Recommend acceptance of final report. [signature] 10/03/2015

COGGO Council of Grain Grower Organisations Limited ACN 091 122 039	**Final Report** **COGGO Research Fund 2014** **A project completion report covering the project. The acceptance of a satisfactory report against the objectives of the project, and agreement on the sharing of any commercial returns and/or IP will trigger payment within 4 weeks, by COGGO for any outstanding payments.**

This Final Report should be completed with reference to the Research and Intellectual Property Agreement (the Research Agreement) signed between the proponent and COGGO Pty Ltd.

1. Project information

Project title	Enhancing WA chickpea industry through targeted demonstration and extension of new ascochyta resistant improved varieties and lines in partnership with grower groups
Commencement Date	1 January 2013
Completion Date	31 December 2014

Name of Proponent	Professor Kadambot Siddique
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Project Number	
Date Received	

2. Project results	This section provides a final report against the Project Aim and the Planned Outputs for the Project.

Achievement of the Project Aim	Brief statement of achievement in relation to the aim of the project

This is the first project that focused on demonstrating the new ascochyta resistant chickpea varieties to the WA growers during 2013 and 2014 growing seasons. Demonstration (demo) trials involving three new varieties and one old variety were conducted in 2013 at Mullewa, Mingenew, Wubin, Merredin, Doodlakine and Corrigin and in 2014 demos were conducted at Mullewa, Mingenew, East Buntine and Corrigin. Replicated yield trials with additional germplasm were conducted at Mingenew and Merredin. At all sites project personnel attended and addressed the field day participants and distributed specially prepared two pager on new varieties. In this way, over 270 growers and agri-business personnel have been directly engaged. Demo and yield trial results were shared with the grower groups for greater dissemination of the information. Media statement was released with press coverage. In addition, a survey of the chickpea industry was conducted and feedback received from this survey and direct interaction at the field days/field walks enabled to understand the issues that need addressing to further promote the chickpea industry in WA.

The message has been positively received but there is a clear need for greater efforts in the future to promote chickpea alongside other grain legume options.

Project Outputs		Please provide a report on the achievement, or otherwise, of the project outputs as per the planned outputs provided in the Project Proposal.
1	-	Output 1 (from Project proposal) Demonstration of new ascochyta blight resistant and improved chickpea varieties and lines
		Comment: Three new ascochyta blight resistant varieties (Ambar, Neelam and PBA Striker) along with the older variety Genesis836 were demonstrated in five demonstration trials (demo) in 2013 and 4 demos in 2014 and in two replicated variety trials in 2014 to more than 270 growers and agri-business people.
2	-	Output 2 (from Project proposal) Timely encouragement to growers for adoption of chickpea
		Comment: Prior to this project there has not been a concerted effort to promote ascochyta resistant chickpea varieties. This project clearly conveyed the message that with new varieties, the risk of ascochyta epidemic is minimal and conveyed timely message that chickpea industry is now ready to grow.
3	-	Output 3 (from Project proposal) Field days conducted and trial data made available as booklet to grower groups.
		Comment: Project personnel attended and addressed at five field days/field walks in 2013 and on similar number of occasions in 2014. The 2013 yield data from demos were included in the 2014 factsheet/leaflet and distributed at the field days (Appendix 1). As 2014 trials have been affected by the drought and depressed yields do not show any marked differences, this activity is not warranted for the 2014 data. However, results will be made available to the cooperating Grower Groups.

Project results	Please provide brief statements on the results of the Project

This section should cover aspects identified in *Section 7.3* of the Research Agreement

- the results of the Project, including discoveries made and other achievements (including any Project IP and Project Confidential Information);
- the potential application of the outputs of the Project to the Western Australian grains industry and broader community;
- the actual or potential economic benefits flowing to the Western Australian grains industry and broader community from the Project;
- the difficulties encountered;
- the conclusions reached;
- the Researcher's recommendations for any further research;
- a list of scientific papers or publications resulting from the Project; and
- attach copies of any photos, diagrams or other artworks (including, if requested by COGGO, negatives, bromides or the like) which the Researcher has and which may be of assistance to COGGO in the dissemination of information concerning the Project to COGGO's stakeholders.

RESULTS

The project addressed its aims through three activities; demonstration trials (demo), replicated trials of current varieties and COGGO/HERITAGE SEED lines, associated attendance and extension at field days and field walks and a survey of growers and agri-industry regarding chickpea. Details of each activity follow as under.

Demo trials

Demo trials were conducted in collaboration with the Grower Groups and Department of Agriculture and Food (DAFWA) using broad acre farm machinery and district practices. Three new varieties (Ambar, Neelam and PBA Striker) and old variety (Genesis836) were demonstrated without replication. The plots sizes were one machine width wide and 100 m long or more. In total 13 seed lots were distributed (6 in 2013 and 7 in 2014). However, whereas all six trials were sown in 2013, only 4 Grower Groups could sow the trial in 2014 for various reasons. Of the six trials in 2013, one trial was to be abandoned due to herbicide resistant rye grass problem (see Table 1). While the 2013 season showed average growth in majority of the demo trials, the 2014 season had generally low rainfall and consequently depressed growth and yields. Field days and field walks were attended at all sites and over 270 growers and agri-industry people were directly addressed and shown the new ascochyta blight resistant varieties. Considerable feedback was received through interaction during these field events. The yield estimates from those demo trials are shown in Table 1. In general, new varieties Ambar, Neelam and PBA Striker were higher yielding than the older variety Genesis836.

