PULSE
UPDATE ANNUAL

No. 13 February 2014

PULSE AUSTRALIA

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World markets explained

Lupins for food

Variety releases 2014

Lentils love stubble

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Pulse Australia is the peak body representing all sectors of the Australian pulse industry.

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COVER: Harvesting Jade-AU mungbeans on Rick and Sandra Sams' property west of Dalby, Qld. Photo by Rob Anderson, B&L Seed and Grain, Dalby.

From the Chief Executive Officer

Tim Edgecombe,
Pulse Australia

In all growing regions there has been increasing interest this year in pulses as part of sustainable farming systems. Demand has been strong for many pulse crops and although conditions were challenging in some regions there were some remarkable production and price combinations, adding to overall grower confidence in pulses.

There were three significant changes made to the Pulse Australia field team in 2013 with Gordon Cumming appointed to lead the field team as Senior industry development manager, Wayne Hawthorne taking on the role of Special projects manager and Mary Raynes being appointed as Industry development manager–southern in September 2013. All members of the field team are now partners in the new Broadleaf Cropping Alliance (see page 19) and applications have been sought for a fourth Industry development manager to join the team and be based in NSW. This position will be co-funded shared resource with NSW DPI.

The delivery of specialised Best management practice workshops is a significant part of the industry development component of Pulse Australia's role. Significant advances have been seen in the industry through the consistent application of the latest agronomic information related to each crop type and variety.

Under the Better Break Crop project the field team developed the 'Southern faba bean—Best management practices' training course and delivered six courses with a total of 81 attendees. In the western region there was renewed interest in chickpea with 15 participants attending a refresher course. In the northern region a total of 68 participants attended four mungbean courses and 66 participants attended three chickpea courses. Both growers and agronomists attend these courses, providing opportunities for participants to contribute their practical experiences and local knowledge while

also having access to the latest technical information available.

During 2013, Ms Caroline Rhodes and Ms Angela Greenhalgh resigned from the Pulse Australia board, both having served for 1.5 years. Their insights and contributions to the board are acknowledged and were appreciated.

Western Australian grower Mr Rod Birch has since accepted an invitation to join the Pulse Australia board. Mr Birch is also a director of Australian Grain Technologies (AGT), Australia's largest wheat breeding company, has a long association with the Leibe Group, a large grower group interested in on-farm investigations and is an executive member of the Grain Industry Association of Western Australia (GIWA) as the current chair of the GIWA Pulse Council.

Ms Georgie Aley has also recently taken up a position on the board. Amongst other roles Ms Aley is managing director and CEO of the Grains & Legumes Nutrition Council (GLNC). GLNC is the independent authority on the nutrition and health benefits of grains and legumes across Australia and New Zealand representing the whole value chain from growers to food manufacturers. Her appointment to the board of directors will add further strength to Pulse Australia's commitment to promoting the significant nutritional and health benefits people can experience when they include pulses in their diet.

International representation

In April 2013 I was honoured to be elected to the The International Pulse Trade and Industries Confederation (CICILS-IPTIC) Executive Board, joining Pulse Australia director, Sanjiv Dubey, to represent the Australian pulse industry. The CICILS Executive Board consists of up to 30 members from all over the world, elected from the membership. CICILS-IPTIC is a global not for profit confederation with its headquarters in Dubai. It draws members from 17 national associations (federations) and 680 private sector businesses in an industry worth over $100 billion at the retail level and over 60 million tonnes in pulse production and distribution in over 55 countries.

The organisation represents the common good of all sectors of the global pulse industry value chain from growers and researchers, through input and logistics suppliers, traders, exporters and importers to government bodies, multilateral bodies, processors, canners and consumers. CICILS-IPTIC works for transparency and sustainability in all sectors and aspires to contribute in as many ways possible to global food security and improved health and nutrition.

Industry networking

Since 2006 the pulse industry in Australia has benefitted from a coordinated, national plant breeding program. Pulse Australia is one of nine partner organisations in Pulse Breeding Australia (PBA) and was very pleased to be part of the inaugural PBA Pulse Conference to showcase the innovation and science behind the development of new varieties with adaptation to the varying climatic and agronomic conditions in Australia and their journey through the supply chain to the consumer. The current suite of varieties available to growers, along with the Variety management packages (VMP), provide many opportunities for the successful integration of pulses into farming systems in each region.

Pulse Australia again co-hosted the 2013 Australian Grains Industry Conference in Melbourne. The conference was the most successful to date, attracting 970 delegates from around Australia and overseas. In 2014 there will be two AGIC events, a new one-day conference in Singapore in March as well as the 3-day event in Melbourne in July.

Pulse Australia was invited to become a member of the Grains and Plant Products Industry Consultative Committee, an industry consultative committee to act as the peak consultative group between DAFF and the grain, seed, fodder, timber and nut export industries. The Committee is the primary consultation body for issues relating to the export inspection and certification of grain, seed, timber, fodder and nuts.

Pulse Australia is a founding member of the Grains Industry Market Access Forum (GIMAF). GIMAF was successful in regaining access for Australian canola into China. As a result of these successful negotiations, GIMAF has developed a 'China Strategy' to focus on attaining access for other grains, including lupins (for human consumption) and faba beans. Work has also commenced on an 'India Strategy' for Australian grains, including pulses.

Pulse Australia to lead 2016 campaign

The General Assembly of the United Nations, meeting in New York, has voted to declare 2016 as the 'International Year of Pulses'.

There is considerable support for the International Year of Pulses bid amongst partner organisations with an interest in all aspects of pulse production, marketing, processing and consumption.

A range of research, engagement and communication activities will be initiated to promote the full value of pulses in achieving healthy nourishment, food security and sustainable agriculture for the world.

Partners from the food industry, global companies, foundations, national organisations, individuals and governments are enthusiastic about being involved in this project. The potential benefits to the industry are enormous and we expect many great innovations to result from this type of exposure and investment.

Four themes have been proposed, to feature market access and trade, production and food security, health, nutrition and food innovation and environmental sustainability in the global pulse industry. Industry initiatives will be developed to make progress in each of these areas during 2016 and beyond.

The opportunities to showcase, promote and innovate are boundless. From conferences and research projects to apps and new convenient healthy foods, all things are possible for the International Year of Pulses.

The Australian industry, along with all major producing and consuming countries worldwide, supported the proposal and welcome the decision of the global peak body CICILS IPTIC to set aside $1.1 million as a preliminary reserve to fund activities related to the Year.

Pulse Australia will coordinate a national committee to work with government, farmers, NGOs, retailers, food manufacturers, health and science organisations and UN bodies to make the Year a success in Australia and contribute to raising the profile of pulse crops and foods globally.

With rates of diabetes and obesity on the rise around the world, the International Year of Pulses presents an opportunity to recognise pulses for their exceptional potential to offer tasty and nutritional meals to promote the well-being of people everywhere. With the global population expected to reach 9 billion by 2050, pulses also represent a cost-effective and carbon-friendly source of protein.

2016 will also be an important occasion to learn about the world's wonderful pulse culinary traditions, and to discover new ways to create great tasting and healthier foods. Pulse Australia will initiate a steering committee early in 2014 that will coordinate major initiatives and events for 2016.

Meeting 2013's challenges

Frost damage was one of many challenges growers faced in 2013.

by Gordon Cumming,
Pulse Australia

In what is becoming an all too common occurrence in the northern grain belt, the 2013 season saw growers facing a difficult start to both their winter and summer cropping programs. Seeding opportunities where limited for many so growers needed a strong focus on making the correct decisions about both paddock and crop choice to minimise their risks and maximise their opportunities. In-crop decisions also needed to be made in a very timely manner as there was often no second chances, particularly with weed and insect management.

The winter cropping season started with a dry and late break. As a result crops were established on varying soil moisture profiles across the region, ranging from a full profile on long fallow paddocks, through to some crops being planted on little more than the opening rain.

Faba bean area down

The area planted to faba bean (18 000 ha) in the northern region was significantly lower than initially expected due to the late winter break being outside the faba bean planting window, which typically closes by the end of April. Grower uptake of the new variety PBA Warda, which was released for the 2013 season, was strong in recognition of its superior yield potential and grain quality in the north.

Although smaller in area the crop was sown into good soil moisture profiles and had mostly set their yields (average 2.25 t/ha) prior to the arrival of the spring heat. This highlighted the value of sowing faba beans early, especially in seasons where the spring is short and we get early heat with daily maximums in excess of 28°C, at which point the faba bean plant shuts down.

A significant problem this year was high levels of heliothis damage being apparent upon delivery of grain to the receival point, which in some instances was high enough to result in loads being downgraded to No2.

This was not the result of high heliothis pressure during the growing season, but rather from a sustained low level of infestation. After talking to several advisors, it became apparent that while the grub counts were below threshold, these low numbers were present for a sustained period of time, often representing multiple egg lays and it was the additive effect over time that resulted in the high levels of grain damage.

Solid prices and good gross margins for the 2013 harvest will see growers once again looking to increase their area of faba beans, provided we have a suitable planting opportunity soon.

Chickpea still profitable

The eastern half of northern NSW and southern Queensland started well for chickpeas, with most growers being able to follow their rotational plans and having some paddocks coming out of fallow that had good levels of stored soil moisture. The western region was not so lucky with most paddocks having only a limited moisture profile. In the north western part of NSW around Walgett, very little winter crop was actually planted, in fact an estimate 85 thousand ha of planned chickpea was not planted.

Throughout what was a very dry season, with little or no in-crop rain after the second week of July, it was remarkable just how well the chickpeas appeared to be doing. Although the plants had low biomass they were flowering and podding well, once again demonstrating the ability of chickpeas to handle dry seasons.

Then the frosts of early August hit. Many crops had an estimated yield of up to 0.75 t/ha already on them and in the worst case situations this was all lost to the frosts. Those crops that still had reasonable soil moisture levels were able to continue flowering and to set new pods with final yields of 1.0 t/ha being commonly reported. Those crops in the western areas that had exhausted their moisture were finished, with many being sprayed out in the hope of an early summer crop planting opportunity.

Central Queensland was the stand out region again for chickpea production, being fortunate enough to start out with better planting conditions and full soil profiles. They also escaped most of the frost damage, except for a small area along the Comet River.

In the final wash up an estimated 510 thousand tonnes of desi chickpea was harvested off 400 thousand ha in the northern grain region. Even though the market price was down on the previous few years and trade continued to be slow (see article on page 33), chickpea has remained a profitable crop for most growers when compared to wheat, which has also suffered from low prices over the same period.

Too dry for mungbeans

The continued dry conditions at the start of the 2013–14 summer season has resulted in a much reduced area being sown to mungbeans, compared to past years.

The mungbean price has remained firm from last year and even increased slightly, which has led many growers to consider growing mungbeans using supplementary irrigation. This involves one irrigation to established the crop and a second in-crop irrigation prior to the commencement of flowering.

Using this approach growers can achieve yields typical of dryland production in an average year on a larger area than a fully irrigated crop, with minimal irrigation water consumption. Mungbeans' high water use efficiency, combined with current high prices, has helped to ensure high crop returns for these growers.

What 2014 brings us is very much in the hands of Hughie or the gods. With such a dry summer following the dry winter season, significant rains will be needed before we can turn a wheel, so here's hoping for a wet end to the summer and a better winter in 2014.

Bringing on 2014 in the Southern Region

by Mary Raynes & Wayne Hawthorne, Pulse Australia

The 2013 season was one of contrasts across the region with valuable insights gained into managing variable growing conditions. Starting with a dry summer and late sowing, winter was wet, then a dry spring, some frosts and a quick finish in some areas.

Successful establishment remains a critical success factor for pulses. Sowing into a profile of stored soil moisture and maintaining soil moisture with limited in-crop rainfall is key. Stubble retention in 2013 proved very important over summer, particularly when spring rain was below average, and had the added benefit of aiding summer weed control. In drier years the combined value of weed control and reduced evaporation is measured in more stored soil moisture.

Timing of sowing involves weighing several considerations. Generally, early sowing promotes yield potential, but if early sowing in marginal conditions means poor establishment then a decrease in yield potential is likely. Shallow sowing depth and the potential for herbicide damage can result from dry sowing into tight soils. Heavy cereal stubbles can also cause establishment problems.

Wet conditions in winter and early spring placed many pulse crops under foliar disease pressure in 2013 with some neighbouring pulse stubbles presenting a high disease risk from the previous season. This was generally well managed and disease risk diminished in some areas over time with dry spring conditions and short rain events. The extended wet spring in South Australia maintained higher pressure in this part of the region. With in-crop rainfall determining the level of disease pressure experienced there is no room for complacency.

Correct application timing and choosing the correct fungicide to control the full range of likely diseases is central to a disease management program in pulses. Disease presence in the lower crop canopy puts immense pressure on subsequent growth, even when protected with later fungicide applications. This was seen in some bean crops that were very bulky and lodged, making it difficult to achieve sufficient penetration into dense canopies during applications late in the season. Achieving adequate leaf coverage with a foliar spray at or close to canopy closure usually helps to avoid later, uncontrolled infection in the lower canopy. Spraying ahead of a rain front is more effective than afterwards, and this was highlighted in 2013 bean crops late in the season.

Seed quality is expected to be very good this year however it is still important to test for germination and vigour every year. Poor seed quality is a common culprit in cases of poor establishment.

Yield potential aside, sowing too early increases the potential disease risk and the need for effective disease management. It can also influence variety choice and the crop's susceptibility to frost. Unfortunately, the dynamics of disease development changes with every season. In 2011 bean crops,

rust was the biggest issue but in 2012 and 2013 it was chocolate spot and we cannot underestimate the impact of botrytis on flowers and pod set. Black spot in field peas was severe in 2013 because of the lack of summer–autumn rain and early sowing. Bacterial blight after late frost was the biggest issue in field pea in 2012. Infected stubble and seed transmission are potential disease sources to be aware of in 2014.

Pulse choices

It is often unwise to change from one pulse to another based solely on last year's price or performance (good or bad). Each year a different pulse crop type seems to be favoured over the others in either yield or price or both. We can not predict what 2014 will bring for individual pulses, but we can play the odds by assessing the production and marketing risks associated with each pulse species. Matching the pulse species to the correct soil type and conditions, and managing the crop accordingly generally achieves the most consistent result.

Southern chickpeas take a check

Following two years of respectable yields and exceptional prices for chickpea, we are now seeing a marketing issue with large global supplies and low prices (see article on page 33). The area of chickpea in southern Australia may fall in 2014 after several years of hard-earned gain.

When choosing a chickpea variety it is essential to consider its resistance to ascochyta blight along with yield, price potential, marketing, delivery, maturity, lodging resistance and other agronomic features relevant to your growing region.

Choose a desi or a kabuli type that suits your marketing plans, the region and farming system. Larger-seeded kabuli chickpeas like Genesis™ Kalkee are later maturing than Genesis™ 090. A price premiums for kabuli over desi is necessary to compensate for lower yields and higher seed costs. Gross margins, marketability and personal choice can often be deciding factors.

Chickpeas do not fit into rotations and farming systems as easily as other pulses, and are far less competitive against weeds. Terbyne® and Balance® offer effective control of most broadleaf weeds, but post-emergent options are limited and can affect crop yield potential. Croptopping is not possible with most chickpea varieties and, if attempted, will affect yield and quality, even with the earlier flowering desi varieties like PBA Striker$^{\phi}$, Ambar$^{\phi}$, Neelam$^{\phi}$ and the kabuki varieties like PBA Monarch$^{\phi}$ and Genesis™ 079.

Faba beans on the rise

The area of faba bean in southern Australia is set to rise again on the back of acceptable yields and exceptional prices in the last three seasons and ongoing strong market interest. Foliar disease management is now better understood and, while management was tested in 2014, disease was largely well held. Recent experience has confirmed the need for early protective fungicide applications and being aware of the potential impact of botrytis on flowers and pod set if early control is inadequate.

