

Understanding the Processing Supply Chain and Value Adding Opportunities for Pulse Industry

The Journey from Gate to Plate



A report for

By Lachlan Seears

2013 Nuffield Scholar

November 2016

Nuffield Australia Project No 1306

Sponsored by:



2013 Nuffield Australia.

All rights reserved.

This publication has been prepared in good faith on the basis of information available at the date of publication without any independent verification. Nuffield Australia does not guarantee or warrant the accuracy, reliability, completeness or currency of the information in this publication nor its usefulness in achieving any purpose.

Readers are responsible for assessing the relevance and accuracy of the content of this publication. Nuffield Australia will not be liable for any loss, damage, cost or expense incurred or arising by reason of any person using or relying on the information in this publication.

Products may be identified by proprietary or trade names to help readers identify particular types of products but this is not, and is not intended to be, an endorsement or recommendation of any product or manufacturer referred to. Other products may perform as well or better than those specifically referred to.

This publication is copyright. However, Nuffield Australia encourages wide dissemination of its research, providing the organisation is clearly acknowledged. For any enquiries concerning reproduction or acknowledgement contact the Publications Manager on ph:(02 9463 9229).

Scholar Contact Details

Lachlan Seears
Boonderoo Pastoral Company
2174 Konetta Rd
Lucindale SA 5272

Phone: 0438 667 060

Email: lachie@boonderoopastoral.com.au

In submitting this report, the Scholar has agreed to Nuffield Australia publishing this material in its edited form.

NUFFIELD AUSTRALIA Contact Details

Nuffield Australia
Telephone: (02) 9463 9229
Mobile: 0431 438 684
Email: enquiries@nuffield.com.au
Address: PO Box 1021, North Sydney, NSW 2059

Executive Summary

The Australian Pulse industry began in the 1980's and although it now only accounts for six to eight per cent of Australia's total grain production, it provides the farmer with many tools to increase business profitability and sustainability. The ability of a pulse crop to fix nitrogen in the soil increases the production opportunities for subsequent crops.

There are five main pulses grown in Australia, these being chickpeas, field peas, lentils, lupins and faba beans. They are grown right across the grain belt, from lupins in Western Australia to faba beans in Southern Australia and chickpeas in the northern region.

The processing supply chain for pulses is made up of a series of steps required to turn a pulse that is grown on farm to a product that is consumed by billions of people around the world. Farmers generally are not familiar with what is required in this process once it leaves the farm gate.

Domestic pulse processors are quite often the grain marketers and international exporters, who buy grain at the farm gate and then process it to meet market specifications. Most of Australia's pulses are exported overseas. Processors have invested significant amounts in capital infrastructure to be able to undertake this process.

Since most of Australia's pulse production is exported, shipping is an important part of the supply chain. End consumers are often large distances from Australia so a shipment, once processed, can spend up to 30 days at sea before it gets to the end user. As part of this process, significant documentation is required to be able to export grain.

The Middle East and the Indian Sub-Continent are the two main regions where pulses are consumed; they have been consumed for thousands of years and are a staple of their diet. Pulse consumption spikes in these countries during religious festivals. Emerging markets in Asia are consuming large quantities of pulses as snack foods.

Canada, France and the United Kingdom are three other major pulse-producing countries that export grain to similar markets as Australia. However, the timing of their harvest is different from Australia, and given that the dates for religious festivals change, different countries have market access advantages in different years.

Value added pulses are increasing and new market options are opening up in some Asian countries where pulses are used as snack foods. Also, with the increase in food allergies the use of pulse products as a replacement over wheat-based products is increasing. Consumer knowledge of the benefits of consuming pulses is increasing as people become more conscious about what we eat. Value added products increase business opportunities along the supply chain and vertically integrating a business allows for greater control over the supply chain.

Contents

Executive Summary	iii
Foreword.....	v
Acknowledgments	vi
Abbreviations	vii
List of Figures.....	viii
Objectives	9
Chapter 1: Introduction.....	10
Chapter 2: Domestic Production.....	12
Crop Types	12
Where the crop is grown	12
Why grow pulses	13
Chapter 3: Domestic Processing	14
Chapter 4: Documentation and Shipping	16
Documentation.....	16
Step by step process to exporting Pulses	16
Shipping	18
Chapter 5: World Production	19
India and Sub-Continent.....	21
Canada	22
United Kingdom (UK) and European Union (EU).....	24
Australian Export Competitors	25
Chapter 6: World Consumption	27
Middle East & Northern Africa	28
Indian Sub-Continent.....	29
Chapter 7: From Gate to Plate.....	30
Vertical Integration.....	30
Chapter 8: Value Adding	32
Value Added Products	32
On Farm Value Adding.....	33
Conclusion and Recommendations.....	34
Work Cited	35
Plain English Compendium Summary	37

Foreword

Pulses or grain legumes have been grown for thousands of years, in recent time farmers have increasingly been interested to see what opportunities there are to vertically integrate their farming business' and add value to the commodities that they grow. The opportunity to add value is something many farmers want to do but they are unsure how to undertake this. Talking to farmers it became increasingly obvious that farmers as a collective did not have a good understanding of what is required to turn the bulk commodities grown in paddocks into products that are consumed all around the world.

In agriculture, risk assessment and management is a major part of farming business, and quite often they look at risks and get bogged down trying to control risks that are uncontrollable such as the weather. Investigating the processing supply chain for pulse crops and see what risks there are when looking to vertically integrate farming businesses will benefit the industry.

Pulses are grown and consumed all over the world; they are a staple in many people's diet and a major source of protein for many of the world's populations. Quite often, the place where the pulse crop is grown is a substantial distance from the end consumer. Travelling the world investigating the processing supply chain to bring information back to farmers will greatly benefit the all aspects of the Australian pulse industry.

There are also some opinions from farmers about who is making all the money in the pulse industry. Farmers believe that processors are making huge margins by offering the farmer a lower price for their commodity and making big profits by turning it into a consumable product.

The risks associated with growing pulses are widely known by farmers. There has been significant investment in research and extension to educate and inform farmers about such things as disease and insect issues, and the importance in controlling weeds effectively. However, risks that are taken on by a third party, post farm gate is not widely known. Many farmers have little understanding on the shipping and logistics to get their grain legumes from the farms where they are produced to the processors and then consumers in countries like Egypt in northern Africa. Farmers also have little understanding on how currency and world production affects our farm gate prices.

Acknowledgments

- I would like to thank my wife Rebecca, children Hugh and Anneliese for allowing me to travel and see all the wonderful people, businesses and sights around the world.
- My parents Peter and Helen for the encouragement and willingness to support me to be away from the business for such a long period of time.
- My sponsor, the Grains Research and Development Corporation, for allowing me to research a topic of interest to me that will bring benefit to the industry.
- Nuffield Australia and Nuffield International for awarding me a scholarship and setting up such a great platform and program to explore my chosen research topic.
- My work colleagues Jamie Partridge and Craig Cooper for stepping up where required taking on challenging roles throughout the year.
- I would like to thank my nine GFP brothers for a once in a lifetime trip, the special moments we had and experiences we shared together, which will stay with me forever.
- Fellow 2013 Nuffield Scholars whom I have been fortunate enough to be able to share such wonderful life experiences with.

