Towards a sustainable Australian temperate pasture legume planting seed market
The Australian Lucerne Seed Industry

by David Hudson, SGA Solutions Pty. Ltd.
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Foreword

This report is the first step in addressing objective one of the RIRDC Pasture Seeds Five-Year Research & Development Plan (2013–2018) which in part focuses on the overwhelming importance of understanding and growing the export market for Australian temperate legume pasture seed. The export market currently absorbs more than 70 per cent of certified temperate legume pasture seed produced in Australia, of which 90 per cent is lucerne seed. This is a domestic and an export market which appear to have potential for additional growth.

This report focuses on identifying the Australian lucerne seed industries strengths, weaknesses, opportunities and threats, together with the barriers and challenges that need to be addressed within global and domestic markets in order to provide a pathway forward for growth. While the focus is on the lucerne seed industry, this report provides a ‘template’ on which the broader temperate legume seed industry can develop a parallel pathway in to the future for consolidation and growth in domestic and export markets.

The report identifies that the Australian lucerne industry is at a crossroads in having to choose between remaining in the current ‘boom-and-bust’ cycle of supply and demand in traditional commodity markets or moving forward with a new vision for the industry. The vision for industry growth will need to focus on increased investment and commitment in research, development & extension (R,D&E), best-practice production (in order to reliably meet market requirements and expectations), and value-focused promotion and marketing to increase its market share in an increasingly competitive domestic and global market place.

To achieve growth in domestic and export lucerne seed markets through to 2020 and beyond will depend on the lucerne seed industry’s ability to embrace innovation, engage investment and adopt new products, technologies and marketing strategies in a manner that allows a timely realisation of the intended benefits of that investment by all lucerne seed industry stakeholders. The report concludes that a process is required to be established under the leadership of Lucerne Australia and the RIRDC to initiate industry engagement and to develop the vision and actions that will deliver on these outcomes for lucerne seed industry stakeholders.

This project was co-funded by RIRDC and Lucerne Australia, which provided cash and in-kind contribution.

This report is an addition to RIRDC’s diverse range of more than 2000 research publications and it forms part of our Pasture Seeds program, which aims to aims to maximise opportunities and minimise risks for a profitable and sustainable pasture seeds industry based on reputation for reliable supply, domestically and internationally, for a range of quality pasture species.

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

John Harvey
Managing Director
Rural Industries Research and Development Corporation
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Abbreviations

AF — Acre feet
AFIA — Australian Fodder Industry Association
AFRP — Alfalfa and Forage Research Program
AOSCA — Association of Official Seed Certifying Agencies
APRI — Alfalfa Pollinator Research Initiative
APS — Adventitious Presence Sensitive
APT — Adventitious Presence Tolerant
ASF — Australian Seed Federation
BMP — Best Management Practice
CCIA — California Crop Improvement Association
CFIA — Canadian Food Inspection Agency
CVWD — Coachella Valley Water District
FAO — Food and Agriculture Organisation
FAPRI — Food and Agriculture Policy Research Institute
GOZ — Grower Opportunity Zones
GM — Genetically modified
IFCN — International Farm Comparison Network
IID — Imperial Irrigation District
ISF — International Seed Federation
ML — Megalitres
MWD — Metropolitan District of South California
NAFA — National Alfalfa and Forage Alliance
NBT — New breeding techniques
NDFD — Neutral Detergent Fibre Digestibility
NIFA — National Institute for Food and Agriculture
RFQ — Relative Forage Quality
SARDI — South Australian Research and Development Institute
SDCWA — San Diego County Water Authority
TUG — Technology User Agreement
UAE — United Arab Emirates
US — United States
USDA — United States Department of Agriculture
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Executive Summary

As with many agricultural industries the Australian lucerne seed industry, based in the south-east of South Australia, suffers from the classical ‘boom-and-bust’ cycle driven by a combination of variability in environmental conditions, the value of the Australian dollar, export competition and fluctuations in domestic and export market demand for lucerne seed. The impact of this cycle has been accentuated through increasing competition for market share and market access in export markets primarily from lucerne seed supplied from the Imperial Valley in California (United States). The irony of this competition being that the US is Australia’s second largest export market, next to the Middle East.

The extended period of this cycle has led to a loss of capability, capacity and confidence in the Australian lucerne seed industry at a time when there are diminishing investments from both the public and private sectors into product innovation and market development.

As a result, the industry together with Lucerne Australia and RIRDC are at a crossroads as they have to collectively decide which of the following is the preferred pathway forward:

1. Is the Australian lucerne seed industry prepared to let opportunities for investment, innovation and access to new markets slip away to competitors and hence retain the current ‘status quo’ in which it operates (i.e. a boom and bust cycle of demand and supply)? or

2. Can the Australian lucerne seed industry, along with Lucerne Australia and RIRDC, create an environment with comprehensive engagement between supply chain participants and vested stakeholders including government and customers (domestic and export) for the purpose of building a sustainable and profitable industry for all stakeholders? The engagement includes well-defined processes for a clear pathway for investment in innovative products and markets for the lucerne seed industry that will ensure it builds on its competitive advantage in domestic and export markets.

The lucerne seed industry, through Lucerne Australia and RIRDC, is seeking to alleviate the ‘boom-and-bust’ cycle of the industry by commissioning SGA Solutions Pty. Ltd. to undertake market research into identifying what strategies are required to consolidate current markets, while at the same time identifying new opportunities for Australian-bred and produced lucerne varieties in domestic and export markets.

Underpinning the market research is a combination of:

i) desktop research that reviews the current global, US and Australian lucerne markets; and

ii) personal interviews with domestic stakeholders, international customers and competitors (i.e. Imperial Valley). Interview participants were asked to identify the strengths, weakness, opportunities, threats (SWOT) and the challenges and barriers that need to be addressed in order for the Australian lucerne seed industry to implement strategies that will build a sustainable and profitable industry for all stakeholders and customers.

The research identified the following in relation to the objectives of the project:

- While providing short to mid-term supply opportunities, the future of traditionally produced lucerne varieties such as Siriver, Supersonic is in question given the pressure existing in current export markets, such as Saudi Arabia. In contrast, there is an expanding market for new Australian-bred proprietary varieties in existing and, more importantly, new horizon markets. The challenge for the Australian lucerne seed industry is to assess the rate of change required to transition from being dominated by the ‘boom-and-bust’ nature of traditional markets into...
developing and supplying new products into new market opportunities, at the same ensuring current market needs continue to be met.

- Australian lucerne seed production expertise is currently perceived by customers and marketers as having room for improvement when compared to its competitors. From time to time this perception is reinforced when either the quality of seed exported requires further attention or contracts fail to be met. The challenge for the lucerne seed industry is to ‘raise the bar’ for the standards to be met in the production, processing and presentation of its product to the market.

- As the decline in investment directed towards RD&E continues, due to declining levies, Federal and State governments have withdrawn resources from supporting the broader pasture industry. The challenge for the lucerne seed industry is to collaborate with like-minded industry organisations to demonstrate to Federal and State governments the value pastures contribute to the Australian economy in order to gain the necessary level of investment and resource commitment commensurate with its contribution.

- A key competitive advantage of lucerne seed from the Imperial Valley, when it competes with Australian lucerne seed in export markets is the ability to sell and achieve a premium price based on promoting value-added benefits of their product. The challenge for the Australian lucerne industry, when competing in export markets, is to convert the current approach from being a ‘price setter’ to adopting an approach of ‘value-added selling’ of Australian lucerne products, based on the benefits and value they deliver.

- To be successful in the global lucerne seed export market requires investment in promotion of products and their benefits, not only from the perspective of gaining entry into new horizon markets, but often it is required to retain access to established markets. This is also the case in domestic markets where in the absence of traditional avenues of promotion (i.e. department of agriculture pasture agronomists) the benefits of lucerne as part of the pasture and fodder mix is now left to seed companies and consultants. The challenge for the Australian lucerne industry is to reignite and raise the profile of the benefits lucerne delivers both in export and domestic markets.

- The recent release of a range of new proprietary lucerne varieties developed in Australia has provided a platform for expansion and growth for Australian lucerne seed in established markets, such as Saudi Arabia and the US, but also in new horizon markets in Europe, Africa and Asia. This growth opportunity is essentially driven by the growing demand for dairy products from the same regions. At the same time due to expected increases in feed base demand from the dairy, beef and sheep industries in Australia opportunities for growth in demand for lucerne seed in the domestic market also exist. The challenge for the Australian lucerne industry is to ensure it clearly confirms, quantifies and prioritises these export and domestic market opportunities.

- The cornerstone of the lucerne industry has traditionally been innovation through the development and release of new varieties. In recent years the introduction of biotechnology and more recently new breeding techniques (NBT) has created opportunities, however at the same time it has created market risk due to the lack of synchronization in market acceptance and de-regulation. For the Australian lucerne industry there are a number of long-term opportunities for product improvements through the adoption of these technologies. The challenge for the Australian lucerne industry is that in the short term Australia’s export and domestic ‘GM-free’ markets are at risk if GM lucerne were to be found as it would lead to market disruption and the closure of these markets.

In response to these findings the following recommendations are put forward for consideration by the industry, Lucerne Australia and RIRDC:
1) It is recommended that Lucerne Australia evaluate, through market research and intelligence, the future in domestic and export markets for traditionally produced varieties, such as Siriver, versus new proprietary varieties and near term product development opportunities such as low lignin technology. Based on this assessment Lucerne Australia needs to clearly articulate individual market requirements and develop industry-agreed goals and objectives for market access, market share and the role of new technology advancements.

2) It is recommended that Lucerne Australia and RIRDC invest in the development of an appropriate accredited training program for seed producers with the aim of up-skilling supply chain participants to a standard where it is regarded as ‘world’s best practice’.

3) It is recommended that Lucerne Australia and RIRDC take leadership to engage and collaborate with ‘like-minded’ pasture-related industry organisations in the development and presentation of a case to the Federal Government that will see pastures adopted as a cross-sectoral platform within the National R, D & E Strategy Framework.

4) It is recommended that Lucerne Australia engages with industry stakeholders to reposition Australian lucerne products in the market by way of promoting to the domestic and export livestock industries (primarily dairy) the benefits and value of Australian proprietary lucerne varieties to customers in established and new horizon markets.

5) It is recommended that Lucerne Australia approaches organisations such as Austrade and Food Innovation Australia to seek their support and expertise in the development and implementation of a range of market development activities in domestic and export markets, where the opportunity exists to promote the value and benefits of Australian lucerne varieties and the quality of the seed produced.

6) It is recommended that Lucerne Australia actively seeks to broaden its membership across the lucerne industry supply chain and its stakeholders, especially seed producers. To achieve this will require Lucerne Australia to re-evaluate its role and ensure it continues to focus on delivering benefits across the breadth of its membership.

7) It is recommended that to alleviate the risk of market disruption from a potential adventitious presence event with GM lucerne in non-GM lucerne, Lucerne Australia facilitates the de-regulation of GM lucerne (i.e. Roundup Ready®) in Australia, while at the same time imposing an industry-based moratorium on growing GM lucerne until such time as trade and market access issues no longer threaten the domestic and export markets for Australian lucerne seed.

The challenge for Lucerne Australia is to develop and gain stakeholder engagement and ‘buy-in’ to supporting a mutually-agreed ‘vision for the Australian lucerne industry’, which encompasses the recommendations outlined.

The path forward for the Australian lucerne seed industry, Lucerne Australia and RIRDC will depend on more than rhetoric. To remain internationally competitive and meet the potential for growth through to 2020 and beyond will depend on the lucerne seed industry’s ability to embrace innovation, engage investment and adopt new products, technologies and marketing strategies in a manner that allows a timely realisation of the intended benefits of that investment by all stakeholders.

To achieve the desired outcomes outlined a process needs to be established under the leadership of Lucerne Australia and the RIRDC to initiate and co-ordinate the actions required to deliver on these outcomes.
Introduction

The Australian temperate pasture legume seed market comprises seven major species, producing an estimated 20 000 tonnes of planting seed a year at a value of A$110 million. An estimated 5000 tonnes are sold into the domestic market and 15 000 tonnes are exported. Lucerne is the major contributor (80%) to the temperate pasture legume seed market, followed by: sub-clover, perennial clover, annual clover and medic. As the major contributor to the market, this project focuses on the lucerne seed industry, its strengths, weaknesses, opportunities and threats within the global and domestic market place in order to provide a ‘template’ for the pathway forward for the broader legume seed industry.

As with many other agricultural industries the Australian lucerne seed industry, based in the south-east of South Australia, suffers from the classical ‘boom and bust’ cycle driven by a combination of fluctuations in environmental condition, the value of the Australian dollar, export competition and fluctuations in domestic and export market demand for lucerne seed. The impact of this cycle has been accentuated through increasing competition for market share and market access in export markets primarily from lucerne seed supplied from the Imperial Valley (US). The irony of this competition being that the US is Australia’s second largest export market, next to the Middle East.

The extended period of this cycle has led to a loss of capability, capacity and confidence in the Australian lucerne seed industry at a time when there are diminishing investments from both the public and private sectors into product innovation and market development.

Through Lucerne Australia, RIRDC and the pasture seed industry is seeking to alleviate the ‘boom-and-bust’ cycle, by: identifying opportunities to consolidate current markets; seeking new opportunities for Australian-bred proprietary lucerne varieties in domestic and export markets; and ascertaining the barriers to achieving growth in these markets.

This project aimed to identify and recommend strategies required for success through qualitative and quantitative research with a combination of desktop research and personal interviews with domestic stakeholders, international customers and competitors. This approach revealed the strengths, weakness, opportunities, threats, together with the challenges and barriers that need to be addressed for these strategies to be successful.

The following report presents the outcomes of the project, which identify:

- the market environment in which the Australian lucerne seed industry operates including drivers for lucerne seed demand and supply in domestic and global markets, a profile of major competitors and where opportunities exist in new horizon markets, management and product development through technology innovation;

- opportunities to achieve continuity and growth in domestic and export market demand for Australian lucerne seed;

- the competitive advantages that currently exist, or will be required, for Australian lucerne seed growers to regain a competitive advantage in the market; and

- the requirements to create a platform for investment in rebuilding capability, capacity and confidence in Australia’s lucerne seed industry.
Objectives

The objectives of this project were to:

1. Identify and scope the current Australian domestic and export lucerne seed market, including market segments, supply chain structure, participants, volumes and value.

2. Identify and profile current export customers for Australian lucerne seed focusing on their view of Australian temperate pasture legume seed as it relates to all aspects of supply and market opportunities.

3. Identify and profile current export competitors for Australian lucerne seed in export markets (Imperial Valley, US), including agronomy practices, costs of production and marketing strategies implemented to compete with Australian-sourced pasture seed.

4. Identify and profile current Australian lucerne supply chain including seed growers, marketers and customers (export hay, irrigated and dryland forage, pasture and cropping systems), including strategies implemented to compete in the export and domestic markets in which they participate.

5. Identify and evaluate export and domestic markets including identifying strategies for adoption by the Australian lucerne seed industry, Lucerne Australia and RIRDC; the outcomes of which will:
   - provide continuity and growth in domestic and export market demand for Australian lucerne seed;
   - provide a competitive advantage to Australian lucerne seed growers exporting their product; and
   - lead to investment in the rebuilding of capability, capacity and confidence in the domestic lucerne seed industry.
Methodology

The research methodology applied to generate the quantitative and qualitative data, which formed the platform for the report's results and discussion comprised six components:

1. A desktop quantitative analysis of the Australian lucerne pasture seed market, including market segments, supply chain structure and participants.

2. A SWOT analysis of the current export market through personal interviews with international customers at the International Seed Federation Conference, Poland 2015.

3. In total 28 interviews were undertaken with Australian lucerne seed customers from countries including: Argentina (5), Canada (1), Chile (1), France (1), Germany (1), Greece (1), Italy (4), Portugal (1), South Africa (2), Spain (1), Turkey (1), and the United States (9).

4. A SWOT analysis of the current major competitors in the global lucerne seed market through personal interviews with supply chain and industry participants based in the Imperial Valley, US. In total 18 interviews were undertaken with representatives from US, including: seed company representatives (6), seed producers (3), commercial technology developers (1), seed processors and marketers (1), export lucerne hay processors and marketers (1), R, D & E providers (3), and industry organisations (3).

5. A SWOT analysis of the current Australian lucerne seed market through personal interviews with supply chain participants (14), including: seed company representatives (6), seed marketers (2), seed processors (2), industry consultants (2), and industry organisation representatives (2).