Bulky canopies and lodging in some crops reduced the effectiveness of disease control, light penetration and the number of pollinators reaching the flowers. All these factors combined to reduce pod set in these crops.

On acidic soils faba beans require inoculation and attention to the nutritional needs of both the rhizobia (e.g. molybdenum) and the crop to ensure adequate nodulation and growth.

Growers and agronomists will benefit from the faba and broad bean training courses being run this season at selected locations in the southern region (see page 38).

Lupins are back

After several years of low prices and demand, the lupin has declined in favour of other options with better returns. This last year lupin yields and prices have however been good with more international and domestic demand. The Australian end-users looking for lupins will need to provide growers with confidence in their market if the area sown to lupins is to increase.

Albus lupin markets have improved since record production in 2010 swamped the limited export market into the Middle East. Fortunately stocks are now somewhat depleted and feed millers are now using albus lupins in their mixes, but at feed prices.

Lentils tight

Lentil prices have rallied since their relative low a season ago and yields have been very respectable. A significant downside has been the prevalence of header fires in lentils this year in both South Australia and Victoria. Adoption of the herbicide tolerant (XT) varieties has been high across the region. It is important not to produce only these small seeded types as oversupply could become an issue and there is market demand for the medium and large seeded types.

Ascochyta is a changing 'beast' in lentils, so it is important to be aware of the revised disease resistance status of varieties and adjusting disease management in response.

Canada and Australia are continuing to producing very high quantities of lentils, mainly because the new lentil varieties and farming systems mean that lentils can be grown as a profitable pulse option at current prices in areas suited to the crop.

Growers and agronomists will benefit from the lentil training courses being run this season at selected locations in the southern region (see page 38).

Field peas hang in there

Field peas performed quite well despite the dry season except where frost or black spot impacted on yield. There is now a choice of several varieties that are short-season yet offering high yield potential. It has now also become clear that in areas regularly prone to bacterial blight, it is important to have the better resistance of PBA Percy$^{\phi}$. Variety choice, stubble management, crop sowing dates and seed hygiene are vital components of a disease minimisation strategy. Use the 'Black spot manager' to determine the optimum sowing dates in your area to minimise the risk of this disease limiting yield potential.

Meeting receival standards

This last harvest has seen minimal weathering and quality issues, but frost and wrinkling have had some impact. Meeting pulse receival standards at harvest can sometimes be a challenge and each year seems to present a different problem with one or more pulse varieties. A dry finish, a wet or delayed harvest, frost, ineffective disease control, even variety contaminants can all cause delivery issues. Cracked grain and insect damage seem to occur every year, particularly in faba beans.

Croptopping is widely practiced in pulses to prevent weed seed set but with the timing based on the ryegrass stage rather than the crop, there is always potential for this to affect pulse grain quality. Growing earlier maturing varieties helps to enable effective croptopping while avoiding a grain quality penalty. However, this does not necessarily overcome issues arising from plants that mature later in wheel tracks or in late patches in the paddock, variety contaminants or harvest rain. Assess each individual situation at croptopping stage and then again before commencing harvest.

Variety choices increased

Pulse variety options have further increased with new releases available for sowing in 2014 (see page 16 for descriptions of new pulse varieties). Remember that newer is not always better as some varieties that have been around for several years are still the best performers in some situations.

Roller coaster ride in WA ends well

by Alan Meldrum,
Pulse Australia

The 2013 cropping year would have to be described as one of the strangest seasons encountered in Western Australia. Every region experienced unusual seasonal conditions yet most finished with a good crop result.

Extensive summer rain generated the need for extensive summer weed spraying in the central wheatbelt and Esperance regions. Elsewhere, summer rain was patchy at best, or non-existent.

As winter approached, this meant that some growers were fortunate enough to have some deep moisture stored while others had very dry soil profiles. The northern wheatbelt was particularly dry, indicating that reaching above average yield potential was unlikely.

When the season broke, however, it gave rise to some of the best sowing conditions in memory with rainfall above average along with warm temperatures. The only region to miss the good start was the eastern wheatbelt, with areas north and east of Merredin and east of Dalwallinu missing out on any substantial rain throughout May.

Suddenly, regions suffering from a lack of summer rain had enough rain to support crop establishment. The Esperance region had a full soil moisture profile from late March and sowing of canola commenced in early April.

Sowing was completed before the end of May in most districts. The promising early start provided excellent crop establishment and early weed control—the season was looking very good.

Then it stopped raining. June was the driest month in history with many centres recorded barely any rain at all for upwards of six weeks. It was mid-July before rain returned and by this time yield potential had fallen dramatically.

The Esperance and south coast regions were the exception, where remarkable early crop growth continued on the back of average rainfall and high levels of soil moisture.

Mid-winter rain revived many stricken crops although many growers remained concerned that the season's potential was almost lost. More rain through late winter and spring returned crops to good health and by mid-September hopes of crops achieving their yield potential were restored.

For the very dry eastern districts, this late winter and spring rainfall yielded a harvestable crop when most growers had decided the header wasn't coming out of the shed in 2013. Mild to warm temperatures prevailed through to harvest and no losses to frost were reported.

For lupins and pulses, the returns were good in most regions. The Esperance region is the base for the western field pea crop and strong early growth promised good yields. Blackspot caused substantial reductions in affected crops, particularly where waterlogging had caused some ill thrift. Clean field peas yielded 2.5 t/ha or more, but diseased crops yielded 1 t/ha or less.

Lupin crops responded to the season by podding very well and delivering some very good yields. In the northern region, some lupin crops out-grossed wheat and canola—something that has not been experienced in quite a few years.

East of the Midlands Road the low plant height of many crops caused problems with harvesting efficiency but, in the main, lupin yields were very high. Yields of 2.5 to 3.5 t/ha were recorded in the northern regions all the way down to districts like Katanning, even where lupins are not particularly well adapted to the shallower soil types.

All in all, 2013 was a very good cropping year for Western Australia with close to 16 million tonnes, one of the best ever delivered grain results. This is an amazing result, particularly after almost writing the season off as below average in July.

Lessons for 2014

Seasonal conditions will always be a major factor influencing yields, but they can't be controlled or predicted. What can be controlled though is the establishment of disease and weed free lupin and pulse crops, sown at the optimum density and with good vigour. If these things are in place growers can then take advantage of good growing conditions, should they occur.

The 2013 season showed how fundamental good crop establishment and weed control is to achieving high yields. Without them, yields will be disappointing even in optimal seasons.

Weed control, particularly in lupins, again caused concern amongst growers. Spraying very stressed weeds in mid to late June proved ineffective however croptopping later in the season achieved a substantial reduction in weed survivors, and crops compensated with some increase in yield.

Harvest weed seed management strategies such as collecting chaff (using chaff carts or narrow windrowing) and burning windrows in autumn are now widespread and will help reduce the number of viable weed seeds entering the soil seedbank each year.

Lupins and pulses are not responsible for blowouts in weed populations. Rather, herbicide resistance in weeds and the timing and rates of herbicides applied in all crops is the cause of additional weed pressure. Integrated weed management strategies enable growers to manage herbicide resistance while producing a profitable yield. Lupins and pulses enable alternative strategies to be employed to reduce the quantity of weed seeds lying in wait for the next crop to emerge.

Rather than abandoning lupins and pulses, consider implementing strategies to reduce the weed burden in the paddock to a level where crop competition and herbicides can control weeds. Chemical fallow, hay production using cereals and judicious use of crops such as Roundup Ready canola, are ways of bringing the weed burden down to manageable levels before sowing a lupin or pulse crop.

Read the article on page 22 for more thoughts on managing herbicide resistant weeds and visit www.weedsmart.org.au In the short term some of these strategies will cost money, but the long term benefit to the rotation is worth the investment.

On-farm storage must be clean and safe

Kingsthorpe farmer and grain storage contractor, Peter Anderson, is trialling grain fumigation using a thermosyphon to safely deliver gasified phostoxin into the top of sealed silos.

by Cindy Benjamin

Wayne and Peter Anderson take a serious approach to grain storage. For about 125 years the Anderson family has been farming on 'Arcadia' near Kingsthorpe, between Oakey and Toowoomba. They run a flexible opportunity cropping rotation of cereal, pulse and fodder crops throughout the year and over the last 15 years have built up a contract grain storage business on the farm.

"We have used on-farm storage for our own grain for many years," said Peter. "Our location and experience have helped build the storage side of our business. At the moment we have 55 grain silos on the farm with a combined storage capacity of over four thousand tonnes, allowing segregation of grain varieties and grades, including planting seed."

Most of the cereal and pulse grain stored on 'Arcadia' has been bought by local grain traders and seed companies and is stored on both long and short term contracts. "We provide a full grain storage service to companies and growers including pre-cleaning, drying, fumigation and transport of the grain," he said.

"Over the years there have been significant changes in technology that have made storing grains safer," he said. "We have stayed up to date with the technology and can be confident the grain we have in storage will maintain its quality."

Mr Anderson said the essential elements for successful storage of grain, and particularly pulses, are aeration and fumigation. "Whatever silos you choose must be set up to allow proper aeration and must be gas-tight so they can be fumigated to eradicate insects if they begin to develop," he said. "Existing silos can be fitted with aeration control units and most can also be modified so they are gas-tight."

"Having on-farm storage gives us additional flexibility with our harvesting," he said. "If a front is predicted and the crop is almost ready but maybe above the optimal moisture level, we will harvest with confidence knowing we can aerate the grain to maintain quality until we can dry the grain down at a later date. This way we can avoid any harvest delays or crop deterioration due to wet weather."

Using mungbeans as an example Mr Anderson explains the process of maximising grain quality. To start with he stresses the importance of putting in place operations that will give a good sample at harvest. "Do what you can to grow an even crop and desiccate to reduce the amount of green pods at harvest," he said. "If there is an amount of admixture in the sample we recommend pre-cleaning."

After the grain is in the silo aeration is essential to maintain the correct temperature in the stack. Any remaining admixture tends to move to the walls of the silo, creating hot, wet spots that can cause grain quality to deteriorate. If this occurs Mr Anderson recommends turning the grain by emptying the silo and then putting the grain back in.

"Humidity controlled aeration systems are the best," he said. "When we harvest mungbeans we often run the aeration constantly for about a week to remove the paddock heat and any greenness in any admixture in the grain. Then we switch the controller to automatic so it can monitor the humidity and operate only when the air is dry."

The Andersons are trialling a thermosyphon to fumigate grain in their silos. The thermosyphon uses solar energy to gasify the phostoxin placed in a container at the bottom of the silo. The gas is safely delivered into the top of the sealed silo and rapidly disperses through the grain stack.

Economics of grain storage

Working out if grain storage would be beneficial for your business is not just about whether it will allow you to make more money. National coordinator of GRDC's Stored Grain program, Chris Warrick, said in most situations there needs to be more than one benefit to the grower to make the investment worthwhile.

"For most growers grain storage needs to help solve more than one problem," said Mr Warrick. "The most common reasons growers invest in on-farm storage are to market their own grain, taking advantage of after-harvest price peaks, to have more timely harvest and transport operations and to segregate grain that meets specific premium standards."

Spreading the fixed costs across summer and winter grain crops also increases the chance of economic success.

'Economics of on-farm grain storage, cost benefit analysis' and a computer spreadsheet 'Grain storage cost benefit analysis template' are both available at www.storedgrain.com.au

Chickpeas are an option in WA

Brothers John (right) and Peter Nichols have found that the new varieties now available in WA have seen chickpeas out-perform wheat, barley, canola and lupins in gross margins since their return to the farm's rotation.

by Cindy Benjamin

The benefits of pulses in rotation with wheat are well known however the economics of growing a pulse crop have not stacked up in many areas across Western Australia in recent years.

John Nichols is one farmer who has chosen to keep pulses in his crop rotation and this year is shaping up to be a good one, especially for chickpea. Farming 5400 ha in the Doodlakine district John, his brother Peter and their mother Lalla run an integrated mixed operation with 1400 ewes, a 100-sow piggery and cropping.

"Our 100-year average rainfall here is 316 mm and we have suffered significantly lower yields in recent years due to very dry conditions," said John. "This year is looking better and the chickpea crop we have planted has germinated well."

The Nichols brothers grew up to 180 ha of chickpea in the 1990s until the fungal disease, ascochyta blight, wiped out the susceptible varieties available at the time. When the ascochyta-resistant variety, Genesis 836, became available a few years ago they were pleased to add chickpea back into their rotation. "After losing chickpea as an option we increased our area of canola but now chickpea is our best gross margin crop," said John. "Genesis has performed well with good yields but the smaller seed type is less suited to the Sub-continental market. This year we have planted PBA Striker, which is a large seeded variety with good market appeal."

John says chickpeas have out-performed wheat, barley, canola and lupins in gross margins since their return to the rotation. He said most of their other grain is sold off the header but they store the chickpea grain on farm after letting their marketer know the area sown. "We hold the grain until the price peaks in the lead up to the Muslim religious festival of Ramadan, which falls in July this year," said John. "Premium Grain Handlers market our chickpea for us and helps us determine the best time to sell."

"After three years of wheat we use canola or chickpea to reduce the grass weed population," he said. "Chickpea have the added benefit of providing a nitrogen boost to the soil for the following wheat crop."

John said the climatic variability they are experiencing in the district makes it difficult to fit lupins into the rotation and so he expects their area of lupins to remain static, with most being consumed on-farm, while the area of chickpea will most likely rise to around 100 ha.

The Nichols can store about 700 tonnes of grain on farm and they use this capacity to store seed for the following year, including wheat variety options so they have a choice of long, medium or short season varieties to plant on different soil types, and the remaining storage capacity is used to store lupins used in rations for the pigs and to finish the prime lambs.

John and Peter also have a contract with a local seed merchant to bulk-up new varieties of field pea. John said their heavy soil is well suited to field peas and they work hard to keep their paddocks weed-free so they can supply clean seed to other growers.

Pulse Australia industry development manager (west), Alan Meldrum, says interest in growing chickpea is picking up again and Western Australian growers are well placed to take advantage of the significant agronomic knowledge and experience that already exists.

Alan said the current varieties and agronomic knowledge are conducive to reliable production of desi chickpea and should lead to an increased area in future years. The new varieties, PBA Striker and Neelam, are being bulked up by growers and will dominate the WA crop in the years to come.

"Chickpea production peaked in the late 1990s in WA with the almost 70 000 ha planted yielding an average of one tonne per ha," he said. "Disease problems saw production drop to very low levels through the 2000s but there is renewed interest and new disease-resistant varieties available to growers."

At a chickpea production workshop in March 17 participants discussed the latest research and variety information. The two new varieties, PBA Striker and Neelam, both offer growers valuable characteristics. Alan said PBA Striker replaces PBA Slasher and offers good early vigour, improved yield, moderate disease resistance and large seed size. "Neelam was released last year and is a taller, erect variety with high yields and disease resistance," he said.

John said the chickpea production course highlighted some new developments and marketing options. "People in this district are starting to take an interest in chickpeas again," he said. "We have significant experience to draw on."

John is an active member of the Kellerberrin Demonstration Group and is currently hosting a chickpea variety trial in collaboration with Pulse Australia.

Lentils pay off

by Cindy Benjamin

Yorke Peninsula grain grower, Mark Schilling of Copper Gone Farms has made the most of good growing conditions and been rewarded with excellent lentil yields across the three varieties grown on the farm.

Mark Schilling couldn't have been happier with his lentil crop in 2013.

Pulses are a permanent part of the crop rotation on the Shilling's Yorke Peninsula property, Copper Gone Farms, for their nitrogen fixing and weed control roles in the farming system and as a cash crop. Mr Schilling said the grain price for broadleaf crops such as lentils, chickpeas and canola is the main consideration when deciding which crops to grow in rotation with wheat.