Abbreviations

A\$ - Australian Dollar.

GFP – Global Focus Program.

GMO – Genetically Modified Organism.

GRDC – Grains Research and Development Corporation.

(MT) – Metric Tonnes.

PBA – Pulse Breeding Australia.

List of Figures

Figure 1: Legume family (Pulse Canada).....	11
Figure 2: Where Australian pulse crops are grown.....	13
Figure 3: Australia Milling Group processing facility Horsham Victoria.....	14
Figure 4: Documentation step by step process. Department of Agriculture and Water Resources.....	17
Figure 5: Shipping Transport Melbourne to Alexandria (www.searates.com).....	18
Figure 6: Candian lentil harvest Saskatchewan.....	19
Figure 7: Pulse planting and harvest timing (FAO Stat).....	20
Figure 8: Pulse plantings in Canada (Pulse Canada).....	22
Figure 9: Simpson Seeds processing and loading facilty Moose Jaw Saskatchewan Canada...23	
Figure 10: Wherry and Sons trial plots and breeding program.....	24
Figure 11: Newlands Farm Shop fresh broad beans.....	27
Figure 12: Fuul traditional Egyptian dish.....	28
Figure 13: Ramadan timing.....	28
Figure 14: McDougall Acres Saskatchewan Canada.....	30
Figure 15: Elyce Simpson “Simpson Seeds”	31
Figure 16: Humus Place New York United States of America.....	32

Objectives

- I will highlight the steps along the processing supply chain for the pulse industry. “The journey from producer to consumer”. This will give the producer and understanding of the steps involved to turn a commodity into a consumable product. This is a process that is not well understood by growers across the industry.
- Understanding both domestic and world production and consumption of pulses and what are some of the drivers of the market.
- I will explore the opportunities to be able to value add to the pulse crop for the grower.
- I will highlight some risks associated with vertically integrating along the supply chain, as a grower aims to get closer to the consumer.
- I will look at current food technologies where pulses can be used as a valuable part of nutrition, particularly given that pulses are consumed by people all over the world.

Chapter 1: Introduction

Pulses are produced and consumed all over the world and for a large part of the world's population it is a vital part of their diet. Pulses or grain legumes are an excellent source of protein. The Australian pulse industry is part of the Australian grain industry, and although only contributing approximately 2.05 million metric tonnes (MT) of the approximately 40 million tonne Australian crop, it is a vital sector of the grains industry.

The pulse industry consists of five main crops and a number of smaller niche crops. The five main types of pulses grown across all grain production areas across Australia are chickpeas, field peas, beans, lentils and lupins. The type of pulse grown depends on various things such as soil type, soil pH, rainfall and proximity of domestic processor. The main crops for the three main production areas across Australia are as follows:

- Lupins in Western Australia (a total of approximately 294,000 MT of lupins are grown in Western Australia accounting for approximately 70 per cent of the total tonnage grown in Australia)
- Chickpeas are the main pulse in the northern growing region taking in northern New South Wales and Queensland (making up 86 per cent of Australia's total chickpea production)
- Faba and broad beans along with field peas are the two main pulses grown in the southern region of Australia. (73 per cent of the nation's faba and broad beans are grown in southern New South Wales, Victoria, Tasmania and South Australia. 66 per cent of Australia's field peas are also grown in this region).
- 100% of the national lentil crop is grown in the southern production region (Southern New South Wales, Victoria and South Australia).

Pulses plantings, although small in area when compared to wheat, are a vital component of the grain industry. Studies have shown that when wheat is sown after a pulse, it has the ability to increase yield by up to 1t / ha the following year.

Many farmers have indicated a desire to add a pulse crop to their rotation for a number of reasons. In particular, pulses fix nitrogen in the soil and make it available for the subsequent crops, allow for greater weed and root disease control as the pulse can be used as a break crop from the traditional wheat and barley grown.

Pulse are part of the legume family as seen in figure 1, crops that are produced on farms across Australia are a bulk commodity; for these pulses to be consumed they have to be processed to turn them into a product. Farmers have excellent knowledge and understanding of the production of pulses on farm but from consultation with farmers the steps required to turn a bulk commodity into a consumable product are not widely known. What is also not known is what risks a processor or grain trader takes once they purchase a bulk commodity from the farmer.

Value adding to a commodity is a great way of increasing profitability of the commodity produced. There have been several developments with food technology in recent years and this has seen an opportunity for farmers and domestic processors to add value to the Australian pulse crops.

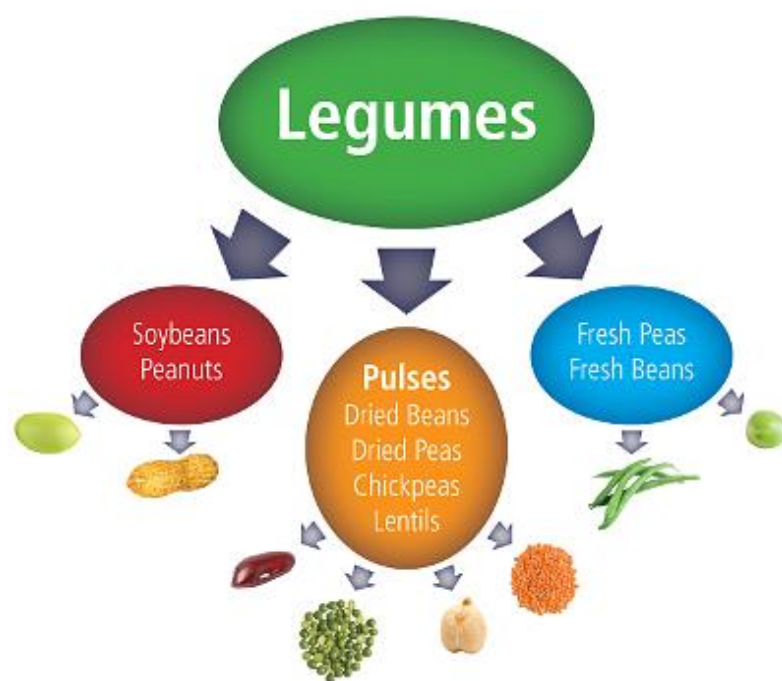


Figure 1: Legume Family (Pulse Canada)

Chapter 2: Domestic Production

Crop Types

Pulse production took off in Australia in the 1980's and production has grown steadily over the years. Ten years after pulse production began, Australian farmers were producing around 1,300,000 MT annually. This figure has grown and the industry now produces approximately 2,050,000 MT. This pulse industry is valued at over A\$675 million.

