidate in chemistry
Funding body	CQU
Seeds	AgriVentis

2 Evaluation of black sesame traits for adaption to rainfed tropical environment in northern Australia

Timing
2019-2021
2yr

Research provider/s	Sanjaya Timilsina, Master's candidate in crop physiology
Funding body	CQU
Seeds	AgriVentis

Industry consultation

This Australian Sesame Strategic RD&E Plan has been developed in close consultation with a key group of industry stakeholders. In the first instance, a core group of interested individuals and organisations were identified at the start of the project by the project team. This group formed the basis of the Sesame Stakeholders Group (SSG).

In mid-January 2021, the SSG was contacted by email to introduce the project, seek contacts of other potential stakeholders, clarify the scope, obtain any relevant documentation and seek a first round of suggested key thematic and priority areas for research.

Subsequently, first drafts of the industry profile, strengths, weaknesses, opportunities and threats (SWOT) analysis, and RD&E themes were prepared and provided to the SSG. In mid-February 2021, 16 SSG members participated in a series of inception meetings via Zoom to obtain input on these papers. Three meetings were held to ensure maximum input from the range of stakeholders. The focus was to:

1. Provide feedback on the industry profile and SWOT.
2. Develop a 20-year vision and identify the key outcomes desired from the Strategic RD&E Plan.
3. Identify the key gaps in the strategies and activities of the Strategic RD&E Plan.
4. Commence discussion about the establishment of the IRB.

At this time, the SSG had grown to 35 members, categorised as follows:

- Industry – 16
- Industry organisation – 3
- Grower – 3
- Researcher – 9
- Government – 4

The second draft of the Strategic RD&E Plan was prepared and sent to the SSG in early March, followed by a two-day workshop attended by 18 SSG members (in-person and online) on 10-11 March 2021.

Following the March 2021 workshop, the revised Strategic RD&E Plan was circulated to the SSG for review, and the final draft developed. Feedback was sought from the IRB and AgriFutures Australia before the IRB endorsed the Australian Sesame Strategic RD&E Plan on 31 May 2021.

**Australian Sesame Strategic
RD&E Plan 2021-2026**



Australian Sesame Strategic RD&E Plan 2021-2026

At a glance

Vision

Australian sesame is the product of choice for domestic and global markets, with the industry recognised for innovation and excellence in production systems and products.

Mission statement

The Australian sesame industry will:

- Be built on purpose-developed and/or adapted germplasm and genetics.
- Be an established, resilient, profitable and sustainable industry.
- Produce a substantial proportion of the world's traded sesame crops.
- Achieve world-leading yields and high-quality produce.
- Attract a wide grower base, forming a key component of flexible cropping systems across several regions.
- Process a range of high-quality, premium, value-add, innovative and accredited products and co-products for multiple domestic and international markets.

Strategic RD&E Plan outcomes

Before 2026, the sesame industry will have established itself in Australia as a viable crop option in northern farming systems. The industry will have exceeded \$10m GVP by having:

Identified and secured elite germplasm

- Varieties suited to Australian conditions are identified and deployed.
- Superior varieties suited to high-value markets are deployed, with grower practices and products aligned with customer requirements; a robust set of receival standards are defined, as well as premium and discount scales that relate to customer quality parameters.

Established industry viability by resolving major agronomic and crop-protection issues, and demonstrated competitive and sustainable production

- Growers have the management knowledge required for high establishment and productivity.
- Growers are applying best agronomic practices to maximise productivity.
- Growers are applying best practice to manage pest, weed and disease threats.
- The industry has appropriate chemistries available to support production (APVMA approvals).
- The industry understands and can manage biosecurity risks.
- Harvesting technologies for Australian farming systems and quality requirements are developed and deployed.
- The industry is climate resilient, with climate risk and adaptation options understood.

Produced high-quality sesame through the post-harvest supply chain

- Effective storage and handling standards and systems are in place.
- Domestic processing and product manufacturing infrastructure is established.
- Competitive transport and logistics infrastructure systems are established.

Established sesame industry key capacity and capabilities

- ASIDA is actively leading industry development, including implementation of the Strategic RD&E Plan.
- A set of industry best management practice (BMP) manuals are available.
- Core capacity of accredited agronomists and consultants to support growth of the industry are in place.
- Benchmarking of key performance indicators is completed.
- R&D capacity is supporting industry development.