6. A SWOT analysis of the current domestic market through personal interviews with customers in segments including planting seed, export hay, irrigated and dryland forage, pasture, and cropping systems, including representatives from: the fodder industry (1), seed companies (6), the dairy industry (1), and the beef industry (1).

7. Collation and evaluation of the information from the desktop and various SWOT analyses, identifying implications and strategies for the growth of the Australian lucerne seed domestic and export markets.

For the purpose of the writing the report the various SWOT analysis completed were collated and incorporated with the desk top market analysis to generate the Results, Implications and Recommendations.
1. Market analysis

1.1 Global lucerne market

Medicago sativa L. (lucerne/alfalfa) has long been referred to as the ‘queen of forages’ (Summers & Putnam, 2006). Its wild relatives (Medicago spp.) are distributed in vast regions, from Spain to China and from Sweden to North Africa.

Lucerne has a cultivation history of more than 4000 years. It was first cultivated in Iran, Turkmenistan and Caucasus in 2000 BC, as verified by archaeological evidence, and in Babylon in 700 BC as recorded in written documents. It was described by Greek writers, in 490 BC, introduced to China in 126 BC, and clearly recorded in Greek and Roman writings in 500 AD. Subsequently, the perennial legume spread from Iran to Spain and the Near East in 1100 AD, from Spain to France in 1550, and then to Belgium and Holland by 1565. Lucerne arrived in the United Kingdom in 1650, and Germany and Austria in 1750; it reached Sweden in 1770, and finally arrived in Russia in the 19th Century.

During the early colonisation of the Americas in the 16th Century, Spaniards and Portuguese introduced lucerne to Mexico and Peru, respectively. Lucerne quickly spread through South America, and several major introductions into the southern United States, where it is known as ‘alfalfa’ to this day, occurred from this region.

Thomas Jefferson introduced South American ‘alfalfa’ to the US state of Georgia in 1736. By 1850 ‘Chilean alfalfa’ was grown in California, and missionaries had brought numerous introductions from Mexico or Peru (‘Peruvian’) into Texas, Arizona and New Mexico.

There is little historical record about the cultivation of lucerne in New Zealand, and it is commonly considered that Europeans introduced lucerne to New Zealand by 1800.

Lucerne was successfully introduced to Australia in 1806, during its early period of colonisation.

1.1.1 Global lucerne market drivers

The demand for lucerne (grazing, hay, silage, processed and seed) is a derived demand in the sense that it depends on the demand for lucerne hay, silage, pellets and meal primarily in the dairy industry.

Increased demand for lucerne by livestock producers translates into increased demand for seed. Specifically, increased numbers of dairy cows increases the demand for high-quality lucerne and in turn planting seed for establishment of paddocks for grazing, silage and/or fodder production.

The International Farm Comparison Network (IFCN) dairy industry forecast for 2014–24 notes three key upward trends that will lead to increased demand for lucerne as part of the global dairy feed base. These trends (quantified in Figure 1.1) are:

- increases in milk supply and demand
- increases in dairy cow numbers (and average milk yield per cow)
- increases in the average dairy farm and herd size (corresponding with a decline in the overall number of dairy farms).
As a result, the IFCN forecasts global milk production to increase across all key regions, most notably in Africa, India and South America, although production is forecast to decline in Japan and Korea. (Figure 1.2 and Figure 1.3)

**Figure 1.1: Key global dairy industry indicators (2014–25)**

Source: International Farm Comparison Network (IFCN) (2013)

**Figure 1.2: Global milk production forecast by region (2014 versus 2025)**

Source: International Farm Comparison Network (IFCN) (2013)
Figure 1.3: Global milk supply and deficit by region (2025)
Source: International Farm Comparison Network (IFCN) (2013)

In countries of interest to US and Australian lucerne seed exporters (China, the Middle East, Argentina, Brazil and the US) milk production increased between 2000 and 2007; whereas in Japan production fell and in Korea it remained flat (Figure 1.4).

Figure 1.4: Milk production in countries where Australian and US lucerne seed is exported (2010–25)
1.1.2 Global lucerne production

Global lucerne production (forage, hay, silage and seed production) has steadily taken hold due to the plant’s vitality, wide range of adaptation, high production, superior feed quality and multiple uses. Lucerne is currently estimated to be grown across about 30 million hectares (ha) worldwide, down from about 33 million ha during the 1970s and 32 million ha in the 1980s.

Currently, lucerne production is mainly distributed across temperate regions such as: the US, Canada, Italy, France, China and southern Russia in the Northern Hemisphere, and Argentina, Chile, South Africa, Australia and New Zealand in the Southern Hemisphere (Map 1.1).

Map 1.1. Global lucerne production areas

Source: Andrew, M.T. (2014)

Since 2000 the global production of lucerne hay and silage has declined from 477.52 million tonnes to 324.53 million tonnes in 2013, representing an annual average decline of 3.18 per cent per year (Figure 1.5).

The primary drivers for the reduction in global production have been: the decline in area planted, which has fallen at an average annual rate of 0.6 per cent; and the average yield per hectare which has declined at a rate of 2.6 per cent per year.
The major lucerne-producing regions globally are: North America, with 11.9m ha (41%); Europe, with 7.12m ha (25%); South America, with 7m ha (23%); Asia 2.23m ha (8%); Oceania 13.32 m ha (3%) and Africa 5.48 m ha (1%).

**Figure 1.5: Global alfalfa hay and silage production (2000–13)**

Source: FAOSTAT (2015)

For the period 2000-13 the world’s largest lucerne hay and silage production came from North America (232.6m tonne - 57.3%), followed by Europe (74.7m tonne - 18.7%), South America (47.8m tonne - 11.8%) with Asia, Africa and Oceania combining to represent the minor share of production (51.1m tonne - 12.5%) (Figure 1.6).
1.1.3 Global markets for Australian and US lucerne products

Despite being located half-way around the world from each other, the evolution and development of the lucerne industries in Australia and its main commercial competitor, the US has evolved along a similar path; especially in the seed industries.

In both countries, public institutions initially supplied the majority of investment needed to improve genetics in the lucerne seed industry. In the US lucerne breeding was aligned with organisations such as the University of California, whereas in Australia it was aligned with various state government departments (e.g. South Australia, New South Wales and Queensland). Today, private investment in research is used in conjunction with public investment to improve plant genetics. This collaborative research investment has improved crop yields and profitability for seed growers.

Growers producing lucerne for grazing, hay, pellets or silage rely on new seed varieties to improve yields and protect against insects, weeds, disease and drought. Enhanced varieties often require growers to buy seed each year, rather than save seed from one year to be used in a following year. Seed companies can only justify plant-breeding investments within this type of business model. Thus, the industry now focuses on research and development as companies compete for plant genetics and associated intellectual property rights.

The evolution of seed genetics during the past half century is mirrored by changes in the structure of the seed industry. Smaller, family-owned and independent seed companies have given way to larger, vertically-integrated organisations, which combine research, production, conditioning, and marketing functions. During the past, smaller seed businesses relied primarily on the public sector for research. These companies existed only to propagate, sell, and distribute seed varieties. Technological changes caused increases in private research and development expenditures. The industry environment favours larger, vertically-integrated seed companies.
Although agribusiness consolidation has been criticised by many for its potential to increase market power, studies have shown that increased concentration can also provide cost-reductions that offset the effects of enhanced market power.

In the US the forage (i.e. lucerne, clover, etc.) seed industry was dominated by Forage Genetics (owned by Land O’Lakes), Pioneer (owned by du Pont), and Dairyland (owned by Dow AgroSciences). The U. Department of Agriculture (USDA) exited the forage breeding business during the 1950s, which provided opportunities for companies like Cal/West Seeds. Apart from Forage Genetics International, as a result of corporate mergers a number of these companies no longer take an interest in lucerne and have sold off these assets to emerging seed companies, such as S & W Seeds (purchased by Pioneer lucerne interests) and Alforex (which represents Dow’s lucerne acquisitions of CalWest and Dairylands).

In Australia, there are a number of seed companies participating in proprietary lucerne breeding, either directly or through licensing rights existing with public sector breeding programs. In the Australian lucerne breeding industry a number of these companies also hold close relationships, either through equity or licensing arrangements, with a number of international seed companies. These companies include: PGG Wrightson Seeds (licensed Qld. DPI varieties and linked to Forage Genetics International), Pasture Genetics (licensed NSW DPI and Pioneer varieties), Seed Genetics International (linked to S & W Seeds in the US), Heritage Seeds (licensed SARDI varieties and linked to Barenburg/ Dow Agrosciences), Valley Seeds (linked to Alforex) and Seed Force (linked to RAGT and Forage Genetics International).

As the climate in the south-east of South Australia is similar to that of the Imperial Valley in California, some US lucerne seed companies contract via Australian seed companies growers in the south-east of South Australia to undertake seed production of varieties with the same dormancy as those produced in the Imperial Valley.

The seed produced under contract is either exported back to the US for re-distribution or shipped directly into export markets. This has proven to be a lucrative opportunity for Australia’s lucerne seed industry.

Despite this level of collaboration lucerne hay and seed exported from the Imperial Valley competes directly with Australian hay and seed exports in a number of countries. The following section provides an overview of the products and markets in which there is competition between these two industry players.

1.1.4 Global lucerne hay and pellet market

The main lucerne products currently traded on the global market are: baled or cubed hay, lucerne meal and processed pellets. Although complete datasets are not available, the demand for dairy-quality hay is rising. Currently about half of all global lucerne exports consist of hay and half are processed lucerne in the form of meal or processed pellets.

In modern medium to large-scale dairy operations, chopped lucerne hay makes up a significant portion of the daily diet in total mixed rations (TMR). High-lactating dairy cattle are fed 6–8 kg of chopped lucerne hay per day in their TMR because of its demonstrated superiority in protein on a per kilogram basis when compared to other roughages. For this reason, the demand for baled hay has increased relative to that of cubes or pellets in countries with significant lucerne imports for dairy production.
The major exporters of lucerne hay, meal and pellets into the global market have traditionally been the US and Canada. While data on global lucerne hay exports were unavailable, information was available for lucerne meal and pellet exports (Figure 1.7).

Figure 1.7: Global market for lucerne meal and pellets (2000–13)
Australia and the US share a number of south-east Asian and Middle Eastern markets for lucerne hay. For the period 1998–2012 Australian exports into these shared markets totalled 3.41m tonnes, compared with US exports, which totalled 14.68m tonnes.

For the US and Canada, as major exporters of lucerne hay, meal and pellets, the key markets have traditionally been around the Pacific Rim in south-east Asian countries such as Taiwan, China, Korea and Japan. In more recent times, with the development of the dairy industry in the Middle East, lucerne hay, meal and pellet export markets have opened up. The proximity of ports along the west coast of the US provides easy market access for growers and marketers located in the key lucerne hay production regions in California, Montana, Washington, Idaho and Oregon.

As Canada’s proportion of the lucerne export market has changed from being dominated by hay to now being predominantly pellets, its volume and share of the lucerne product export market has declined. This has, together with changes in market dynamics in south-east Asia and the Middle East, and changes to the dynamics of the dairy industry in the US, presented expansion opportunities for the US and to a lesser extent Australia.

### 1.1.5 Global lucerne seed market

As competitors, Australia and the US are the major global suppliers of non-dormant winter active (7–8) and highly winter active (9–11) lucerne varieties to 11 countries within South and North America, the Middle East and North Africa (Table 1.1).

From 2000–13 a total of 237 710 tonnes of lucerne seed was imported into these countries, most of which was derived from the US and Australia. Total imports into these countries during this period varied from a peak of 26 600 tonnes in 2007 to as low as 8 770 tonnes in 2009 (Figure 1.8).

<table>
<thead>
<tr>
<th>Lucerne seed importing country</th>
<th>Percentage of commercial seed imported based on dormancy rating x country (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>1–4 for colder regions</td>
</tr>
<tr>
<td>Mexico</td>
<td>10</td>
</tr>
<tr>
<td>Saudi Arabia</td>
<td></td>
</tr>
<tr>
<td>UAE</td>
<td></td>
</tr>
<tr>
<td>Turkey</td>
<td>10</td>
</tr>
<tr>
<td>Jordan</td>
<td></td>
</tr>
<tr>
<td>Kuwait</td>
<td></td>
</tr>
<tr>
<td>Argentina</td>
<td>10</td>
</tr>
<tr>
<td>Chile</td>
<td>20</td>
</tr>
<tr>
<td>Uruguay</td>
<td></td>
</tr>
<tr>
<td>Paraguay</td>
<td></td>
</tr>
<tr>
<td>Peru</td>
<td>20</td>
</tr>
</tbody>
</table>

During the period Saudi Arabia was the major importer of lucerne seed (34% - 81,100 tonnes) followed by Mexico (24% - 56,400 tonnes) and Argentina (24% - 56,100 tonnes) and Turkey, UAE and Peru which when combined represent 31,300 tonnes or 13 per cent of the market. These six countries combined represented 95 per cent of the seed imported into the countries in which US and Australian exporters compete during this period (Figure 1.9).

Figure 1.9: Lucerne seed imports by country and market share (2000–13)
For the period 2002/03–2012/13, Australian lucerne seed exports totalled approximately 80,770 tonnes, compared with exports from the US, which equated to 191,260 tonnes (Figure 1.10).

Although major export markets for Australian lucerne seed also exist in Europe and the US, export market customers report that often both Siriver and proprietary varieties from Australia are either: directly re-exported, or re-branded and re-exported into third-party countries in the Middle East, North Africa or South America. This is especially the case in Saudi Arabia where the lucerne variety Siriver from Australia competes directly with the US variety CUF 101.

Apart from Mexico, which is a major importer from, and to a lesser extent supplier of, lucerne seed to the US, both Australia and the US compete ‘head to head’ in most of the winter-active and highly winter-active markets, especially in Saudi Arabia and Argentina.

![Figure 1.10 Australian vs US lucerne seed exports (2002/03–2012/13)](image)

**Figure 1.10 Australian vs US lucerne seed exports (2002/03–2012/13)**


US exports of lucerne seed dominate the Middle East market, which is primarily focused on Saudi Arabia, the UAE and more recently Turkey. For the period 2009/10-2012/13 the US exported 30,830 tonnes (77.5%) of lucerne seed to the Middle East compared with 8,930 tonnes (22.5%) of lucerne seed from Australia. Whereas, for the same period exports into Argentina from Australia and the US were equally shared with 5,970 tonnes (53.4%) exported from Australia and 5,200 tonnes (46.6%) from the US (Figure 1.11).
Figure 1.11: Australian and US seed exports to the Middle East and Argentina (2009/10–2013/14)


Because of the importance of the Middle East and Argentinian lucerne markets to Australian and US lucerne seed growers, the following overview provides an insight into these key export markets. Both markets, albeit for different reasons, are potentially in decline as an export option for Australia and the US.

In the case of Saudi Arabia (Middle East) an increase in environmental pressure on its diminishing water resources is forcing the government to reduce agricultural production and seek alternative supplies of lucerne either:

   i) through increasing exports of lucerne hay from the US, and/or
   
   ii) buying up land in countries such as Jordan, US and Australia, producing lucerne hay in ‘closed system’ and exporting it back to Saudi Arabia.

In the case of Argentina, after starting from a low base, it is gradually building up its ‘in-country’ breeding programs and seed production capacity and capabilities. In the process Argentina has remained ‘GM-free’. An application is currently being assessed by Argentinian regulators for the deregulation of GM lucerne. If approved it is expected the market will quickly swing to GM lucerne varieties, thus reducing the need for non-GM lucerne imports, which will impact on the Australia opportunities to export GM-free lucerne products to Argentina.

1.1.6 Middle East lucerne market

As with the broader global lucerne market, the lucerne market in the Middle East (import and export of hay and import of seed) is driven by developments in the dairy industry. During recent years the development of the intensive dairy industry within the Middle East, especially Saudi Arabia, Syria and UAE, has triggered exponential growth in the trade of lucerne hay and seed. The dairy industry is viewed as one of the most progressive food industries in the Middle East and as early as the mid
1970s, several Middle Eastern countries established executive programs to promote dairy farming; the major objective was to attain self-sufficiency in milk production.

The Saudi Arabian government invested significant funds to support the import of high-quality cattle, management practices that would comply with best practice operating standards, and the introduction of the latest technology in processing, packaging, and distribution. As a result, milk production has grown tremendously, at rates of 6.6 per cent and 4.9 per cent in Syria and Saudi Arabia respectively between 2002 and 2007. This resulted in these nations being almost self-sufficient and in a position to export certain dairy products.