There are five major pulse crops grown within the agricultural production zone of Australia plus a number of smaller niche crops in selected growing areas.

The largest crop grown by tonnage is chickpeas. There are two types of Chickpea grown in Australia; the major type is the Desi and the other is Kabuli. The Desi type accounts for approximately 85-90 per cent of total production. According to figures obtained from Pulse Australia, in the production year 2012 an estimated 713,400 MT of chickpeas were produced. This is higher than the 639,300 MT predicted for the 2013 production year. The second largest crop grown in Australia is the lupin. Western Australia accounts for 86 per cent of Australia's lupin production.

There are a number of smaller niche type pulse crops that are grown in Australia. Some examples of these niche crops are mung beans, cowpeas, pigeon peas, azuki beans, and broad beans.

Where the crop is grown

The Australian pulse crop is grown across all the major grain production areas from Queensland in the north to Victoria in the south and all the way across to Western Australia as seen in figure 2. For the five major crop types grown in Australia the location of each growing zone is typically dependant on rainfall and soil types. New South Wales (NSW) and Southern Queensland account for 85 percent of Australia's Chickpea production. Western Australia (WA) is the largest production area for lupins, the sandy soils of WA being ideal for producing the high quality lupins that Australia is globally known for. Pulses are a necessary crop for the WA grower as it is a great break crop that is used in the traditional wheat producing areas.



Figure 2: Where Australian Pulse crops are grown

(https://www.researchgate.net/figure/269040247_fig1_Fig-1-Shaded-areas-indicate-the-Australian-grain-belt-a-northern-grain-region-b)

In recent years, Grains Research and Development Corporation (GRDC), has encouraged an increase in the production of pulses grown in non-traditional growing areas particularly on the acidic soils in South West Victoria. These areas have also not been traditional growing areas due to such issues as water logging. Pulse Breeding Australia (PBA) has been focusing quite a lot of effort in the breeding of beans both faba and broad varieties along with peas to suit these areas.

Why grow pulses

Pulses were once a crop that was grown to provide nitrogen to the subsequent wheat crop, and to also act as a weed and disease break crop. As an industry, we have progressed from using pulses only as specialists crops, to become an integral part of the crop rotation. Profitability of growing pulses is increasing as growers are having access to better agronomy packages and the introduction of new varieties becoming available through research and extension.

One downside of growing pulses is that seasonal variations that are experience in Australia have a huge impact on pulse yield and quality. For example, faba beans are often referred to as “Failure Beans” as production was never consistent and quite often production is a boom or bust situation. Once the pulses have been harvested they are now ready for the processing stage.

Chapter 3: Domestic Processing

The processing of pulses includes the steps required to turn a pulse crop that is grown on farm into a consumable product that can be eaten all over the world. There are varying degrees of processing that are undertaken domestically that enable a pulse to be marketed either domestically or internationally. The main type of processing that is undertaken in Australia can be described as primary processing. Primary processing is mainly whole grain grading and splitting. This processing is undertaken by Australia Milling Group located in Horsham in Victoria whos facility can be seen in Figure 3. The majority of domestic processors in Australia are also international grain marketers. They usually purchase the crop direct from the farmer and then undertake varying amounts of processing before on-selling it.



Figure 3: Australia Milling Group processing facility Horsham Victoria.

In a normal situation, a pulse is grown on farm and once harvested is either put in on-farm storage or delivered to a bulk handler (E.g. Graincorp or Viterro). One of the common crops grown in the southern growing region is faba beans. The amount of processing undertaken for this crop can vary dramatically. The crop can be harvested and delivered to a bulk handler and from there the process could be as simple as being trucked from a grain receivable site, delivered to port and loaded onto a shipping vessel to a destination such as Egypt.

A value-added product is also being processed domestically; a split faba bean market is quite active in Australia. Companies such as Australian Milling Group (AMG) have invested significant amounts of capital to be able to process these pulses. They have a splitting and bagging facility that allows them to take delivery of a bulk commodity and then go through the process of cleaning (removal of foreign material), grading and size sorting before being split and bagged. After this is would be loaded into a shipping container ready to be delivered to port for export.

Broad beans are a niche crop with annual production estimated to be approximately 50,000 MT. This tonnage is quite small when compared to the 540,000 MT of Desi chickpeas that are produced annually. The typical processing for this crop is that once harvested it could be typically stored on farm. From here domestic grain-marketing companies will buy the product based on sample provided. Once purchased the commodity will remain in storage until the processor / grain marketer requires the product to be delivered. The price paid for this depends on a number of different things. The first thing a processor measures is the size of the beans. They are typically sized using a 14 millimeter round hole sieve to determine what percentage of crop is above or below the nominate sieve size. Once sized they will then check seed count per 100 grams of grain. As always the pulses are visually inspected for any defects in colour, insect or mechanical damage.

Once the pulses have been processed if they are to be consumed locally they would be distributed to shops, markets etc where they could be sold into domestic market. However if they are destined for the export market they are now ready for the quarantine and shipping documentation step in the processing supply chain.

Chapter 4: Documentation and Shipping

Once any processing if required is completed the grain is ready for shipping. Because there is little domestic consumption of pulses in Australia, the majority of the crop that is grown in Australia is exported overseas and they are required to satisfy certain standards to be suitable for export and shipping. Shipping can be either in bulk vessels or in a twenty or forty foot shipping container. The main form of transport from a processing plant to port is via road freight typically truck. One big factor for the use of trucks is that we have a poor national rail network, however the cost to implement a rail network that would be efficient is cost prohibitive.

Booking shipping freight is only one half of what is required in the shipping part of processing supply chain. The other half of this very important and necessary step in the supply chain is documentation. There are very strict quarantine rules that apply for both the importation and exportation of any good that is leaving or entering Australia. As pulses are food products they have extra measures put on them to ensure that no foreign pest or diseases are entering the country that the Australian pulses are being exported to.

Documentation

Documentation is a crucial part of the processing supply chain, and without the relevant and correct documentation you will not be able to export anything from Australia.

Step by step process to exporting Pulses

There are six main steps that need to be completed in the pulse export chain.

All of the steps are required to be granted permission to export grain from Australia to important markets all around the world.

They are as follows:

- **Step 1:** Is to identify if the goods are prescribed or non-prescribed. A good is defined under Australia's *Export Control Act 1982*. Under this act most grains are described as prescribed goods and require export certification.
- **Step 2:** Check importing countries requirements. This is vital as there is little point in going through the process of exporting your pulse crop to find that when it gets to its country of destination it will be rejected as it does not meet their requirements.