Table 1: Yields (t/ha) in demo trials.

Year	Co-operator	Yield Estimate (t/ha)			
		Ambar	Neelam*	PBA Striker	Genesis836
2013	Mingenew Improvement Group	1.614	1.504	1.665	1.306
2013	DAFWA Research Station, Merredin	1.059	0.948	1.093	1.085
2013	Corrigin Farm Improvement Group	1.108	0.821	1.016	0.834
2013	Liebe Group, Dalwallinu	0.725	0.823	1.059	0.957
2013	Mullewa Farm Improvement Group	0.223	0.341	0.343	0.356
2014	Mingenew Improvement Group	0.890	0.910	0.820	0.820
2014	Liebe Group, East Buntine	0.380	0.360	0.320	0.330
2014	Corrigin Farm Improvement Group#	0.337	0.360	0.702	0.315
2014	Mullewa Farm Improvement Group	Not harvested due to drought; yields too low at around 100 kg/ha for reliable comparison.			

*Neelam yields in 2013 are underestimates as due to damaged seed, emergence was poor with an estimated 20 % lower plant population.

#Corrigin site suffered from low pH, soil variability and lack of sufficient rain.

Replicated Variety Trials

Two replicated trials of the prevalent variety, new varieties and four advanced lines currently under commercial consideration were conducted at Mingenew and Merredin in six replications. Spatial row-column design with replication in two directions (along rows and columns) was applied and generated using DiGGer (Coombes, 2002). Linear mixed model has been formulated using a randomization-model based approach typically used for multi-environment trials (METs). The model used for the analysis of each trial includes blocking terms to account for the randomization process and additional terms to model the extra sources of variation, such as spatial trends and extraneous variation (Stefanova *et al.*, 2009). In the MET analysis an unstructured model was used for the variance - covariance structure of the genotype by environment (G x E) interaction effect. The analyses were conducted using ASReml-R (Butler *et al.*, 2009).

Due to very low rainfall at the critical flowering and podding stages both trials had low yields (Table 2). Lower yield at Merredin than the Mingenew site may be due to comparatively lower spring temperatures that prevail at Merredin. While all new varieties yielded more than Genesis836, Ambar, the earliest flowering variety, was particularly consistent over the two sites. Neelam's lower yield than Ambar and PBA Striker in this low rainfall season may be due to its later flowering habit. Interestingly, crossbreds under commercial consideration showed marked interaction with sites. Ranking of WACPE2199 and WACPE2234, in particular, showed sharp decline in the low yielding environment of Merredin.

Table 2: Yields (t/ha) of varieties and crossbreds under commercial consideration in replicated trials at Mingenew and Merredin.

	Mingenew			Merredin		
Variety	Yield	%Genesis 836	Rank	Yield	%Genesis 836	Rank
WACPE2196	0.746	103	5	0.434	66	8
WACPE2199	0.805	111	2	0.625	96	6
WACPE2201	0.668	92	8	0.668	102	3
WACPE2234	0.844	117	1	0.604	92	7
Ambar	0.782	108	3	0.687	105	2
Neelam	0.728	101	6	0.658	101	4
PBA Striker	0.753	104	4	0.722	110	1
Genesis836	0.724	100	7	0.654	100	5
Mean	0.756			0.631		
Standard error	0.041			0.046		
CV%	9.512			12.919		
P<	0.01			0.001		

Extension and communication during the field days/field walks

2013

Mullewa: The field day was organized by DAFWA Geraldton for the Mullewa Farm Improvement Group on 14 August 2013. Approximately 35 growers attended. Peter Elliot-Lockhart from PlanFarm detailed the demo objectives and talked about the new varieties. Due to very dry May-July, growth was affected and yields were very low.

Corrigin: The Corrigin Farm Improvement Group (CFIG) held two field walks, on 25 July and on 19 September. Over 40 growers and agri-industry personnel attended both events. Alan Meldrum and Tanveer Khan spoke about the new chickpea varieties and their potential and also discussed the management issues. None of the growers who attended the field walks had a lupin or pulse crop in 2013 but considerable interest was shown.

The demo was located on the COGGO funded fallow crop trial. The CFIG is aiming to trial high value crops for fallow rotations. The trial suffered from water-logging in winter and poor nodulation possibly due to low sub-surface pH. Despite these set-backs, yields around 1 tonne per hectare are impressive showing the potential of high rainfall southern areas for chickpea if management problems can be addressed. CFIG showed keen interest in continuing the trial in 2014.

Merredin: The demonstration trial at Merredin showed excellent growth and potential good yield. The field day on 26 September was organised by DAFWA and it also celebrated 100th anniversary of the Research Station. There were more than 80 attendees including growers, agribusiness and DAFWA personnel. The availability and virtues of ascochyta blight resistant new varieties were demonstrated and spoken about. There was considerable interest in varieties and also in management issues including current herbicide practices which were discussed at some length.