In Saudi Arabia, the three major producers of liquid milk are Almarai, Al-Safi, and NADEC. These companies account for almost all the sales of fresh, pasteurised milk and have nearly 90 per cent of the market of laban and 94 per cent of the market of yoghurt (Abdel Fatah & Hassan, 2008). Due to the requirement for year-round access to fodder for dairy production, countries in the Middle East have been importing fodder (primarily lucerne and grass hay) from countries such as the US and Canada.

While importing fodder, during the 1970s Middle Eastern countries, such as Saudi Arabia started to invest heavily in the construction of vast areas of irrigation for the purpose of eventually becoming self-sufficient in fodder, such as lucerne, to supply their expanding dairy industry (Map 1.2).

Map 1.2: Saudi Arabia — irrigation schemes incorporating lucerne production
Example of 1997 Saudi irrigation scheme based on centre pivot technology (i.e. circles). Each field is approximately one kilometre in diameter. (Source: https://www.revealnews.org)

By the time astronauts aboard the International Space Station took this photo in 2012, Saudi Arabia had started fallowing its fields (brown circles). The agricultural fields in active use are dark green.

As a result of the policies adopted by the Saudi Arabia government it now has less than half the farmland it did in the mid-1990s, according to the Food and Agriculture Organisation (FAO) of the United Nations (Figure 1.12).
Figure 1.12: Land dedicated to agriculture in Saudi Arabia (1975–2013)

From 2000–13 the area of land planted to lucerne for hay and silage production declined by 2.5 per cent annually, however the production of lucerne hay and silage slightly increased by an annual rate 0.87 per cent per year (reflecting the increasing adoption of higher-yielding proprietary US lucerne varieties in recent years by corporate dairy farms as a replacement for CUF 101) (Figure 1.13).

Figure 1.13: Annual production of lucerne hay and silage in Saudi Arabia (2000–13)

US marketers have characterised the Saudi Arabian lucerne seed market follows:

- 50 per cent small farms, target low-cost production, purchase Siriver @ US $4.50-$7.00/kg, Supersonic @ US$7.00/kg and Cuff101 @ US$7.50-$10.00/kg.
50 per cent large corporate farms, target productivity, variety selection is information driven (yield data/demonstration sites), prepared to pay a premium for performance (value/benefit), purchase most recent high-performing variety releases from US (S & W, FGI – US$8.00-$10.00/kg) and Australia (Heritage Seeds, PGG Wrightson Seeds – US$5.50-$8.00/kg)

1.1.7 Argentina lucerne seed market

Argentina has about 7.56 million ha devoted to lucerne hay production, requiring an estimated 2700–3600 tonnes of lucerne seed per year (Argentina seed industry contacts, 2015). About 20 per cent of this seed is sourced domestically and the remaining 80 per cent is imported; mainly from the US and Australia.

More than 90 per cent of the lucerne grown in Argentina is used for grazing in both the beef and dairy industries; much of the remaining 10 per cent is used for fodder conservation (hay and silage) (Basigalup & Ustarroz, 2007).

The total area devoted to lucerne in Argentina is mostly concentrated in the Pampa Region (central Argentina), which carries about 65 per cent of the total beef and dairy cattle population.

Lucerne is either planted as a pure stand (50%), or in a pasture mix with temperate grasses (50%) mainly Festuca arundinacea (tall fescue), Bromus catharticus (prairie grass), Lolium spp. (Italian ryegrass) and Dactylis glomerata (cocksfoot). While pure lucerne stands are primarily used for dairy pastures and hay, lucerne–grass mixtures are used primarily for beef production.

The north-east (subtropical Campos and Chaco) and the central east (temperate Pampas) regions of Argentina are super-humid environments with evenly distributed annual rainfall of 1200 millimetres. In the mid-west rain becomes scarcer during summer and ceases during winter, causing sub-humid continental environments in central subtropical Chaco and central Pampas, with 600 millimetres spread over the summer, with a dry winter (Map 1.3).

Map 1.3: Areas of lucerne production in the central Pampas region of Argentina
The production of lucerne hay and silage has been steadily increasing from 38.75m tonnes during 2000 to 40.0m tonnes during 2013, which is based on annual production increase of 0.22 per cent per year and an average increase in area planted of 0.23 per cent per year (Figure 1.14).

Figure 1.14: Argentina lucerne hay and silage production (2000–13)

1.2 United States lucerne market: ‘friend or foe’?

The US domestic dairy industry is the key focus for the US lucerne hay and seed industries, with between 85–95 per cent of all lucerne hay and seed produced in the US entering this market, the balance is exported.

The current and future ‘health’ of the US dairy industry and to a lesser extent the global dairy industry is a core focus for the US lucerne industry.

Within the US dairy industry, there has been a shift in the regional supply of milk with a decline in the number of dairy farms and volume of milk produced in eastern states and mid-west and a significant increase in the number of dairy cows and volume of milk produced across the 11 Pacific west coast states. This follows a trend of increased population in the western US, however other factors have contributed to relocation of the US dairy production, including a combination of sustained high productivity costs (especially alfalfa hay), increasing use of corn silage as a replacement for lucerne and historically low feed prices (Ottman et al., 2013) (Figure 1.15).
Figure 1.15: US alfalfa domestic hay prices (2013–15)
Source: Gould (2016) http://future.aae.wisc.edu

In 1970 the western US states provided 17 per cent of the US milk supply; today they supply almost 50 per cent of the nation’s milk. The largest percentage increases have been in New Mexico and Idaho, but California has logged the largest quantitative increase in both cow numbers and milk production, with California now producing more than 20 per cent of the US milk supply.

Between 2000 and 2010, US fluid milk production increased from about 75m tonnes to about 87m tonnes; almost 15 per cent over 10 years. Both the USDA and the Food and Agricultural Policy Research Institute (FAPRI) project a gradual increase in milk production of more than one per cent per year for the next decade. FAPRI extends their projections to almost 110m tonnes by 2025.

1.2.1 Lucerne production in the US

Lucerne production is centred in the key dairy regions throughout the US (Map 1.4, Figure 16) with the leading lucerne hay producing states being California, Idaho, Montana, North and South Dakota and Wisconsin.

About 40 per cent of the lucerne hay in the US is produced in the 11 Pacific west states of Arizona, California, Colorado, Idaho, Montana, Nevada, New Mexico, Oregon, Utah, Washington, and Wyoming. The primary driver for lucerne production within the Pacific West is access to surface and ground water for use in irrigated production systems. (Map 1.5)

Lucerne hay production systems in the Pacific West range from 2–10 cuts per year, from dormant winter varieties through to highly active winter varieties grown on soils that range from heavy clays to beach sands (Putnam, 2000). This region also supplies most of the seed for the nation’s lucerne plantings, and it contributes significantly to exports of lucerne hay and seed. The area planted to lucerne in Montana is greater than any other western state, followed by Idaho, California, and Colorado. However, production in terms of overall volume (tonne) of lucerne hay is greatest in California due to the higher yields. More than 80 per cent of California’s lucerne hay is grown in regions where 7–10 harvests per season are possible.
**Figure 1.16: US lucerne hay production by US state (2013)**

Source: USDA, National Agricultural Statistics Service, Crop Production; and ERS calculations (2015)

**Map 1.4: Major US dryland and irrigated lucerne production regions (2012)**

Source: USDA, National Agricultural Statistics Service, Crop Production; and ERS calculations (2015)
Map 5: Major US irrigated lucerne hay production areas (2012)
Source: USDA, National Agricultural Statistics Service, Crop Production; and ERS calculations (2015)

Since 2001/02 there has been a steady decline in the area planted to lucerne in the US, together with the corresponding decline in the volume of lucerne hay produced primarily for the dairy market. (Figure 1.17, Map 1.6)

Figure 1.17: US alfalfa hay production area and volume (2000/01 – 2015/16)
Source: USDA, National Agricultural Statistics Service, Crop Production; and ERS calculations (2015)
Of concern to the US alfalfa industry has been the rising cost of production. Since 2001 the cost of producing lucerne hay has almost doubled. While prices received for hay in both the domestic and export markets have increased, they have not maintained parity with the costs of production. For example, in the Imperial Valley (a major supplier of lucerne hay for the Californian dairy market and export markets in Pacific Rim countries) the cost of producing lucerne hay has risen from US$2176.88/ha in 2001 to US$4164.38/ha in 2013 (Table 2).

Table 1.2: Costs for production of lucerne hay in the Imperial Valley (2001 & 2013)

<table>
<thead>
<tr>
<th>Costs for lucerne hay production (Imperial Valley, US)</th>
<th>2001 (US$/ha)</th>
<th>2013 (US$/ha)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Land preparation</td>
<td>507.57</td>
<td>1287.89</td>
</tr>
<tr>
<td>Establishment</td>
<td>354.74</td>
<td>650.61</td>
</tr>
<tr>
<td>Cultural practices</td>
<td>794.15</td>
<td>1419.22</td>
</tr>
<tr>
<td>Harvest costs</td>
<td>520.42</td>
<td>806.66</td>
</tr>
<tr>
<td>Total costs*</td>
<td>2176.88</td>
<td>4164.38</td>
</tr>
</tbody>
</table>

* Excludes land rent and overheads

The primary factors affecting cost of production are increases in:

1. **Manpower (labour):**
   - Casual labour: 2001: US$7.75/hr
     - 2013: US$11.20/hr

2. **Water access:** (both in terms of cost per unit area and volume applied)
   - Water budget: 2001: 1.85 ML (1.5ac-ft) @ US $9.70/ML ($7.87/acre-feet)
     - 2013: 3.08 ML (2.5ac-ft) @ US $24.66/ML ($20.00/acre-feet)

Even with rising costs of production, the US lucerne industry is optimistic about the future. For example, through the use of biotechnology plant breeders now have tools available to deliver improvements in lucerne forage quality. Key improvements plant breeders are working on includes:

- **Reduction in lignin content** (RL) through gene knockout. Reduced lignin content can benefit hay growers by delaying harvest 7–10 days without compromising forage digestibility. Delay in harvests can translate into:
  - fewer harvests
  - higher yields
  - longer stand life

  In preliminary trials of experimental varieties of RL lucerne, these varieties are showing a 10-15 per cent decrease in lignin content and a 12–15 per cent increase in Neutral Detergent Fiber Digestibility NDFD and Relative Forage Quality (RFQ) compared with conventional commercial checks harvested at the same time. This can translate into a ~20 point RFQ advantage and a US$15–20/tonne price premium based on current Midwest hay pricing standards.

  During October 2014, the CFIA (Canadian Food Inspection Agency) deregulated the RL trait in Canada. On 10 November 2014 the USDA deregulated RL lucerne in the US. In the coming years the RL trait will be marketed as HarvXtra™ lucerne.

- **Condensed tannin** via insertion of transgenes can slow protein degradation in the rumen and allow more protein bypass and utilisation. Benefits of tannin lucerne can translate into:
  - decrease in use of protein supplements in dairy rations
  - decrease in nitrogen losses to the environment
  - reduction in bloat when the lucerne is grazed by ruminants

### 1.2.2 US lucerne hay market

The US lucerne hay market is dominated by domestic supply with an estimated 96.5 per cent of all lucerne hay produced during 2014 entering the domestic market with the balance of 3.5 per cent entering the export market.

More than 99 per cent of all lucerne hay exports are from Pacific West ports. When compared with the national figure of between 3–4 per cent of hay being exported, exports from the Pacific West states represents between 12–15 per cent of total production, which raises the significance of these exports in this region.
The primary driver for the increase in US hay exports during the past five years has been a surge in demand from the United Arab Emirates (UAE) and China (Figure 1.18).

Figure 1.18: US lucerne hay exports x country of destination (1998–2014)
Source: http://ucanr.edu/blogs/Alfalfa//blogfiles/29329_original.png

The economic circumstances in the Arabian Peninsula and China will make the demand for US forage products strong for the foreseeable future. US producers’ ability to satisfy export and domestic demand will depend on:

- reducing the cost of inputs, especially labour
- increased crop productivity per land unit, especially per irrigation water unit (Matthews et al., 2014)
- maintaining a ‘GM-free’ status.

A major threat to the US lucerne hay and seed export markets has been the introduction of genetically modified (GM) lucerne (i.e. Roundup Ready®), which was introduced primarily for use in supplying lucerne hay into the domestic dairy market. A number of countries importing US lucerne hay, especially from California, do not accept product containing GM lucerne. There have been documented cases where traces of GM lucerne have been found in non-GM lucerne hay exports resulting in trade disruptions, which have threatened access to markets such as China and Middle East.

Regulatory approvals for the importation of GM feed and/or food purposes has been granted by Japan, Canada, Mexico, Korea, Philippines, Australia, and New Zealand and none is required at the present time for feed import to Taiwan. China currently does not allow importation of GM lucerne, but approvals are in progress.

Several other importing countries (e.g. UAE, Saudi Arabia, Costa Rica) have no government approval process so regulatory approvals per se cannot be obtained for GM lucerne at this time.
With the exception of the specialty livestock market sector (e.g. organic, grass-fed, GM-free), most Asian producers are currently importing and feeding other Roundup Ready® and GM trait feedstuffs to their dairy and livestock. This includes corn, cottonseed, soybean, and several other GM products, primarily for livestock feeds. GM lucerne does not differ substantially from these other products, since it contains the same gene. However, some importers have indicated a significant portion of their clients do not want GM traits in their animal feed. Therefore, the presence of the GM lucerne creates both logistical and marketing issues, which are not related to the legality of importing GM crops.

### 1.2.3 US lucerne seed market

On average the US produces approximately 36,300 tonnes of lucerne seed each year. The five western states, California, Idaho, Oregon, Washington, and Nevada, produce 85 per cent of this seed. The balance of the seed comes primarily from Arizona, Utah, Montana, and Wyoming.

California has historically been the largest supplier of lucerne seed, however due to changes in economics, environmental constraints, and regulatory issues, the area planted to lucerne seed in California has declined. As plantings in California have contracted, expansion in Idaho and other Pacific West states has maintained US lucerne seed supplies at a nearly constant level. Production per hectare has been fairly steady within a given seed-producing region.

Lucerne seed is produced across California, from the low desert in the south to the northern intermountain region. However, most is produced in the central San Joaquin valley (Freson and Kings Counties), the Low Desert Region (Imperial Valley County) and Yolo County near Sacramento. Some small-scale production of winter-dormant lucerne varieties is undertaken in the intermountain counties (Map 7).

**Map 1.7: Lucerne seed-growing regions of California**

Lucerne seed production transitions from the cooler reaches of the intermountain counties, where dormant varieties (5 per cent of total production) are grown, to Sacramento, Imperial and San Joaquin Valleys, where the varieties are predominantly winter-active and highly winter-active types (95 per cent of total production) (Table 1.3).
Table 1.3: Percentage of California commercial seed produced by region by dormancy rating.

<table>
<thead>
<tr>
<th>California production regions</th>
<th>Proportion of commercial seed produced x dormancy rating x region (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>2–5 for colder regions</td>
</tr>
<tr>
<td>Intermountain</td>
<td>100</td>
</tr>
<tr>
<td>Sacramento Valley</td>
<td>100</td>
</tr>
<tr>
<td>San Joaquin Valley</td>
<td>20</td>
</tr>
<tr>
<td>Low Desert (Imperial Valley)</td>
<td>100</td>
</tr>
</tbody>
</table>


Between 2007 and 2015 the average area of lucerne planted for seed production in California was 13 564 ha, being dominated by the San Joaquin Valley (31%) and the Imperial Valley (68%) (Figure 1.19).

Figure 1.19: Area planted in California to lucerne seed by region (2007–15)

Source: California Crop Improvement Association (2016). http://ccia.ucdavis.edu

Since 1994/95 the trend in the volume of clean lucerne seed produced in California has been declining, albeit the data suggests there has been a consistent ‘boom-and-bust’ production cycle for the same period (Figure 1.20). At the same time there has been a relatively flat trend in terms of clean seed yield on a per hectare basis.
**Imperial Valley lucerne**

The Imperial Valley is regarded as Australia’s major competitor in the export market primarily because it produces similar dormancy lucerne, has a “GM-free” status and competes directly in countries such as Saudi Arabia and Argentina. The following overview provides a snapshot of lucerne seed production in the Imperial Valley.

The Imperial Valley is located in the Colorado Desert section of the Sonoran Desert, with high temperatures and low average rainfall (76mm per year). Soils consist of very fertile, alluvial deposits from the Colorado River flood plain. These soils may be as deep as a 1.5 km in places. Nitrogen and phosphorus fertilisers are needed for vegetable production (Map 1.8).