"The chickpea price is pretty ordinary at the moment but the price for lentils is very good," he said. "We have proven the agronomic value of legumes over and over on our farm so we don't even consider leaving them out of the rotation."

"In 2013 we have only grown seed crops of chickpeas having opted for lentils as our main pulse crop," he said. "We decided to plant more lentils than canola this season and this has turned out to be a good decision given the exceptional season we have had and the high grain price."

In January-February Mr Schilling looks carefully at the pulse grain market indicators and decides on the area of each crop and variety to sow for winter.

Three lentil varieties were planted on Copper Gone Farms this season—the herbicide resistant small red lentils, PBA Hurricane XT and PBA Herald XT, and the larger seeded variety PBA Blitz. Reaping is now complete on Copper Gone Farms with lentil yields averaging 2.5 t/ha making a very strong contribution to the farm's profitability.

Mary Raynes, Pulse Australia industry development manager for the southern region, said the harvest is around 70 per cent complete on the Yorke Peninsula and lentil crops are generally yielding from under 1 t/ha to 2.2 t/ha.

"A significant concern is the number of header fires this year, particularly in lentils," she said. "We are urging growers to take care to clean down the headers to remove dust that can build up and increase the risk of machinery fire."

While grain price is important, Mr Schilling is also looking for other ways to improve the gross margin of all crops on the farm, including ways to reduce input costs. "We direct drill and apply chicken manure as a fertiliser and soil conditioner to all our crops," he said. "Being close to poultry farms here we can sell them straw and but back chicken litter."

Mr Schilling is also an advocate of on-farm storage of pulses. "We have a grain storage business on the farm offering other growers the advantages of machine dressing their grain to earn premium payments for a value-added product," he said. "I think pulse growers, including ourselves, can benefit from getting closer to the end user and adding value to our products. An important part of this is maintaining product segregation and integrity in storage."

"Although we have been in the business of providing contract storage services for over 15 years, we have these facilities primarily to store our own grain," he said. "I would encourage all pulse growers to invest in on farm storage to increase their harvest flexibility, segregate their grain products and take control of their marketing."

Pulse breeding program

Mark Schilling is a strong supporter of the pulse breeding program and assists with the development and commercialisation of new pulse varieties suited to the Yorke Peninsula.

"We work closely with the breeding program to field test and bulk up new varieties," he said. "Pulse Breeding Australia has produced several excellent new varieties in recent years offering herbicide resistance traits, good yields and better disease tolerance."

"The plant breeding program is an essential component of the industry and as growers we need to get behind the breeders and support their efforts by describing varieties correctly on delivery and paying the end point royalties that help fund the development of new varieties," he said.

Remember that it is an offence to make a false declaration, including falsely identifying varieties, at the delivery point or on the annual 'production declaration notice'.

The seed of PBR protected varieties cannot be sold, traded, bartered or given away as seed for sowing.

For more information visit www.grdc.com.au/GRDC-FS-EndPointRoyalty

Southern pulse industry development manager has practical focus

The pulse industry in Australia is expanding, with new varieties and new opportunities across the supply chain. Newly-appointed Pulse Australia industry development manager Mary Raynes has extensive broadacre grains experience and is enthusiastic about being back in the field, working with growers, consultants and Pulse Australia member organisations.

Covering the GRDC southern growing region from Dubbo in NSW, through Victoria to Ceduna in South Australia, Ms Raynes will be joining the Pulse Australia field team to deliver industry intelligence, information and training across the supply chain.

The size and diversity of the southern growing region demands the skills of highly qualified and experienced development personnel. Senior development manager, Gordon Cumming, said attracting high quality managers such as Ms Raynes was a key component of Pulse Australia's strategy to increase the area sown to pulses and to build confidence across the industry.

"Ms Raynes comes to Pulse Australia bringing a wealth of experience with pulses and other crops," he said. "She has practical, on-farm experience of the role pulses can play in crop rotations and boosting whole farm profitability. Her business acumen and broader experience in grains research and marketing will provide additional strength to the Pulse Australia field team."

Ms Raynes maintains a hands-on connection with her family's grain and sheep operation at Donald, in Victoria's Wimmera district. She left the area to study agriculture and has since worked in marketing, plant breeding and research.

"The Australian grains industry is a really exciting industry to work in," said Ms Raynes. "This role provides a conduit for information flow throughout the supply chain and providing an independent perspective on industry issues."

Ms Raynes will soon become a familiar face at industry field days and training events as well as offering a strategic business approach to Pulse Australia member businesses.

Her contact details are: mobile 0408 591 193 and email mary@pulseaus.com.au

Mary Raynes, is based in Horsham and works with pulse growers, traders and processors in the southern growing region.

Grain Quality and Market Requirements Forums

This year the Australian Export Grains Innovation Centre (AEGIC) is expanding their Grain Quality and Market Requirements Forum program to encompass other commodities, including pulses, in addition to wheat.

AEGIC supports the trade and use of Australian grains around the world through cutting-edge grain quality and processing technology and market research innovation.

Five one-day forums are planned for the northern and southern regions:

17 March	Goondiwindi
19 March	Narrabri
21 March	Wagga Wagga
8 April	Horsham
10 April	Adelaide

One key objective of the forums is to outline the factors that impact on grain quality and the impacts of grain quality throughout the supply chain. The second objective is to update participants on the latest grain quality and management systems innovations and the future focus of grain quality-related research and development.

Pulse Australia industry development managers will present information about managing grain quality for the major pulse crops grown in each forum location.

To register go to www.aegic.org.au/services/training/register-interest-for-2014-grain-quality-forums.aspx
T: 08 9368 3785 E: admin@aegic.org.au

PBA CONFERENCE 2013

Pulse Australia, one of the nine Pulse Breeding Australia (PBA) partners, was a proud participant at the inaugural PBA Pulse Conference 'Expanding Horizons' in Adelaide. The conference attracted over 150 delegates to the field day and almost 200 to the main conference sessions.

Pulse Australia's CEO, Tim Edgecombe (pictured with Pulse Australia board member and Western Australian grain grower, Mr Rod Birch) said the conference provided an excellent opportunity for people across the industry to gain insights into how plant breeders respond to the production and marketing needs of the pulse supply chain.

Hakan Bahceci, president of the international pulse industry organisation, CICILS, and CEO of Haken Agro Group,

PBA
INAUGURAL PULSE CONFERENCE
20-23 OCTOBER 2013
EXPANDING HORIZONS
The Sebel Playford · 120 North Terrace Adelaide

the largest privately-owned pulse trading company in the world, opened the marketing segment of the conference. As chair of the CICILS International Year of Pulses and promotion standing committee Mr Bahceci took the opportunity to outline CICILS' plans for the International Year of Pulses and encouraged the Australian pulse industry to be involved.

As one of the key note speakers, Pulse Australia chairman Peter Wilson drew from his long association with the industry to outline the benefits that had come from the establishment of a focussed pulse breeding organisation.

"Since the establishment of Pulse Breeding Australia in 2006 and implementation of better agronomic practice there has been a steady increase in the export value of the Australian pulse industry from $304 million in 2006 to over $1054 million in 2012," said Mr Wilson. "The development of the national and international industry structure has seen positive outcomes for market access, contract execution, quality standards and supply chain support for pulse food and fodder products."

"PBA's focussed national breeding program and their commercialisation strategy have been critical to achieve this, hand in hand with the integrated agronomy and supply chain focus of Pulse Australia."

Since 2006 the pulse industry has expanded from 1.4 million ha to 1.66 million ha annually and doubled annual production from one million tonnes to two million tonnes.

Pulse Australia senior industry development manager Gordon Cumming said this was the result of superior varieties, improved production management knowledge and skills and strong global demand for Australian pulses.

"Pulses are recognised for their value to the crop rotation and as a profitable option for Australian growers," he said.

Western Australian grain grower, Rod Birch, attended the conference having recently taking up a position on the Pulse Australia board. With over thirty years experience in pulse and grain production, breeding and extension he is well placed to provide valuable input and direction to Pulse Australia, particularly with insights into key issues facing the Western Australian pulse industry.

The next PBA conference is being planned for 2016 and is most likely to be held in the northern growing region.

Tony Leon's forte in peas is over

by Wayne Hawthorne, Pulse Australia

In June 2013, Tony Leonforte, leader of the PBA Field Pea Program, embarked on a new role with Cargill's canola breeding program.

His dedication to the field pea breeding program is deeply appreciated and will be missed. Under Tony's leadership the national field pea program produced eight new varieties—PBA Gunyah, PBA Twilight, PBA Oura, PBA Percy, PBA Pearl and Australia's first ever forage field pea, PBA Hayman, and the newest releases PBA Coogee and PBA Wharton—offering growers an excellent suite of varieties and types across a range of environments and target markets.

Tony, from the pulse industry we thank you and bid you a fond farewell.

Hay-man, you are a Bonzer bloke, fair Dinkum and you are close to a Santi claus when it comes to delivering new field pea varieties.

Just like Kaspa the friendly ghost, Tony you are quietly spoken. Certainly you're no Bruce Maki-vaney with commentary, but that's a good thing. You have never had a Bluey with anyone. Most would consider you to be part of Mait-land with us.

With the sugar-pod trait we thought you would not shatter. With your tendrils and semi-leave less habit who would have thought you would be saying goodbye? Like Captain Charles Sturt rowing down the river to Morgan, you are a real pioneer that faced the strong current when rowing back upstream to Yarrum (a backwards Murray).

Your proud history has however been well documented in your Alma-nac that We're-eager to read. As a pea breeder you Excell.

Little did we know that Tony was in the Twilight of his pea breeding career with field peas when we heard his departure news. For a guy that has Percy veered with Gunyah grit, we wish you well.

His career Snowy balled when Tony stepped from the Moonlight into the spotlight with the release of Kaspa, affectionately called the 'kick ass pea'. Recently seven PBA releases have been made, with more to come yet after Tony has gone.

Other pea breeders thought they were King, but ultimately they were all attracted to your program like a Magnet that passed Parafields into Victoria for a Paravic national approach.

Your departure from pea breeding is a real Wart on the pulse industry. You have left us in the Soupa like green and yellow peas with no Cooke. Glen- Roy, Laura, Helena and all of us will miss you. Any chance of a Coog eeee like echo call to get you to come back?

Thanks again Tony and best wishes. You are a Pearl in history of the pulse industry in Australia. Your time is now unfortunately Dun. You have waved the Pennant since 1996, having Done -dale as well as Done wah. May we raise our glasses, toast you with a Bundy and coke and say a fond Ooo rah.

Thanks and good luck! (Text contains 37 pea varieties, of which Tony bred at least 11).

Tony Leonforte (right) 'in action' at a variety release field day.

Australian Grains Industry Conference (AGIC) in Australia and Singapore

The Australian Grains Industry Conference (AGIC) has established itself as the must attend event for senior executives, traders and others interested in the Australian grains industry.

In 2014 AGIC is launching a new initiative with a one-day event in Singapore.

AGIC is the premier industry hosted conference for grain industry market participants and service providers.

The event is hosted by Grain Trade Australia, the Australian Oilseeds Federation and Pulse Australia.

Australian Grains Industry Conference Singapore

10 March 2014

Singapore

www.ausgrainsconf.com/singapore

AUSTRALIAN GRAINS INDUSTRY CONFERENCE SINGAPORE 2014

Australian Grains Industry Conference Australia

28-30 July 2014

Crown Conference Centre, Melbourne, Australia

www.ausgrainsconf.com/australia

THE AUSTRALIAN GRAINS INDUSTRY CONFERENCE 2014

Pulse Agronomy Projects

Good agronomy practice is paying off for the pulse industry through the concerted efforts of growers, researchers, agronomists and plant breeders. This is seen in the consistently good crops grown even in dry or marginal conditions.

Coordinated regional pulse and broadleaf agronomy programs are now in place in the three grain growing regions across Australia.

The Southern Pulse Agronomy Project, led by Dr Jason Brand, senior research agronomist–pulses, Victorian Department of Environment and Primary Industries, is the longest-running program and has a strong track-record of investigating and demonstrating various agronomic practices.

In 2013 the team has continued collecting and analysing data from the lentil stubble research (see page 26) and brown manuring of pulses. Work on testing for herbicide tolerance in lentils has expanded and the focus has altered to study the response of the transformed genetic code to Group B herbicide applications.

A large project has started to evaluate the feed quality and biomass production of available forage pea varieties.

Dr Brand said that their work will fill a knowledge gap and provide growers with detailed information about biomass production curves for different varieties.

They are also looking at different scenarios to determine the best conditions and management for both vetch and forage peas. The sowing windows are quite different for these two species so there will be seasons that favour one species or the other.

Early indications are that vetch will be the better option if there is an early break in the season or if weed control is a desired outcome. If the season break comes later then peas are a better choice as they will stay productive through winter and into spring.

Another new area of research involves measuring time of sowing responses in pulses. Early results are suggesting that early sowing provides overall benefits even if the breaking rains do not come until the end of May. Dr Brand said they are seeing 10–20% higher yields in crops that were dry sown early. He highlighted the need to take care that dry sown pulses are correctly inoculated unless it is know that there is adequate 'background' rhizobia in the soil.

The southern agronomy team is also responding to the incidences of ascochyta in chickpeas in 2013, with some resistant varieties suffering from the disease. This project is also developing improved disease management strategies for lentils.

Dr Brand is pleased to see pulses contributing strongly to farm income and profitability in recent years. His economic analysis of the effect of seed size distribution in kabuli chickpeas has shown that the premium price paid for large seeded kabuli varieties outweighs the lower yield potential.

PBA Monarch$^{\phi}$ crops grown in 2012 and 2013 had lower yields but were more profitable than desi chickpeas. In 2012 the difference in economic terms was $400–500/ha and in 2013 the difference was $200–300/ha.

The Southern Pulse Agronomy project incorporates 45 trials across 17 sites.

Similar dedicated agronomy programs are now also in place in the northern region and in Western Australia. In the early days of the programs there is little to report though expectations are high for the coming years.

MORE INFORMATION: Dr Jason Brand, Senior research agronomist–pulses, Victorian Department of Environment & Primary Industries
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Balance® 750 WG Herbicide now an option for problem weed control in fallow

Article supplied by Bayer Group

Chickpea growers are well aware of the excellent residual weed control provided by Balance® 750 WG Herbicide during the growing season.

However, recent changes to the Balance® 750 WG Herbicide label now gives growers and advisers another weapon in the fight against hard-to-kill weeds in fallow situations. The Balance label has been extended to include pre-emergent control of fleabane (*Conyza bonariensis*), sowthistle (*Sonchus oleraceus*) and feathertop Rhodes grass (*Chloris virgata*) in fallow. A suppression claim for barnyard grass (*Echinochloa colona*) in fallow has also been added.

This label change is particularly relevant for those growers who are looking for alternate herbicide groups to rotate in their fallow spray program.

It should be taken into account that few, if any, residual herbicides give consistent complete control. However they are important tools that need to be considered to reduce the weed population exposed to knockdown herbicides as well as to alternate the herbicide chemistry being employed. Balance is currently the only Group H herbicide registered for fallow spraying.

Fleabane control: Balance plus Simazine on the left versus untreated on the right.

Unlike many other residual herbicides, Balance is only weakly affected by sunlight and is slow to degrade if moisture is not present. This means, Balance doesn't require immediate incorporation by rainfall and will still work when you need it the most.

Best results are obtained where a complete and even application of Balance is applied to weed-free soil prior to weed germination and sufficient rainfall occurs after application and prior to weed emergence to allow herbicide uptake by germinating weeds.

It's important to note that Balance will not control emerged weeds when applied alone. Emerged weeds must be controlled by application of a knockdown herbicide.