- **Step 3:** This is when the first amount of paperwork is required to be submitted. The paperwork required at this step is the “Notice of intent to export” and supporting documents. The supporting documents will vary depending on what you are intending to export. For pulses there are a number of documents required. Some of these additional documents are inspection of goods permit, a certificate of condition, phytosanitary documents, genetically modified organism (GMO) status along with several others.
- **Step 4:** Prepare your goods: With this step it is not only the goods that need to be prepared but also the business or location where the goods are processed or packed. The place where the goods are packed must qualify for an export license and must be constructed and operated in an effective and hygienic manner.
- **Step 5:** Presentation of Documents: Before you can export any goods they will need to be inspected and must comply with all relevant regulations. Once satisfied documentation will then be authorised.
- **Step 6:** Export your goods, once you have had the goods inspected and authorised they can be packed. If you are packing into a container you will have to have the container inspected to ensure it is compliant as well. Once all of this has been done you are able to contact the “*Plant Export Operations*” for your certificates to be authorised.

See figure 4 below for simplified step-by-step process.

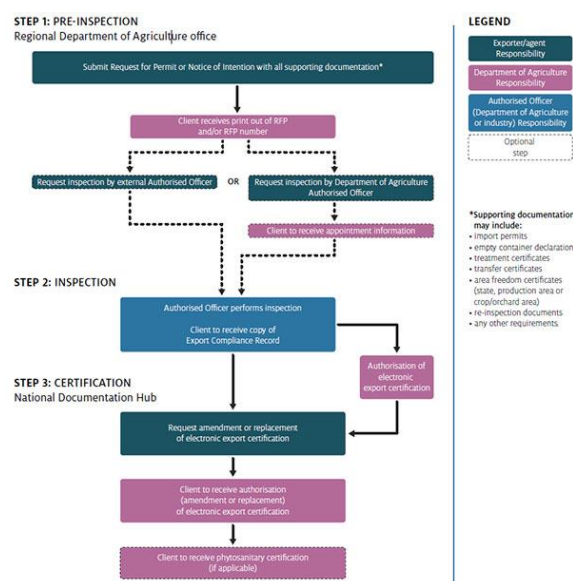


Figure 4: Department of Agriculture and Water Resources, 2014

The export permits are valid for 28 days once issued, and authorisation for any goods not exported in this time will be revoked.

Shipping

Once all paperwork has been completed the goods destined for export are now ready to be shipped. Shipping is booked and you would then be allocated a loading position for you to have your container ready to be loaded. As ship loading and unloading is based on a tight schedule, loading time of containers or bulk vessels is done so that a ship is docked in port for the shortest time as possible. Any delays in unloading and loading process are unacceptable.

Once the ship has been loaded it is then given permission to leave port and starts the journey to its destination. As most pulses are exported to the Middle East the average time for the trip is approximately 24 days this can be seen in figure 5 below with estimations from the searates website. Once the ship has arrived at its destination it goes through receivable standards and practises. Once the ship or container has cleared customs, the documentation for the country that has taken delivery can be submitted. Documentation and ownership of the pulse remains that of the seller until it has been paid for. At this time documentation can be picked up and ownership title now goes to the buyer. Inspection of the goods is not allowed until documentation has been paid for.

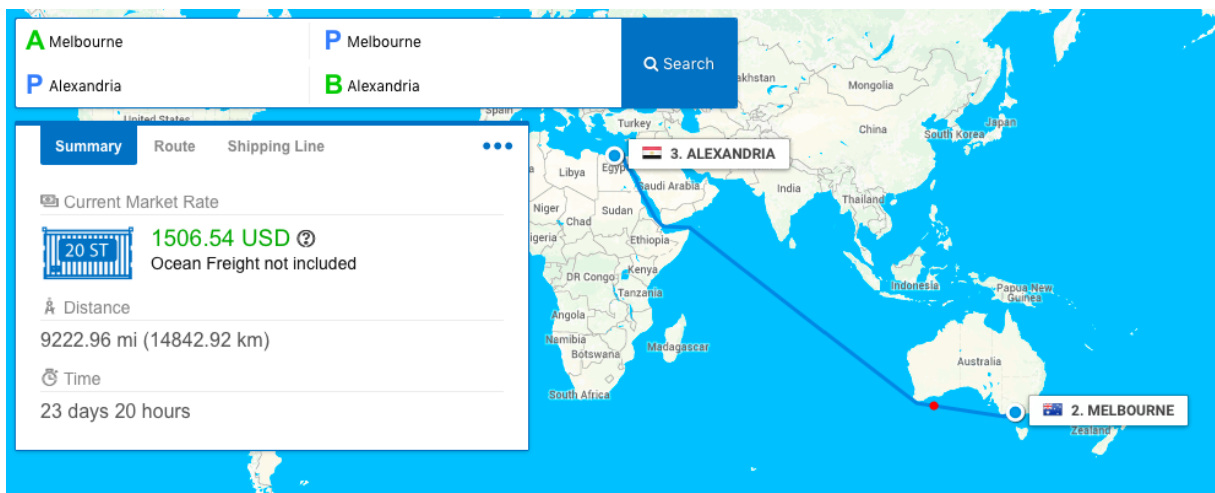


Figure 5: Ship freight time Melboure to Alexandria (www.searates.com)

Chapter 5: World Production

Pulses are grown all over the world in some cases the place of production is the point of consumption. During the year of 2009 approximately 60,000,000 MT of pulses were produced around the world. Of the world production, India makes up just under one third of world production. The Desi chickpea dominates India's production, accounting for 75 per cent of total production, with the vast majority of production being consumed domestically. In other cases, the point of production can be a world away from the point of consumption. An example of this is the production of Canadian Lentils which are grown, processed and shipped from the West Coast of Canada to as far as Egypt, which is over 20,000 km by land and sea freight and estimated travel time is 32 days. Figure 6 below shows typical machinery used by farmers to harvesting lentils. The air booms at the front of the reel are added to ensure all lentil grain is harvested and collected and not lost in the paddock.



Figure 6: Canadian lentil harvest Saskatchewan

Timing of operations both sowing and harvest happen at different times in countries around the world as seen below in figure 7. The timing of harvest can be crucial when marketing pulses. Pulse consumption peaks during religious festivals and if harvest for a particular country occurs after the event they have missed a big marketing opportunity.