The demo plots yielded just over 1 t/ha.

Mingenew: The Mingenew-Irwin Group organised a heavy land field walk that covered wheat, canola and chickpea on 3 October 2013. Approximately 40 growers attended and heard about the new improved chickpea varieties displayed in the demo trial.

Mingenew demo was well grown and all new varieties yielded 1.5 t/ha or more and were clearly superior to the old variety Genesis836.

Wubin: The demo trial showed good early growth but the site received less than average rainfall. A field walk was specially organised for the chickpea demo with support from the Liebe Group on 17 October 2013. Seven growers and agribusiness people attended the field walk and spent over two hours examining new varieties, discussing management and market related issues. The group included keen chickpea growers. The price and seasonal conditions will determine the direction of chickpea revival in the coming years. The demo plots yielded less than 1 t/ha due to the dry finish.

Doodlakine: The demo trial at the property of John Nichols was well grown. It had at least 1 to 1.5 t/ha yield potential. Unfortunately, the grass selective herbicide Select (ai Clethodim) failed to control the ryegrass. The ryegrass growth was lush and swamped the chickpea entirely. If harvested, the yield of the chickpea would have been less than 0.5 t/ha and the ryegrass seed set would have caused the grower problems for the next few years. It was agreed to spray the crop out. This included 30 ha of the grower's chickpea in addition to the demo.

2015

Mullewa: The field day was organized by the DAFWA Geraldton for the Mullewa Farm Improvement Group on 14 August 2014. Alan Meldrum attended and spoke at the demo trial. There were 50 participants, mostly growers. There was little feedback as the audience included only one chickpea grower. There appeared to be overall satisfaction with chickpea as an option but in this risky environment it is a difficult crop to promote especially during later break seasons.

Mingenew: The field day organized by the Mingenew Farm Improvement Group (MIG) on 4 September, 2014. Alan Meldrum and Tanveer Khan attended and spoke at the trial. About 35 growers and agribusiness industry representatives visited the chickpea trial site. Discussions were lively and the range of topics covered included herbicide tolerance, price fluctuation, fungicide spray, yield relativity amongst currently available varieties and storage logistics. Concerns raised included low prices, weed control risks and prevalence of much greater herbicide resistance in the region. It was also pointed out that on-farm storage capacity often limits how much chickpea to grow.

East Buntine: The field day was organized by Liebe Group on 11 September, 2014. Alan Meldrum and Tanveer Khan spoke at the chickpea demo trial. Due to a concurrent session involving a wheat trial, only 7 growers and agribusiness representatives visited the chickpea site. However, lack of numbers was well compensated by the interest of the audience which led to lively discussions. Range of topics discussed included variety suitability and selection, height of plant and harvesting, marketing and storage, storage insect pests, ascochyta blight control, time of sowing, depth of sowing and flowering habit in relation to adaptation. In this region chickpea is seen as a part of a better rotation but will remain an opportunistic crop due to generally low rainfall.

Corrigin: Two field walk/field days were organized by the Corrigin Farm Improvement Group. The first field walk on 24 July was attended by Alan Meldrum. About 35 people, mostly growers, visited the demo plots of chickpea. Interest was shown but not many questions asked. The soil pH for chickpea was discussed as the site was found to be generally low pH and hence not suitable for suit to chickpea production.

The field day on 18th September 2014 was a more elaborate affair. About 40 people, mostly growers, visited the chickpea plots. All project personnel including Kadambot Siddique, Alan Meldrum and Tanveer Khan attended the event. While Alan Meldrum spoke mainly about the varieties and agronomy, Kadambot Siddique, on invitation, spoke on chickpea markets including international factors. Apart from this, soil pH requirement, chickpea rhizobia for acid soils, crop topping, substitution to chemical fallow and disease control were also discussed. There is a clear potential for chickpea in this medium rainfall region.

Merredin: The field day on 25 September was organised by DAFWA at the Merredin Research Station. Tanveer Khan attended the event even though scheduled visitation at the chickpea trial was cancelled as it was felt that chickpea was not a viable economic option in the eastern wheat belt and this was not communicated to us until less than 24 hours before the event. It is not clear, though, as to whether this is the opinion of the Field Day Organising Committee or the growers in this region.

There were over 110 participants representing over 20 shires and some interstate visitors. Glen Reithmuller acknowledged Tanveer Khan's presence in his address. Tanveer Khan interacted with the growers and distributed chickpea hand out as well chickpea survey forms.

Chickpea Industry Development Survey

A survey was conducted as part of the COGGO funded project "Enhancing WA chickpea industry through targeted demonstration and extension of new ascochyta resistant improved varieties and lines in partnership with grower groups". The questionnaire designed is presented in Attachment 2. In 2014, over 150 survey forms were distributed through email requests to Growers Group and by personally handing out at field days and field walk. Only 15 returns were received and of these, 14 arrived through emails or fax and one was personally handed over during a field day. All respondents supplied names (which were optional) but the report identifies returns from shire only for privacy reasons. This 10% return reflects the level of current interest in chickpea.