Engaged and supportive communities

- The community (rural, regional, Indigenous and broader) is engaged and supportive through communication of the sesame story; industry has a social license to operate.
- Environment, social and governance (ESG) data is understood, collected and reported.

Established markets for Australian sesame

- The customer and consumer behaviours are clearly understood; domestic and international markets are clearly identified.
- Product, quality demands and standards are developed and are being met.
- Innovative new products (including co-products) are in development for further value-add and new markets.

The road ahead

The Sesame Strategic RD&E Plan detailed below is nominally a five-year plan. However, achieving the 2026 outcomes described is contingent upon the level of funding and investment that is secured, and noting that many later activities are contingent upon early activities being completed successfully.

Each theme and strategy relates to the outcomes described. Each activity describes an RD&E investment area, and includes key performance indicators (KPIs), the recommended timeframe for investment over a five-year period and the relative priority of the activity, classed as very high, high, medium and low.

The Strategic RD&E Plan should be evaluated regularly, against the KPIs described for activities and for progress towards the theme outcomes, by ASIDA. In 2025, as part of and including the proposed National Sesame Conference (see 'Communication and extension'), a full progress review against theme and strategy outcomes should also be assessed by ASIDA and potential funding bodies with a view to developing a new or updated Strategic RD&E Plan.

Australian Sesame Strategic RD&E Plan 2021-2026

1 Theme – Elite germplasm is identified and secured

Justification

Varieties suited to Australian conditions need to be identified and deployed. Growers need varieties that will suit mechanical harvesting, a variable and changing climate, and multiple farming systems. The varieties must also produce high yield and high-quality seed, and associated products that are aligned to customer requirements, especially in high-value and niche markets suited to premium produce.

Strategies

- 1.1** Varieties suited to Australian climate conditions need to be identified and deployed.
- 1.2** Superior varieties suited to high-value markets need to be identified and deployed, with grower practices and products aligned with customer requirements.

Activities

- 1.1.1** Select varieties to suit Australian conditions, factoring in climate variability and change scenarios, to meet market opportunity and productivity.

KPI Two new varieties selected for oil, and two new varieties for baking/confectionary, available, by year 2

Timing Years 1-2

Priority Very high

- 1.2.1** Establish seed certification systems to ensure quality planting seed is delivered to producers.

KPI Recognised planting seed quality certification system operational, by year 2

Timing Years 1-2

Priority High

- 1.2.2** Select varieties to match receival standards (seed size, colour, oil content, etc) that have been established and associated matrix of premiums/discounts to align growers with customers.

KPI Receival standards accepted and published by Australian Oilseed Federation, by year 4

Timing Years 3-4

Priority Medium



2 Theme – Industry viability is established by resolving major agronomic and crop-protection issues, and demonstrating competitive and sustainable production

Justification

Growers require major agronomic issues to be resolved to establish industry viability. Knowledge is required of the optimal planting time by region, variety, seasonal conditions and farming systems/rotation to maximise likelihood of establishment and productivity. Growers also require knowledge to implement the best agronomic practices to optimise productivity, profitability and yield, including the impacts of abiotic and biotic stress, and options for including sesame into farming systems.

Strategies

- 2.1** Crop establishment – Growers require knowledge of the optimal planting time by region, variety, seasonal conditions and farming systems/rotation to maximise likelihood of establishment and productivity.
- 2.2** Agronomic practices to maximise productivity – Current knowledge of best agronomic management practices needs to be collated and distributed to growers. New knowledge needs to be continually developed to ensure best management practices with respect to crop nutrition, water use and stress, farming systems, and optimising interactions between genetics, environment and management.
- 2.3** Best practice to manage pest, weed and disease threats – The industry needs to understand pest, weed and disease threats, and how to mitigate and manage risk.
- 2.4** Chemistries are available to support production (APVMA approvals) – Growers require suitable chemistries that support control of pests, weeds and diseases, with clear guidance on their appropriate use, including as part of IDPM strategies, to maximise economic return.
- 2.5** Understand and manage biosecurity risks – The industry needs to understand and manage exotic biosecurity risks at national, regional and local levels.

2.6 Harvesting technologies for Australian farming systems and quality requirements – Growers need to understand harvesting technologies and techniques to minimise loss and maximise quality.

2.7 Climate resilience – The industry needs to be climate resilient and have ongoing assessment of climate risk and adaptation options.