Also, when considering Balance for fallow weed control ensure that minimum re-cropping intervals are taken into account with respect to future cropping options. To obtain the best results when using Balance in fallow situations it is recommended that you seek the advice of a Bayer CropScience representative and always read the label for full instructions.

Bees boost faba bean returns

Research has proven that bee and hive management in faba bean crops is practical and profitable, achieving average yield increases of 17 per cent.

by Wayne Hawthorne, Pulse Australia

Everyone knows that honeybees play a role in pollination of field crops but until now there has been no conclusive scientific evidence of the impact bees have on crop yield.

Pulse Australia is encouraging faba bean growers in all regions to seriously consider engaging a commercial apiarist to supply hives for placement in the current crop. An opportunity to achieve substantial yield increases such as this is rare and well worth investigating. A crop that might normally yield 2 t/ha could be expected to yield an extra 0.33 t/ha, worth an extra $130/ha, for an additional cost of just $35/ha.

Growers need to act well before flowering begins in August to gain the greatest potential benefit.

It now appears that bee and hive management is a practical and affordable option for pollination in faba beans. Research published recently in the scientific journal 'Field Crops Research' has demonstrated a large yield response to honeybees placed strategically in faba bean crops.

Researcher Danny Le Feuvre says the seven-year field study in South Australia has shown beyond doubt that there is an economic benefit to using commercial honeybees to increase pollination and crop yield.

"We measured an average 17 per cent yield response where the greatest benefit was in low yielding crops," he says. "We believe that the higher yield gains in lower yielding crops is at least partly due to a lack of natural pollinators in the areas where these trials were conducted."

CSIRO researcher Saul Cunningham and Mr Le Feuvre conducted the research, which was partly GRDC-funded, that collected yield data direct from the header off commercial fields of faba bean. They found that 90 per cent of the yield benefit consistently occurred within 750 m of hives.

An economic analysis has shown that placing hives in groups through the crop is profitable for both the farmer and the apiarist. "The study has proven that a hive density of 1 hive/ha is practical and profitable," he says.

"Grouping 30 hives together every 300 m, or larger groups further apart, will achieve a yield response. It is important to consider the placement of the hives in relation to other crops such as canola because the bees will preferentially graze in canola."

Bees placed in faba bean crops will produce harvestable honey and so apiarists are able to charge growers around $35 per hive and harvest honey as well. This makes it possible for field crop growers to compete for bee hives with almond growers.

Mr Le Feuvre says that the yield response can be expected in all faba bean growing localities and will be most noticeable in areas far from wooded areas, which host a higher population of pollinators.

"It is important for growers to introduce the bee hives early in the season, preferably at the onset of flowering," he says. "It is common to see large pods very low on the faba bean plants when bees are active. Increased seed set through bee activity is well accepted in horticultural crops and now we know it also occurs in field crops. These additional and larger pods are a major contributor to the increased yield."

MORE INFORMATION:
YouTube: http://youtu.be/3gfPK1bfGT4

'Significant yield benefits from honeybee pollination of faba bean (*Vicia faba*) assessed at field scale'

by Saul A. Cunningham (CSIRO) &
Danny Le Feuvre (Australian Bee Services)

Our experiments indicate that provision of honeybee hives to V. faba fields consistently leads to higher and less variable yield in parts of the field near the hives. The yield benefit diminishes with increasing distance and is well described by an exponential decay, with the yield benefit down to 10% of its maximum after 767 m. The maximum (at hives) was 17% greater yield than at the asymptote. We calculated the "pollination profit" (i.e. yield benefit-hive cost) for different scenarios of crop value and hive price, and found that provision of hives is a profitable practice for a realistic range of values.

By using field scale experiments under normal farming conditions, and spatially comprehensive yield map data, this study provides a very solid foundation for understanding pollination benefits in V. faba. Our methods for estimating benefit were conservative because our baseline for comparison was open pollination rather than exclusion of all pollinators. Further, by applying treatments at field scale we only describe benefits that are large enough to be detected over and above the natural level of variation in yield expected due to a multitude of environmental factors.

We only examined a limited range of pollination practices in terms of hive management, placement and densities. It is therefore expected that further experience could reduce costs and possibly increase the area of the field that receives a high level pollination benefit. The potential for similar pollination benefits to be exploited by V. faba growers elsewhere deserves further study. Our study indicates that the crop and pollinator biology allow for significant benefits in this environment.

Outcomes in other locations could vary according to the level of pollination provided by wild insects, and the effect of local conditions on both honeybees and the crop. We believe that benefits of the kind documented here may well be replicated in other field crops, but this potential remains unappreciated because of a lack of appropriate experiments. Many legumes in addition to V. faba are thought to benefit from insect pollination (Klein et al.,2007) as does cotton (Rhodes, 2002). Brassica napus receives a yield benefit from insect pollination that is of a similar relative value (Bommarco et al., 2012) and is very attractive to honeybees.

Nevertheless these crops are commonly grown without any attention to pollination management. We predict that economically favourable yield benefits could be achieved for a number of these crops by pollination management that includes support of free pollination by cautious insecticide use and habitat protection, and provision of managed honeybees to ensure best pollination outcomes when free pollination is insufficient.

Full paper published in *Field Crops Research* 149 (2013) 269–275.

ACKNOWLEDGEMENTS
This work was funded by an Australian Government 'AusIndustry' grant to Mr Le Feuvre, and some additional funding from the Grains Research and Development Corporation (GRDC). Mr Cunningham was supported by CSIRO's Sustainable Agriculture Flagship.

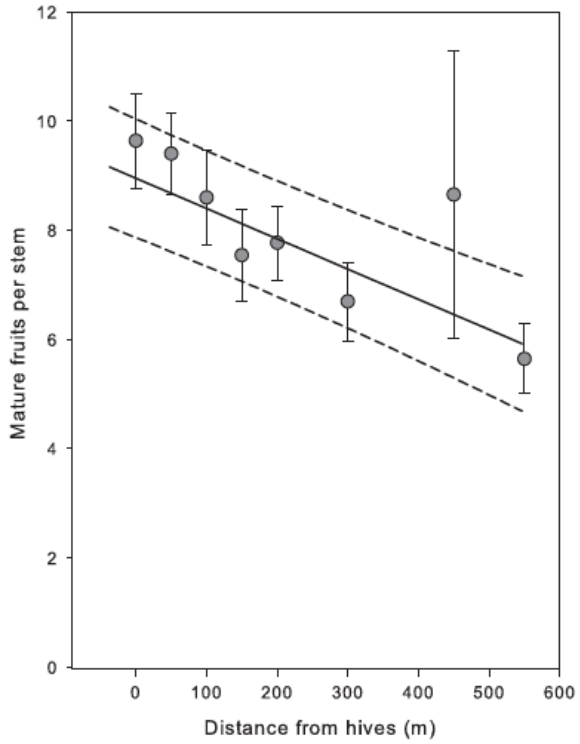

Fig. 2. Mature fruits per stem as a function of distance from bee hives. The solid line shows the function fit by a linear mixed model (flower number and site as random factors) and 95% confidence intervals in dashed lines. Grey symbols show mean (±1 SE) fruit per stem at each distance class in the underlying dataset (N = 134, 178, 155, 126, 154, 119, 32, 102 in distance classes from 0 to 550 respectively).

New pulse varieties for 2014

Pulse Australia industry development manager–southern, Mary Raynes and Dr Jason Brand, senior research agronomist–pulses, Victorian Department of Environment and Primary Industries, inspect a trial plot of PBA Wharton$^{\phi}$ field pea.

Spring is a very busy time for the Pulse Australia field team. Our industry development managers (IDMs) are highly sought-after as guest speakers at grower meetings and field days, particularly as the new varieties are released from the Pulse Breeding Australia (PBA) and National Mungbean Improvement programs. In 2013 eight new pulse varieties were released—two chickpea varieties, three field pea varieties, one new lentil, one lupin and one mungbean variety—across all three growing regions.

In the north, senior IDM, Gordon Cumming, coordinated and presented at 12 mungbean grower meetings in Queensland and NSW as part of the release of Jade-AU, the latest mungbean variety release.

Mary Raynes, IDM–southern, attended field days across Victoria and South Australia where growers were impressed with the opportunities the new small red lentil variety, PBA Hurricane XT$^{\phi}$, offers.

In the west, IDM Alan Meldrum arranged variety trials to show lupin growers the value of the latest variety from the PBA program, PBA Barlock$^{\phi}$.

Pulse Australia publishes variety management packages (VMP) for each new variety that provide specific agronomic information for growers to assist with variety selection and crop management.

PBA Maiden$^{\phi}$: a large-seeded, early to mid flowering desi chickpea

- Suitable for the medium to low rainfall environments of southern Australia. It is broadly adapted to these regions and has shown similar yields to PBA Slasher$^{\phi}$.
- Moderately resistant (MR) to foliar infection by ascochyta blight (equal to PBA Striker$^{\phi}$). It has a semi-spreading plant type and height similar to PBA Slasher$^{\phi}$.
- Seed size is greater than current southern desi varieties (28% larger than PBA Slasher$^{\phi}$) with a yellow-tan seed coat. Larger uniform seed size is more likely in medium rainfall regions.
- Well suited to whole seed desi markets such as those in Bangladesh.

PBA Monarch$^{\phi}$: a high yielding, early flowering kabuli chickpea

- Medium sized kabuli chickpea particularly well adapted to the shorter seasoned, medium rainfall environments of south eastern Australia. Has improved adaptation through earlier flowering and maturity compared to Genesis™ 090, Almaz$^{\phi}$ and Genesis™ Kalkee.
- It is adapted to the traditional kabuli chickpea growing regions of Australia and has shown a consistent yield advantage of 5–13% over current medium and large seeded kabuli varieties.
- It has shown similar yields but larger seed size than the small sized Genesis™ 090.

PBA Coogee$^{\phi}$: a 'dun-type' field pea with powdery mildew resistance and tolerance of soil boron and salinity

- Tested as OZP1103, this variety is a conventional (trailing) type dun pea that provides the flexibility of a forage option if frost or drought limit grain yield.
- Has a conventional plant type similar to the variety Parafield but with increased early season growth, more basal branching and longer vines.
- Is a long season variety that flowers mid to late season but pods rapidly and combines resistance to powdery mildew with high tolerance to soil boron and salinity. This variety has moderate resistance to bacterial blight.
- Produces grain that can be marketed as 'Australian dun type', suitable for stockfeed or human consumption.

PBA Hayman$^{\phi}$: a forage-type field pea for hay, silage and green manure

- Tested as OZP0902, this variety is a forage field pea that can be used for hay, silage or for green manuring as an alternative to vetch or Morgan$^{\phi}$ field pea.
- A tall, vigorous, conventional field pea, producing smaller tare-style leaflets and a high number of basal branches.
- It is late flowering and grows vigorously over spring given favourable conditions producing large amounts of dry matter. It has long vines (over 2 m under good conditions), which can remain semi-erect.
- Resistant to powdery mildew and produces small pods and small white seeds, reducing the cost of sowing.
- The grain is soft seeded, ensuring that there are no hard seeds carried over to germinate in following crops.
- Grain yield can vary but is generally between 30–80% of a normal field pea crop and is suitable for stockfeed.

PBA Wharton$^{\phi}$: a 'kaspa-type' field pea with virus and powdery mildew resistance

- Tested as OZP0805, this variety is a superior yielding kaspa-type field pea.
- It combines disease resistance to powdery mildew and the viruses PSbMV and BLRV with higher soil boron toxicity tolerance.
- Widely adapted across southern cropping regions of Australia and best suited to districts with a short to medium growing season or those that are prone to powdery mildew and virus diseases (e.g. south east SA). It is the first kaspa type variety suitable for production in northern regions of New South Wales.
- It is early to mid season flowering and early maturing (similar PBA Gunyah$^{\phi}$). It has a semi-leafless erect growth habit, pink flowers and shatter resistant pods like Kaspa$^{\phi}$.
- Grain colour and size is similar to Kaspa$^{\phi}$ but more spherical and smoother.
- Can be marketed as 'kaspa type' grain.

PBA Hurricane XT$^{\phi}$: a high yielding, herbicide tolerant small red lentil

- This variety builds on the success of the first herbicide tolerant lentil, PBA Herald XT$^{\phi}$. It incorporates the same improved tolerance to some Group B herbicides, but with higher grain yields and improved agronomic characteristics.
- PBA Hurricane XT$^{\phi}$ and PBA Herald XT$^{\phi}$ are in the process of APVMA permit renewal and registration for imazethapyr use.
- Has resistance to ascochyta blight and higher yields than Nipper$^{\phi}$ and Nugget.
- Is lower yielding than PBA Ace$^{\phi}$ and PBA Bolt$^{\phi}$, but may be preferred where more flexible weed control is desired or for marketing reasons.

PBA Barlock$^{\phi}$: an Australian sweet lupin with anthracnose resistance and tolerance of metribuzin

- A high yielding variety suitable as a replacement for Tanjil$^{\phi}$ and Wonga$^{\phi}$ in most lupin growing areas of Western Australia.
- Provides a very significant yield improvement in most regions of New South Wales, Victoria and South Australia.
- A considerable improvement in metribuzin tolerance over the varieties Tanjil$^{\phi}$ and Wonga$^{\phi}$ and will allow growers to use metribuzin as an option for controlling weeds within the lupin crop.

Jade AU$^{\phi}$: a large-seeded, shiny green mungbean offering high yield and improved resistance to powdery mildew

- A large seeded bright green mungbean that is broadly adapted to the northern region. It is suitable for both 'spring planting' (Sept/early Oct) and 'conventional summer planting' (Dec/Jan).
- It has a demonstrated consistent yield increase of 12% when compared to Crystal$^{\phi}$ across all regions of central and southern Queensland and northern New South Wales.
- Grain quality is equivalent to Crystal$^{\phi}$ and is highly acceptable in the market place.
- Has the best available combined suite of resistance to powdery mildew (greater than Crystal$^{\phi}$), tan spot and halo blight (ratings are equivalent to Crystal$^{\phi}$).
- Is of an equivalent plant type and has similar production agronomy to Crystal$^{\phi}$ and other current varieties.

MORE INFORMATION:
Click on the variety name to open the Variety Management Package (VMP) or search the Pulse Breeding Australia website.

Paul Villis grows mungbeans in rotation with sugarcane near Ayr in North Queensland and has been part of the seed increase program for Jade-AU$^{\phi}$.

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Broadleaf Crop Alliance

The essential role of broadleaf crops (and pastures) in broadacre farming systems is well documented and both growers and advisors acknowledge the significant benefits. Despite this, the adoption of broadleaf crops is below optimal levels for overall farm system profitability and sustainability.

The two major factors perceived to be limiting the area sown to broadleaf crops are input costs relative to potential dollar returns (price risk) and reliability (production risk). The development and release of new varieties and their management packages has gone a long way to improve the reliability of broadleaf crops. To fully realise the economic benefits, growers must also fully understand and meet market demand and quality requirements.

Pulse Australia chairman, Peter Wilson, said that pulse and oilseed crops provide similar benefits to cropping rotations and could be promoted together for their important contribution to farming systems and farm profitability.

Pulse Australia, Australian Oilseeds Federation and the GRDC have recently signed-off on a new 3-year industry development project to provide growers and advisors with the knowledge and confidence required for them to lift the proportion of broadleaf crops grown in Australian farming systems.

"An industry wide approach to industry development has worked well for pulses and we now have an opportunity to collaborate with the oilseed industry to cross-promote all broadleaf crops," he said. "Each broadleaf crop commodity is relatively small compared to the major cereals but collectively they represent a significant part of Australia's grain production."

Industry development managers currently involved in the various broadleaf crop commodity supply chains are well-placed to share their knowledge and the relationships they have with agribusiness for the benefit of the whole industry.