Only 6/15 identified themselves as chickpea growers; although only 5 were growing chickpea in the current 2014 season. However, 13/15 had grown chickpea in past. Of those who had grown chickpea in the past, 9 grew before 2009, 7 grew it in the past 4 years (2010-2013). As for the future, 10 respondents were going to grow chickpea, whereas 5 were uncertain. When asked when they will grow chickpea in future, four were uncertain and six said in 2015 and/or 2016.

Of those who did not identify themselves as chickpea growers gave the following reasons for not growing: -

- Did not fit rotation this year
- Disease, profitability and weed control were concerns
- Stop growing chickpea since the first outbreak of ascochyta blight epidemic and did not re-visit the crop
- Hangover from early failure due to disease
- Unsuitable soil type

Varieties being grown by the respondents in 2014 were Genesis836, Neelam, PBA Striker and Genesis510 and one respondent grew kabuli variety Almaz. It is interesting, that 3/15 respondents did not know that ascochyta blight resistant varieties are now available.

When asked about the impediments to chickpea growing, overwhelming response (10/15) was difficulty in controlling weeds. About half the respondents were concerned about the profitability and similar considered disease threat to be significant. Of those who considered disease as an impediment, all were concerned about the ascochyta blight and one also mentioned botrytis grey mould.

Most respondents provided valuable comments which are presented in full and identified against the shire in Table 1.

The key points emerging from the survey are as follows: -

1. The current interest in chickpea is low due to recent dry seasons and also a lack of targeted extension effort.
2. Not all growers know that ascochyta blight resistant varieties are now available and there is limited knowledge about the merits of newly released varieties.
3. The two most important issues to be targeted for enhancing the chickpea industry are effective weed control and improving profitability. Profitability can be improved by extension of robust agronomic practices and improved marketing structure. However, the chickpea price is dependent on overseas market demand on which there is little control.

POTENTIAL APPLICATION TO WA GRAIN INDUSTRY AND BROADER COMMUNITY AND ECONOMIC BENEFITS

The grain industry will directly benefit from greater adoption of chickpea and associated benefits of grain legume in crop rotation. The results will also help judicious selection of variety. With greater chickpea production, economic and health benefits will flow to the broader community.

DIFFICULTIES ENCOUNTERED

1. 2013 was a difficult season in some districts and 2014 turned out to be very poor with wide spread failure of rain at the critical period of vegetative and early reproductive stage. Yields were therefore depressed or just under average with one exception. Drought affected trials make poor display material at the field days. Also, at low potential yield level, differences between varieties become clouded.

2. The project budget was very limited and we had to rely on good will of the Grower Groups and DAFWA to sow the demo trials. This meant that we could not expect the high priority when it came to choosing land or sowing trial. Three trials in 2014 were not sown due this reason.

3. Neelam seed received in 2013 was partly damaged in the seed cleaning and which disadvantaged this variety in the 2013 trials.

CONCLUSIONS

The chickpea industry, which in late 1990s rose rapidly from almost no chickpea to over 75,000 ha in a short time, was halted due to the devastating epidemics of ascochyta blight disease for which there was no genetic resistance in varieties at the time. Although, the problem has been addressed and resistant varieties have become available in recent years, there has not been any marked resurgence in the area sown to chickpea in Western Australia.

This project aimed to demonstrate the new ascochyta blight resistant varieties and in doing so, gain first hand feedback from growers in order to re-kindle interest in chickpea. During the two years, almost all major field events in the potential chickpea growing regions and some other regions were exploited through demo trials and other trials to spread the message first hand to hundreds of growers and agro-industry personnel. Both demo and replicated trials showed that the new ascochyta resistant chickpea varieties perform better than the older variety and disease risk is now minimal. Valuable first hand feedback and survey results have provided information on the growers concerns and if targeted efforts are made to address these issues, there is every possibility that the chickpea industry will expand in WA.

RECOMMENDATION FOR FUTURE

Grain legumes are generally missing link in WA cropping system despite their known role in improving soil nitrogen status, providing disease break and opportunity for grass weed control. This two year small project on chickpea can work as a model for developing an adequately funded project that includes all major grain legumes (e.g. chickpea, field pea and faba bean) for the fine textured soils targeting relevant cropping regions in WA. Such a project should work in collaboration with the Grower Groups, Pulse Australia and DAFWA and funds should be available to compensate Grower Groups for their input to ensure priority for the project activities.

PUBLICATION

Siddique, K., Khan, T, Meldrum, A., Stefanova, K. (2015). New ascochyta blight resistant chickpea varieties offer profitable legume options to growers. Proceeding of the Crop Update 2015, Grains Industry of Western Australia (GIWA), in press.

MILESTONES

The milestone table for the duration of the project is presented in Appendix 3.