Winters are mild and dry with daily maximum temperatures in the 18–24°C (65–75°F). Summers are extremely hot with daily maximum temperatures of 40–46°C (104–115°F). The annual rainfall is just above 75 mm mostly falling during late summer or midwinter.

The economy is heavily based on irrigated agriculture, which is supplied wholly from the Colorado River via the All-American Canal. Thousands of hectares of prime farmland have transformed the desert into one of the most productive farming regions in California with an annual crop production of more than $1 billion. Agriculture is the largest industry in the Imperial Valley and accounts for 48 per cent of all employment. An environmental cost of this extensive irrigation is that, south of the canal, the Colorado River no longer flows above ground at all for much of the year into Mexico.
A vast system of canals, check dams, and pipelines carry the water all over the valley, a system which forms the Imperial Irrigation District (IID). The water distribution system includes more than 2300 km of canal and 1800 km of pipeline. There are more than one hundred canal and pipeline branches.

Imported water and a long growing season allow two crop cycles each year. Fields are served by a constructed agricultural drain system, which conveys surface run-off and sub-surface drainage from fields to the Salton Sea, which is a designated repository for agricultural run-off (Map 1.9).

*All American Canal, which brings water from the Colorado River to Imperial Valley and also acts as the border with Mexico. (September 2015)*
Lucerne is, and has long been, an integral part of agriculture in the Imperial and Palo Verde valleys of California. For nine of the past 10 years lucerne has occupied more area than any other crop grown in these low desert valleys.

Several unique properties set lucerne production in this region apart from its production in other parts of the state including environmental factors, such as climate, soils and water. Agronomic practices have evolved to address environmental constraints on desert lucerne production.
Climate:

Part of the Sonoran Desert, the low desert is just that, low and dry. Elevations start below sea level in the Imperial Valley and climb to 300 feet in the Palo Verde Valley.

Low-intensity winter rains arise from storm systems moving eastward from the Pacific Ocean. Summer thunderstorms originate from storm fronts moving north-westward from the Gulf of Mexico. In spite of these storms, total precipitation averages less than 75 mm of rain per year, not enough to support agriculture.

Classified as subtropical desert, the region is hot during summer with the average daily maximum temperatures in the hottest month, July, range from 33–35 °C. Winter is short and mild with frosts possible from December through mid-February. The average minimum temperature during winter is 5 °C. Significant temperature fluctuations are common, not just from summer to winter, but also from day to night. Diurnal temperature fluctuations of -5 to -15 °C are common.

Photosynthetically active radiation is plentiful in the Imperial and Palo Verde valleys. Even in winter, sunshine exceeds more than eight hours a day. An average of 4000 hours of sunlight occurs each year, i.e. more than 90 per cent of the possible hours for one year. As a result of its mild winter climate and plentiful sunshine, this region can produce lucerne year-round, although summer yields are not as great as those obtained during spring and autumn (fall). Not surprisingly, because of high summer temperatures, evapotranspiration can exceed 1800 mm of water per year.

Soils:

A variety of soil textures are represented including silty clays, silty clay loams, clay loams, fine sands, fine sandy loams and sand. Soils include calcareous alluvial fan and floodplain soils, wind-modified soils, saline and alkali soils and residual soils of very shallow depth to bedrock. pH typically runs above 7.0.

Drainage can be a problem in irrigated areas. Soils are low in organic matter (the high summer temperatures oxidise and destroy any organic matter). Fine- and moderately fine-textured lakebed sediments from prehistoric Lake Cahuilla (current location of part of the Imperial Valley) are the parent materials of the Glenbar, Holtville, and Imperial soils. These sediments also form the underlying layers of the Meloland and Niland soils. Windblown and river channel silts are the sources of the Indio, Vint and Rositas soils and the surface layer of the Meloland soils.

The desert plain to the east of the old lake basin is a terrace of the Colorado River delta. Terrace sands are the parent materials of the Rositas and Superstition soils. Loamy terrace deposits are the parent materials of the Antho soils. Clayey materials deposited in the ponded areas during formation of the delta terrace are the sources of the Holtville and Imperial soils. The soil series in the Imperial Valley are representative of those in the Palo Verde Valley.

Water:

Irrigation water is supplied primarily from the Colorado River by a network of gravity-fed canals that make up the All American Canal System. At the point its waters are diverted to the Imperial Valley, the Colorado River contains about 1.2 tonnes of salt per acre foot of water. A perched water table exists in the lake-bed basin of the Imperial Valley as a result of seepage of water from irrigation canals and excessive irrigation. Consequently, tile drains needed to carry unused water and salts away from irrigated fields.

The New and Alamo rivers flow north through the Imperial Valley and serve as conduits connecting a man-made network of agricultural drains to the Salton Sea. Those drains receive run-off from the tile drains installed beneath fields. Ultimately, via this network, drainage water carries excess salts away from irrigated fields and dumps them into the Salton Sea.
There is little run-off in the Palo Verde Valley. Most of the irrigation water applied goes through the field. A grid of drainage ditches is cut at about 1.6 km intervals across the valley. Lateral movement of irrigation water in the subsoil results in any excess water draining out into these ditches, which empty directly back into the Colorado River. This system is referred to as ‘open drains’.

Agronomic practices:

Lucerne is generally grown on a 3–5 year rotation with vegetable and field crops. Late September through early November is the optimum time for sowing lucerne in the low desert valleys. Cultivars with resistance to the spotted and blue alfalfa aphids are grown.

Soils of the low desert valleys tend to be well supplied with potassium. Phosphorus, however is likely to be deficient. On valley soils low in nitrogen an application of nitrogen will stimulate initial seedling growth.

Laser levelling is used to ensure even irrigation and lessen the likelihood of salinity, scald and root rot problems. About 7–8 acre feet of water are used on a lucerne crop in one year. Most growers sow lucerne on the flat with 40 m borders and 400 m runs in the Palo Verde valley. In the Imperial Valley 20 m borders are more common. Flood irrigation is used at both locations.

Some growers corrugate their fields at sowing as a means of controlling salinity and root rot. Ideally salt moves to the peaks of the corrugations and the water is directed more uniformly across the field in the troughs. Without having to modify harvesting equipment, this variation gives some of the advantages of sowing on beds.

A third sowing method is on beds, utilising furrow irrigation. Advantages include better salinity and moisture control, and the equipment runs in the troughs and not over the crowns of the plants. A disadvantage is that most equipment needs to be modified to deal with lucerne grown on beds.

In recent years many growers reinstituted a practice common in the Imperial Valley in the 1950s—drying down fields during summer. The rationale behind this action was two-fold. First, by cutting lucerne during summer (July), and withholding water until autumn (October), growers were removing the lucerne canopy, which served as a feeding and breeding ground for the sweet potato whitefly.
Second, lucerne produced during summer brings a poor price, a reflection of its low quality compared with spring or autumn hay, and a value not giving the grower any income.

**Insect, pathogen, and weed pests:**

The spotted and blue lucerne aphids can damage non-resistant lucerne. The Egyptian lucerne weevil and the pea aphid sometimes require control measures during winter/spring (February and March). Lucerne caterpillar and beet armyworm usually require control during mid to late summer. Occasionally outbreaks of cutworm occur during autumn and spring. Lucerne planted on beds is more susceptible to cutworm damage than flat-sown lucerne.

Root rots caused by rhizoctonia and phytophthora can cause severe problems. Rhizoctonia root canker often infects where fields are uneven and drainage is poor. It can develop in fields suffering scald damage. Some *Phymatotrichum omnivorum*, Texas root rot, has appeared in the region. All of these fungal pathogens are best controlled by effective irrigation management.

Sooty moulds covering the leaf surfaces of the lucerne plants are an increasingly severe problem in lucerne field. The sooty moulds grow on the honeydew exuded onto lucerne leaves by feeding sweet potato whitefly nymphs. The honeydew, excrement from feeding nymphs, is rich in carbohydrates and provides a good substrate for fungal growth.

Loss to the grower is significant. The honeydew gums up harvesting equipment, and no one wants to buy black, mouldy hay.

Winter broadleaf weeds can be a problem in lucerne new stands. Annual summer grasses can be troublesome in established lucerne stands. Purple nut-sedge can occur in both new and old stands. The best weed control in lucerne is to get a dense stand established and to keep it healthy.

**Cost of lucerne seed production:**

The University of California Extension Service based in the Imperial Valley has estimated that during 2013 the average cost of production was A$2838.93 per ha for a crop yielding 504.01 kg/ha of clean seed (Table 1.4).
Table 1.4 Imperial Valley County sample lucerne seed production costs 2013

<table>
<thead>
<tr>
<th>OPERATION</th>
<th>MATERIALS</th>
<th>HAND LABOR</th>
<th>COST</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Rate</td>
<td>Type/Amount</td>
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<tr>
<td><strong>SEED PRODUCTION COSTS</strong></td>
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<td>US$</td>
</tr>
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<td>Irrigate 4x</td>
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<td>Water 1.5 ac-ft</td>
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<td>Water availability charge</td>
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<td>Per acre</td>
<td></td>
<td>600.00</td>
</tr>
<tr>
<td><strong>YIELD (Cleaned)</strong></td>
<td>Per acre</td>
<td></td>
<td>450.00</td>
</tr>
</tbody>
</table>


(FX: US$1 = AU$1.41)
1.2.6 US lucerne seed exports

The value of the US lucerne seed export market averaged US$84.2 million dollars annually between 2009–13. The quantity of exported seed ranged from 12,520 – 22,860 tonnes during that period. Statistics include both certified and non-certified seed as well as coated seed (Figure 1.21).

Seed was exported to 37 countries during 2013. Mexico, Saudi Arabia, Argentina, and Canada are the largest markets, accounting for more than 60 per cent of total US lucerne seed exports (Figure 1.22).

The Pacific West states produce a small portion of the seed for the winter-active lucerne seed export market and virtually all of the seed of the dormant variety (winter-hardy germplasm) export market. About 60 per cent of the US dormant variety lucerne seed export is to Canada. The California Crop Improvement Association (CCIA) estimates that 50 per cent of lucerne seed produced in California is exported (Palmer, 2015).

![Figure 1.21: US lucerne seed exports (2000–13)](http://www1.agric.gov.ab.ca)

http://www1.agric.gov.ab.ca
Figure 1.22: US lucerne seed exports by major countries of interest (2009/10 – 2013/14)

http://www1.agric.gov.ab.ca

Lucerne varieties from the Imperial Valley for US domestic and export markets. (September 2015)
1.2.7 Challenges for lucerne seed production in the Imperial Valley.

There are a number of macro and micro trends that may determine the future of lucerne seed production in California and the Imperial Valley (Putnam et al., 2013), these include:

1.2.7.1 Access to irrigation water for lucerne seed production

Water availability and price will likely be the key determinant of lucerne’s future in California and more specifically the Imperial Valley. Competition for water access from urban consumers and high-value crops, which are more water use efficient, together with the impact of the current long-term drought is severely impacting on lucerne production.

The Colorado River serves more than 40 million people across the Western US and is the sole source of water for lucerne seed production in the Imperial Valley. Explosive population growth and increased water demands increasingly threaten to overtax the finite supply of Colorado River water (Figure 1.23). Since the year 2000, the Colorado River basin has been experiencing drought conditions and is at its lowest flow since 1963, when Glen Canyon Dam was filled. To prevent shortage triggers from being hit, agencies are looking at ways to identify short- and long-term alternatives to prop up the reservoir elevations as the river hydrology continues to decline.

Figure 1.23: Allocation of water in California by use segment
Source: Medellín-Azuara, 2015

Of all irrigated crops in California, lucerne, at an average water application rate of 11.6 ML/ha (3.8 ac-ft/acre) is secondly only to rice 13.71 ML/ha (4.5 ac-ft/acre) in terms of the volume of irrigation water applied within a growing season (Medellín-Azuara, 2015).

In terms of net water use (water applied minus run-off and ground seepage) lucerne has the highest overall consumption when compared to other irrigated crops grown in California, such as almonds/pistachio, rice, corn, vegetables and fresh tomato (USDA, 2013). Irrigated lucerne in California also generates the major share of soil water losses into the atmosphere via evapotranspiration (Figure 1.24).
In order to address the impact of the prolonged drought on the supply of water from the Colorado River to the Imperial Valley and the increasing competing demands from rural and urban end users, the regional water authority, the Imperial Irrigation District (IID) has initiated a number of schemes to address the competing interests.

Of the 3.1 million acre feet (AF) of water the Imperial Valley is entitled to receive each year, more than 10 per cent, nearly 500 000 AF each year, will be conserved for transfer purposes by 2026. Of that total, 267 700 AF is dedicated for transfer to urban use by the San Diego County Water Authority (SDCWA) from efficiency-based conservation programs and canal linings. A total of 103 000 AF will be conserved each year for transfer to Coachella Valley Water District (CVWD) for urban use. This is on top of the 105 000 AF of water already made available annually to Metropolitan Water district of Southern California (MWD).

Since its execution in 2003, the water transfers have ramped up, from the 10 000 AF scheduled for transfer to SDCWA and the related 5000 AF of Salton Sea mitigation water necessary to mitigate the transfer’s impacts, all generated from fallowing.

More than a decade later, in 2013, the district’s conservation programs generated nearly 200 000 AF for transfer and mitigation purposes; more than 150 000 AF from fallowing and an additional 46 000 AF from efficiency conservation measures both on-farm and in the IID delivery system. The conservation and transfer schedule continues to ramp up through 2026 and then hold steady until 2047.

Land fallowing is being employed as the chief means of generating conserved water, mainly to lessen the environmental impacts to the Salton Sea. When farmland is taken out of production for fallowing, the water the crop would have consumed can be used for transfer while the field return flows to the sea (both surface and subsurface) can continue to be used for environmental mitigation. Conversely, efficiency-based conservation measures target only the field run-off (tile water and/or tail water) for transfer purposes, and have larger, more direct impacts on the Salton Sea.
During the fallowing term (generally 12 months from 1 July of one year to 30 June of the next in parallel with farm/crop leases), delivery gates are physically locked and field codes are programmatically blocked in IID’s water order system so water can’t be requested for delivery to a fallowed field.

Lucerne and various other crops growing in competition with land allocated for fallow as part of the IID water transfer to San Diego domestic supply) and use for solar energy generation. (September 2015)

The IID Board of Directors sets the price for fallowed water each year and a solicitation is conducted to identify program applicants.

Fields are contracted for fallowing purposes, as necessary, to meet annual conserved water requirements and applicants that exceed these targets are given top priority in the following year’s solicitation. Each field’s participation in the fallowing program is limited to three out of every five years Anon. 2010–13).

IID land fallowing activities were initiated during December 2003 and have continued on an annual/biannual basis since then (Figure 1.25).

IID continues to administer fallowing programs for water transfer purposes and, through 2013, had implemented a number of iterations of this conservation program, paying out more than US$86.4m to landowners and tenants.

During 2010/11, IID paid US$6.9m to farmers for fallowing a total of 7 410 ha, which equated to an average payment of US$931.17/ha (A$1311.50/ha). By 2014/15 the area allocated to fallow had increased to 110 780 ha with farmers receiving a total of US$38.2m.
1.2.7.2 Loss of ‘GM-free’ market access status

In more recent years a major issue that has arisen, which threatens market access for lucerne seed relates to the introduction of Roundup Ready® lucerne for use in the US lucerne hay market. As lucerne hay and seed exports dominate production from the Imperial Valley, many of the current export customers, especially China and Saudi Arabia, are either opposed to GM crops or do not have the necessary regulatory approvals in place to support imports of these products.

There have been documented cases where traces of GM lucerne have been found in non-GM lucerne hay resulting in trade disruptions, which have threatened access to markets such as China and the Middle East.

With the exception of the specialty livestock market sector (e.g. organic, grass fed, GM free), most Asian producers are currently importing and feeding their dairy and livestock other Roundup Ready® and GM trait feedstuffs. This includes corn, cottonseed, soybean, and several other GM products, primarily for livestock feeds. GM lucerne does not differ substantially from these other products, since it contains the same gene. However, some importers have indicated that a significant proportion of their clients do not want GM traits in their animal feed. Therefore, the presence of the GM lucerne creates both logistical and marketing issues, which are not related to the legality of importing GM crops.