"Being in a position to discuss all broadleaf crop options with growers means better information is available to support growers in their decision making," Mr Wilson said.

Australian Oilseed Federation executive director, Nick Goddard echoed the comments of Mr Wilson, saying there is no doubt that synergies exist within the broadleaf crop industry. "The opportunity to work closely with researchers investigating the agronomy of specific crops and topics common to all broadleaf crops is exciting," said Mr Goddard.

He also commended the development of an on-line knowledge bank for growers, saying it would make available a wealth of industry knowledge aimed at assisting with finding solutions to a range of potential agronomic challenges

"The success of our last collaboration with Pulse Australia has prompted a continuation and expansion of the working relationship between our organisations," said Mr Goddard.

The 3-year 'Australian Broadleaf Cropping Project' will support the specialist team to provide targeted and highly relevant support services and materials to growers, advisors and agronomists. They will work closely with R&D providers (including GRDC funded projects) and state departments. The project will run to 31 August 2016 and has four major outputs:

- A total of nine Best Management Practice Training Manuals will be produced and/or revised over the life of the project.
- A purpose built e-library consisting of easily accessible resources for growers, advisors and researchers, on the sustainable and profitable production of broadleaf crops will be developed and maintained.
- A dedicated broadleaf crop specialist team will maintain a high public profile will be established.
- Relationships with key research providers will be established, providing effective and informed two-way flow of information.

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Online calculator for helicoverpa in chickpeas

by Dr Melina Miles,
DAFF Queensland

Establishing economic thresholds for an insect pest in a particular crop has been a valuable outcome of entomology research over the last few decades, assisting growers and agronomists with the decisions surrounding economic pest control.

Traditionally, economic thresholds were stated as a fixed pest density per m^2 that is known to cause economically-significant crop damage—for a specific set of crop value and control costs. Typically these specifics have been lost in time, and there is some uncertainty around how well these fixed thresholds represent current costs of control and crop values. Dynamic economic thresholds, which are the focus of DAFF Queensland research, account for variables such as row spacing, costs of control and crop value. However, until recently agronomists and growers had to input their variables into a formula, or refer to ready reckoner tables that provide an economic threshold for a range of variables.

The most recent advancement in the application of economic thresholds has been made in Queensland where the DAFF entomology team has built an online economic threshold calculator for helicoverpa in chickpeas that takes away the need to remember formula or do complex calculations in the field. The calculator is built on sound entomology data and has been thoroughly tested in the field. It can be used to estimate the potential yield loss and subsequently the economic threshold, taking into account all the relevant variables and information available about the crop.

For instance, research by the team had shown that if one helicoverpa larvae (per square metre) completes its lifecycle on the chickpea crop, the resultant loss is 2 grams of grain. This relationship is the outcome of an interaction between crop damage caused by the larva and the compensatory response of the crop. The calculator uses this yield loss estimate to predict the grain yield loss based on the number of helicoverpa present.

The calculator uses beatsheet sampling data and adjusts the predicted yield loss that will be caused by the population by taking into account likely larval mortality (30 per cent mortality of small larvae) and stage of crop growth.

The cost of control (product plus application costs) is entered into the calculator, along with the expected value of the crop. The calculator will even offer suggestions about whether control is warranted (an economic proposition) based on the current crop stage and susceptibility to damage. For instance spraying pesticide while the crop is vegetative is not warranted, regardless of the pest density, because helicoverpa only do economic damage to chickpea pods. An exception to this rule may be if a significant number of small to medium larvae were present late in flowering, where control may be warranted to avoid having to attempt control of medium and large larvae during pod set and pod fill.

From the information entered by the agronomist or grower, the calculator determines the potential loss (cost) of taking no action. Having an idea of what it would cost in lost production if no action was taken makes it possible to determine whether the cost of control is greater or less than the potential loss of yield.

Generally growers are looking for a better outcome from a control operation than just break even, so the calculator offers the option of increasing the cost benefit ratio from 1 (break even) to say 1.5, effectively raising the economic threshold.

The chickpea/helicoverpa calculator has so far only been evaluated for the northern growing region, north of Walgett, NSW and throughout Queensland. Nationally there is variation in the thresholds recommended for helicoverpa in chickpeas in Queensland, NSW, Victoria and Western Australia. The thresholds are similar, principally because they are all relatively low, reflecting the generally low costs of control.

The northern online calculator is very likely to work well in other chickpea growing areas although it would be prudent to evaluate or test the recommendations against past experience or use the calculator to make decisions in one paddock while managing all other paddocks using the thresholds generally used in your area. If the outcome is very similar then the calculator could be used with confidence in the future. An important point that must be stressed is that the calculator will only work correctly if the sampling is done with a beatsheet, not a sweep net. The sweep net and beatsheet have not yet been calibrated in chickpeas to enable the conversion of one to the other.

Rather than being used for each control decision, the calculator is probably most useful for re-calibrating rules of thumb that growers and agronomists use when there are changes in the costs of control or chickpea grain price.

The threshold calculators on the Beatsheet website are written in HTML5 with the capability to be used off-line if necessary, and will work on the newer operating systems on computers, mobile smart phones and tablets.

Helicoverpa are the main insect pest affecting chickpea and require control leading up to and during podding.

The economic calculators are calibrated to sampling using a beatsheet.

Using the calculator

Steps in determining if control is warranted:

1. Sample the crop and record the number of small (S), medium (M) and large (L) larvae in each sample (e.g. 5 beatsheet samples of metre row).
2. Average the number of each size of larvae and enter into the relevant box.
3. Enter the crop's row spacing and click the calculate button for mean larval density.
4. Add your estimate of the cost of control (including application) and expected crop value to calculate potential yield loss and breakeven economic threshold. If you have a preferred cost benefit, enter it to get a revised economic threshold.
5. You can then request a 'suggestion for action' based on crop stage and selected threshold.

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Beatsheet website http://thebeatsheet.com.au/sampling-2/

Other calculators on Beatsheet

Landmark senior agronomist for southern Queensland, Paul McIntosh was involved in the ground-truthing of the DAFF economic threshold calculators and highly recommends their use. He says they are an invaluable tool for decision making, particularly in cases that are not clear-cut. "They are based on solid research and have been fully ground-truthed," he says. "We know they work well and they can give an extra level of confidence to agronomists and growers who might not have a lot of experience with a particular crop yet."

Mr McIntosh is particularly enthusiastic about the release of the latest calculator for use in mungbeans. "There are several important insect pests that attack mungbeans and working out the relative levels of damage and when to take action can be tricky," he said. "The mungbean threshold calculator is brilliant because it factors in all the pests in the same matrix and gives a combined recommendation."

Hugh Brier is DAFF's senior entomologist specialising in pulse crops. He is the developer of the mungbean threshold calculator, which is now available in the same online format as the chickpea calculator.

"The decisions surrounding insect control in mungbeans are different to those for chickpea in that the penalty for not controlling insects far exceeds the cost of control," he said. "This means that the main purpose of the calculator is to assess the damage potential of all species in the crop and make recommendations regarding the timing of control measures."

The mungbean threshold calculator uses sampling data from the field to calculate adult equivalents and estimate the damage potential against days to harvest.

Similar calculators are available on the Beatsheet website for use in soybean and sorghum crops.

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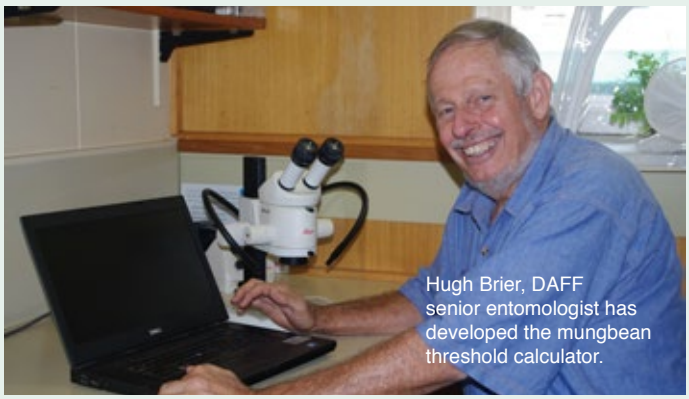
Beatsheet website http://thebeatsheet.com.au/sampling-2/



Hugh Brier, DAFF senior entomologist has developed the mungbean threshold calculator.

Tonia Grundy, DAFF Queensland and Paul McIntosh, Landmark assisted in the development and ground truthing of the mungbean pest calculator.

Lupins better in a longer rotation

Herbicide resistant ryegrass and radish continues to trouble Western Australian grain growers. Lupins provide an opportunity to croptop and destroy residual seed.

by Peter Newman, AHRI

The short rotation of wheat-lupin is one of the rotations that puts a lot of pressure on herbicides. Weed control in these two crops is limited to a relatively small number of herbicides and the repeated use of these chemicals in quick succession brought about the development of herbicide resistant wild radish and annual ryegrass.

The situation with wild radish was particularly bad because this weed has developed multiple resistance to the available herbicides so resistant populations were able to take hold of vast areas of cropping land making lupin production impossible.

Wild radish is now widely resistant to Group F (e.g. diflufenican) and Group B (e.g. metsulfuron-methyl) herbicides and annual ryegrass is widely resistant to Group A (e.g. clethodim) herbicides. Annual ryegrass is becoming increasingly resistant to the Group D herbicide, trifluralin.

The value of lupins in the crop rotation has not been doubted although many growers have discontinued lupin production due in part to the weed pressure. It has taken some dedicated growers ten years of consistent effort to reduce weed seed banks and gain a winning hand over wild radish. They have been rewarded with clean paddocks and successful lupin crops that are contributing to the soil health and farm profitability.

The key to their success has been reduced reliance on herbicides and the implementation of other practices such as longer rotations, croptopping and harvest weed seed control.

Rather than the once common wheat-lupin rotation growers are planting lupins less often and incorporating another broadleaf crop such as canola. A successful rotation might now be lupin-wheat-wheat-canola-wheat-wheat.

The next step is to adopt a 'no-survivors' policy for weed control. This means not accepting escape of any weed in any crop in any year. The beauty of lupins is that they offer additional weed seed management options.

Current herbicides, applied at the correct rates, still play an important role but must be applied when the weeds, particularly wild radish, are small. Two spray applications on small plants is most effective but herbicide applied to large wild radish plants is wasted.

Croptopping can be used to successfully stop seed set in both wild radish and annual ryegrass growing in lupin crops. Timing is critical but the results are excellent, drastically reducing the addition of herbicide resistant weed seed to the soil seed bank.

Harvest weed seed management is the final, and probably the most important, step to drive down the weed seed bank. Narrow windrow burning is particularly successful in lupins because the lupin trash generates a hot fire that kills a very high percentage of weed seeds, yet the burning operation is much safer than in a large cereal crop.

If growers prefer to use chaff carts rather than narrow windrow burning for harvest weed seed control the lupin trash dumps also provide good feed for sheep. Only a very small amount (around 3 to 5 per cent) of weed seed is still viable after passing through a sheep's digestive system. This is not the case for cattle, where a much higher percentage of weed seed remains viable.

Lupins are a very important part of the grain production system in Western Australia and offer growers some significant weed control opportunities that are not available with other crops. Bringing herbicide resistant weeds back under control has been a hard road for many growers but the good news is that growers can win and successfully bring lupins back into their rotations.

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WeedSmart website: www.weedsmart.org.au

WeedSmart 10 Point Plan

1. **ACT now to stop weed seed set.**
2. **CAPTURE weed seeds at harvest.**
3. **ROTATE crops and herbicide modes of action.**
4. **TEST for resistance to establish a clear picture of paddock-by-paddock farm status.**
5. **AIM for 100% control and monitor every spray event.**
6. **DON'T automatically reach for glyphosate.**
7. **NEVER cut the on-label herbicide rate and carefully manage spray drift and residues.**
8. **PLANT clean seed into clean paddocks with clean borders.**
9. **USE the double-knock technique.**
10. **EMPLOY crop competitiveness to combat weeds.**

www.weedsmart.org.au

Maximising herbicide efficacy in lupins

- Where practical, delay sowing to maximise weed kill from knockdown herbicides.
- Maximise the effectiveness of the pre-emergent herbicide simazine by incorporating in wet soil.
- Ensure an even crop so that all plants are at the correct growth stage when post-emergent herbicides are applied.
- Spray small weeds early for an effective kill.
- Use the highest registered rate of post-emergent chemical possible without causing unacceptable crop damage.
- Use Mandelup if you intend to apply metribuzin post-emergent.
- Croptop with Gramoxone® or Reglone® if required.

MORE INFORMATION: http://www.agric.wa.gov.au/objtwr/imported_assets/content/fcp/lp/lupin_dl_no1_chemical_weed_control.pdf

CONTROLLING WEED SURVIVORS IN LUPINS

by Alan Meldrum, Pulse Australia

Croptopping is the first stage of controlling weed survivors. The correct timing for croptopping is at 80 per cent leaf drop for lupins. At this stage the lupin seed is physiologically mature and the risk to grain size and yield is very low.

Ryegrass is most susceptible to herbicide during the flowering to soft-dough stage, when you can squeeze dough from the seed. Correct timing of herbicide application can control 50–95 per cent of the ryegrass and 15–80 per cent of the radish present. Following this with after-harvest burning of lupin residue in a narrow windrow will provide a very high level of control.

Use paraquat to target ryegrass or diquat if radish is the main target. Check herbicide labels for application rates and harvest withholding periods.

Croptopping after 80 per cent leaf drop should not adversely affect lupin yield or grain quality but grain should not be retained for seed.

Check the maturity of the ryegrass as this is the critical factor affecting the effectiveness of this control program. High water rates and maximum herbicides rates are required for maximum benefit.

The second step is to harvest as early as possible and collect and burn the lupin residue in narrow windrows or remove the trash using a chaff cart. Burning lupin residue generates temperatures hot enough to destroy ryegrass and radish seed. For best results, avoid grazing the lupin stubble and burn the windrows in a light cross-wind.

Harvest weed seed control strategies, like using a chaff cart, can significantly reduce the amount of weed seed being added to the seedbank.

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Herbicide options for croptopping

HERBICIDE	TRADE NAMES	OPERATION	CROP	RATE	WITHHOLDING PERIOD
Paraquat 250g/L	e.g, Gramoxone®, Nuquat®	Croptopping	Chickpea, faba bean, field pea, lentil, lupin, vetch	400 to 800 mL/ha	GSF: 1 day (7 days for horses) Stock must be removed from treated areas 3 days before slaughter Harvest: 7 days check the label for compliance
Diquat 200g/L	Reglone®	Desiccation	Lupin, dry pea, chickpea, lentil, faba bean	2 to 3 L/ha	Grazing/stockfeed (GSF): 1 day Harvest: Lupin 0 days; Dry pea 0 days; Chickpea 2 days; Lentil 2 days Faba bean 2 days

Lupin pods with sclerotia.

Sclerotinia in broadleaf crops

by Geoff Thomas &
Dr Ravjit Khangura, DAFWA

Sclerotinia is becoming increasingly common in broadleaf crops in Western Australia. This fungal disease has a wide host range that includes canola, grain legumes such as lupins and chickpeas, and a range of broadleaf weeds. With several different broadleaf crops commonly included in rotations there is a significant risk that the disease can be perpetuated from one season to the next.

Canola is very susceptible to sclerotinia, so if favourable conditions exist, as they did in 2013, the disease can quickly build up in canola crops, significantly reducing yield and leaving behind sclerotia that provide inoculum to infect subsequent broadleaf crops.

Canola pathologist, Ravjit Khangura, has undertaken sclerotinia surveys in the canola growing regions of WA during the past five years. The surveys have revealed that, in years favouring sclerotinia, the level of stem infection in canola crops was above 60 per cent in some paddocks, causing estimated yield penalties of up to 30–40 per cent.