ATTACHMENTS

1. Appendix 1: A promotional leaflet distributed in 2014
2. Appendix 2: Chickpea Industry Development Questionnaire
3. Appendix 3: The project milestone table covering 24 months
4. Appendix 4: Contribution to MIG trial booklet 2013
5. Appendix 5: New item Merredin Field Day 2013
6. Appendix 6: UWA Media Statement
7. Appendix 7: Promotional Flyer Field Walk at Wubin 2013

3. Project resources	This section describes use of the funding listed in the initial plan and any refunds due to COGGO

Expenditure of funds requested from COGGO	$ Total funds budgeted	$ Total funds expended (actual)	$ Total funds requested from COGGO*	$ Total COGGO funds expended	$ Refund due to COGGO of any unexpended COGGO funds
Salary/Contractors	47,150	73,340.32	41,112.50	73,340.32	-32,227.82
Operating costs	49,200	23,085.87	42,900.00	23,085.87	19,814.13
Capital	0	0	0	0	0
TOTAL	**96,350**	**96,426.19**	**84,012.50**	**96,426.19**	**-12,413.69**

*Funding provided by COGGO.

IMPORTANT: Return of unused funds to COGGO is required as per *Clause 3.3* of the Research Agreement.

4. Commercialisation	Insert details of the proposed commercialisation process,as applicable, with reference back to the planned commercialisation plan in the project proposal) for any outputs from the project. This should include recommendations for the commercialisation of the results of the project and the registration or other protection of Project IP and Project Confidential Information as per the Research Agreement.

Nil

It is understood that this may require further discussion and agreement with COGGO via its' agent GIWA, as per the undertakings given and terms agreed, in the project proposal. This can be the subject of an appended letter and attachments. In all cases such discussion and subsequent agreements need to be governed by *Section 8 Project IP, Improvements and Project Confidential information* of the Research Agreement.

5. Communication/ Extension	Insert details of how the communication and extension of the project outcomes has been achieved to date and recommendations for future activities to disseminate and promote adoption of the results of the Project.

This project was basically an extension project and demo trials and yield trials were specially located at the field day/field walk circuits. All such events at trial locations were attended and visitors to the field day/field walk addressed. In addition, a two pager was produced promoting the new ascochyta resistant chickpea varieties and related information and distributed during the field events. Grower Groups were also supplied with the trial data. A survey conducted engaged growers and agri-business personnel to provide feedback regarding the chickpea industry. In addition, media statement has been issued and there has been some press coverage. An article written from the project outputs has been accepted for inclusion in the 2015 Crop Update Proceedings.

Note: As per *Clause 7.3 (b) (ii)* of the Research Agreement COGGO may require the Researcher to produce an edition of the Final Report in a form suitable for general distribution. If so required by COGGO, the Researcher must produce a non-confidential version of the Final Report within 28 days of receiving a request to that effect from COGGO.

6. Certification

The Project Supervisor and the Research Organisation certify that all information contained in, and forming part of, this final project report is complete and accurate. The project supervisor and research organisation further warrant that the project complied with all the relevant guidelines affecting the conduct of research, for example in relation to ethics, bio-safety, environmental legislation, GMAC or National Health and Medical Research Council Codes.

Project Supervisor's signature _____

Name (in Capitals) Professor Kadambot Siddique Date: 19/2/2015

Research Organisation signature _____

Name and title of authorised signatory (in Capitals)

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Date: 19 FEB 2015

Completed Final Project reports

Email to coggoresearchfund@giwa.org.au or mail to
COGGO Research Fund, GIWA, PO Box 1081, Bentley DC, WA 6983

For any further enquiries please email questions to coggoresearchfund@giwa.org.au

Or phone (08) 6262 2128

COGGO representative

For the purpose of this Project agreement contract, COGGO will be represented by Grains Industry Association of Western Australia (GIWA), or such other representative that is nominated by COGGO as authorised to operate on behalf of COGGO.

COGGO

THE UNIVERSITY OF WESTERN AUSTRALIA

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CHICKPEA INDUSTRY DEVELOPMENT

Ascochyta Blight Resistant Varieties for Western Australia

A fast emerging desi chickpea industry in Western Australia faced a major setback with the occurrence of ascochyta blight disease in 1999 and went into decline. A major effort by plant breeders helped to develop resistant varieties that have now become available for growers. Of the first ascohcyta blight resistant varieties released Genesis836 has persisted but it is now superseded by three new varieties released in 2012 that are higher yielding (Table 1). These new varieties are better adapted and offer greater options to growers. They have good seed quality for whole seed as well as split dhal markets, principally in the sub-continent.

Table 1: Yields (t/ha) in demonstration trials (in order of site mean yield).

Site	Co-operator	Yield Estimate (t/ha)			
		Ambar	Neelam*	PBA Striker	Genesis836
Mingenew	Mingenew Improvement Group	1.614	1.504	1.665	1.306
Merredin	DAFWA Research Station	1.059	0.948	1.093	1.085
Corrigin	Corrigin Farm Improvement Group	1.108	0.821	1.016	0.834
Wubin	Liebe Group	0.725	0.823	1.059	0.957
Mullewa	Mullewa Farm Improvement Group	0.223	0.341	0.343	0.356

*Neelam yields are underestimates as due to damaged seed emergence was very poor with an estimated 20 % lower plant population

New Varieties

Ambar: Released by COGGO Alliance in 2012, it is an early flowering ascochyta blight resistant variety capable of high yields in a favourable environment. It gave a record experimental yield at Mingenew in 2008 producing 4.3 tonnes/ha. It's a bush type plant which is lower in height but taller than the old variety Tyson. Its ascochyta blight resistance has also been confirmed in tests in the eastern States and internationally. The seed size is slightly smaller than Genesis836 but seed coat colour is a very attractive pale brown with uniform seed size.