A key initiative for the US lucerne seed industry was the establishment of Grower Opportunity Zones (GOZ). A GOZ is a seed-grower defined geographical area within which a validated super-majority ≥80 per cent of lucerne seed growers, or lucerne seed growers representing >80 per cent of the lucerne seed production acres, elect to focus on producing either Adventitious Presence Sensitive (APS) or GM lucerne seed, facilitating meeting isolation requirements for these markets. Within either GOZ, conventional AP-tolerant (APT) seed can be produced in accordance with the applicable NAFA Best Management Plan for that GOZ. The formation of such GOZ facilitates seed production of GM and APS lucerne seed, and so allows the lucerne seed industry to meet the demands of various markets.
• APS GOZ is a GOZ for seed production of APS lucerne seed and conventional lucerne seed. GEA seed production within an APS GOZ is not consistent with the intent of the APS GOZ and would not comply with the NAFA BMP for GEA seed production. To date seven APS GOZ have been declared (Map 1.10).

• GMGOZ is a GOZ for seed production of GE and conventional lucerne seed that is destined for markets that are not APS. APS lucerne seed production is not practical within a GE GOZ. As outlined in NAFA best management practice (BMP) for GEA Seed Production, Association of Official Seed Certifying Agencies (AOSCA) certified seed production isolation requirements apply between GE and conventional seed within a GE GOZ. NAFA BMP for GEA Seed Production isolation requirements apply between a GE seed production field within a GE GOZ and the nearest conventional or APS seed production field outside the GOZ border. Currently, there are 22 GE GOZ that have been declared and isolated.

NAFA officially recognizes a GOZ based on a request by lucerne seed growers in a specific geographic area. The area can be a county, or an area defined by specific roads/highways, rivers or other clearly defined boundaries — GPS coordinates must be provided. Upon receipt of a request for a GOZ by two or more growers, and for an area encompassing a minimum of 1120 seed production hectares.

Map 1.10: US lucerne seed production - Grower Opportunity Zones (2016)
Source: US AP & GE Grower Opportunity Zones

After a GOZ is formed, it stays in place until or unless the growers within the GOZ notify NAFA of their intent to change the status. Upon receipt of a request for a change in a GOZ by greater than 20
per cent of the lucerne seed growers and hectares, NAFA will facilitate a vote on the request for revalidation.

In light of the unique growing circumstances in Imperial Valley County and the current international approval status of GM lucerne, Monsanto has worked with the Imperial County Farm Bureau and established unique stewardship requirements for GM lucerne in the Imperial Valley County (Map 1.11).

Map 1.11: Imperial Valley GM lucerne planting seed and hay production isolation zone.

Currently, Monsanto provides the following statement with regard to the exclusion of GM lucerne from the Imperial Valley:
Crop product export
“Grower must lawfully plant Genuity Roundup Ready® Alfalfa, direct any product produced from Genuity Roundup Ready® Alfalfa seed or crops (including hay and hay products) only to those countries where regulatory approvals have been granted, and grow and manage Genuity Roundup Ready® Alfalfa in accordance with the information found in this Technology User Guide (TUG). Pending import approvals in China, do not export Genuity Roundup Ready® Alfalfa seed or crops (including hay and hay products) to China. In addition, due to the unique cropping practices do not plant Genuity Roundup Ready® Alfalfa in Imperial County, California, pending import approval in China and until Monsanto grants expressed permission for such planting. It is a violation of national and international laws to move material containing biotech traits across boundaries into nations where import is not permitted.”

Currently, all lucerne seed production in Imperial Valley County meets the isolation standards for ASSP, making this a favourable production area for winter-active lucerne seed destined for APS markets.

1.2.7.3 Corn silage as a replacement in the dairy cow ration

Increasingly dairy producers in California and other dairy regions are asking the question:

“Should I be growing and feeding more corn silage at the expense of alfalfa?”

Some producers don’t even bother to ask the question, they just do it! The trend toward producing more corn silage is being driven by several factors (USDA, 2015). This industry trend has prompted increased testing and research on corn silage. As farms get bigger, it becomes increasingly difficult to harvest large areas of lucerne in the window where optimum forage quality is obtained. In these situations, growing more corn for silage helps to spread both risk (growing more than one crop species to meet forage needs) and labour demands. Since 1995 there has been a significant increase in the use of corn silage versus lucerne hay, which has declined at the same time (Figure 1.26).

![Figure 1.26: US lucerne hay production vs corn silage production (1990/91–2012/13)](source: USDA (2015))
1.2.7.4 Competition with other high-value crops

In California between 2004 and 2013, the overall harvested area increased for almonds, walnuts, pistachios, raisins, grapes, berries, cherries, pomegranates, and olives, but also for corn.

During the same period, the overall harvested area decreased for some field crops (cotton, lucerne, rice, wheat), but also for certain orchard crops (wine grapes and some citrus and tree fruits).

This shift to growing more permanent crops, especially tree nuts, appears to be largely market-driven and is coming at the expense of crops such as lucerne (Figure 1.27).

![Figure 1.27 Area planted to various crops in California (2005–14)](https://www.cdfa.ca.gov/statistics)

**Figure 1.27 Area planted to various crops in California (2005–14)**


1.2.7.5 The impact of endemic and emerging pest issues

In recent years there have been a number of instances of severe infestations of various insect pests, which have led to losses of seed yield due to damage. The frequency and intensity of the pest occurrence is on the increase and increasing concern to the industry. These pests include the blue lucerne aphid, stem nematodes, leafhoppers as well as long-term pests such as lucerne weevil and lepidophthora pests.
1.3 Australian lucerne market – ‘home base’

Lucerne was first planted in New South Wales during 1806. By 1833 some 800 ha were growing as permanent specialist pastures, valued for their combination of productivity and feed quality. Gradual expansion occurred until 1976, when there were more than 200,000 ha under pure lucerne, dominated by the local Hunter River cultivar. This cultivar proved to be highly susceptible to attack by several exotic aphid species, which arrived in Australia during 1977 and spread rapidly. Consequently, stands of lucerne were devastated, new plantings ceased, lucerne hay production fell dramatically and seed production became insignificant. State departments of agriculture and commercial seed companies reacted promptly, evaluating cultivars from the United States to identify adapted and productive aphid-resistant germplasm for use and incorporation into local breeding programs.

As it became clear new cultivars could resist aphid attack a second wave of interest in lucerne emerged. By 2011 the area sown to lucerne, both pure and mixed stands, had recovered to achieve their current levels of about 2.3m hectares.

Lucerne Australia estimates the overall lucerne seed industry in Australia to be worth about A$95 million per year (2008 figures), with exports contributing about AUS30m and domestic sales of AUS8.7m (Carter, 2008). The remainder of the value lies in the associated inputs and allied industries (e.g. seed processors and marketers), that are crucial to the lucerne seed value and supply chain.

1.3.1 Lucerne production in Australia

The overwhelming majority of lucerne (77.2% - 1.7m ha) is grown in NSW, followed by South Australia (11.7% - 2.2m ha) and then Victoria (2.1m ha - 9.1%) (Donald, 2012) (Figure 1.28, Appendix One).

Lucerne has been widely adopted across diverse agro-ecological environments within and between states and it provides a number of advantages when compared against alternative temperate legumes:

- As a summer-active perennial, lucerne can use out-of-season rainfall for production. Unlike annual species, the feed quality of lucerne is not spoilt by summer rainfall events.
- Lucerne is compatible with rotational cropping systems, and as a break crop can assist with weed and disease management and nitrogen fixation.
- With appropriate management, lucerne can be regularly grazed or stored as conserved fodder.
- Lucerne is currently the most important and readily available plant to manage salinity across southern Australia.
- Lucerne can be grown across a wide range of environments, from sub-tropical to temperate, and areas receiving as little as 250 millimetres of annual rainfall in the south west, up to 1200 millimetres in the sub-tropics. It also thrives under irrigation where rainfall is insufficient.
- The nutritive value of lucerne is among the highest of all major pasture species and it has recognised worldwide by livestock producers as a superior source of feed.
- Lucerne is compatible with forage conservation practices including: silage, hay, chaff, pellets or cubes.
Apart from its primary ‘on-farm’ production use as part of the feedbase (i.e. grazing, stored hay and silage) for livestock in dairy, sheep and beef production systems, lucerne has also been grown for supply into recreational animal markets (e.g. horses) and for the commercial supply of hay and planting seed into domestic and export markets.

1.3.2 Markets for Australian lucerne hay and pellets

Total annual hay production in Australia has varied between 4m and 7.7m tonnes since the mid 1990s, with three dominant hay types: cereal, meadow and lucerne. The annual production variability has been greatest in cereal hays, ranging from 1–3m tonnes. A number of factors have contributed to this variability, but the principal influences are seasonal conditions and export demand relative to grain prices.

Of the species available for hay production, lucerne provides the most flexibility in terms of nutritive value, market acceptance and area of adaptability. As a result, it is estimated that most (52%) of the lucerne hay produced enters the high-value dairy and horse feed markets (Figure 1.29).

Since 2005, the major export market for Australian lucerne has been the export sheep and beef trade, where it has been used in pellet form to feed livestock during transport.
Figure 1.29: Industry estimates for domestic and export utilisation of lucerne hay and pellets

Source: Coffey & Ramsey (2008)

Since 1988, Australian hay exports rapidly increased from just over 100 000 tonnes to just over 700 000 tonnes during 2002, since which time exports have plateaued. Of the total volume of hay exported between 1988 and 2013, lucerne products represented 5.3 per cent of total hay exports. During this period lucerne exports in the form of hay and pellets increased from just over 20 000 tonnes to an industry peak of 98 000 tonnes during 2006. Since 2006 export of lucerne hay has rapidly declined to 18 500 tonnes during 2012 (AFIA, 2016) (Figure 1.30).

Of the global regions that have imported Australian lucerne during recent years, South-East Asia is responsible for the vast majority of imports (AFIA, 2016) (Figures 1.31 and 1.32).
Figure 1.30: Australian hay exports by product (2000–13 July YTD)


Figure 1.31: Australian lucerne exports by regional destination (1988–2013)


Figure 1.32: Australian lucerne export market share (%) by country (2000–13)

Due to its proximity to the South-East Asian markets, the supply of lucerne hay has been dominated by Western Australia followed by South Australia and Victoria (AFIA, 2016) (Figure 1.33).

Figure 1.33: Australian lucerne hay exports by state (2000–12)


1.3.3 Lucerne seed production in Australia

The Australian lucerne seed industry is made up of more than 250 individual seed growers who submit export and some domestic lucerne seed for Australian Seed Authority (ASA) certification under a range of schemes which it administers. It encompasses dryland and irrigated production systems. Irrigated production is mainly from center pivot and border-check (flood) irrigation systems.

Currently, 83 per cent of total lucerne seed production in Australia occurs in the upper-south-east and mid-south-east of South Australia, around Keith, Naracoorte, Tintinara and Bordertown, encompassing more than 16 000 ha of both irrigated and dryland area. Production then extends into the neighboring south-west regions of Victoria (Map 1.12).
Map 1.12: Lucerne planting seed production - south-east South Australia and south-west Victoria.

The Australian lucerne seed production comprises varieties that range in dormancy from low winter dormancy through to highly winter-active. The ability to grow varieties that cover the full range of dormancy options has attracted seed companies from all over the world to multiply their seed in Australia (RIRDC, 2008).

The combination of climate, soil type and access to irrigation water in the south-east of South Australia supports the production of primarily winter-active (7–8) and highly winter-active (8–11) lucerne varieties (Figure 1.34).

Figure 1.34: Estimate of commercial production—south-east South Australia by dormancy rating.

During 2015, of the 50 lucerne varieties marketed in Australia and recorded on the Australian Seed Federation seed database most (48%) were in the 8–11 dormancy range (winter active to highly winter active) (Table 1.5).

**Table 1.5: Lucerne varieties listed by dormancy rating on the ASF seed database during 2015**

<table>
<thead>
<tr>
<th>Dormancy description</th>
<th>Dormancy rating</th>
<th>Number of varieties</th>
</tr>
</thead>
<tbody>
<tr>
<td>Winter dormant</td>
<td>1</td>
<td>0</td>
</tr>
<tr>
<td></td>
<td>2</td>
<td>0</td>
</tr>
<tr>
<td></td>
<td>3</td>
<td>1</td>
</tr>
<tr>
<td>Semi-dormant</td>
<td>4</td>
<td>0</td>
</tr>
<tr>
<td></td>
<td>5</td>
<td>6</td>
</tr>
<tr>
<td>Winter active</td>
<td>6</td>
<td>5</td>
</tr>
<tr>
<td></td>
<td>7</td>
<td>14</td>
</tr>
<tr>
<td>Highly winter active</td>
<td>8</td>
<td>2</td>
</tr>
<tr>
<td></td>
<td>9</td>
<td>18</td>
</tr>
<tr>
<td></td>
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<td>3</td>
</tr>
<tr>
<td></td>
<td>11</td>
<td>1</td>
</tr>
</tbody>
</table>


There are two key reasons for the dominance of winter-active varieties; primarily these varieties align best with the key export markets into which lucerne seed is sold (Middle East, United States and Argentina) and secondly, their seasonal production cycle best matches the feed demand of the major livestock enterprises operating in the regions where they are agronomically suited.

Based on an industry estimated average annual production for the 2008–14 period of 9 700 tonnes of lucerne planting seed, about 72 per cent is certified seed, with a balance of 28 per cent uncertified.1

During 2015, 37 of the lucerne varieties listed on the ASF seed database were certified with one or more domestic and/or international seed certification agencies for sale into the domestic or export markets.

Since 2002, the volume of proprietary lucerne seed certified by the three Australian certification agencies has increased from about 1.7 tonnes to 5.7 tonnes during 2014. For the same period the proportion of proprietary lucerne seed versus other certified lucerne varieties has increased from 33 per cent to 80 per cent (Figure 1.35).

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1.3.4 Lucerne seed markets

Of the average 9 700 tonnes of lucerne seed produced annually in Australia, industry participants suggest 26 per cent (2 500 tonnes) is sold into the domestic market and 74 per cent (7 200 tonnes) is exported.

Based on an average sowing rate of 6.0 kg/ha across all market segments in Australia, the annual sowing of 2 500 tonnes represents an area of 417 000 ha or about 18 per cent of the total current lucerne area in Australia (2.3m ha).

At an average wholesale price of $7.00/kg, the Australian domestic lucerne planting seed market is estimated to be worth about AU$17.5m.

Industry participants suggest that of the lucerne seed sold domestically, most is sold into high-rainfall or irrigation areas. The primary domestic markets for lucerne seed are: hay production (25% - 675 tonnes), lamb fattening pastures (25% - 675 tonnes), dairy pastures (20% - 540 tonnes) (Figure 1.36).

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Between 2005 and 2010, Australia exported a total of 69,220 tonnes of lucerne planting seed to 67 countries across nine global regions. Of the total seed exported about 95 per cent was exported to 16 countries (Teague, 2015; Jury, 2016; ABS, 2005–15) (Figure 1.37).

During 2015, Australia exported a total of 13,600 tonnes of lucerne planting seed to 33 countries, with 11 countries representing 95 per cent of all the seed exported. Table 6 and Figure 1.38, identify countries represented 95 per cent of export for the periods 2005–15 and 2015.

Throughout the period 2005–15 and during 2015 the four major export destinations for Australian lucerne seed were Saudi Arabia, United States, Argentina, Italy and the Netherlands. Most of the seed exported to United States and Argentina is made up of a mix of Australian-developed proprietary varieties.
Figure 1.37: Australian lucerne planting seed exports (tonne) by region (2005 – 2015)

Table 1.6 Exports of lucerne seed by country for 95 per cent of total export market (2005–15) and 2015

<table>
<thead>
<tr>
<th>Countries</th>
<th>Total export (tonnes)</th>
<th>Share of exports (%)</th>
<th>Countries</th>
<th>Total export (tonnes)</th>
<th>Share of exports (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Saudi Arabia</td>
<td>2,136.04</td>
<td>28.52</td>
<td>Saudi Arabia</td>
<td>4,629.49</td>
<td>35.17</td>
</tr>
<tr>
<td>United States</td>
<td>1,915.23</td>
<td>25.57</td>
<td>United States</td>
<td>2,718.11</td>
<td>20.64</td>
</tr>
<tr>
<td>Argentina</td>
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<td>Argentina</td>
<td>1,095.95</td>
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<tr>
<td>Italy</td>
<td>274.68</td>
<td>3.66</td>
<td>Netherlands</td>
<td>884.52</td>
<td>6.71</td>
</tr>
<tr>
<td>South Africa</td>
<td>268.31</td>
<td>3.58</td>
<td>Italy</td>
<td>748.20</td>
<td>5.68</td>
</tr>
<tr>
<td>Morocco</td>
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<td>2.92</td>
<td>South Africa</td>
<td>584.97</td>
<td>4.44</td>
</tr>
<tr>
<td>Taiwan</td>
<td>208.69</td>
<td>2.78</td>
<td>UAE</td>
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<td>Netherlands</td>
<td>177.70</td>
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<td>Sudan</td>
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</tr>
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<td>Sudan</td>
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<td>Egypt</td>
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</tr>
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<td>Canada</td>
<td>119.91</td>
<td>1.60</td>
<td>Spain</td>
<td>313.75</td>
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<tr>
<td>Spain</td>
<td>79.69</td>
<td>1.06</td>
<td></td>
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<tr>
<td>China</td>
<td>61.42</td>
<td>0.82</td>
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</tr>
<tr>
<td>UAE</td>
<td>53.29</td>
<td>0.71</td>
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<tr>
<td>New Zealand</td>
<td>50.40</td>
<td>0.67</td>
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<td></td>
<td></td>
</tr>
<tr>
<td>Bulgaria</td>
<td>40.52</td>
<td>0.54</td>
<td></td>
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</tr>
</tbody>
</table>
Figure 1.38: Exports of lucerne seed by country for 95 per cent of total export market (2005–15)


It has been confirmed by industry participants that a percentage of Australian lucerne seed imported into countries such as the US, Italy and the Netherlands may be re-screened and/or re-bagged for shipment onto third-party countries for which records are unable to be identified.