The 2013 canola season saw significant yield impacts over a larger area than previously encountered. In addition to the cost of a yield reduction, the sclerotia (the disease's resting bodies) were also found as contaminants in grain samples, adding to the grower's costs. Yield reduction is due mainly to lodging and collapse of the plant's stem.

Lupin crops grown in sclerotinia-affected districts were also infected more than in previous seasons however yields do not appear to be affected to the same degree as in canola. In lupins, sclerotinia infection can affect the plant as stem or branch lesions or by directly infecting pods. In several instances lupin deliveries have been rejected due to the presence of sclerotia and have required cleaning.

Currently the area planted to canola is significantly larger than the area planted to pulse crops and so in disease-favourable seasons the disease has spread extensively and subsequent lupin crops sown in affected paddocks can be infected and perpetuate the disease.

Sclerotia are the hard fruiting structures of fungus produced at the end of the disease cycle. The sclerotia can remain dormant in the soil for up to ten years, ready to respond to favourable environmental conditions—the same conditions that favour crop growth. Mild wet conditions promote sclerotinia infection, particularly seasons with frequent late winter and spring rainfall that favours denser crops. In suitable weather, sclerotia germinate to produce tiny mushroom-like structures, called apothecia. These apothecia release spores that can infect host plants within a 400 metre radius.

There is no indication that current varieties of lupins grown in Western Australia have any meaningful differences in resistance to the disease, so variety selection is not expected to help reduce the risk of infection. Sclerotinia has previously been considered a minor disease for lupins and so screening for this disease has not been a key objective in lupin breeding. To date, a management package has not been developed specifically for sclerotinia in lupins, although the same general management and risk avoidance concepts recommended for other broadleaf crops should apply for lupins.

Growing non-host crops for several years would be the only way to eradicate the disease from a paddock but this is not usually an economically or environmentally sustainable option. Consequently, it is necessary to implement management strategies in the canola crop that will reduce the impact of this disease on future broadleaf crops. Canola paddocks that have been heavily infected with

sclerotinia will pose the greatest risk for infection of subsequent pulse crops.

In districts where the disease has not been observed it is particularly important to ensure that the canola, lupin and chickpea seed planted is not contaminated with sclerotia. Once a pulse crop is infected with sclerotinia there is no in-crop treatment available.

Retaining crop residues favours the disease, however, the sclerotia are not killed by burning crop residues or by cultivation.

Risk outlooks and the development of risk reduction strategies is the focus of ongoing research work, however careful attention to paddock rotation and infection history will help with managing risk.

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Managing sclerotinia in broadleaf crops

Sclerotinia usually occurs sporadically in lupin crops and there are no specific management packages for this disease in lupins. Like other crops lupin varieties do not have much resistance to sclerotinia. No fungicides are currently registered for the control of sclerotinia in lupins. The only management measures are to avoid spreading the disease in contaminated seed and to give consideration to sclerotinia risk when selecting paddocks for sowing pulses.

However, preventative fungicide treatment for the disease may be of value in canola crops. Current treatment costs are approximately $35–50/ha. Fungal sprays are applied to canola at 20–50 per cent flowering, depending on the product used.

Currently registered fungicides for management of sclerotinia in canola include Prosaro®, iprodione (e.g. Rovral® Liquid) and procymidone (e.g. Sumisclex®, Fortress®).

The recommended strategies in canola that, apart from fungicide application, will be applicable to pulse crops are:

- Use good quality seed that is free of sclerotia to reduce the spread of the disease.
- Avoid sowing canola next to or in paddocks that were infected with sclerotinia in the previous three years.
- Crop rotation, particularly with non-host crops such as cereals, can help reduce the severity of the disease in canola.
- If rotating with broadleaf crops check for sclerotinia symptoms in the preceding broadleaf crops and weeds if considering sowing canola into the same paddock the following year.
- Consider applying preventative strategic sprays of foliar fungicides at early to mid flowering. Fungicides should only be considered for very high yielding crops in districts prone to sclerotinia.

More information: www.grdc.com.au/GRDC-FS-ManagingSclerotiniaStemRotInCanola

Lentils respond to stubble retention

Standing stubble improves the micro-climate for lentils and increases yield, regardless of the seasonal conditions.

by Cindy Benjamin

Low lentil yields across the lower Mid North of South Australia in the low rainfall years of 2006–2008 prompted a three year trial to determine if sowing date and stubble management could influence yields. The results indicated that stubble retention can have a positive effect on lentil yields of up to 13 per cent.

Pulse agronomy researcher Michael Lines of the South Australian Research and Development Institute says their trials demonstrated that sowing lentils into standing cereal stubble improves yield stability, regardless of the length of the season or the amount of effective rainfall. "The benefit is more pronounced in drier seasons, suggesting that the benefit lies mainly in conserving soil moisture," he says.

In 2010 a trial was established near Mallala (Mid North, South Australia) to test if lentil yield would improve if the crop was sown into the inter-row of standing cereal stubble. This treatment was compared to two other stubble management techniques: 1. slashing and retaining stubble and 2. completely remove stubble by burning or raking. In addition to the three stubble management treatments the trials contained eight lentil varieties planted at three sowing dates—break of season, two weeks after the break and four weeks after the break.

"The stubble present in the trial was 30–35 cm standing height and ranged between 1.8 and 2.2 t/ha dry matter," says Mr Lines. "The varieties included Boomer$^{\phi}$, Nipper$^{\phi}$, Nugget, PBA Blitz$^{\phi}$, PBA Bounty$^{\phi}$ and PBA Flash$^{\phi}$."

The seasonal conditions varied across the three years of the trial, which helped indicate the conditions under which the most benefit is achieved from retaining cereal stubble. The season start in 2010 was considered average, followed by a wet finish. In 2011 there was a wet start and an average finish and in 2012 started normally and finished drier than average.

"When the results were analysed we found that stubble management had a positive effect on yield, regardless of the seasonal conditions," he says. "In 2010 significant two-way interactions were found with Sowing date x Stubble management and Variety x Stubble management. In 2011 and 2012 significant three-way interactions of Sowing date x Variety x Stubble management were generated."

Yield improvements of the Standing stubble over the Removed stubble treatment averaged 13 per cent across the three years. This significant yield response is thought to be largely due to soil moisture conservation but also factors related to the micro-climate within the lentil crop canopy.

"Along with reduced evaporation effects we also believe that most varieties benefitted from the protection and support that the standing stubble provided," says Mr Lines. "Protection from the wind means the lentil plants do not need to put additional resources into thickening their stems to withstand the wind, and there is less displacement of soil from around the stems, and potentially less upper root breakage, when the stems are blown by the wind. The combination of more resources and less damage to the stem and roots may boost the production of flowers and pods."

The less erect varieties also benefit through support from the stubble by reducing lodging and assisting with harvestability (e.g. raising the pods higher off the ground).

The greatest yield benefit was seen in PBA Blitz, an erect lentil variety that is often slow to reach canopy closure. This trait means there is usually more soil evaporation in a field of this variety compared to more prostrate varieties, which tend to quickly cover over the soil surface.

In contrast, Boomer has a high biomass and reaches canopy closure rapidly, reducing evaporation. This variety demonstrated the least yield response to stubble retention.

Key points

- Retained stubble can increase lentil yield and is unlikely to cause a decrease in yield.
- Greater yield advantage from standing stubble rather than slashed stubble, especially when lentils are sown later.
- Sowing lentils into standing stubble may provide further benefits to harvestability e.g. increased biomass, better plant and pod height and less lodging.
- Opportunity to investigate effect of individual processes (e.g. season, planting date, stubble and variety) on yield.

Table 1: Summary of grain yield improvement (% of Removed/burnt stubble yield) from Slashed and Standing stubble treatments compared to the Removed treatment for six varieties and three sowing dates across three seasons in the Mallala region. Some varieties were not included at all trial sites and have been omitted from this summary.

Variety	Variety characteristics	2010		2011		2012	
		Slashed	Standing	Slashed	Standing	Slashed	Standing
Boomer	Late, high EV, high BM, prostrate	0%	0%	0-16% (M)	0-27% (L)	0-16% (E, L)	0-29% (E, L)
Nipper	Mid-Late, erect, low BM	11%	12%	0%	0%	0%	13-34% (E, M, **L**)
Nugget	Late, industry standard	17%	11%	0%	0-21% (M)	0-33% (M)	0-38% (M, **L**)
PBA Blitz	Early, erect, low BM	12%	**22%**	0%	0-36% (**E**, L)	0-33% (M)	0-28% (E, M)
PBA Bounty	Mid-Late, prostrate	0%	11%	0%	0-20% (**E, M**)	n/a	n/a
PBA Flash	Early-Mid, erect	9%	9%	0-34% (M)	0-26% (E, M)	0%	0-30% (E, L)
Average stubble treatment response (all sowing dates and varieties) P<0.05		7%	**10%**	8%	**11%**	11%	**18%**
Season summary		Average start Wet finish		Wet start Average finish		Average start Dry finish	
Site mean yield (t/ha)		3.8		2.0		1.4	

Bracketed treatments denote which sowing date, Early (E), Mid (M) or Late (L), yielded higher than the Removed stubble treatment.
Bolded treatments denote the sowing date (E, M or L) where the Standing stubble treatment yielded higher than the Slashed stubble treatment.
Variety characteristics: EV = early vigour, BM = biomass, Early, Mid, Late refers to plant maturity, Erect or prostrate refers to plant growth habit.

Farming system considerations

Mr Lines says the decision to retain standing cereal stubble must be taken after considering possible disadvantages to the whole farming system.

Standing stubble can interfere with the proper operation of machinery and may have implications for disease, weed and pest management. Retaining stubble will lead to immobilisation of nitrogen and potentially stratification of nutrients in the soil profile. If the stubble interferes with herbicide application and incorporation there is the potential for herbicide resistance to develop over time.

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PBA Blitz, early, stubble burnt

PBA Blitz, early, stubble slashed

PBA Blitz, early, stubble retained

The greatest yield benefit was seen in PBA Blitz with standing stubble retained. This erect lentil variety is often slow to reach canopy closure so there is usually more soil water evaporation compared to more prostrate varieties, which tend to quickly cover over the soil surface.
Photos are from the trial at Pinery, 2012 that experienced an average start to the season and a dry finish.

Pumping a slurry of rhizobia inoculant into the auger to coat the seed before sowing.

Is inoculation of pulses worthwhile?

by Maarten Ryder,
University of Adelaide &
Ross Ballard, SARDI

Pulses are grown in crop rotations for several reasons, including their potential to fix atmospheric nitrogen and boost soil fertility. They don't do this job alone and if their symbiotic rhizobial partner is not present in high enough number in the plant root zone there will be reductions to the amount of nitrogen fixed, and sometimes little to no nitrogen fixed.

The pulse crop may survive if sufficient soil nitrogen is present but there will be a net loss of soil-N rather than the potential net gain.

Across the southern region we estimate that 75 per cent of pulse crops and 50 per cent of legume pastures are sown with rhizobium inoculant. Paddock history and soil type are the key factors influencing the need for inoculating pulse crops with rhizobium bacteria.

If a pulse crop has not been grown in the paddock, then inoculation is always required. If the pulse crop has previously been grown, there will be paddocks where inoculation is not required at every sowing, while others will benefit from topping–up the number and nitrogen fixation capacity of the soil rhizobia, using inoculation.

Rhizobia bacteria are able to live free in the soil without a host for a time but generally only when soil conditions, especially pH, are favourable to their survival. Rhizobia and their host legume tend to have similar pH tolerance. So for pulse legumes that dislike strongly acid soils such as pea and bean, the rhizobia tend not to survive well in soils with pH below 6 ($CaCl_2$) or below 6.5 (in water). Research has shown that pulse crop response to inoculation is more likely on low pH soils (except lupins), so inoculation is generally recommended on these soil types, Inoculation of acid sensitive pulses should always be practiced on very acid soils.

Lupins are much more tolerant of low pH (acidic) soils as are their rhizobia, and so inoculation is less critical for lupins on acid soils, so long as they have been recently been grown in the paddock and good nodulation has been observed.

In higher pH soils, rhizobia associated with all pulse crops can survive for several years without a host plant. Even so, as a rule of thumb, we suggest using inoculant if it is four or more years since you have sown the same pulse in a paddock. For example, if you plan to sow field peas and it is four or more years since pea, bean or vetch (which can all use the same rhizobia) have been grown in that paddock, then inoculation of the seed with rhizobia is recommended to top-up the background rhizobia.

In a national survey of farmers who grow pulse crops or legume pastures only 1 per cent of respondents indicated that the cost of inoculant was a factor in their decision whether to inoculate. The more common reasons for not using inoculant were that the benefit of inoculation was not clear or that the process of applying inoculant was messy and inconvenient.

The benefits of inoculation can sometimes be hard to see, but many studies have shown that improving nodulation is important to optimising nitrogen fixation. Even if there is no immediate benefit to the yield of the pulse crop, often there will be substantial benefits to the yield and protein levels of the cereal and oilseed crops that follow.

Pulse crop response to inoculation

Crop	High response	Moderate response	Low response
Chickpea	Chickpea not previously grown	Previous inoculated chickpea crop more than four years ago, or recent crop performed below expectation	Well-nodulated chickpea crop in past two years
Field pea, vetch	Crop not previously grown, or soils with pH ($CaCl_2$) below 6.0 and high summer temperatures (over 35°C for 40 days)	Previous inoculated pea, vetch (or bean) crop more than four years ago, or recent pea/vetch crop nodulated poorly and performed below expectation	Soils loam or clay, neutral to alkaline pH, and recent well-nodulated host crop
Faba bean, broad bean, lentil	Crop not previously grown, or soils with pH ($CaCl_2$) below 6.0 and high summer temperatures (over 35°C for 40 days)	Previous inoculated bean or lentil more than four years ago, or recent pea/vetch crop nodulated poorly and performed below expectation	Soils loam or clay, neutral to alkaline pH, and recent well-nodulated host crop
Lupin and serradella	No previous lupin or serradella grown in paddock	More than four years since growing inoculated legume host, or recent crop performed below expectation	In the north and central regions of WA wheat/sheep belt OR vigorous lupin/serradella growth and good nodulation in past four years
Mungbean and cowpea	No previous mungbean, cowpea or other related vigna species grown in paddock	Previous inoculated crop more than four years ago, or recent crop performed below expectation	Recent and or intensive mungbean or cow pea cultivation

Source: Inoculating legumes: The back pocket guide, GRDC, September 2013. Available online at www.grdc.com.au/GRDC-BPG-InoculatingLegumes

Pulse plants without nodules can not fix nitrogen. This means that if there is a nodulation failure the pulse crop itself may become deficient in nitrogen,which is very difficult to remediate. If the value of the crop is high enough, the addition of nitrogen fertiliser may be a viable way to produce some yield from the pulse crop, but there will be no residual fixed nitrogen for following crops.

If in doubt about the paddock's history, the use of inoculant is the most effective, and a much cheaper option at $5–10 per ha, than any remedial action and will ensure the maximum residual N benefit of growing pulses in the rotation.

Eighty per cent of growers use the traditional peat inoculants, applied in a slurry to the seed. Some growers are choosing to use granular, freeze-dried and seed coating products to allow them additional flexibility.

Using traditional peat inoculants and sowing after breaking rains is still regarded as the best strategy to ensure good nodulation, especially for crops that are highly responsive to inoculation, such as chickpea. For other pulses that have been widely sown, dry sowing carries less risk. For instance, faba bean and field pea can be dry sown on alkaline soils in South Australia if there has been a recent history of these crops in the paddock. In this situation the risk of nodulation failure is minimal.

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Inoculating legumes: a practical guide, GRDC (2012)
Inoculating legumes: the back pocket guide, GRDC (2013)
Rhizobial inoculants: harvesting the benefits of inoculating legumes, GRDC (2013)

Field pea inoculation trials show the highest response occurs when the crop has not previously been grown in the paddock, or in soils with pH ($CaCl_2$) below 6.0 and high summer temperatures (over 35°C for 40 days).