Neelam: Released by COGGO Alliance in 2012, it is a mid-flowering ascochyta resistant variety with wide adaptation and high yield potential in Western Australia, as well as Victoria and South Australia. It is a tall and erect variety and hence more suited for mechanical harvesting. Its ascochyta blight resistance has been confirmed through several years of testing in WA and in variable environments in India and NSW. Seed size is marginally larger than Genesis836 with a mid-brown seed coat colour.

Appendix 1

PBA Striker: Released by Pulse Breeding Australia (PBA) in 2012, it is an early flowering, high yielding variety which is moderately resistant to ascochyta blight. Similar to Ambar and PBA Slasher, it has bushy growth habit with average height but good early vigour. Its plant height is similar to PBA Slasher and lower than Genesis836. Its seed size is the largest of all current WA varieties.

The 2014 demonstration plots and trials

The demonstration plots and trials sown in 2014 are presented in Table 2. You are welcome to visit them and for more details and mud maps please contact Alan Meldrum (0427 384 760).

Table 2: Trial details and sowing dates 2014.

Trial type	Replications	Location	Date of sowing	Management
Variety comparison and demo	6	Mingenew	6 May	DAFWA (Stephen Cosh)
Variety comparison and demo	6	Merredin	21 May	DAFWA (Adrian Cox)
Large plot demo trial	1	Mullewa	10 May	Peter Elliot-Lockhart
Large plot demo trial	1	Mingenew	30 May	Ben Cobley
Large plot demo trial	1	Dalwallinu	28 May	Ross Fitzsimons
Large plot demo trial	1	Corrigin	28 May	Simon Wallwork

Seed availability of new varieties

Seed of **Ambar** and **Neelam** is available through Heritage Seeds

Contact Tim O'Dea **Free Call 1800 007 333**

Seed of **PBA Striker** and **PBA Slasher** is available from Seednet

Contact Simon Crane on 0407 887 901 or Free call 1300 799 246

Alternatively, for all varieties contact EDSCO (Eastern Districts Seed Cleaning Co.) Phone 08 9045 4036

More information and variety brochure

Variety management packages for Ambar, Neelam and PBA Striker are available on the Pulse Australia website, www.pulseaus.com.au

Contact Alan Meldrum, 0427 384 760, alan@pulseaus.com.au

Project contact

All interested parties are welcome to cooperate in this project for promoting chickpea. Please contact Winthrop Professor Kadambot Siddique, Director, UWA Institute of Agriculture, The University of Western Australia (Phone: 64887012, Email: Kadambot.siddique@uwa.edu.au).

COGGO

THE UNIVERSITY OF WESTERN AUSTRALIA

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Chickpea Industry Development Questionnaire

We will appreciate your feedback to enable us to form a strategy for promoting and developing this profitable grain legume crop. Please tick (√) where appropriate. Thank you!

Your name (optional) _____

Property location (shire) _____

Are you a chickpea grower? Yes _____ No _____

If no, why? _____

Have you grown chickpea in past? Yes _____ No _____

If yes, when? 2013 ___ 2012 ___ 2011 ____ 2010 ____ 2009 _____ Before 2009 _____

Are growing chickpea in the current season (2014)? Yes _____ No _____

If yes, which variety or varieties? Ambar _____ Neelam _____

PBA Slasher _____ PBA Striker _____

Genesis510 _____ Genesis836 _____

Other (name) _____

Will you consider growing chickpea in future? Yes _____ No _____ Uncertain _____

If yes, when? 2015_____ 2016 _____ Uncertain when _____

Do you know that ascochyta blight resistant varieties adapted to WA are available? Yes ___ No ____

What is the impediment(s) in growing chickpea in your opinion?

Soil type _____ soil pH _____ Weed control _____ Harvesting _____ Handling _____

Storage _____ Marketing _____ Profitability _____

Disease threat? Yes _____ No _____

If yes, which disease? Ascochyta blight _____ Botrytis _____ Root rot _____

Any other comments

_____

_____

_____

Please complete and email or fax or mail to Alan Meldrum,
Email: alan@pulseaus.com.au Fax: 9368 3082 Post: PO BOX 1081 BENTLEY DC WA 6983