Activities

2.1.1 Assessment of in-field planting technology and strategies to maximise the speed of emergence and early growth of the crop (including planting technique, by soil type and region).

KPI Current knowledge of best management practice shared, by year 2

KPI Planting technologies and strategies included in BMP manual by region, by year 5

Timing Years 1-5

Priority Very high

2.1.2 Identify planting windows by regions.

KPI Current knowledge of planting windows shared, by year 2

KPI Planting windows included in BMP manual by region, by year 5

Timing Years 1-5

Priority High

2.2.1 Desktop review of crop nutrition and its impact on yield and quality (% oil content/seed size).

KPI Nutrient recommendations refined and included in BMP manual by variety and region, by year 5

Timing Years 4-5

Priority Low

2.2.2 Research into understanding plant water use and requirements through the growing cycle, and impact of water deficit on growth and product quality.

KPI Plant water uptake (PWU) modelled, contributing to further potential RD&E investments, by year 4

KPI PWU incorporated into BMP manual, by year 5

Timing Years 4-5

Priority Low

2.2.3 Assess the impact of genetics x environment x management (G x E x M) to enable optimised interactions.

KPI Sesame growth model developed and validated using APSIM, by year 1

Timing Years 3-5

Priority Medium

2.2.4 Assess the impact of drought and heat stress on crop development, yield and seed quality.

KPI PWU modelled, supported by current data and new observations on yield and seed quality, by year 5

Timing Years 1-5

Priority Medium

2.2.5 Evaluate the cropping system options for adapting sesame to existing farming systems, including off-site or spillover benefits (carbon management, bee health).

KPI Generated knowledge about opportunities for sesame in farming systems gathered and published, by year 5

Timing Year 5

Priority Medium

2.3.1 Collate and promote adoption of current known best practices for pest, disease and weed control.

KPI Current pest, weed and disease knowledge delivered as management guide in year 1

Timing Year 1

Priority High

2.3.2 Identify and review current known and potential pest and disease threats, including their biology, ecology and management. Identify the RD&E gaps to enable the evaluation and development of response strategies and/or IDM/IPM/IPDM strategies. Develop a database of pest occurrence for learnings.

KPI Single industry database for pest occurrence and key learnings established, by year 1

KPI RD&E gap analysis of the pest and disease threats, and their biology and management, completed, by year 2

Timing Ongoing

Priority Medium

3 Theme – High-quality sesame is produced through the post-harvest supply chain

2.3.3 Identify primary weeds of concern and assess weed control/management options to limit early-season weed competition, including for planting as summer or rotation crop.

KPI Current and new knowledge for early-season weed management collated, by year 2

Timing Years 1-2

Priority High

2.3.4 Develop new integrated pest and disease management (IPDM) strategies for priority pests and diseases.

KPI Draft IDPM strategies included in BMP manual, by year 4

Timing Years 2-4

Priority High

2.4.1 Provide technical support/screening of chemistries, including maximum residue limits (MRLs), for registration by APVMA of important chemicals for pests and diseases.

KPI At least two chemistries available and permitted, with draft operations manual in year 2

Timing Years 1-2

Priority High

2.4.2 Develop economic thresholds for use of chemistries for control of key pests and diseases.

KPI Assessment of thresholds and their importance to operations completed as part of BMP manual, by year 5

Timing Year 5

Priority Low

2.5.1 Identify and review current known and potential exotic pest and disease threats, their biology, ecology and management, and potential risk mitigation strategies.

KPI Industry biosecurity plan developed, by year 3

Timing Year 3

Priority Medium

2.6.1 Develop a draft manual that identifies ideal harvesting systems and technologies suited to the varieties and farming system employed under Australian conditions.

KPI Draft manual for growers delivered, by year 2; included as part of BMP manual, by year 5

Timing Years 1-2

Priority Medium

2.7.1 Model climate change and risk scenarios based on Intergovernmental Panel on Climate Change (IPCC) climate forecasts, combined with known growing range of sesame, to assess risk and opportunities for regions.

KPI Report produced modelling climate scenarios matched to sesame growing regions, by year 4

Timing Year 4

Priority Low

Justification

The post-harvest supply chain needs to be developed and managed to maintain product quality and integrity through the system to the customer.