Reviving subsoil fertility

Potassium deficiency in young mungbeans. INSET: Deep placement of fertiliser is a practical option that does not alter surface cover or produce a cloddy surface.

by Dr Mike Bell, QAAFI

Decisions about phosphorus (P) fertiliser use on pulses like chickpeas and mungbeans are shrouded in uncertainty, partly because so little research has been done to determine the extent of P responses in these species.

A common misconception has been that these pulses show little response to P fertiliser, mainly because neither species has an obligate P requirement in early growth to set final grain number, unlike grains such as wheat, barley and sorghum. However, recent experience suggests both species do respond to P and, in some cases, the response is very strong.

Requirements for P mirror crop growth, with demand greatest when growth rates are high. Both chickpeas and mungbeans require some starter P (in low P soils) to help the crop root system establish and to grow vigorously as it uses moisture and nutrients in the subsoil. Deficiency can occur if there are insufficient nutrients available deeper in the profile.

Perhaps the greatest response to P and K in our environments occurs when these nutrients are either already present or placed as fertiliser in the subsoil (10–30 cm layer). These deeper nutrients are well placed to meet the demands for growth, as they are in moist soil for longer and are in profile layers where there are lots of crop roots. Deeper placement is particularly important for chickpeas, which are often planted below the top 10 cm layer, which typically has the highest immobile nutrient concentrations. As the coarse taproot system develops, only P from deeper in the profile can be accessed.

Changes in farming practices over recent decades have seen the nutrient profile of agricultural soils alter, particularly for immobile nutrients like P and K. While subsoil reserves are depleted, topsoil concentrations can be retained or even increase due to inputs from crop residue and surface applied fertiliser. These shallow nutrient stores are not available to plants when topsoils are dry, and we no longer till to redistribute those nutrients into the subsoil. Therefore, nutrients removed from subsoils require replacement, and the idea of deep placement of fertiliser bands has been investigated at a number of trial sites since 2006–07. While not specifically targeting pulse crops, chickpeas and mungbeans have featured in the crop rotations.

In each trial the reference treatments consisted of normal practice (e.g. starter fertiliser at the normal farm rate), a nil treatment (no P or K applied, but with deep tillage), a starter P treatment and a starter P treatment with either extra P (or K) applied deep (15–20 cm) during the preceding fallow. The nil and starter P treatments provided benchmarks for the effects of P, and also the effects of soil disturbance when compared to the farmer normal practice.

Deep placement of phosphorus, typically at a rate of 40 kg P/ha, was applied as TSP or MAP at depths of 15–20 cm (with extra N applied to compensate for the N in MAP), with bands 50–100 cm apart. Deep placement of potassium was also in bands and at the same depth and spacings, using a typical application rate of 100 kg K/ha applied as muriate of potash. In sites where both P and K were low, trials looked at adding each nutrient alone or as a combination of P and K to simultaneously overcome both constraints. Rates were deliberately high to ensure residual effects could be followed in subsequent crop years.

While the number of pulse trials is small, especially from 2013 winter due to a combination of both dry conditions and frost, there have been some consistent trends emerging.

- Chickpeas seem to be fairly consistently responding to P placed deep in the soil profile. Responses were significant in three of the four trial sites, with a trend for an increase in the fourth site. Some of the higher yielding crops accumulated 20–30 kg P/ha in the crop biomass, with up to 40% of that coming from the applied P. Yield responses typically averaged an increase of 20%.
- Mungbeans crops also demonstrated a trend for benefits from deep P at all sites. However, while relative benefits ranged from 10% to an impressive 60% yield increase, depending on soil P status, the benefits were only statistically significant in one of the three trials. There also seemed to be greater responses to starter P than in chickpeas, although more work is needed to confirm this.
- At a number of sites there were interactions between P and K (see the case studies below). At the Capella site the primary limitation was P (generating a 20% yield increase), with a trend for a small additive effect of K. However at Gindie the primary limitation was K (generating a 27% yield increase), with a strong additive effect of P after the K demand was met, making a total of 51% yield increase.
- Similar P and K effects were seen in a mungbean trial near Warwick, but while both P and K effects were significant there was no evidence of additivity. This can occur where the better root development that occurs when P deficiency is corrected allows the crop to then scavenge more effectively for K. This is the equivalent to squeezing a little more blood from the stone, as it does nothing to replenish soil K reserves!

The implications of these findings from a farming systems perspective are significant. Many farmers are concerned over the suggested return to deep tillage—even if

Deeper soil tests needed

Minimum tillage and long-term export of nutrients have resulted in depletion of P, K and sulphur (S) reserves at depth across the northern region. Research to date suggests that analysis of the 10–30 cm soil layer, along with the traditional top 10 cm layer, is critical for assessing P and K status of soils. Sulfur is more mobile in the soil and so testing as deep as 60 cm is needed to assess the status of this nutrient.

There is currently no information on the critical soil concentrations of these nutrients in the subsoil for any crop. Research is underway to fill these gaps in our knowledge through trials across the region, from the Central Highlands in Queensland through to the southern Liverpool Plains in New South Wales, with additional sites in the western areas of southern Queensland and central and northern NSW.

The focus of this research is to determine the critical soil concentrations required for yield responses in sorghum, wheat, mungbean and chickpea to applied P, K and S.

Chickpea response to deep placed fertiliser—control in foreground, PK response in background.

only at infrequent intervals. However, the management of immobile nutrients may require the use of such tillage if we are to replenish nutrients exported from farms across the region. The recommended frequency of this management strategy will be considered as the research project continues to collect data about the residual effect of fertiliser placed at depth. Early results indicate that the benefits of deep placement of fertiliser may be reasonably long-lasting and so the frequency required may be tied more to the application rate than any other factor.

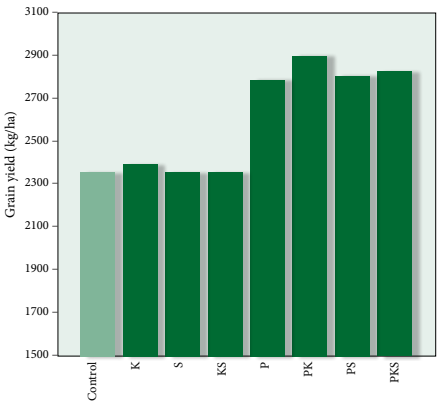
Case studies—CQ fertiliser deep placement trials

Two trials were conducted on sites near Capella and Gindie in Central Queensland, with support from the International Plant Nutrition Institute (IPNI) and Canpotex. Soil tests indicated that the soils at both sites were depleted in P, K and S.

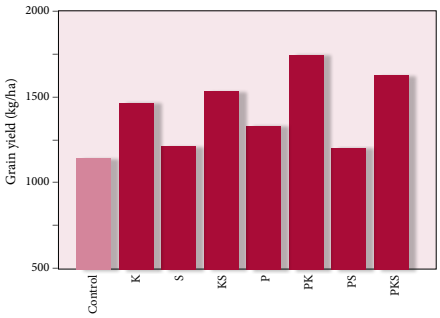
In winter 2011, treatments of these nutrients, alone and in combination, were banded 50 cm apart at depth during a fallow at both sites. Crops of chickpea (2012) followed by wheat (2013) at Capella and sorghum (2011–12) followed by chickpea (2013) at Gindie have so far been monitored for yield responses.

At Capella, deep placement of P gave rise to a 20% increase in yield above the control (deep tillage only), an additional 500 kg/ha of grain. Along with this main response there was also a slight trend for an additional benefit of K once P adequate, such that the combined effects of deep tillage and (P + K) fertiliser yielded 900 kg grain/ha more than the farmer reference. Effects in the following wheat crop were limited by a lack of water (there was no in-crop rain in 2013) that restricted the development of secondary roots and tillers (a key part of wheat P responses), but trends for higher yields with P and K (13% increase) were still evident.

Chickpea at Capella 2012 (first crop after treatments)



Chickpea at Gindie 2013 (second crop after treatments)



The additional crop production (2012 chickpea @$550/t and 2013 wheat at $275) was calculated to be worth $310/ha for P only, or $380/ha for P+K. Compared to commercial practice (no deep tillage) in 2012, the combined effects of deep tillage and P lifted the combined benefit to $600/ha after two crop seasons.

At Gindie the sorghum crop only responded to P (again a 20% yield increase), but the chickpea crop responded to the residual of the applications of both P and K, and there was a strong additive effect of the two fertilisers that delivered a 51% yield increase. The primary limitation in this season seemed to be K (27% response), and only once K was supplied could the additional response to P be observed. These yield increases represented additional grain production of 340 kg/ha and 530 kg/ha respectively, with the combined value of additional crop production (assessed as 2012 sorghum @$200/t; 2013 chickpea at $375) worth $160/ha for P only, or $320/ha for P+K.

Interestingly, the dry seasonal conditions in 2013 seemed to enhance the response to residual deep P and K in chickpea (where development of secondary roots and tillers is not a key driver of extra yield) at Gindie, versus the opposite effect in wheat at Capella.

The question remains about how long the residual benefit of deep placement of fertiliser will continue.

Soil test data from case study sites

Site	Depth (cm)	pH	Colwell P	BSES P	SO4-S	Exch K	CEC	DTPA Zn	Org C%
Gindi	0–10	7.2	13	10	3	0.17	35.3	0.2	0.6
	10–30	7.8	<5	5	2	0.07	38.4	0.1	0.5
Capella	0–10	8.1	10	14	3	0.46	73.7	0.25	0.7
	10–30	8.3	<5	9	2	0.16	74.6	0.1	0.65

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Desi's perfect storm

by Peter Wilson,
Australia Milling Group

In 2013 we saw what can happen when a market turns upside down. After high prices in 2012 chickpeas looked like a good option for growers and many responded with increased planting for the 2013 season. The season that followed was good across most desi growing areas but whilst it was a bumper crop, prices did not live up to expectations as India, Pakistan and northern Africa also experienced good growing seasons and production levels.

Australia shipped large volumes early and the price fell as local Indian and Pakistani crops arrived on the market. Defaults in India and Bangladesh and a devaluation of the Indian rupee against the US and Australian dollar caused further instability.

Having been out of the desi market since the end of 2012, Pakistan returned with a big crop, putting downward pressure on prices. Adding to the mix, Bangladesh buyers had previously over-imported by about 30 per cent and so demand in late 2013 was lower.

The recent lifting of the Indian pulse export bans are a new dynamic that the wider market is trying to digest. The main question is, how much of the Indian crop will now force its way into various destinations and how will this disrupt current supply chains?

The final piece to the price puzzle was the entry of Ethiopia and Tanzania into the desi market on the sub-continent.

The result was six to nine months of lower prices which is expected to remain until at least February–March 2014.

The rabi crop is now planted on an estimated 11 million ha across India. The size of the rabi (northern hemisphere winter sowing, spring harvest cropping period) pulse crop remains the single most important market indicator for Australian desi chickpeas during 2014.

The outlook in February and March gives an indication of production conditions and likely harvest outcomes. By May the information available is fairly concrete and gives Australian growers an indication of which way prices are likely to go.

Pulse market outlook

Faba beans have high yield potential and Australia has a strong niche market into the Middle East (see article on page 34). The combination of excellent varieties, proven management packages along with market access has made faba beans a good option for growers and seen plantings expand into previously unknown territory such as the Darling Downs in Queensland.

Our success has attracted interest in the Egyptian market from other countries, especially the United Kingdom and France. Sowings in these two countries will indicate if pressure is likely to be put on the Middle East market, particularly given that the European harvest will come in before the Australian crop.

Field peas are particularly sensitive to price comparisons with wheat. At the moment the price of paid for peas ($320 to $330 per tonne) makes them on par or better than wheat at $240 to $250 per tonne, taking in the 20 per cent difference in grain yield. Domestic demand for field peas as stockfeed provides peas with a solid demand mix and therefore price stability.

On the export front, Canada is the main competitor for field pea and lentil markets so watching their planting trends can help make crop choices here.

Gross margin battle: pulses v wheat

Wheat remains the main competitor for cropping land in Australia. When wheat prices are strong, the area sown to pulse crops usually drops. Many wheat growers are convinced of the many benefits that pulses bring to their production system, cash flow and farm business profitability.

Farmers can see the dollar value of improved soil fertility, better soil moisture retention, disease control and more chemical weed control options.

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Lupin Industry Plan

Pulse Australia and the Australian Export Grains Innovation Centre (AEGIC) have initiated a review of the lupin industry to identify opportunities for development and expansion into new markets, including new export market access applications, livestock feed value-adding and innovative food products.

Representatives from AEGIC, GIWA, DAFWA and GRDC joined Pulse Australia CEO, Tim Edgecombe and Industry development manager (western), Alan Meldrum to discuss whether the export lupin industry needed assistance and if so, what pre-competitive activities could be undertaken to develop market opportunities for the industry.

A wide ranging discussion of production and price, plant breeding, markets and marketing, market access and food safety, research and innovation and opportunities for lupin food development concluded with a decision to go ahead with a further investigation of the opportunities for the industry.

GIWA and Pulse Australia will establish a Lupin Industry Steering Committee charged with initiating the development of a Lupin Industry Plan in 2014.

Faba beans, to Cairo from Down Under

Egypt's hunger for Australian faba beans has helped the niche market grain become one of the country's fastest growing pulse exports.

by Charlie Higgins

If you ever find yourself wandering the streets of Cairo, don't be offended by the countless street vendors yelling "fooooooool!" They're selling Egypt's most popular breakfast food, ful medames, a dish of mashed faba beans flavored with garlic, lemon, and cumin typically served with eggs and pita bread.

Faba beans, or ful, are a staple of Egyptian cuisine and have been cultivated in the region since ancient times. Ful medames is the most popular way of eating faba beans, but there are literally thousands of recipes and variations used by Egyptians across all social and economic classes. Faba beans are to Egypt what black beans are to Brazil.

With a population of 84.3 million and growing about 2% annually, Egypt has a lot of mouths to feed. Though faba beans are produced domestically, the country must import large volumes to meet the growing demand for its second most important staple food.

For Australia's pulse industry, Egypt's faba bean fever has created a lucrative opportunity with demand that continues to grow. Between November 2012 and February 2013, Australia exported 153,988 metric tons of fabas to Egypt, representing nearly 70% of its entire export volume. Though the country lost some of its market share to France and the UK after a national drought in 2002, Australian growers continue to innovate and improve the quality and reliability of their fabas.

The dawn of Australian faba

Faba and broad beans (a larger faba variety with lower production) first became significant pulse crops in Australia during the mid 1980s and reached their heyday a decade later. Between the 1920s and 1970s, growers had experimented with a few Tic or "horse" beans using poorly adapted European varieties, but the results were mediocre at best. The first Australian and well-adapted faba bean variety, Fiord, was released in 1980, sparking interest in the national pulse-growing community.

Since then, faba bean production has grown steadily in Australia. Individual states have experienced ups and downs due to disease control and climate issues, but most have increased their production consistently since 1995. Australia saw peak production levels in 2000, with national acreage reaching 206,000 hectares. However, major drought between 2006 and 2008 left a significant impact that allowed France and the UK to obtain greater shares of the Egyptian market.

Despite setbacks, Australia's faba bean industry remains strong and is now seeing renewed interest thanks to higher prices and solid average yields. Fabas are well suited to a range of soil types and climates, and are currently grown in parts of Western and Southern Australia, Victoria and New South Wales.

"In all Australian States, beans have historically been considered too difficult to grow because of disease problems. With variable yields and returns, even total crop losses, they had earned a reputation as 'fraud' or 'failure' beans," says Wayne Hawthorne, Industry Development Manager for Pulse Australia.