Appendix 3

Project Milestones		Please provide a report on up to four milestones due in the first twelve months of the project – as per milestones provided in Project Proposal
1	First 6 months	**Project planning meeting held** **Progress**: The project planning meeting held on 27 January 2013 was attended by the project supervisor W/Prof Kadambot Siddique, project consultant Prof Tanveer Khan and Mr Alan Meldrum of Pulse Australia.
2	First 6 months	**Demo trials sown** **Progress**: 6 sites were sown in May and June at Mullewa, Wubin, Mingenew, Doodlakine, Merredin and Corrigin, mostly in conjunction with Grower Groups.
3	First six months	**Interim Progress Report submitted** **Progress**: Interim Progress Report submitted before 30 June 2013.
1	Second six months	**Planning of field day attendance and communication completed.** **Progress**: In the first week of July, a meeting was held in the first week of July 2013 to review the likely opportunities for field days and field walk in the coming month and to ensure that at least project personnel was available to participate at each event. Alan Meldrum took the responsibility of liaising with various growers groups and demo trial managers to find the event dates.
2	Second six months	**Demo trials demonstrated and spoken about in at least one event at each site. Survey forms distributed at each event and collected.** **Progress**: The demo plots at Doodlakine became infested with resistant rye grass had to be sprayed out and abandoned (see detail in "Progress to date" section). At Mingenew, Merredin and Mullewa field days were held and at each site demo plots were spoken about. At Corrigin, two field days were held, one in July and one in September and both were attended. At Wubin, a special field walk was organized (see Attachment 1). Over 150 growers and agri-business personnel were exposed to demo trials directly with greater exposure through grower groups news network and word of mouth. At all events, a leaflet prepared specially by the project for these events was distributed (see Attachment 2). A survey form was designed (see Attachment 3) but due to time constraint and other considerations during field events it became impossible to administer. Alternative plan for survey are presented in "Progress to date" section. Trial report has been contributed to the Mingenew Improvement Group's Trial Handbook (see Attachment 4). A news rural press is presented in Attachment 5.
3	Second six months	At least one comprehensive media release after spring. **Progress**: After all field events were completed, a media released was posted on 25 October 2013 (see Attachment 6).
4	Second six months	**Annual Progress Report Submitted** **Progress**: Annual Progress Report submitted following the completion of all activities of 2013.
1	Third six months	**Milestone**: Project assessment and planning meeting held. **Progress**: First meeting was held on 20th February which over viewed the 2013 season and projected 2014 operations. A second meeting on 12th March finalized the demonstration and experimental operations, reviewed progress and made a time table for sowing preparations and sowing.
2	Third six months	**Milestone**: Questionnaire forms assessed and modified if needed. **Progress**: The original questionnaire prepared in 2013 was found to be difficult to administer due time constraints during the field days/field walks. Alternative approach has been proposed and will be followed during the coming months.
3	Third six months	**Milestone**: Demo trials sown **Progress**: In total six trials have been sown. Four of these have been sown using broad acre farm machinery and included the prevalent chickpea varieties. Another two trials involved all prevalent varieties plus four COGGO advanced lines licensed to the Heritage Seeds and sown with six replications.

Appendix 3

4	Third six months	**Milestone:** Interim report submitted **Progress:** Interim Report submitted in July 2014.
1	Fourth six months	**Milestone:** Planning of field day attendance and communication completed. **Progress:** Soon after sowing of the trials finished, in early June all project personnel met to discuss attendance at the field day and about the communication strategy on such occasions.
2	Fourth six months	**Milestone:** Demo trials demonstrated and spoken about in at least one event at each site. Survey forms distributed at each event and collected. **Progress:** At least one personnel attended field walk/field day at trial sites Mullewa, Mingenew, East Buntine, Merredin and Corrigin and in this way over 225 growers and agri-business people directly engaged. A brief talk was given on the trial and the chickpea industry and questions fielded. For full details see Appendix XXX
3	Fourth six months	**Milestone:** At least two comprehensive media releases done, one about the field day/contact events and one about the overall project. **Progress:** Due to drought in most of the State, yields were very depressed and therefore it was difficult to find a theme different to 2013 for developing media release. However, project progress has been reported in the UWA Institute of Agriculture Newsletter which is widely distributed.
4	Fourth six months	**Milestone:** Returned questionnaires from two years analyzed and summarized **Progress:** As reported before, in 2013 it was found difficult to administer survey. In 2014, more than 150 survey forms were distributed; only 10% returned the questionnaire showing current lack of interest in chickpea. However, returned forms came from all over the State. The significant feedbacks received showed that the two most important issues to be targeted for enhancing the chickpea industry are effective weed management and timely marketing information. Profitability can be improved by extension of robust agronomic practices and timely information on price and marketing. Full details in Appendix xxx.
5	Fourth six months	**Milestone:** Final Report Submitted **Progress:** Final Report submitted as required.

Appendix 4

Trial Name: Trial

Trial Number: 20MIG13
Researcher: Alan Meldrum
Organization: UWA, Pulse Australia & COGGO

Why do the trial?

To demonstrate the improved yield potential of newly released chickpea varieties for the northern wheatbelt PBA Striker, Neelam and Ambar, and to demonstrate the value and worth of chickpea as a viable and profitable cropping option.