Strategies

3.1 Storage and handling – The integrity of the product is critical, especially as a high-value product with multiple uses, and therefore management practices and standards that are effective and are implemented early in the commercial phase are necessary to reduce the risk of downgrading produce quality and consequent market share loss or reputation loss.

3.2 Processing and product manufacturing – To supply domestic and international markets and provide significant value-add, domestic processing and product manufacturing infrastructure must be established.

Activities

3.1.1 Develop strategies to ensure maintenance of sesame stored medium-to-long term that consider optimum temperature and moisture conditions, and potential stored grain pests and their impact.

KPI Review complete of existing practices and standards for other commodities and other regions, to develop best management practices and identify key knowledge gaps for Australian conditions, by year 1

KPI Storage systems trialled and incorporated in draft BMP manual, by year 3

Timing Years 1, 3

Priority High

3.1.2 Develop optimal seed cleaning and grading systems and protocols.

KPI Systems developed and implemented that deliver to customer requirements, by year 2

Timing Years 1-2

Priority High

3.1.3 Develop an optimised and integrated post-harvest supply chain system.

KPI A multi-modal network and schedule to meet supply and demand needs established at an industry level, by year 5

KPI A supply chain platform that enables the planning and operations of the multi-modal network developed, by year 5

Timing Years 1-5

Priority High

3.2.1 Explore and optimise feasible processing facility/hub options for the Australian sesame industry in conjunction with key industry partners, other industries and potential co-funding arrangements.

KPI Prototype dehulling, roasting and oil expelling system trialled, by year 2

KPI Feasibility study of domestic processing facilities completed and discussed across industry, by year 2

KPI Processing facilities established and operational, by year 5

Timing Years 1-2, 3-5

Priority High

4 Theme – Australian sesame industry key capacity and capabilities are established

Justification

The industry needs strong leadership to develop, grow and ensure sustainability, with strong communication and engagement among key stakeholders. Well-developed management systems with certified growers, agronomists and consultants are required. Well-understood industry performance indicators should be benchmarked and measured, and the next generation of scientists developed to support the industry.

Strategies

- 4.1** Sesame industry body leading – ASIDA needs to actively lead industry development, including implementation of the Strategic RD&E Plan and its communication. ASIDA needs to include stakeholders from various components of the industry, including growers, processors, exporters, agronomists and researchers.
- 4.2** Sesame BMP – To enhance capacity and capability, and to demonstrate and communicate best practices being used, the sesame industry needs to develop an industry-wide BMP manual covering all aspects of the supply chain and certification system for widespread adoption.
- 4.3** Agronomists and consultants to support the sesame industry – To support growers and the development of the industry, the core capacity needs to be enhanced through training and accreditation of agronomists and consultants.
- 4.4** Key performance indicators – Industry key performance indicators and recognised benchmarks around production, quality, and environment, social and governance (ESG) are required.
- 4.5** R&D capacity – To support medium and long-term industry development, sesame-focused capability development should include undergraduate and postgraduate, and through postgraduate and postdoctoral, research opportunities, developed in conjunction with universities and other research agencies.

Activities

- 4.1.1** ASIDA to lead industry, communication and RD&E implementation.

KPI ASIDA has an established network, engages widely, and has secured an Industry Development Officer (IDO), Executive Officer (EO), or similar, by year 2

Timing Years 1-2

Priority Very high

- 4.1.2** ASIDA to explore industry body/association models to maximise industry buy-in and growth.

KPI Discussion paper written that explores industry body/association directions, by year 2

Timing Years 1-2

Priority Very high

- 4.2.1** Develop sesame industry BMP manual and certification system.

KPI BMP system, training and structure for certification established, by year 5

Timing Years 4-5

Priority Very high

- 4.3.1** Deliver training programs and accreditation manuals for industry.

KPI Twenty accredited agronomists, by year 5

Timing Years 4-5

Priority Medium

- 4.4.1** Develop the industry benchmarks by examining other industries and benchmarking systems.

KPI Potential industry performance benchmarks developed and assessed, by year 5

Timing Years 4-5

Priority Medium

- 4.5.1** Ensure sesame-focused capability included in undergraduate and postgraduate activities and research opportunities in conjunction with universities.

KPI Four postgraduate students completed sesame industry-specific activities, by year 5

KPI Sesame-specific information included in university training, by year 5

Timing Year 5

Priority Medium

5 Theme – Communities are engaged and supportive

Justification

The sesame industry needs to ensure that communities at various levels are engaged and supportive through communication of the sesame story, including its financial and broader benefits. Achieving this will provide a social license to operate and the development of expanded opportunities.