"Now, 30 odd years after the first major crop losses, faba beans are considered a valuable and profitable pulse crop that

suits broad acre cropping rotations. With new variety releases, a better understanding of how to manage diseases, better agronomic advice and improved marketing and infrastructure, there is considerable confidence in growing faba and broad beans, and production is set to expand even further."

Meeting Egypt's demand

Egypt imports approximately 48% of all the faba and broad beans traded internationally. The top four importing countries—Egypt, Italy, Sudan and Spain—comprise 74% of the entire import market for fabas. Australia has remained competitive in this industry and currently exports about 70% of its fabas to Egypt. Hawthorne says several factors have enabled this lucrative trading relationship.

"The release of the new faba bean variety Fiesta VF in 1998 assisted the Australian faba bean industry greatly as this was a preferred faba bean product in the Egyptian markets because of its larger, more uniform grain size and light color."

"The harmonization of product specifications negotiated by Pulse Australia and the Egyptian Government were ratified in April 2002, and this greatly facilitated trade in beans and lentils between the two countries. Australian national export standards for faba and broad beans were set based on this harmonization and receival standards set to achieve those exportable grades," Hawthorne said.

Competition with France and the UK remains a key challenge for Australia's faba bean industry, though Hawthorne says the country has a few advantages that make up for its susceptibility to drought.

"Recent faba bean varieties released in UK and France are targeting the Egyptian market for quality and size in the same way as Australian breeders do. Australia has the advantage of clean and dry beans at harvest and the absence of bruchids, a pest of European beans and a major quality issue in the Egyptian market," Hawthorne explained.

The future of faba

With new varieties being introduced, improved farming techniques, better disease control and the expansion of emerging markets, Australia's faba bean industry is set to grow in the coming years. One of these new markets is China, which Hawthorne says is expected to become a net importer of faba and broad beans.

"Importation of faba and broad beans into China from Australia is currently restricted by trade regulations in China. This situation is expected to eventually be overcome, opening the way for Australian beans to be exported directly to China," Hawthorne explained.

"China produces 41% of the world's faba and broad bean, but consumes much of its production. China was a major export competitor to Australia during the 1990s, and still rates fourth in world export tonnages now. The price and quality of their product has influenced Australian export tonnages and prices," said Hawthorne.

On the production side, northern Australia is seeing a lot of growth with the release of new varieties of marketable quality. Technological advancements in southern Australia have also helped growers better understand the nuances of growing faba beans on more acidic soils. These factors, combined with increasing market demand, should bode well for the industry.

"Market expansion into a wider range of countries will also assist in the further production of faba beans in Australia. There will remain many factors that will affect the production levels in the future including demand from new and emerging markets, comparative pricing from alternative crops and the continued development of new varieties and agronomic practices," Hawthorne said.

Article originally published in 'International Food Trader', 19 June 2013. Reproduced with the kind permission of the publisher. https://www.goift.com/news/130619-pulse-feature-faba-beans-to-cairo-from-the-land-down-under-charlie-higgins/

Interest in faba beans is increasing with growers in non-traditional locations, such as southern Queensland, trialling the crop. Condamine grower Brett Bidstrup was pleased with the performance of his first crop of Warda faba beans, grown in 2013.

Stockfeed to SUPERfood

Changing consumer's perceptions of lupins.

by Cindy Benjamin

Australia produces around 85 per cent of the world's lupins, most of which are used for stockfeed, but there is now compelling evidence that incorporating lupin flour into human diets can have direct health benefits for individuals.

A team of researchers from the School of Medicine at the University of Western Australia, led by Professors Jonathan Hodgson, Trevor Mori and Ian Puddey, ran a study involving 131 overweight but otherwise healthy people to determine if a lupin-enriched diet would have a positive effect on key health risk factors. Dr Regina Belski, currently a researcher and senior lecturer at La Trobe University coordinated the study.

"In the study, half the participants were given bread, biscuits and pasta incorporating lupin-enriched flour while the rest of the group had these same foods made using wholemeal flour," said Dr Belski.

The aims of the research were to determine if eating lupin flour-enriched foods would assist in weight loss and hence improve cardiovascular health.

"At the end of 12 months the results indicated that lupin flour did not significantly affect weight loss, as both groups lost a similar amount of weight," she said. "However, despite similar weight loss in both groups, the group eating lupin flour foods had significantly larger improvements in a number of key risk factors associated with cardiovascular disease and diabetes."

Cardiovascular disease, or heart disease, remains the number 1 cause of death in Australia, and high blood pressure is a major risk factor. Eating products made with 40% lupin flour substituted for wholemeal flour significantly lowered blood pressure and so reduced the risk of heart disease.

High fasting insulin concentrations and insulin resistance are precursors to diabetes and both appeared to be reduced when an individual's diet included lupins. Diabetes is Australia's largest and fastest growing chronic disease. If the addition of lupin flour to baked products can stem the tide of this disease many lives will be improved and the large cost of treating and managing the disease can be reduced.

"To have the risk factors associated with these diseases reduced even without a significant difference in weight loss was a very promising finding," Dr Belski said. "It also seems that the greatest benefits will be observed in high-risk individuals who are likely to see a significant lowering of their key risk factors."

Lupin kernel flour from Australian sweet lupin (*Lupinus angustifolius*) has a unique macronutrient composition of 45 per cent protein, 30 per cent dietary fibre, negligible available carbohydrate, virtually no starch and is gluten free. Incorporating lupin flour into baked foods can increase protein and fibre, which are linked to increased satiety, while also reducing the refined carbohydrate content of the food.

Lupin flour was approved for human consumption in Australia in 1987 and in Europe in 1999 however very little product development has been done. Less than four per cent of the world's lupin production is consumed as a human food however this equates to around half a million tonnes of foods containing lupin ingredients being consumed each year in Europe.

There are immediate opportunities for the development of a range of lupin products that could be direct substitutes for existing mainstream products and could simultaneously improve the health of Australians.

Dr Belski suggests that products such as low carb muffins and bars, dips, lupin baked beans and tinned beans, bread, pasta, lupin milk and direct substitution in baked products could increase our food's protein and fibre content while lowering the food's glycaemic index (GI).

Some niche market opportunities include gluten free products for individuals with coeliac disease, protein bars and shakes for sports people and to produce popular Asian foods such as tempe and miso, usually made with soybeans.

"Whilst the idea that simply changing the toast we eat in the morning may improve our heart health is an attractive one, more research is needed in the area to determine the true benefits of lupin for high risk groups," said Dr Belski.

MORE INFORMATION:
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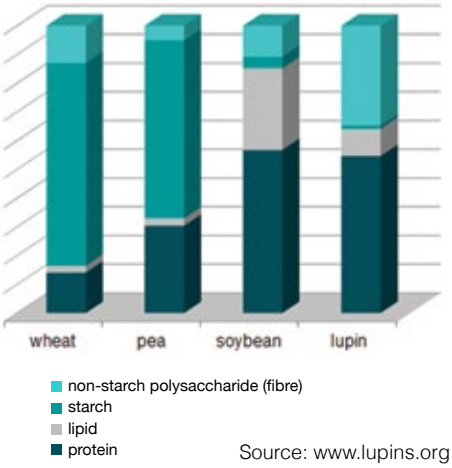
Composition of Lupin Splits vs Wheat Flour

	White Flour	Lupin Splits	Lupin vs Wheat
	Grams per 100 gram flour		
Moisture	10	10	100%
Protein	11	42	382%
Fat	2	7	300%
Ash	0.3	0.5	167%
Carbohydrate	74.5	3.5	18%
Fibre* - Pectin	2	29	1400%
Fibre* - Oligosaccharides	0.5	8	1600%
Total	**100**	**100**	
Energy			
kJ	1501	1024	68%
Calories	366	250	68%

Fibre* - lupin contains approximately 29-30% non-starch polysaccharide petic like fibres, however it also contains 6 - 8% oligosaccharides also classed as dietary fibre.

NB - wheat and lupin are biological materials therefore all parameters will vary slightly depending on variety and growing conditions.

Source: www.lupins.org



Source: www.lupins.org

Value-adding to lupins

In recognising the value of lupins as a tasty, nutritious and versatile food, Lupin Foods Australia has adopted a simple strategy—develop a set of outstanding lupin foods for breakfast, lunch, dinner and even high-end cocktail party menus.

Making functional foods that are easily incorporated into the mainstream diet is the inspiration for the company's new lupin mill. Lupin food ingredients must be easy to use so even the most amateur of cooks can prepare a wholesome meal in 15 minutes, within the family's food budget. With applications in the kitchen from falafels to brownies there is a place in every pantry and many cookbooks for lupin food ingredients such as flour, kibble, flake, splits and hulls.

The company's new mill is small in capacity at the moment but there is plenty of room for expansion as lupins find their way into mainstream use. The current mill can process up to 145 thousand tonnes of whole lupin annually to produce 100 thousand tonnes of split lupins and flake, 35 thousand tonnes of lupin hull, 3 thousand tonnes of flour and 7 thousand tonnes of kibble. Each of these products have uses in health foods.

The next step in developing the market for lupin food products is to establish a 'lupin food standard' so lupins can move from being seen only as a commodity to being sought after as a high value food, worthy of global demand. Some elements of this standard would include quality assurance on farm, variety specifications, cleaning pre-delivery and the like. Such a standard will underpin the consumer's confidence in lupins and lupin ingredients as high quality and valuable products.

Lupin Foods Australia plans to grow this market with the support of committed growers. Their aim is to achieve price stability in the short-term and a gradual increase in prices as demand for these unique products expands.

Interested growers can investigate the Lupin Foods Australia website then contact the company to express their interest in supplying lupins grown to superior standards as expected for a culinary product.

MORE INFORMATION: Lupin Foods Australia
E: enquiries@lupinfoods.com.au
T: 08 9416 1401 W: www.lupinfoods.com.au

Lupin processors in Australia

There are three lupin processors in Australia, all based in WA where almost all our lupins are grown. These companies produce a range of value-added products and ingredients such as lupin kernel flour, kernel 'splits', bran, seed for 'sprouting' and lupin meal for use in foods for human consumption. Their products are available to the domestic and international food manufacturers, bakeries, retailers and consumers.

- Irwin Valley Pty Ltd was originally established in 2002 as a 'commercial arm' to one of Australia's leading grower groups, the Mingenew-Irwin Group. T: 08 9319 9214 E: info@irwinvalley.com.au
- Coorow Seeds was established in 1995 by growers and business entities in the Midwest region of Western Australia. T: 08 9952 1088 E: admin@coorowseeds.com.au
- Founded in 2012, Lupin Foods Australia is a wholly owned subsidiary of Co-operative Bulk Handling Limited ('CBH Group'), an organisation owned by the grain growers of Western Australia. T: 08 9416 1401 E: enquiries@lupinfoods.com.au

Lupin Falafel

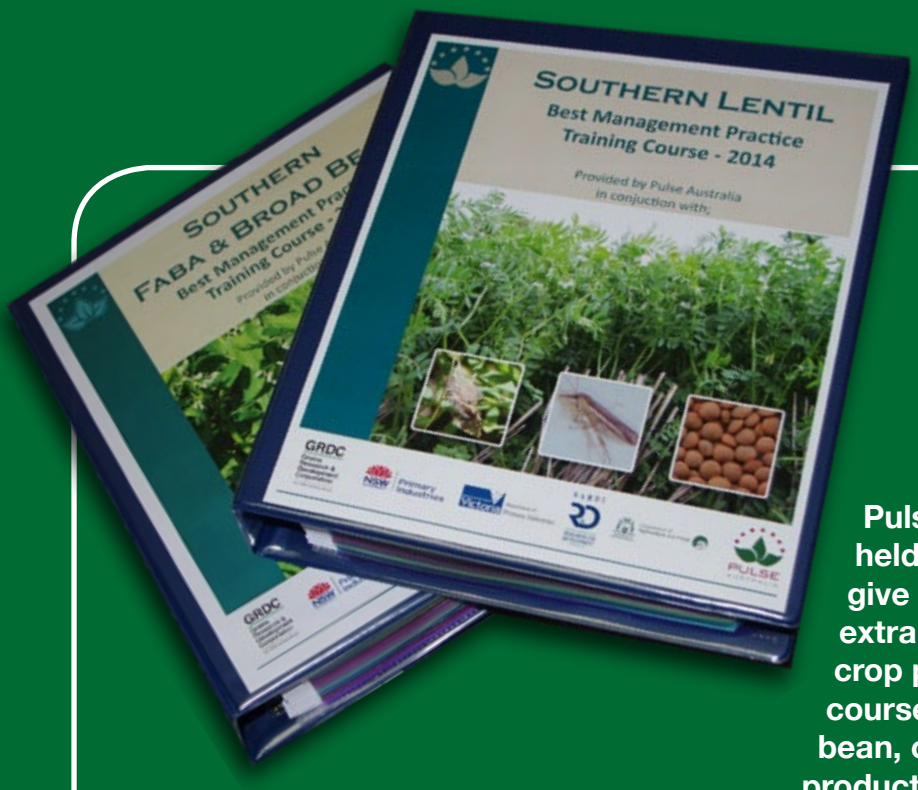
100 g lupin flake mix
10 g vegie stock powder
50 g onion finely chopped
60 g gluten-free bread crumbs (or other starches e.g. tapioca, potato, rice)
¼ tsp chilli powder
1 tsp ground cumin powder
1 tsp ground coriander powder
2 cloves garlic
10 g chopped parsley
2 tsp fresh lemon juice
160 mL water
2 tbsp (30 mL) vegetable oil

Method

Place all ingredients, except water and oil, in a bowl and blend well.
Add the water and oil to the dry ingredients and use a spoon to combine well.

Let mixture stand for 15 minutes.
With wet hands, form the mixture into balls (of desired size).
Deep fry balls in oil until golden brown.
Serve with plain Greek yoghurt, sweet chilli sauce or condiments of your choice.

Recipe and Image courtesy of Lupin Foods Australia



Pulse crop training workshops held in all growing regions give agronomists and growers extra confidence with pulse crop production. The 2014 courses will focus on lentil, faba bean, chickpea and mungbean production and marketing.

Pulses are not difficult to produce, but they are distinctly different to cereals, oilseed and cotton crops so it is important for first time or inexperienced growers to get advice.

Strong international interest in pulses, combined with increased grower confidence in varieties and growing practices, has led to a steady increase in plantings of several pulses over the last three to five years across most of Australia

The best management practice courses cover the A-to-Z of pulse production and offer participants the opportunity to engage in open conversation with a range of specialists, including growers, discussing different management practices suited to different areas. A comprehensive manual is available only to workshop participants and provides a source of on-going support and information as the season progresses.

The courses provide the science and reasoning behind the recommended management practice and an update on the latest research and advancements in the pulse industry.

Growers are encouraged to choose Pulse Australia-accredited agronomists to provide planning and in-crop advice on pulses.

The courses are conducted in conjunction with leading pulse researchers from GRDC-funded projects in the respective government departments of each state.

Lentil, faba bean, chickpea and mungbean will feature in the 2014 Broadleaf Crop BMP training program funded by GRDC. Growers and advisors wanting to reserve a place at these workshops can contact their Pulse Australia industry development manager or send an email to subscription@pulseaus.com.au to express their interest.

BMP COURSE DATES (dates and locations are subject to change)

South Australia		
Kadina	Lentil	11 March
Mallala	Lentil	13 March
Cummins	Faba bean	9 April
Victoria and southern NSW		
Horsham	Lentil	26 March
Swan Hill	Lentil	27 March
Moama-Echuca	Faba bean	2 April
Western Australia		
Esperance	Faba bean	Spring 2014
Queensland and northern NSW		
Emerald, Toowoomba, Goondiwindi, Narrabri	Mungbean	Spring 2014

Register: subscription@pulseaus.com