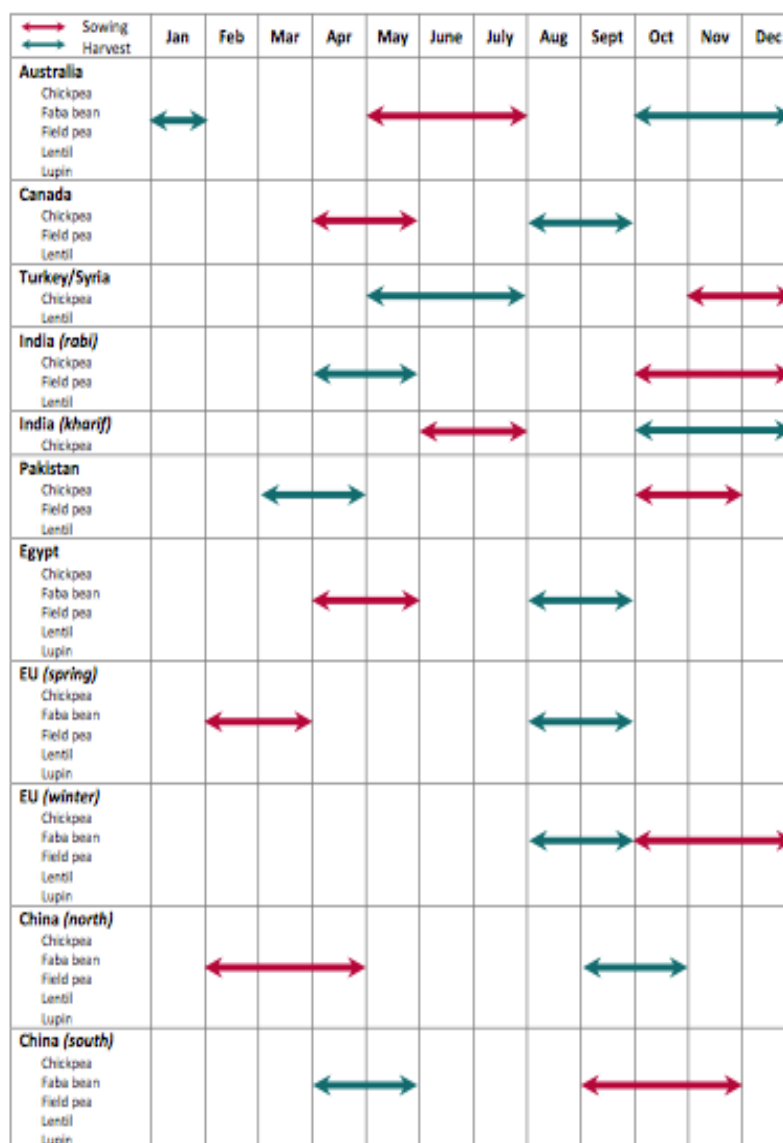


Figure 7: FAO Stat (2012)

India and Sub-Continent

India is the largest producer of pulses in the world and the Sub-Continent region is one of the biggest consumers of pulse crops. The region is the major producer and consumer of chickpeas sourced locally and overseas.

India has two growing seasons. The first is the Rabi (winter production) and the second is the Kharif (summer production). The Rabi accounts for approximately two thirds of all of India's production. It produces annually approximately 12 million metric tonnes and the Kharif produces approximately 6 million metric tonnes, with total annual production of approximately 18 million metric tonnes. Along with its domestic production, India also import between 4-5 million metric tonnes annually to feed their one billion plus human population.

Production of pulses is a major part of the Indian production system; pulse plantings for the winter season make up 25 per cent of the total production area. This is substantial when compared to the Australian growing region where pulse planting makes up only 8 per cent of total crop production area. Wheat and barley account for 72 per cent of the area sown under crop for the five-year average from 06/07 to 10/11 production years. (Department of Agriculture, Fisheries and Forestry, 2012)

Other significant countries in the Sub-Continent include Pakistan, Sri Lanka and Bangladesh. These countries are all significant importers of Australian pulses and the four countries combined account for the majority of Australian exports from November 2010 to October 2011 of chickpeas (76 per cent of exports), field peas (84 per cent of exports) and lentils (65 per cent of exports). (Australian Bureau of Statistics, 2010-2011) (Agricultural Ministry of India, 2009-2010)

Canada

Canada accounts for approximately ten per cent of world pulse production. Canada's production has been at record levels since 2010 with the whole crop averaging approximately six million metric tonnes of grain produced. The two main pulse crops produced in Canada are field peas and lentils. Alberta, Saskatchewan and Western Manitoba as seen below in figure 8 are the major pulse production growing regions for both the pea and lentil. Canada exported 75 per cent of its annual production to countries all over the world and meets the needs of over 150 markets. "In 2011 they exported 4.7 million metric tonnes worth nearly \$2.7 billion" (Pulse Canada, 2011).

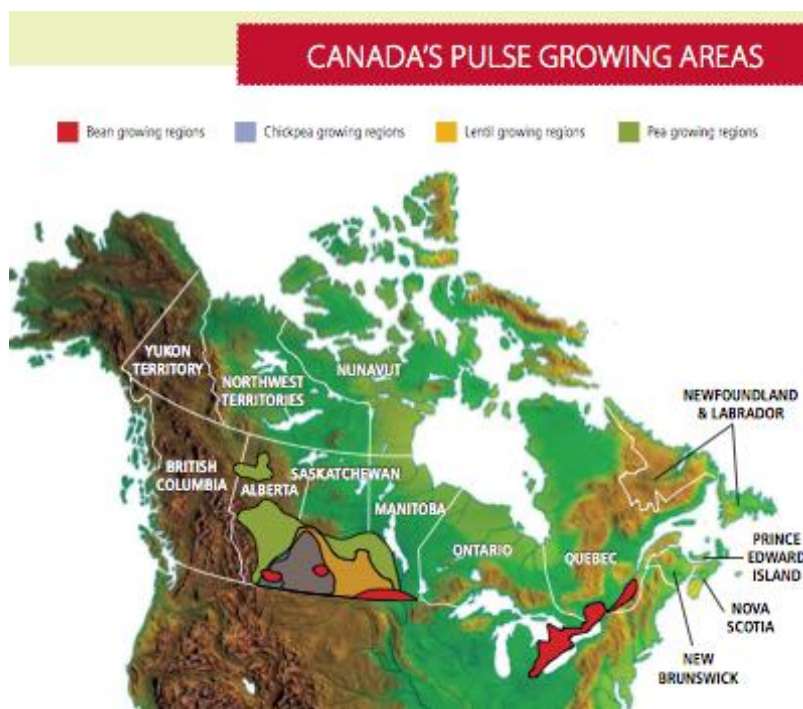


Figure 8: Pulse Canada 2011

Canada has traditionally been a very large grower of the green lentil, and in the 1990's it accounted for 75 per cent of lentil production. In the mid 2000's, the Canadian green lentil market suffered from depressed pricing and saw growers making a switch to growing more of the red lentil varieties. In 2006, there was roughly a 50/50 split of green / red lentil production. Now there is significant planting of red lentils and are the major type of lentil produced in Canada, and is in direct competition to the high quality red lentil produced in Australia.