1.3.5 Returns to lucerne seed growers

Since 2002, there has been an overall trend of increasing prices received for contract seed production for the majority of lucerne varieties (certified and uncertified) from $2.58/kg in 1995 to approximately $5.00/kg during 2015 (Figure 1.39).

While no specific price information was available for inclusion in this report, anecdotal evidence from industry sources suggests ‘farm gate’ contract prices for the proprietary varieties is at a premium compared to more common varieties, such as Hunter River and Aurora. Albeit to achieve these premiums growers need to provide more attention to management and production in order to achieve the incremental yields these new proprietary varieties offer.

As previously noted in export markets such as Saudi Arabia, there has been a price differential between Australian common varieties such as Siriver and Hunter River. The export price differential is reflected in the contract price received by US farmers growing CUF 101 and Australian farmers contracted to produce Siriver and Hunter River for the Saudi Arabia market (Figure 1.40).

For the ten-year period between 1995 and 2004 the average contract production price for Siriver was AU$3.23/kg and for Hunter River $2.43/kg, compared to US producers receiving an average of AU$5.14/kg for CUF 101.

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Figure 1.39: Average lucerne contract seed prices and exports of Australian lucerne seed 1995–2015

Figure 1.40: Average Australian contract seed prices for Siriver & Hunter River versus US contract seed price for CUF 101 (1995–2015)

(Note: The US Cuf 101 US$/kg contract price has been converted to AUS/kg based on the average FX rate for each year)

Results and Discussion

The challenge facing the Australian lucerne seed industry is that it is viewed by some in the industry as being in decline due to the ‘boom and bust’ nature of demand and supply for domestic and export seed.

These peaks and troughs are driven by a combination of factors including, but not limited to: increasing competition from exporters primarily in the Imperial Valley (US) who produce similar winter-active varieties in a GM-free environment; increasing costs of production and diminishing returns due to currency exchange rate fluctuations. This combination of factors has led to a loss of capability, capacity and confidence within the Australian lucerne seed industry; the result of which has led to a recognised need to place a stake in the ground and assess the current status of the industry and the options that exist to move the industry forward.

In developing a structured approach to assessing the information gathered through desk top research, personal interviews and subsequent SWOT analysis, the classical 5 Ps of marketing (product, price, promotion, place and people) is used here as a framework to analyse and discuss the results leading to an evaluation of the implications for the lucerne seed industry.

The product

In assessing and understanding the ‘product’, the lucerne industry needs to understand exactly what they are offering to domestic and export customers. This product includes the value-added features as well as what is being developed in the industry’s research and development product pipeline.

In context of the research carried out for this report, the product refers to a combination of:

- established public sector common varieties, primarily Siriver (which are sold into Middle East markets) and a range of relatively new proprietary varieties developed by the private sector (which are sold into the US and an expanding array of markets in Europe and Africa), and
- commons and proprietary lucerne varieties developed by public and private sector breeding programs, which are sold into the Australian domestic market.

Production and supply

Compared to Australia’s major US competition which is located in the Imperial Valley of California, Australia has the capacity to harvest and supply seed earlier to its export customers than its US counterparts. This provides Australian seed growers with two key advantages:

1. Australia has the ‘first mover’ market advantage for market entry, especially in the Middle East markets.

2. An early harvest allows for shipping of seed to the US and Europe for repacking and on-selling before the US harvest gets underway.

Customers interviewed as part of this project generally agreed that Australian lucerne seed is of acceptable quality, supported by a ‘best-in-class’ seed certification scheme that ensures the integrity of the product.

Customers importing Australian commons such as Siriver and Supersonic into the Middle East and similar markets are more accepting of the quality of Australian seed produced than US and Argentinian customers who are either buying Australian new proprietary varieties directly or through contract seed production for higher-value markets.
Export customers and local marketers contracting production of proprietary varieties criticized Australian seed growers’ inability, from time to time, to meet contract requirements in terms of volume, quality and timeliness of supply. Comments reflecting these sentiments included:

“When it comes to seed from Australia you get what you pay for.”

“Lucerne seed production in Australia is unpredictable.”

“When imported seed arrived it had to be re-screened and graded.”

“Australian growers walk away from contracts and do not consider the consequences.”

Export contract customers and local marketers comment that Australian lucerne seed growers have the potential to improve their management of seed crops, which would generate improved yields, better product quality and more timely supply to meet contracts. Export contract customers suggested that while Australian seed producers can learn from seed growers in the Imperial Valley they are more likely to learn from seed growers in the San Joaquin Valley where the climate and growing conditions were more likely to be similar to that of the south-east of South Australia and south-west Victoria.

The basis for these comments is that in the Imperial Valley and the neighboring San Joaquin Valley, where farmers not only produce lucerne seed, but also grow a range of crops in rotation including vegetable crops, grass seed crops and/or grass and lucerne hay. A key feature of these crops is that they are grown exclusively on irrigation and in the case of seed crops are exclusively managed for seed production versus dual purpose hay and seed production. In essence lucerne seed growers in the Imperial Valley and the neighboring San Joaquin Valley are experienced in managing a range of intensive ‘high-value’ crops.

By contrast, in the south-east of South Australia, lucerne seed crops are often part of an extensive farming operation, which may include cereal crops in rotation with oilseed and legume crops. Often these crops are grown alongside either irrigated or dryland pasture for livestock production. In this system a more diverse range of management skills is required, which often results in ‘trade-offs’ in management decisions and allocation of resources due to competing priorities. For example, depending on seasonal conditions and market prices for hay and seed, lucerne crops are often targeted for hay production with a seed crop being an option, the management of which often conflicts with what is ideally required for seed production.

Proprietary export customers in the US and Argentina commented that the ‘top’ seed growers in Australia are as good as their counterparts in the US, however the average seed growers in the Imperial Valley and the San Joaquin Valley were well ahead of those in Australia. Suggested areas of management where Australian seed growers could improve their management include:

- pollination management—number of hives per hectare
- pre-harvest management—lock up paddocks earlier to maximise seed yield
- harvest timing—need to lower seed moisture content (i.e. harden off)
- harvest management—need to reduce screenings/abnormals by reducing drum speed (i.e. lower mechanical damage)
- seed cleaning—be more attentive to quality assurance; particularly the need to reduce screenings in the final export product
- length of crop rotation—needs to be shortened (from 6–7 years to 3–4 years) due to genetic drift.

There appears to exist within the Australian lucerne supply chain an interest in gaining more knowledge relating to seed production management. During 2015, Pasture Genetics (ex-Seed
Distributors) facilitated a two-day accredited training program for supply chain participants focused on lucerne production – attendance was booked out, with in excess of 50 participants attending the course.

**Product development**

The global dairy demand for lucerne hay and seed is on the decline due to:-

i) the introduction of low-cost corn silage as a replacement for lucerne in the ration; and

ii) from increasing environmental pressure as a result of declining access to both surface and sub-artesian water.

The impact of environmental pressure is a two-edged sword for the lucerne industry. On one hand countries such as Syria and Saudi Arabia, that have rapidly diminishing ground water resources have put in place active policies to reduce the domestic production of lucerne (i.e. greater demand for seed) in preference to increasing imports of fodder. Coinciding, countries are investing in buying land in countries such as the US, Jordan and Australia, where they are setting up ‘closed-loop’ production chains, which will in turn increase domestic demand for lucerne seed.

Another factor impacting on the Imperial Valley and to a lesser extent the south-east of South Australia is the increasing scrutiny of irrigated farming systems with regard to competition for the diminishing water assets (ground water and surface run off) that support lucerne seed production versus what could be achieved with higher-value more water use efficient crop options or for diversion into domestic use, especially in major US cities such as Los Angeles and San Diego.

As a result of these pressures the US lucerne industry, through various public and private sector initiatives, either in collaboration or in parallel, has embarked on an aggressive lucerne product development program in order to improve per hectare productivity with lower inputs. Through NAFA, the US Federal government has invested US$2.55m in funding into two industry-generated research programs during 2014–16:

- Alfalfa Pollinator Research Initiative (APRI)
- Alfalfa and Forage Research Program (AFRP)

The APRI, administered through USDA’s Agricultural Research Service (ARS), is devoted to ensuring the availability of healthy non-Apis pollinator populations essential for lucerne seed production. APRI research focuses on pollinator management, production, safety, epidemiology and disease management, and genetics and demographics.

The AFRP, administered through USDA’s National Institute for Food and Agriculture (NIFA), supports integrated, collaborative research and technology transfer to improve the efficiency and sustainability of conventional and organic forage production systems. The program is devoted to improving lucerne forage and seed yield, improving persistence, lucerne forage and seed harvesting and storage systems, improving estimates of lucerne forage quality, and breeding. The specific objectives within the AFRP are to:

- improve lucerne forage and seed yield through better nutrient, water and/or pest management.
- improve persistence of lucerne stands by lessening biotic or abiotic stresses.
- improve lucerne forage and seed harvesting and storage systems to optimise economic returns.
- improve estimates of lucerne forage quality as an animal feed to increase forage usage in animal feeds.
- breed to address biotic and abiotic stresses that impact forage yield and persistence and the production of seed for propagation.
Much of this work is being undertaken by organisations such as University of California at Davis, University of Arizona and the Nobel Foundation.

Complementing the NAFA research programs is a range of improvements which US lucerne seed companies are working on including:

- improved persistence
- improved adaptation
- improved forage yield
- improved quality—low lignin
- improved tolerance to nematodes
- improved salt tolerance
- improved selection through use of markers
- improved weed control—herbicide stacking
- improved pest tolerance
- improved hay production—delayed flowering.

By contrast the current Australian lucerne industry research objectives, administered through the RIRDC Pasture Seeds Five-Year R & D Plan, are:

- a focus on the growth of domestic and export pasture seeds markets
- improved industry capacity through skills and leadership training
- production and processing efficiency and improved sustainability
- improved industry knowledge with data, extension and communication.

Funding for the current research program is sourced from a combination of industry levies of which the lucerne industry represents greater than 80 per cent of levies paid, and matching government funding (via RIRDC). When compared to the US government’s investment in lucerne product development, Australia’s research budget is understandably smaller, given the size of the market. Of greater concern is the overall declining trend of investment into lucerne. After reaching a peak combined industry and government investment during 2009 of $820 000 by 2012 it had declined to $410 000 in 2012 and is projected to decline even further in the following years. Additionally, State governments have continued to reduce their resources into supporting lucerne breeding programs, agronomy and management research, and market development programs.

A major contributing factor to this declining investment in lucerne has been the absence of pastures from the National Research, Development & Extension (RD&E) Strategy for Agriculture as a cross-sectoral strategy, even though pastures contribute to a number of the sectoral platforms, such as dairy, beef, sheep and grains.

Since 2009, the Federal Government’s National RD&E Strategy Framework has been in place to act as the template for focusing and prioritising government public sector funding and resources. As a result, significant investment from the Federal and State governments has occurred through various initiatives, including Research and Development Corporations and Cooperative Research Centres, into the following sectoral and cross-sectoral platforms:

- 14 sectoral strategies: beef, cotton, dairy, fishing and aquaculture, forestry, grains, horticulture, new and emerging industries, pork, poultry, sheep meat, sugar, wine, and wool.
• 9 cross-sectoral strategies: soils, animal biosecurity, food and nutrition, plant biosecurity, animal welfare, biofuels and bioenergy, climate change and water use in Australian agriculture.

While there have been a number of ‘false starts’ in individual pasture-related initiatives, such as Pastures Australia, the only sustainable, albeit nominal investment for the lucerne seed industry has been via RIRDC matching levies collected on certified seed, which is then re-invested in strategic research.

As long as pasture and fodder remains absent from the National RD&E Strategy for Agriculture as a cross-sectoral strategy, RD&E investment in the pasture-related industries (including lucerne) will remain in the wilderness with investment being undertaken by various stakeholders in isolation, rather than in a collegiate, coordinated, prioritised and focused approach which is the case in the US lucerne industry.

In order to secure increased investment into more meaningful product development for the pasture industry and more specifically the lucerne industry will require the broader Australian pasture industry to develop and implement a strategy to elevate pastures to become a formal part of the National RD&E Strategy.

In parallel to developing research and development opportunities in Australia, the lucerne industry should seek to develop relationships with the key US lucerne research and extension institutions (e.g. University of California & University of Arizona). Given the depth and breadth of research generated by the US lucerne industry the opportunity exists to identify research that maybe transferable to Australian lucerne production. Especially, given the similar challenges seed growers face in the Imperial and San Joaquin Valleys in California when compared to those experienced in the south-east of South Australia.

Price (value)

The price, or more correctly the ‘value’, element of the 5Ps of marketing refers to the manner in which the industry establishes and promotes the benefits its products provide versus alternative options and competitors.

Value can be influenced by factors such as: product demand, price sensitivity in the market of interest, the level of competition and potentially government regulations (e.g. GM technology).

A key to identifying the right value is knowing the customer, this entails:

• their current and anticipated demand for this type of product/service
• what they pay for similar products
• the quantity likely to be purchased
• additional features they value.

How customers perceive a product is often a result of how they perceive the supplier. This is particularly important if the lucerne seed industry is to reposition itself in the market.

The topic of pricing for Australian lucerne seed drew a number of comments from both Australian growers, marketers and their counterpart customers and competitors particularly in relation to the price premium US seed is able to achieve in many of the markets where Australian commons and proprietary varieties compete ‘head to head’ with equivalent US products.

As previously noted, Australian export lucerne has two distinct markets:
i) the low-value commons, which are primarily exported (directly and indirectly) into the Middle East and Europe, and

ii) the relatively new proprietary varieties, which are exported into the established US market and into emerging markets in Europe, South America, Asia and Africa.

Within the Australian supply chain, lucerne growers expressed a range of concerns in relation to the Saudi Arabian market, as it was perceived to be the cause of their ‘boom and bust’. The three most notable concerns were:

- the continual fluctuation in the price received for Siriver
- the continual fluctuation in supply of Siriver
- US counterparts were achieving a premium for CUFF 101 versus Siriver.

Access to information relating to the Saudi Arabian lucerne seed market from Australian industry participants is difficult, hence most of the information generated within this report was sourced from competitors supplying the Saudi Arabian market.

Apart from foreign currency exchange fluctuations, part of the problem relating to the price of seed exported from Australia into the Saudi Arabian market seems to be generated by two factors:

- The early harvest and supply of seed into the market may lead growers / marketers to ensure they were not left holding stock. Therefore, there may be a tendency to apply early discounts to ensure exports, in the absence of knowing what the supply/price would be for the forthcoming US Cuff 101 harvest.

- When supply was high and prices were low, customers in Saudi Arabia would take advantage and build stocks for planting the following season, hence creating a potential glut of seed the following year.

As to why there is a price differential between Siriver and Cuff 101 (Figure 1.4); those interviewed suggested this is due to a fundamental difference in the way US and Australian marketers sell and promote their products. It was suggested that Australian marketers deal in commodities and therefore sell down on price alone, whereas their US counterparts sell up based on benefits. In so doing, the US sets a price differential their customers accept as additional benefits worth the additional value. For example, US marketers of Cuff 101 point to the following benefits versus Australian-grown Siriver:

- better finishing conditions in the Imperial Valley
- lower moisture content at harvest
- harder seed and improved shelf life
- better germination
- improved pest and disease tolerance
- growing and production conditions between Imperial Valley and Saudi Arabia are more closely aligned
- more reliable supply
- less prone to leaf diseases and more attractive to animals for grazing in absence of leaf disease
- better quality hay.