Strategies

- 5.1** Engaged and supportive communities – The sesame industry needs to ensure that communities (rural, regional, Indigenous and broader) are engaged and supportive through communication of the many positive aspects of the sesame story. This should include engagement and communication with communities in existing and potential production areas, relevant indigenous communities, and the broader community.
- 5.2** License to operate – To ensure the sesame industry has a social license to operate, economic, social and governance (ESG) data requirements, systems and processes need to be understood, and data collected/ collated and reported.

Activities

- 5.1.1** Develop and commence implementation of an effective engagement and communication plan.

KPI Key stakeholders and their views identified, to develop targeted communications, by year 2

KPI ASIDA has developed and is implementing an appropriate communication and engagement plan, with 50% of growers in potential growing regions aware of the opportunity, by year 5

Timing Year 2, Year 5

Priority Medium

- 5.2.1** Evaluate the ESG components of sesame, including community and consumer perceptions, to target appropriate and relevant communications.

KPI ESG values documented and fed into industry communication and extension plan for domestic purposes, by year 5

Timing Years 4-5

Priority Low



6 Theme – Markets are established for Australian sesame

Justification

Markets need to be clearly identified, domestic and international supply chains need to be understood, and linkages and relationships need to be formed. Markets can be accessed through government support as required, with provisioning information supplied to government from industry. Stakeholders require a detailed understanding of the market and export protocol guidelines; with this understanding, innovative new products can be developed for further value-add and to develop the Australian sesame brand.

Strategies

- 6.1** Markets are clearly identified and understood – Markets need to be clearly identified, domestic and international supply chains need to be understood, and linkages and relationships need to be formed. Customer and consumer preferences and trends must be understood in detail to inform industry and grower management decisions.
- 6.2** Product quality and standards – Growers and the industry require a detailed and shared understanding of product quality and standards for each of the identified markets, and must ensure those demands are met.
- 6.3** Innovative new products – The Australian sesame industry needs to take advantage of its clean, green image and innovation capacity to develop new products and co-products, and must examine positive functional values of Australian sesame, to create value-add and new market opportunities both domestically and internationally.

Activities

- 6.1.1** Develop an updated sesame market analysis.

KPI The industry has a revised detailed market analysis and assessment of opportunities publicly available (revised from Coriolis, 2018 and Rahman et al, 2019), by year 2 and 4

Timing Years 1-5

Priority High
- 6.1.2** Use e-commerce platforms to enhance market access.

KPI E-commerce platforms used to enhance market access, by year 2

Timing Years 1-2

Priority Medium
- 6.2.1** Develop and establish markets and export guidelines for export protocols with key markets.

KPI Key data and information supplied to government to support development of export protocols, by year 2

Timing Year 2

Priority Very high
- 6.2.2** Demonstrate food safety qualities of Australian sesame, including MRLs, as a competitive advantage.

KPI Demonstrated food safety procedures and guidelines established and embedded in industry BMP manual, by year 5

Timing Years 2-5

Priority High

- 6.3.1** Explore and develop a range of innovative value-add products, including co-products.

KPI New industry investment attracted to develop new value-add products, co-products, and market opportunities, by year 3

Timing Years 1-5

Priority Medium

- 6.3.2** Explore, evaluate and validate functional properties of sesame.

KPI Assessment of functional properties completed, by year 4

Timing Years 3-4

Priority Medium

- 6.3.3** Explore, evaluate and validate value of provenance (Australian/regional) on functional properties in markets and for market value.

KPI Assessment of functional properties completed, by year 4

Timing Years 3-4

Priority Medium

Communication and extension plan

The objectives of the communication and extension plan are to:

1. Build awareness of the Strategic RD&E Plan, and its strategies and expected outcomes, so that key stakeholders understand RD&E priorities and investments.
2. Increase potential for adoption of outcomes from the Strategic RD&E Plan by identifying target audiences and establishing appropriate contacts and communication channels.
3. Build awareness of the sesame industry opportunity among growers and the broader community.

The industry communication activities should be led by ASIDA but undertaken collectively with key industry stakeholders. Communication and engagement activities will need to evolve and expand as the industry demonstrates its viability and resources become available.