When looking at the map above in figure 8 of Canada in relation to the growing regions of pulses, the majority of pulses are grown in Western Canada across the three provinces (Alberta,

Saskatchewan and Manitoba). When looking to export their products, because of their proximity to end consumers, all products have to be shipped by sea freight. One significant challenge when exporting from Canada is getting product to ports on the West Coast. The most cost effective form of transport from processing plant to port is via rail freight. The reason for this is the large mountain range between production zone and port facility, this makes truck freight cost prohibitive. However, Canada is currently going through an oil boom and the two rail providers are dealing with significant increases in rail cars used to cart oil. In 2009, it was estimated that there were 6,000 train carloads moved. In 2014 it has been estimated that 14,000 train carloads have been moved. This is at the same time as producers are trying to move Canada's record harvest, and to compound the situation Canada has experienced an extremely cold winter since early December which is meaning Canadian trains need to be shorter and not able to haul as much freight at one time (CBC News Calgary, Feb 2014).

The issues with rail freight have been going on for a number of years according to Elyce Simpson from Simpson Seeds based in Moose Jaw Saskatchewan. "Getting a train to stop at our facility and hook on extra grain carts is proving very difficult, the trains just want to hook up in one place and continue non-stop all the way to their destination".



Figure 9: Simpson Seeds Moose Jaw is Saskatchewan.

Canada's second biggest pulse crop is peas, the two varieties are the yellow and green pea. Canada is the largest exporter of yellow peas around the world with the majority of exports going to India and other Sub-Continent countries. The pea market in Canada is heavily influenced by the world chickpea and lentil price. Consumers in the Sub-Continent will use peas as a substitute when chickpeas and lentils become too expensive.

United Kingdom (UK) and European Union (EU)

Europe has not traditionally been a world leader in terms of total amount of pulses grown, when compared to countries in the Indian Sub-Continent and Canada, however they are world leaders in some crops in terms of export quantities that they sell. The UK produces between 450-500,000 MT of faba beans annually. Of this, around 150,000 MT is exported for human consumption to countries mainly in the Middle East, while the remainder of production is used in the domestic stockfeed market. France, like the UK, is a large producer of faba beans and exports significant amounts of faba beans each year to Egypt and the Middle East.

The UK and France both have significant market advantages over the Australian faba bean crop, in that they are very close to the end consumer in terms of the travel time. To get from France to Egypt is only four days via sea freight as opposed to just under 30 days from the east coast of Australia. The European countries also have an earlier harvest time when compared to Australian production. The EU growers are harvesting their pulses crops in August and September as opposed to Australian that doesn't traditionally start until October.

UK company “Wherry and Sons” have made significant investment in the faba bean industry and are responsible for the research and commercialisation as shown in figure 10 work of varieties such as “Wizard”. The team at Wherry and Sons have developed the variety “Wizard” and seed is sold to producers and then Wherry and Sons have market options for the producer to be able to sell back through them. This is quite unique for a private company to be involved at either end of the supply chain. Dan Wherry said “They no longer have a processing facility due to capital cost and maintenance required, they have now contracted the cleaning and processing to a third party”.



Figure: 10 “Wherry and Sons” Trial Plots



New Bean varieties breeding program

Australian Export Competitors

Australia accounts for just fewer than 4 per cent of world production, but is one of the biggest exporters of chickpeas and faba beans internationally. The reason Australia is one of the biggest exporters is that India although it is the largest producer in the world the majority of production is consumed domestically. Australia has a number of other countries that it is in direct competition with for its export markets. It is not only different countries that compete with Australia but also different crops. An example of this is Australian chickpea exports. Australia is the largest exporter of chickpeas worldwide, accounting for 37 per cent of world exports in 2008. A competitor to the Australian chickpea export market is the Canadian yellow pea crop. If the chickpea becomes too expensive the Indian processor or consumer will substitute the Canadian pea for the chickpea when making flour.

World exports for faba beans are dominated by three main countries; being Australia, United Kingdom (UK) and France. The major world market for faba beans is the Middle East, principally Egypt and Saudi Arabia. 75 per cent of Australian faba bean production has historically been exported to Egypt. France and the UK have the big advantage over the Australian grower in that the shipping cost and time on sea are both considerably less. On average, it takes approximately 28 days on sea for a ship to leave Australia on the east coast before it docks in Egypt. This also presents risks for the Australian marketer in terms of spoilage, but a bigger risk is the potential shift in the market during the 28 days of transit when a change in currency could cause the price to drop, and the buyer in these Middle East markets may default on the contract. They will then look to renegotiate a new price lower. This gives the Australian marketer little option as they have committed to shipping product to that country.

Canada and Australia are competing for the same markets in regards to the international red lentil crop. In the past Canada has mainly produced the green lentil and Australia has produced the red lentil, however a drop in green lentil pricing meant many Canadian growers changed to growing the red lentil.

Apart from the traditional competitors to Australia, some new ones are emerging that are fast catching up to countries such as Australia, France and the UK in regards to the quality of pulses that they produce. They are countries located in the Black Sea grain-growing region such as Russia and the Ukraine. Turkey is a large shipping and processing hub for pulses produced in the UK and EU. Pulse brokers Sait Dervisoglu from Agroder located in Mersin Turkey has the ability to be able to source pulses and other grains from the UK and EU and have them processed

and delivered to their customers in the Middle East within a number of days. Other countries that are on the rise, according to Peter Wilson, Chairman of Pulse Australia and CEO of Australian Milling Group, are Ethiopia and Tanzania. A big advantage of these countries is geographical proximity to Egypt and the Middle East markets.

For Australia to position itself at the front of world exports the Australian grower needs to continue to grow the industry while at the same time not compromising on quality of product that is produced. The Australian crop is known for its uniformity of size and good colour. This type of consistency is what the processor wants. Mufaddal for Food Industries located in Cairo, Egypt is extremely happy with the Australian product but does not like the time taken to ship from the growing regions of Australia to their processing facility in Egypt.

After considering who Australia is competing against it is now time to turn attention towards the consumer to see where and how pulses are consumed around the world.

Chapter 6: World Consumption

Pulses are a major source of protein in many diets around the world, people have consumed them for thousands of years. However, in recent years the nutritional benefits of pulses have been widely publicised and pulse consumption is increasing in countries that haven't traditionally been large consumers. Consumption of pulses falls into two categories, the first being for human consumption and the second being for the stock feed industry.

In the UK, there is a push to increase in the amount of food that is grown locally and sourced from fresh markets. With consumers becoming better educated and having a greater appreciation for where their food comes from, more and more the consumer is wanting to buy local seasonal produce. This type of buying attitude can be seen in figure 11 where “Newlyns Farm Shop” in Hampshire are sourcing locally grown fresh broad beans and being sold into the domestic market.



Figure 11: “Newlands Farm Shop” Hampshire UK.

Middle East & Northern Africa

The Middle Eastern and North African countries are traditional consumers of pulses. It has been part of their diet for thousands of years. Pulses are consumed as part of the everyday diet. However peak consumption happens during religious and cultural festivals such as Ramadan. In Egypt, the traditional faba bean dish is referred to as “Fuul” which can be seen in figure 12. It is made by soaking dry beans overnight and then stewing them to be eaten for breakfast the next day.