By contrast, Australian-derived proprietary varieties are selling at a premium price in markets such as Europe, Asia and Africa. The companies who have developed and marketed these varieties are selling
these varieties based on product performance and the value-added benefits these varieties are delivering.

This is also the case in Saudi Arabia, where a number of Australian companies have actively entered the market in recent times with their new proprietary varieties and are achieving sales due to their value-adding approach. However, they are still receiving discounted prices versus US varieties.

The challenge for Australian lucerne growers with established paddocks of Siriver and similar commons, is to determine whether to continue to produce and sell these into low-value Middle East markets, at a time when these traditional markets are diminishing in size and value due to factors, such as limited access to water; decreasing quality of water that is available; increased lucerne hay imports from countries such as the US and their investment in down-stream supply from ‘closed loop’ production in foreign countries. Or, do they persist in supplying these markets while the current demand justifies the investment in maintaining these production paddocks which may result in forgone opportunities to establish proprietary variety paddocks which are increasing in export demand.

Promotion

Promotion refers to all the activities the lucerne seed industry utilises to promote the value and benefits of its products to domestic and export customers.

In the case of US companies promoting their lucerne products within export markets, customers noted the use of the following promotional activities as being of value and contributing to their purchase decision:

- availability of independent comparative performance data
- the supply of new pre-release varieties for field testing
- access to lucerne breeders and agronomists from the seed companies and affiliated organisations, such as universities, to provide expertise on the growing of the lucerne varieties
- ‘meet and greet’ sessions undertaken by US trade attaché’s working out of in-country embassies.

In addition, customers were extremely impressed when US seed companies hosted visits to the Imperial Valley and San Joaquin Valleys to gain first-hand experience of the plant breeding and production of seed destined for their markets.

These types of promotional activities are viewed by most customers as being initiatives the Australian lucerne industry should seek to adopt for the purpose of not only securing and enhancing sales of Australian lucerne seed in established markets but also it would provide opportunities for entry into new markets.

Historically, the Australian lucerne seed industry was at the forefront of promoting the use and adoption of lucerne throughout Australia and in global markets. This was undertaken primarily within the domestic market by representatives from various State and Territory Departments of Agriculture within Western Australia, South Australia, Victoria, New South Wales and Queensland, each of which supported a lucerne breeding program and pasture extension specialists. Hence it was in their interest to promote the adoption of lucerne as part of the feedbase for livestock in their respective dairy, beef and sheep industries and more recently in the fodder industry.

Following the demise of pasture extension programs in most states, together with the closure and/or selling off of the various lucerne breeding programs, apart from South Australia, seed companies and pasture consultants were left with the responsibility of promoting the benefits of Australian lucerne varieties as part of the livestock feedbase in the domestic market and in export countries.
Some support in promoting lucerne within the Australia domestic market came from the CRC for Plant Based Management of Dryland Salinity, which went on to become the now defunct Future Farm Industries CRC, which promoted the use of lucerne in salt affected environments and mixed farming systems. As well as Pastures Australia who unsuccessfully tried to initiate the establishment of a national lucerne breeding program made up of the remnants of the state government lucerne breeding programs in Queensland, New South Wales and South Australia.

Apart from the loss of impetus from the public sector extension programs to support the ongoing development and use of lucerne, another major factor impacting on the use of lucerne has been the significant decline in livestock numbers and profitability within the beef and sheep livestock industries, in-lieu of the corresponding increase in cropping in traditional grazing environments. Lucerne was once viewed as an alternative long-term perennial crop, which could be used in conjunction with other perennial and annual pastures or in crop rotations, these factors together with the impact of severe drought during the 1990’s and into early part of the millennium have seen lucerne decline in priority as a management option in dryland extensive agriculture.

The regular use of lucerne is now limited to high-value enterprises such as dairy, fat lamb finishing and domestic fodder conservation in environments where there is either guaranteed high rainfall and/or access to surface and/or sub-artesian irrigation.

The major contributors to the promotion of lucerne in the Australian domestic market are now limited to the seed companies, with some support activities provided by Dairy Australia and MLA, AWI and from time to time Lucerne Australia and the Australian Seed Federation.

Within export markets, the initial push for the adoption of Australian lucerne varieties came from the South Australian Research and Development Institute (SARDI) through its support of sending its representatives over a number of years to visit various countries promoting the benefits of lucerne varieties primarily developed in the SARDI lucerne breeding program. Since that time the major source of promotion has come via the various Australian seed companies and marketers active in the export market.

Current export customers of Australian lucerne are critical of the lack of promotional support Australian companies and marketers present as part of their promotion of Australian lucerne when attending conferences, such as the International Seed Federation (ISF) Conference, or when in one-to-one discussions.

The opportunity exists for the Australian lucerne seed industry to promote as an industry the benefits and value of Australian lucerne seed via:

- generating and communicating independent third-party data on benefits and value of new proprietary varieties vs commons/publics vs ‘US varieties’
- obtaining support from organisation’s such as AusTrade and Food Innovation Australia for developing and implementing market access strategies. (e.g. utilise Australian embassies to facilitate industry/end-user introductions and promotions)
- attending key international agricultural shows/symposium
- providing ‘in-country’ support to promote Australian varieties. (e.g. seed samples for trialling, visiting agronomists and breeders, marketing)
- providing ‘in-country’ support to promote benefits and value of ‘certified’ seed versus 'uncertified' seed and ‘brown bag’ seed
- inviting export customers to visit Australia and meet producers, supply chain participants and stakeholders.
Placement (markets)

The placement element refers to the scope of the markets where customers for Australian lucerne seed operate. It is essentially the markets where for customers a product has a fit which can generate incremental benefits when compared to alternative options.

Discussion with export customers and Australian industry participants and stakeholders focused on what opportunities exist for growth in the lucerne seed market.

Australian domestic market

It is well recognised lucerne brings multiple benefits to Australian farming systems, these include: a high-value source of protein as both pasture and fodder; risk management by avoiding the risk of frost damage in low-lying areas by replacing crop with lucerne; a grass-free phase that helps manage cereal root disease and the development of herbicide resistance; and of course an opportunity to significantly lower water tables in areas experiencing or at risk from salinity.

Despite these benefits the area planted to lucerne in Australia is still far short of its potential, so there is no shortage of growth prospects for the industry. In 2006, the CRC for Plant Based Management of Dryland Salinity (Robertson, 2006) estimated that across south-eastern Australia and Western Australia the potential area suitable for lucerne was 30.4 million hectares, however it was estimated that only 10 per cent (3.1m ha) had been planted to lucerne (Appendix Two).

There have and continue to be a number of factors that inhibit the expansion of the market for lucerne planting in various parts of Australia, these include:

- an increase in cropping area at the expense of traditional pasture country incorporating lucerne
- the loss of established lucerne stands in pastures as a result of the extended drought across Australia
- the decline in profitability of extensive livestock industries (i.e. beef, sheep and wool)
- the declining value of the Australian dollar impacting on the competitiveness of exports
- the cost of access to water for irrigation and the profitability of alternative high-value crop options
- the loss of export lucerne and hay export markets to cheaper more efficient competitors
- the loss of key public sector resources which supported lucerne industry R, D & E.

Despite these factors industry participants expect that with the recent increased interest in the Australian dairy industry as a preferred supplier of milk products to Asian markets, in particular China, demand for quality feed derived from lucerne as part of the dairy cow feedbase will see plantings increase. Similar expectations are held with the beef feedlot market, where increased demand for Australian meat is expected to follow onto increase demand for lucerne as part of the finishing ration.

ABARE (2013) forecasts that between 2011 and 2018 there will be an increase in beef cattle numbers of 3.0% p.a. within south-east Australia and south-west WA, which represents a cumulative increase of 2.59m cattle and calves. For the same period ABARE has forecast national the dairy herd to increase by an average of 1.3% p.a. and the sheep flock to increase by 1.0% p.a. These estimates correlate to a dairy herd increase of an incremental 228 000 dairy cows and calves and a sheep flock increase of an incremental 5 million sheep and lambs.

As a result of these projections the additional number of livestock (beef, dairy and sheep) requiring the provision of pasture-based nutrition will increase from a projected incremental 1.06m head during 2012 to a total of 8.23 million head in 2018.
The incremental feedbase required to meet the nutritional requirements of the extra livestock will need to be by way of an increase in the adoption of producers of one or more of the following feedbase strategies, each of which may include the use of lucerne as a component of the pasture:

- the replacement of current pasture species with ‘new’ high-performing pasture species
- the reintroduction of permanent and/or semi-permanent pastures to replace crop rotations established during drought years
- the replacement of current declining pastures (quantity and quality) with perennial and annual pasture species
- the replacement of native and or self-sown pastures with perennial and annual pasture species
- the use of short-rotation high-energy pastures to meet key feed gaps during the year
- the planting of fodder crops for grazing and/or fodder conservation
- the application of fertilisers to native and self-sown pastures to generate incremental feed increases.

Underpinning the successful adoption of one or more of these strategies is the need for the lucerne seed industry and livestock industry stakeholders to recognise it will be mutually beneficial to collaborate and generate the lucerne component of the incremental feedbase required to meet these livestock production projections.

An example of potential expansion for the lucerne seed industry and the livestock industry is in the recent development by the Tasmanian and Australian Federal governments of a new extensive irrigation scheme in Tasmania. From the 10 completed schemes and the five soon to be completed, this irrigation scheme in Tasmania will be storing and distributing about 160,000 ML of water across almost 250,000 ha of arable land. Many of the farmers in areas such as the Midlands with access to this land and water are looking to grow lucerne for the purpose of finishing fat lambs and producing lucerne hay and silage for the dairy industry.

Another example is the recent interest by dairy companies from the Middle East to take up land in Australia for the ‘closed-loop’ production and export to parent companies in the Middle East of lucerne hay for dairy production. This represents an opportunity for the lucerne seed and fodder industries to collectively encourage and facilitate such an opportunity.

**International export markets**

Current export customers identified a range of opportunities to expand exports of Australian lucerne seed. Underpinning these market expansion opportunities was the recognition that if Australian seed companies and marketers were to act on these opportunities there existed a significant challenge for the industry.

The challenge is that most, if not all, of the potential existed with Australia’s recently-developed proprietary lucerne varieties rather than the traditional public sector commons such as Siriver. Therefore, if the industry is to act and take advantage of these export opportunities, the industry in the mid to long term would need to move from being dominated by ‘publics / commons’ to new ‘proprietary’ varieties with enhanced performance, such as yield (kg/ha), increased persistence, cold/frost tolerance, increased water use efficiency and improved nutrient quality.

Markets identified by customers as having potential for Australian proprietary lucerne varieties include:

- Eastern Europe: Belarus/ Kazakhstan/ Ukraine/ Turkey,
- Africa
  - North Africa: Sudan, Somalia
  - Central Africa
While in the mid to long term the opportunity exists to expand exports into new markets a critical consideration for the Australian lucerne industry is to ensure it retains and secures market access to the US and Argentinian markets. Albeit that in Argentina (and Mexico) deregulation of GM lucerne is being sought, with an expectation that once granted a significant proportion of these markets will transition into GM lucerne and reduce the opportunity for non-GM Australian lucerne.

To retain market access, the Australian lucerne seed industry needs to focus on increasing the reliability of supply and volume of quality seed production in Australian, with an emphasis on improving:

- crop management practices (e.g. pest control, pollination, length of rotations),
- seed presentation (e.g. seed cleaning/treatment), and
- timeliness of supply (e.g. contract adherence).

A key consideration for the Australian lucerne seed industry when planning for expansion into new markets or the retention of existing markets is Australia’s current ‘GM-free’ lucerne status.

Maintaining the existing ‘GM-free’ status is important to many of the countries into which product is currently exported and to potential new markets due to the current market access requirements for lucerne seed.

The advantage this brings to the Australian industry has been further strengthened by the recent identification of GM hay in non-GM hay shipments to China from the Imperial Valley, which has been declared free of GM seed and hay.

The presence of the GM lucerne hay resulted in disruption to the lucerne export market in so far as shipments were turned back and a price discount was imposed on any suspect shipments. This event cast a cloud over the Imperial Valley lucerne seed industry because of the close relationship between lucerne hay exporters and lucerne seed producers.

The US lucerne industry through the National Alfalfa and Forage Alliance (NAFA) is a strong supporter of the current Australian lucerne industry’s ‘GM-free’ status for two reasons:

- it supports the US stance in the export market of providing ‘GM-free’ seed; and
- as there is an increasing volume of non-GM seed exported from Australia to the US, which is then re-directed into domestic and export markets, NAFA are concerned that if GM lucerne was allowed into Australia it could potentially enter the US through these imports.

The Australian lucerne industry has a similar concern to the US regarding the potential introduction of GM lucerne seed from the US to Australia resulting in contamination of Australian domestic and export seed. Currently, if GM lucerne seed were to be identified in Australia then under the current Gene Technology Act (2000) this would be non-compliant with the Act due to the lack of approval for the GM material being present in the Australian environment. Ultimately such an event would lead to significant market disruption including the closure of the domestic and export seed industry until the event was brought into compliance, which in effect may take a number of years to resolve.

Given the current level of concern held by the industry for the potential occurrence of adventitious presence of GM lucerne occurring in Australia, one option to allay these concerns would be for the industry (either directly or indirectly) to seek the deregulation by the OGTR of Roundup Ready® lucerne in Australia. The approval being subject to a caveat that there is in place an agreement between the Australian lucerne industry and Monsanto for a moratorium to be placed on the growing of GM
Lucerne in Australia until such time as the industry and Monsanto agreed its introduction was warranted and it would not cause trade disruptions in domestic and export markets. This is a similar strategy to that employed by the US industry via NAFA and the California Crop Improvement Association for the growing of lucerne in the Imperial Valley of California, which remains a ‘GM-free’ lucerne growing region.

Given these concerns exist in parallel it may be mutually beneficial for each country’s peak industry organisations (i.e. NAFA, LA and the ASF) to establish a more formal relationship on the topic of managing GM technology in lucerne. Topics of mutual interest may include:

- the establishment of mutually-agreed standards for the Low Level Presence (LLP) of GM lucerne seed in non-GM seed in countries where Roundup Ready® lucerne has been approved.
- comparing strategies each has in place to maintain their respective and where appropriate adopt parallel strategies.
- identifying opportunities to collaborate in the development of strategies to support their respective ‘GM-free’ status and communicate these to customer.
- assessing the impact of new ‘value-added’ technology developments (e.g. low lignin) which customers may seek to access requiring a change in position for each industry.

**People**

A feature of the US lucerne industry is the collegiate approach that exists between participants and stakeholders along the supply chain, whether that be in dealing with industry-related issues (e.g. GM technology), marketing or seeking funding from governments for research. This approach can be seen from growers through to university researchers, onto industry organisations and end users such as dairy farmers. The nature of the relationships which exist within the US lucerne industry reflects the value they place on generating mutually beneficial outcomes for the overall good of the industry.

Whether it be through industry organisations such as NAFA, the CCIA, the University of California Extension Service or via company representatives or individual growers the common thread is the generation and communication of information to assist the industry to move forward.

A leading example of how this collegiate approach and communication of up-to-date research and market information is proactively delivered is the University of California Alfalfa and Forage Working Group (http://alfalfa.ucdavis.edu). The group led by Prof. Dan Putnam is responsible for the generation and delivery of industry-driven research ranging from agronomy, plant breeding and variety selection through to information on domestic and export hay and seed markets and dairy industry information. Through the UC Extension Service officers located throughout the lucerne seed growing regions, information is delivered via its website and regular blogs. The Alfalfa & Forage Systems Workgroup also produces publications, which provide detailed information to industry participants.

Since 1971, the University of California has sponsored the biannual California Alfalfa Symposium, which alternates annually with the Western Alfalfa & Grains Symposium as the industry’s premier event for communicating recent research findings as well as market intelligence and forecasts. To support the symposia the Alfalfa & Forage Systems Workgroup periodically holds field days to discuss on-going research.
Another example of how the US lucerne industry acts a collective is NAFA, whose mission is to ensure the ability of all segments of the lucerne and forage industry to compete effectively while maintaining access to global markets and meeting the requirements of those markets.

The objective of NAFA is to be a forum for consensus building among the various stakeholders and to be an effective advocate on behalf of the lucerne and forage industry. Formed in 2006, the NAFA is an umbrella organisation of state and regional lucerne seed and lucerne hay associations, genetic suppliers, seed marketers, and allied industry members dedicated to promoting the interests of the nation's lucerne, lucerne seed, and forage producers through education, research, promotion, and advocacy.