Key communication messages and products

- Sesame is a significant commercial opportunity for Australia.
- The industry has overcome the challenges of the past and unlocked the potential for sesame production.
- The industry can produce high-quality sesame suitable for premium domestic and international markets and a range of innovative and value-add products.
- The industry has a clear vision and is supported by a comprehensive Strategic RD&E Plan.
- The industry is led by a proactive ASIDA.
- Grower-targeted information on varieties, including the suitable growing conditions and best management practices, is available.

Key audiences and why they are needed

- Existing and potential growers across suitable regions – to enable sustainable growth of the industry.
- Industry and supply chain partners – to ensure commercial viability and access to markets.
- RD&E community – to provide innovation that supports industry development and new market opportunities.
- Relevant agronomists and extension specialists – to ensure the right advice is available to growers.
- State and federal governments (departments of agriculture and trade, APVMA) – to enhance development of industry opportunities, gain support for industry development, ensure appropriate chemistries are available, and ensure the industry has access to international markets.
- General community in potential growing regions – to raise awareness of and support for the sesame opportunity, including community benefits.
- Food companies and customers/consumers of sesame products – to raise awareness and understanding of Australian sesame and its advantages.
- Chemical companies and equipment suppliers – to enhance offerings to and support for growers and others in the value chain.

Key communication activities

- Grower champions and word of mouth.
- Media on the back of good news stories, including social media via existing communication channels.
- Dedicated sesame industry website.
- Development of information fact sheets and video guides (e.g., Vimeo/YouTube tutorials).
- Development of a BMP manual.
- Field days.
- National Sesame Conference 2025.
- Other conferences:
 - Northern Australia Food Futures.
 - Developing Northern Australia.
 - 20th Australian Agronomy Conference.
 - Australian Institute of Food Science and Technology.
 - Others as appropriate.

Implementation

As sesame is an emerging industry, the implementation of this Strategic RD&E Plan is the responsibility of all stakeholders. In the first instance, the Sesame Stakeholders Group (SSG) is now established as part of the development of this Plan. The IRB, now ASIDA, should take responsibility for overall leadership and co-ordination of the Plan, supported by the SSG.

The ASIDA terms of reference describe its purpose as:

- Be the primary source of leadership for the sesame industry.
- Be the primary driver and co-ordinator of the Strategic RD&E Plan.
- Actively engage key stakeholders to develop opportunities for the industry, be it with commercial, government or research partners (plant breeders, producers, processors, exporters, government, and markets).
- Serve as the key communication agent for the industry, including raising awareness of the Plan, latest RD&E activities and new knowledge.

- Serve as a key point of contact for industry stakeholders, government, media and broader community on information and knowledge in relation to Australian's developing sesame industry.

- Consider the appropriate needs and structures of an industry body as part of the industry's evolution.

- Secure appropriate resources to support ASIDA's activities (e.g., EO or IDO).

Membership of ASIDA is determined by the SSG, with members of the IRB initially appointed during the development of this Strategic RD&E Plan. It consists of representatives from growers, industry, government, research, agronomy and traders. ASIDA must always act in the best interests of the industry.

The key risks and mitigation strategies for implementing this Strategic RD&E Plan are outlined below.

Risk	Mitigation measure
Lack of RD&E funding.	Sesame stakeholders, led by the ASIDA, must champion the importance of the Strategic RD&E Plan and seek funding from multiple sources in a coordinated manner.
Lack of ownership of the Strategic RD&E Plan.	ASIDA must proactively own and implement the Strategic RD&E Plan, seeking to ensure maximum participation of stakeholders including growers, private industry, funding bodies, and researchers. ASIDA should ensure the SSG remains engaged and supportive through regular communication and engagement activities.
Lack of buy-in from key investors, research agencies and industry stakeholders of the significant sesame opportunity.	As per previous, specifically targeting key funders, research agencies and industry stakeholders. This will be especially important with successful completion of current and early trials.
Inability of voluntary IRB/ASIDA members to commit their own time and resources.	Sourced funding from AgriFutures Australia to establish the IRB in the short term (PRJ-012800). Medium and longer term, ensure ASIDA and its activities are supported by funding obtained from funders/donors, industry and government contributions, with an Industry Development Officer/Executive Officer (or equivalent) employed to support ASIDA and drive the Strategic RD&E Plan.



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