Figure 12 “Fuul” traditional Egyptian dish

Ramadan is a month long religious festival that takes place during the ninth month of the Islamic calendar; the calendar year consists of 12 months and is 354 days long. Because the Islamic calendar only goes for 354 days instead of the traditional Gregorian calendar that goes for 365 days, the date for the start of Ramadan changes each year. Moving forward approx. 11 days as illustrated in figure 13.

Ramadan Start Date

<u>Day</u>	<u>Month</u>	<u>Year</u>
Sunday	Jun 29	2014
Thursday	Jun 18	2015
Tuesday	Jun 7	2016
Saturday	May 27	2017
Wednesday	May 16	2018
Monday	May 6	2019
Friday	Apr 24	2020

Figure 13: Ramadan timing

The timing of Ramadan is important for countries that are looking to supply product as some countries will have product that is able to be used in some years and in other years Ramadan happens before they are able to harvest their crop.

As you can see in the above table a country that is able to harvest, process and ship their product to the Middle East before Ramadan has a significant market advantage. Since the timing of Ramadan changes the market advantage also changes for various countries that supply to Middle Eastern and Northern African countries.

Indian Sub-Continent

The Indian Sub-Continent is a major destination for quite a lot of pulse crops that are grown in Australia. With India having a population in excess of 1,000,000,000 people and the chickpea being a major staple of the diet, their desire is for Australia's high quality chickpea. Chickpeas are consumed in a number of different forms; the two most common are as a whole grain or as flour. Throughout India, peas are cooked and eaten as a snack food. Split peas and pea flour are used and quite often blended with more expensive pulses such as chickpeas. Lentils are often added with rice and consumed as *dal*. *Dal* is an entrée that is eaten by everyone in India. It is served by roadside vendors all the way through to five-star restaurants.

The Indian consumers' habits are highly sensitive to price. If one particular commodity becomes too expensive they will switch to a cheaper product and blend it to keep the cost down.

Now that we have looked at where pulses are produced and consumed we now need to consider how to vertically integrate businesses and look at value adding opportunities that are available.

Chapter 7: From Gate to Plate

Vertical Integration

Any business that is involved along the processing supply chain has the opportunity to add value to the commodity or product that they are growing, marketing or selling. If you are able to move either up or down the supply chain you are vertically integrating your business. The McDougall brothers in Saskatchewan Canada at “McDougall Acres” have undertaken vertical integration to maintain control of their product and increase profitability. They started farming by growing pulses such as lentils and chickpeas. In an effort to diversify and make the business more profitable they made a business decision to set up on farm storage, seed cleaning and processing facility that can be seen below in figure 14. One way they are value adding to what they grow is by making products that are able to substitute carbohydrates based products in dog food with pulse based products, this provides a great source of protein. Although they are supplying processed pulses into a lesser value product they are able to do this by using the second and third grade pulses that other processors do not have a market for. They are able to buy them at a heavily discounted prices and then process them and add them to the dog food.



Figure 14 “McDougall Acres” Moose Jaw Saskatchewan

Simpson Seeds is a family owned and operated company that was incorporated in 1979. It was started by a father and his three sons, they began by growing pulses near Moose Jaw in Saskatchewan. They started experimenting by growing yellow peas. They looked to expand their business and diversified into cleaning seed for farmers during the Canadian winter. The next step in the business evolution was to do third party processing for the export market. This then lead them to establishing their own client base overseas. Now the Simpson family has a stake in all steps in the supply chain from producing pulses on farm to delivering processed pulses to clients overseas. Director of marketing and business development Elyce Simpson pictured in figure 15 is part of the third generation of the Simpson family now working in the business as new family members enter the business they work in the part of the business that suite their expertise such as working on the farm or trading grain overseas.



Figure 15: Elyce Simpson from “Simpson Seeds”

There are some risks associated with vertical integration. Progressing either up or down in the supply chain requires significant capital investment. There can also be a great number of different skills and requirements to be able to do this. For example if a pulse producer was looking to vertically integrate their farm through marketing pulses direct to the consumer, they may need to employ someone with the necessary marketing skills. More often than not when exporting overseas, they would have to take into account a number of external risks including currency volatility and quarantine requirements and restrictions.

Consumers these days are demanding more and more information about how their food is produced. The paperwork required to demonstrate this is increasing. However, producers are not being rewarded for the extra information in dollars per tonne at the farm gate. It has become a necessity to provide this information to be able secure access certain markets.

Chapter 8: Value Adding

Adding value to something should by its nature, increase the value and potentially the profit margin of what you are selling. Value adding your pulse crop could be something as simple as cleaning the smaller grains out and selling the larger seeded ones with the smaller ones used in a feedlot ration. Or it could be as complex as splitting faba beans and processing them so they can be sold into the snack food market.

Food technology developments are allowing processors to add value to the pulses that we are growing on farms. Companies such as Alliance Grain Traders in Canada are undertaking significant work in the US to develop further processed pulse products. Pulse flour replacing wheat-based flour is a development that is being widely adopted by the consumer. With more and more food allergies becoming common, pulses are a great alternative to the mainstream wheat based products. The nutritional benefits of using pulses are many. With the increase of food intolerances especially to wheat based products, the increase use of pulses in food manufacturing will only increase.



Figure 16: “Hummus Place” on Bleeker St in New York’s West Village.

Value Added Products

The snack food industry has the ability to value add a pulse more than just a grain additive. Countries in South East Asia are increasing their consumption of these snack foods as their disposable income increases. China is a country that has a rising middle class and presents a great opportunity to enter and develop markets for our value added pulses. The most common value added product in the pulse industry is Hummus, which is produced from chickpeas. In developed countries, the consumption of these products is increasing as the health benefits are

being more widely known. As mentioned in chapter 6 there is a rise in consumption of pulses and pulse products in non-traditional consumption countries. This can be seen in figure 16 with the Humus place shop being opened in New York.

On Farm Value Adding

Growers are always looking to extract every bit of income they can from what they produce on farm. If you are able to add value to your pulses on farm it is a good way to extract the last bit of added earning potential before it is sold or transferred to the next person in the supply chain.

A farmer investing in such infrastructure as on farm grain storage gives them the ability to store the grain harvested and to then market at a later date. Boonderoo Pastoral Company which is a family property located in the southeast of South Australia and run by the Seeers family did this in 2002. They started with using on-farm storage to store broad beans. The crop was then marketed to domestic processors at a later date and they were able to capture in excess of \$100 + per MT more than what was being offered at harvest time. This gave them the ability to pay for storage investment in the first year. Peter Seeers says “While this is not the normal case it was a nice bonus to be able to pay it off in the first year”. He went on to say that over the coming years they have increased on farm storage and are using it as a marketing tool to add value to other crops they grow on farm.