NAFA's primary focus is issue advocacy and policy development/implementation in all areas affecting the lucerne seed and forage industry such as federal research funding, farm policy, agricultural coexistence, crop insurance, environmental regulation, and biotechnology.

NAFA educational activities focus on its highly respected and popular Alfalfa Intensive Training Seminar, held each autumn and featuring the latest information with regard to genetics, varieties, seed production, growth and development, soils, fertility, management, and a host of other topics intended to give participants the knowledge they need to make the most of their lucerne investment.

NAFA is governed by a 25-member board of directors which includes lucerne seed and forage producers, university researchers, and representatives from allied industry organisations who guide the direction of NAFA activities.

The approach demonstrated by the University of California Alfalfa & Forage Systems Workgroup and NAFA reflects the approach which is fostered by individual participants and stakeholders in the broader the US lucerne seed supply chain appears. The outcome of this collegiate behavior appears to have provided a competitive advantage in relationships that exist between the US lucerne seed industry and its domestic and export customers.

By contrast the Australian lucerne industry has a number of representative organisations, which represent discrete elements of the industry, each of which has a critical role within the industry:

**Lucerne Australia** aims are to incorporate all relevant sectors of the Australian lucerne seed industry and has formed a membership body that acts in the best interests of the industry as a whole. Lucerne Australia focuses on research projects that will benefit the sector long term, as well as issues such as noxious weeds and pests. Events and workshops focus on integrated pest management, irrigation, pollination, contracts, cost of production, and phyto-sanitary.

**The RIRDC Pasture Seeds Program** aims to maximise opportunities and minimise risks for a profitable and sustainable pasture seeds industry based on reputation for reliable supply, domestically and internationally, for a range of quality pasture species. The RIRDC Pasture Seeds R, D & E Program is concerned with certified temperate pasture legumes, predominantly lucerne which represents greater than 80 per cent of levies collected.

**The Australian Seed Federation (ASF)** is the peak industry body for the Australian seed industry at the local, state, national and international level. The ASF also represents its members internationally, as a member of the International Seed Federation (ISF) and the Asia Pacific Seed Association (APSA). The ASF strives to deliver Leadership, Advocacy, Adaptation and Solutions on key issues including climate change adaptation, world food security, technological developments, trade, and the growth in productivity of Australian and international agriculture, through the delivery and supply of new and improved commodities and services to the market. The ASF vision is to maintain and protect the interests of ASF members and to increase the prosperity of members through superior leadership and management of issues critical to the Australian seed industry. The ASF’s mission is to serve its members through the creation of a commercial and fair operating environment.
The Australian Seed Authority (ASA) is responsible for controlling seed certification in Australia, and oversees two certification schemes: i) the OECD Schemes for the Varietal Certification or the Control of Seed Moving in International Trade, and ii) the Australian Seed Certification Scheme. ASA is licensed by the Commonwealth Department of Agriculture Fisheries and Forestry (DAFF) to undertake the role of the National Designated Authority for the OECD seed schemes, and, at the request of the Australian seed industry, operates the Australian Seed Certification Scheme which is used principally for seed not destined for export.

The Australian Fodder Industry Association (AFIA) is the peak body for the Australian fodder industry connecting all sectors of the supply chain from seed to feed. AFIA’s mission is to provide leadership to the Australian fodder industry and, by engaging members and stakeholders, ensure a favourable environment for members to do business in. AFIA works to help the fodder industry grow through sharing information, assisting trade, and promoting research and development. AFIA also works closely with government regulators to ensure our members have freedom to operate and sustain market access.

Pasture Improvement Initiative (PII) The founding partners in the Pasture Improvement Initiative comprise a unique mix of national and international agribusiness and industry stakeholders, who collectively identified the need to promote the value and benefits of pasture improvement for livestock, fodder and crop production systems. The Pasture Improvement Initiative’s goal is to boost the productivity, profitability and sustainability of Australia’s pasture feedbase, so stakeholders can realise the full potential of our livestock, pasture seed and fodder crop supply chains.

While each organisation has their respective roles and responsibilities for member constituents, a criticism leveled by a number of industry participants and customers with knowledge of the Australian lucerne seed industry is that there is no one organisation which brings the collective together under one umbrella nor do they individually or collectively represent a number of key stakeholders who choose not to participate in industry-driven initiatives.

An outcome of the current situation is that from time to time the lack of structured communication and coordination between these stakeholders may lead to:

- inconsistencies in policy development and implementation.
- the loss of collective opportunities to collaborate in establishing priorities in R, D & E and market development.
- the dilution of industry effort in dealing with issues that straddle the supply chain.
- the delivery of mixed messages when dealing with government and/or regulators.

An immediate opportunity is for a number of these industry organisations with an interest in pastures and fodder to collaborate to establish a collective industry driven case for the inclusion of pastures as a cross-sector strategy within the National R, D & E Strategy Framework. When adopted it would provide a platform for recognition of:

- the value pastures (encompassing lucerne seed production) delivers to the Australian economy
- the need for greater public and private sector collaboration focused on the continuous improvement in productivity through a coordinated and priority focused investments in pasture related R, D & E nationally. This will ensure the national research capability and capacity in pastures is better focused and used efficiently and effectively to achieve the best outcome and uptake by primary industry stakeholders.

Another opportunity identified by industry participants in Australia and by US participants familiar with the Australian lucerne industry is in relation to the role of Lucerne Australia. While there is general consensus that Lucerne Australia fulfils a key role for the lucerne industry within the Keith region of the south-east South Australia, a number of interview participants were of the view that
Lucerne Australia has to some extent moved away from the original role for which it was established and as a result needed to recast its role of representing the broader lucerne industry.

To achieve this will require Lucerne Australia to re-evaluate its role and ensure that it continues to focus on delivering benefits to a membership which represents the breadth and depth of the lucerne industry supply chain nationally.

The challenge for Lucerne Australia is to develop and gain stakeholder engagement and ‘buy-in’ to supporting a mutually agreed ‘vision for the Australian lucerne industry’. Key elements of the process for developing such a vision include:

- To be successful the process requires participation and representation from the lucerne seed industry supply chain, including the R, D & E providers, ‘on-farm’ production, seed companies, seed processors, marketers and service providers to the industry as well as associated industry stakeholder organisations.

- The lucerne industry visions needs to encompass:
  - why lucerne is necessary for Australian agriculture going forward.
  - what benefits lucerne will derive for Australia, including production, economic and social benefits agriculture and the public at large.
  - what is required to be in place for the lucerne industry to deliver on the benefits and value it can deliver to stakeholders and the broader Australian economy.
  - the timelines for the lucerne industry to deliver on its vision for the industry.
  - the likely current and future barriers to the adoption of the vision with the lucerne industry.

- Prior to and following adoption of the vision by the lucerne seed industry, the vision will need to be effectively communicated to affiliated public and private sector industry stakeholders, together with on a regular basis updates on progress against the vision.
Implications

The results and discussion emanating from the research undertaken identified a number of implications for the lucerne seed industry, Lucerne Australia and RIRDC, these are summarised as follows:

1. While providing short to mid-term supply opportunities the future of traditional lucerne varieties such as Siriver, Supersonic and other commons is in question given the pressure existing in current export markets, such as Saudi Arabia. In contrast, there is an expanding market for new Australian-bred proprietary varieties in existing and, more importantly, new horizon markets. The challenge for the Australian lucerne seed industry is to assess the rate of change required to transition from being dominated by the ‘boom and bust’ nature of traditional markets into developing and supplying new products into new market opportunities, at the same ensuring current markets’ needs continue to be met. To meet this challenge, the lucerne supply chain will need to collaborate and work collectively to assess individual market requirements and develop industry-agreed goals and objectives for market access.

2. Australian lucerne seed production expertise is currently perceived by customers and marketers as having room for improvement when compared to its competitors. From time to time this perception is reinforced when either the quality of seed exported requires further attention or contracts fail to be met. The challenge for the lucerne seed industry is to ‘raise the bar’ for the standards to be met in the production, processing and presentation of its product to the market. To meet this challenge, it will require investment in developing the necessary skills and focus of supply chain participants to a standard where it is regarded as ‘world’s best practice’.

3. As the decline in investment directed towards R, D & E continues as a result of declining levies, Federal and State governments have withdrawn resources from supporting the broader pasture industry. The challenge for the lucerne seed industry is to collaborate with like-minded industry organisations to demonstrate to Federal and State governments the value pastures contribute to the Australian economy in order to gain the necessary level of investment and resource commitment commensurate with its contribution. To meet this challenge will require leadership and sustained commitment by Lucerne Australia to engage and collaborate with other pasture-related industry organisations in the development and presentation of a case that will see pastures adopted as a cross-sectoral platform within the National R, D & E Strategy Framework.

4. A key competitive advantage of lucerne seed from the Imperial Valley, when it competes with Australian lucerne seed in export markets is the ability to sell and achieve a premium price based on promoting value-added benefits of their product. The challenge for the Australian lucerne industry, when competing in export markets, is to convert the current approach from being a ‘price setter’ to adopting an approach of a benefit based ‘value added selling’ of Australian lucerne products. To meet this challenge will require a collective commitment by industry stakeholders to re-position Australian lucerne products in the market by way of promoting the strengths and benefits of individual products and the broader industry to customers in established and new horizon markets.

5. To be successful in the global lucerne seed export market requires investment in promotion of products and their benefits, not only from the perspective of gaining entry into new horizon markets, but often it is required to retain access to established markets. This is also the case in domestic markets where in the absence of traditional avenues of promotion (i.e. Department of Agriculture pasture agronomists) the benefits of lucerne as part of the pasture and fodder mix is now left to seed companies and consultants.
The challenge for the Australian lucerne industry is to reignite and raise the profile of the benefits lucerne delivers both in export and domestic markets. To meet this challenge requires a combination of individual seed company commitment plus Lucerne Australia and Austrade investment in a range of activities in domestic and export markets, where the opportunity exists to promote the value and benefits of Australian lucerne.

6. The recent release of a range of new proprietary lucerne varieties developed in Australia has provided a platform for expansion and growth for Australian lucerne seed in established markets, such as Saudi Arabia and the US, but also in new horizon markets in Europe, Africa and Asia. This growth opportunity is essentially driven by the growing demand for dairy products from the same regions. At the same time due to expected increases in feedbase demand from the dairy, beef and sheep industries in Australia opportunities for growth in demand for lucerne seed in the domestic market also exist. The challenge for the Australian lucerne industry is to ensure it clearly confirms, quantifies and prioritises these export and domestic market opportunities. To meet this challenge will require industry stakeholders to be engaged and transparent with each other in order to work collectively for the benefit of the industry, from which individual stakeholders will benefit from the outcome.

7. The cornerstone of the lucerne industry has traditionally been innovation through the development and release of new varieties. In recent years the introduction of biotechnology and more recently new breeding techniques (NBT) has created opportunities, however at the same time it has created market risk due to the lack of synchronization in market acceptance and de-regulation. For the Australian lucerne industry there are a number of long-term opportunities for product improvements through the adoption of these technologies. The challenge for the Australian lucerne industry is that in the short term Australia’s export and domestic ‘GM-free’ markets are at risk if GM lucerne were to be found as it would lead to market disruption and the closure of these markets. To meet this challenge requires the Australian lucerne industry to facilitate the de-regulation of GM lucerne in Australia, while at the same time imposing an industry-based moratorium on growing GM lucerne until such time as trade and market issues will no longer threaten the domestic and export markets for lucerne seed. Obtaining deregulation would allay many of the industry and regulator concerns relating to potential trade disruption if unregulated GM lucerne were to be found.

In conclusion, the implications from the report raise two key questions for the Australian lucerne seed industry, Lucerne Australia and RIRDC in relation to the choice of the preferred pathway forward for the lucerne seed industry:

1. Is the Australian lucerne seed industry prepared to let opportunities for investment, innovation and access to new markets slip away to competitors and hence retain the current ‘status quo’ in which it operates (i.e. a boom and bust cycle of demand and supply)? or

2. Can the Australian lucerne seed industry, along with Lucerne Australia and RIRDC, create an environment with comprehensive engagement between supply chain participants and vested stakeholders including government and customers (domestic and export) for the purpose of building a sustainable and profitable industry for all stakeholders? The engagement includes well-defined processes for a clear pathway for investment in innovative products and markets for the lucerne seed industry that will ensure it builds on its competitive advantage in domestic and export markets.

The report identifies that for the Australian lucerne industry to break from the current ‘boom and bust’ cycle in which it operates, it needs investment in innovation (product, placement, positioning, people and value) in order to generate the necessary supply and demand for lucerne seed from domestic and export markets so as to sustain the industry.
In the absence of this investment the Australian lucerne seed industry will surely suffer in the long run if it cannot capture innovation and generate the ability for its supply chain participants to make choices as to how to identify, develop and implement strategies that will deliver participants a competitive advantage in domestic and in particular, export markets.

The future of innovation and sustainability for the Australian lucerne seed industry is a long-term strategy. To ensure meaningful progress it requires a combination of a clearly articulated and stakeholder-accepted industry vision, together with the stamina and fortitude to wrestle the tough issues and follow through.

The path forward for the Australian lucerne seed industry, Lucerne Australia and RIRDC will depend on more than rhetoric. To remain internationally competitive and meet the potential for growth through to 2020 and beyond will depend on the lucerne seed industry’s ability to embrace innovation, engage investment and adopt new products, technologies and marketing strategies in a manner that allows a timely realisation of the intended benefits of that investment by all stakeholders.

To achieve the desired outcomes outlined a process needs to be established under the leadership of Lucerne Australia and the RIRDC to initiate and co-ordinate the actions required to deliver on these outcomes.
Recommendations

In response to these findings the following recommendations are put forward for consideration by the industry, Lucerne Australia and RIRDC:

1) It is recommended that Lucerne Australia evaluate, through market research and intelligence, the future in domestic and export markets for traditionally produced varieties, such as Siriver, versus new proprietary varieties and near term product development opportunities such as low lignin technology. Based on this assessment Lucerne Australia needs to clearly articulate individual market requirements and develop industry-agreed goals and objectives for market access, market share and the role of new technology advancements.

2) It is recommended that Lucerne Australia and RIRDC invest in the development of an appropriate accredited training program for seed producers with the aim of up-skilling supply chain participants to a standard where it is regarded as ‘world’s best practice’.

3) It is recommended that Lucerne Australia and RIRDC take leadership to engage and collaborate with ‘like-minded’ pasture-related industry organisations in the development and presentation of a case to the Federal Government that will see pastures adopted as a cross-sectoral platform within the National R, D & E Strategy Framework.

4) It is recommended that Lucerne Australia engages with industry stakeholders to re-position Australian lucerne products in the market by way of promoting to the domestic and export livestock industries (primarily dairy) the benefits and value of Australian proprietary lucerne varieties to customers in established and new horizon markets.

5) It is recommended that Lucerne Australia approaches organisations such as Austrade and Food Innovation Australia to seek their support and expertise in the development and implementation of a range of market development activities in domestic and export markets, where the opportunity exists to promote the value and benefits of Australian lucerne varieties and the quality of the seed produced.

6) It is recommended that Lucerne Australia actively seeks to broaden its membership across the lucerne industry supply chain and its stakeholders, especially seed producers. To achieve this will require Lucerne Australia to re-evaluate its role and ensure it continues to focus on delivering benefits across the breadth of its membership.

7) It is recommended that to alleviate the risk of market disruption from a potential adventitious presence event with GM lucerne in non-GM lucerne, Lucerne Australia facilitates the deregulation of GM lucerne (i.e. Roundup Ready®) in Australia, while at the same time imposing an industry-based moratorium on growing GM lucerne until such time as trade and market access issues no longer threaten the domestic and export markets for Australian lucerne seed.
Appendices

Appendix One

Distribution of Australian pasture containing lucerne

1. New South Wales

2. Victoria
3. Tasmania

Legend
- Non-Agricultural Land
- tassla polygon
- LUCERNE
  - Not Significant
  - < 1 %
  - 1.0 - 1.6 % content

4. South Australia

Legend
- FREE-LEASE
- Non agricultural land
- sa-sla2011 polygon
- LUC-ERNE
  - Not significant
  - < 1 %
  - 1.0 - 5.0
  - 5.1 - 10.0
  - 10.1 - 15.0
  - 15.1 - 18.8 % content
Appendix Two:

Areas suitable for lucerne production Australia.

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The Australian Lucerne Seed Industry

by David Hudson, SGA Solutions Pty. Ltd.

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