A simple value adding process that farmers are able to do is to clean or grade their pulse crops. Cleaning them could be something as simple as putting them over a rotary grain-cleaning machine. These screens have the ability to take out any smaller grains and foreign material such as rocks and dirt. An example of this is that broad beans that are grown in southern Australia are bought on the basis of what percentage of the crop is above a 14 millimetre screen. If the crop grades out at seventy per cent then it may have a value of \$500.00 per MT. If the grain was cleaned but the farmer and the percentage of grain that is above a fourteen millimetre screen was increased to eighty per cent that could expect to receive an extra \$50 per MT. The second graded beans could then be utilized to supplementary feed livestock. This is another value adding opportunity that is available to the farmer.

Conclusion and Recommendations

Pulses are an important part of the Australian grain industry and play a crucial role in the rotation. As farmers see developments in pulse breeding and with agronomy packages, the area sown to pulse plantings should increase into non-traditional growing areas. When considering what pulse to grow you should look at what will suit your area and grow that. An example of this is if broad beans are a high rainfall bean that is grown in 650+ millimetre growing regions if you only receive 500 millimetres they shouldn't be grown and faba beans would better suit this type of rainfall environment.

Processors have made significant investment in capital and in infrastructure to be able to process pulses; the greater growing community does not appreciate just how expensive grading and cleaning machines are. Another issue that isn't greatly appreciated by the grower is the risk that they are taking by purchasing a pulse crop and then having to process it and then on-sell it. Processors are taking on board all the risk of the crop spoiling, currency variations and also the fact that they are dealing with countries and people that historically default on contracts.

Farmers should look to develop relationships with processors and grain marketers for the long term. Processors find it hard to develop markets and supply to them if production is in a boom or bust cycle. As breeders develop new varieties that are suitable to grow in emerging production areas that have reliable rainfall such as the acidic soils in the western districts of Victoria, stability of production tonnages will make it easier for marketers to have confidence to secure market access.

As a grower it is hard to get accurate and up to date market information, and we rely on feedback from processors who buy and market grain. To benefit all aspects of the pulse industry, farmers and processors and grain marketers need to have more open communication where information on production and export demand and market outlook information is exchanged to benefit everyone that is involved with the processing supply chain from the farmers in Australia to the international exporters of products.

Work Cited

Agricultural Ministry of India. (2009-2010). *Indian Agricultural Review*.

Alberta Pulse (February 2015) *Pulse Market Insight #100 "India Pulse Crop Situation"*
<http://pulse.ab.ca/news/article/pulse-market-insight-issue-100>

Australian Bureau of Statistics. (2010-2011).

CBC News Calgary. (Feb 2014). *Railway grain backlog prompts farmers to demand action*
<http://www.cbc.ca/news/canada/calgary/railway-grain-backlog-prompts-farmers-to-demand-action-1.2524134>.

Department of Agriculture, Fisheries and Forestry. (2012). *ABARES Australian Crop Production*.

Department of Agriculture. (2014). *Step by Step Documentation process*.
<http://www.agriculture.gov.au/export/controlled-goods/plants-plant-products/exportersguide>

Dervisoglu, S (July 2013). Personal Communication. Agroder Mersin Turkey.

Dr John Kirkegaard (2/3/2015) GRDC *Grain legumes can deliver an extra 1t/ha yield to wheat*
<http://www.grdc.com.au/Media-Centre/Ground-Cover-Supplements/Ground-Cover-Issue-115-Profitable-pulses-and-pastures/Grain-legumes-can-deliver-an-extra-1tha-yield-to-wheat-crops>

Eric Armstrong, Luke Gaynor, Gerald O'Connor, Sarah Elliis & Neil Coombes. (17/2/2015). *Faba beans for acidic soil in southern NSW*.
<https://www.grdc.com.au/Research-and-Development/GRDC-Update-Papers/2015/02/Faba-beans-for-acidic-soils-in-southern-NSW>

FAO Stat. (2012). *World Pulse Production*.

Pulse Australia. (February 2013). *Crop Forecast*
http://www.pulseaus.com.au/storage/app/media/markets/20130212_Australian-Pulse-Crop-Forecast.pdf

Pulse Canada. *Pulse growing regions of Canada*.
<http://www.pulsecanada.com/canadas-growing-regions>

Pulse Canada. *Pulse V's Legume - What's the difference?*
<http://www.pulsecanada.com/about-us/what-is-a-pulse>

www.searates.com
<https://www.searates.com/reference/portdistance/?F=ChIJ0w9xJpHE9RQRuWvuKabN4LQ&A=ChIJ90260rVG1moRkM2MIXVWBAQ&B=27613&E=3012&>

Seears, P (April 2013) Personal Communication. Boonderoo Pastoral Company Lucindale Australia.

Simpson, E. (September 2013). Personal Communication. Simpson Seeds Moose Jaw Canada.

Wherry, D (July 2013). Personal Communication. Wherry & Sons Rippingale UK.

Wilson, P (October 2013) Personal Communication. Australia Milling Group Toowoomba Australia.

Plain English Compendium Summary

Project Title:	Name of project
Nuffield Australia Project No.: Scholar: Organisation: Phone: Fax: Email:	Lachlan Seears GRDC 08 87667078 lachie@boonderoopastoral.com.au
Objectives	To understand the processing supply chain for pulses that are grown on Australian farms. To follow and understand the processes required to turn a pulse grown on farm into a consumable product that is consumed all over the world. To understand both domestic and world production and consumption of pulses. Exploring the opportunities for Australian farmers to value add pulses that are grown in Australia. Highlight risks along the supply chain particularly if a farmer is looking to vertically integrate their business and move closer to the consumer.
Background	From discussions with farmers it became evident that the average farmer doesn't know what happens to the commodities that they grow on farm once it has left the farm gate. To better understand about what crops we grow I wanted to investigate post farm gate processing of pulses all the way up to understanding what drives the consumer.
Research	To follow the pulse crops along the supply chain. Starting at the farm gate and seeing what happens to turn the grain produced into a consumable product that is eaten all over the world. To spend time with both domestic and international processors and marketers, to understand what the consumer is looking for when buying pulses. To investigate what countries that are in competition for markets with Australia are doing in regards to production and supply, namely the UK, France and Canada.
Outcomes	Pulses are an important crop in the Australian grain industry allowing for a break crop in the traditional wheat growing regions. They also have the ability to add 1t/ha in yield for the following wheat crop. Domestic processors have invested significant a significant amount of money in infrastructure and take on a lot of risk when buying pulses from Australian farmers then having to process them, and supply markets overseas. Because of the risking if looking to vertically integrate a farming business the currency risks, spoilage while in transit and buyers defaulting on contracts, I believe its best to develop better relationships with businesses along the supply chain rather than take that risk on themselves.