Crop management

Grower and Location: Ian and Murray Thomas, Yandanooka
Soil Type: red loam
Soil test results:

Depth	PH	EC	Organic Carbon	Ammonium CaCl	Nitrate Nitrogen	Phosphorus Colwell	Potasium Colwell	Sulphur	Aluminium (CaCl2)
(cm)	(H_2O)	(dS/m)	(%)	(mg/Kg)	(mg/Kg)	(mg/Kg)	(mg/Kg)	(mg/Kg)	(mg/Kg)
	PH(1:5 Cacl2) 5.5,		Organic Carbon .47,			Phos 43,	Potash 176,	Sulphur 4.3	

Total Annual Rainfall:
GSR (Apr-Oct): 272 mm
Paddock History:

2012	2011	2010	2009
Wheat	Wheat	Wheat	Pasture

Paddock Average Yield: 1.4 t/ha Genesis 836
Plot size: 196m x 12.1m
Seeding Date: 23rd May 2013
Seeding Rate: 105 kg/ha
Seeding Machinery: DBS bar on 26cm tyne spacing
Plant Counts:
Vigor Ratings:

Paddock Inputs

Fertilizer
Pre: 25kg Agstar Xtra
Post: Nil
Total Fertilizer Cost:
Herbicide
Pre: 1kg terbyne, 1.25L Glyphosate, 100ml alphacypermetherin, 100ml dimethoate .2% wetter and 1% ammonium sulphate

Post: 100g Balance, 1L clethodim, .5% uptake and 1% sulphate of ammonia

Insecticide
Pre: **Nil**
Post **Nil**

Key Messages

Table 1.

Variety	Yield t/ha	Plants per m2	Vigour	Protein %	Weight kg/hl	Screenings %	Returns $/ha
PBA Striker	1.66			22.70%			$ 583
Genesis 836	1.31			23.80%			$ 458
Neelam	1.50			22.40%			$ 526
Genesis 836	1.30			23.80%			$ 455
Ambar	1.61			23.80%			$ 565

Price Notes: Chickpea priced at $350/tonne for illustration purposes only

Comments:

The results show a clear trend towards higher yields with the new varieties, PBA Striker, Neelam and Ambar, with approximately 300kg/ha improvement over Genesis 836. This result reflects the data from several years of trialing before release which showed a substantial improvement over older varieties but only a small difference between the 3 new varieties.
Definitive analysis will be conducted by combining the results of similar demonstrations from 5 sites across Western Australia.

The Neelam yield was affected by fragile seed resulting in lower plant numbers than the other 4 varieties. While plant counts were not conducted, the low establishment rate did contribute to a lower yield than otherwise would be expected.
The Neelam seed displayed fragility at sowing. At harvest in 2013, Neelam showed no difference in fragility to the other varieties. It is assumed that the delayed harvest of Neelam in 2012 resulted in very dry moisture content. As a result there is no suspicion that Neelam is inherently more prone to splitting than other chickpea varieties. Grain samples from each strip will be analysed for defects.

The yield performance of PBA Striker, Neelam and Ambar is very similar in this environment, while demonstrating a significant improvement on Genesis 836. Growers should consider the worth of one of the 3 new varieties based on their inherent characteristics rather than on yield performance.

- PBA Striker- best early vigour, semi-prostrate growth, largest seed size
- Neelam- tall erect variety, similar seed to Genesis 836
- Ambar- short bushy habit, very early flowering, suited to later sowing, similar seed to Genesis 836.

Acknowledgements:

Thank you to Ian and Murray Thomas for conducting this demonstration, ie seeding maintenance and harvest. Your contribution and time is gratefully acknowledged.

The MIG team assisted with the field walk in October and with operation of the weigh trailer at harvest. The support of the MIG team is always forthcoming and is welcomed.

COGGO provided funding for this project which will continue in 2014.

▲ Continued from page 7

At lunch time, with steak sandwiches in hand, attendees gathered into the old station shed and heard about the fascinating history the Research Station holds.

Well known InterGrain wheat breeder Robin Wilson offered a rare glimpse of its achievements and the people that have made them possible.

According to Mr Wilson, wheat breeding in Australia was started by William Farrer, near Canberra, at the beginning of the 20th century.

"In 1916 WA was making good progress in wheat production using wheats from the east," he said.

The first wheat produced in WA was called Gresley and was developed by a farmer, C Harper, in co-operation with an editor of an agricultural newspaper, WS Grasby.

"It was a dual-purpose wheat, suitable for grain and hay," Mr Wilson said.

"It is important to remember that in those days the tractors were horses and they needed to be fed."

These varieties are a far cry from those developed in the last decade with comprehensive disease resistance packages and much higher yields.

And the Merredin Research Station has played a significant part in this.

Dr Sweetingham said many of the advancements in cropping hinged on the advent of minimum tillage, which revolutionised the way crops were sown.

"Long-term research at Merredin demonstrated the use of minimum tillage in continuous cropping systems improves soil structure and water-holding capacity," he said.

"Investigations by soil scientists, agriculture engineers and agronomists at Merredin found that some heavy soils responded well to gypsum application.

"This led to the department developing a simple test that growers could use to determine which soils would respond well to gypsum."

❒ **For more photos from the day see page 43.**

❒ DAFWA development officer Ian Pritchard revealed a new field pea trial.

Appendix 6

University News

Tough new varieties set to revive profitable chickpea industry

Friday, 25 October 2013

Chickpea has emerged as Australia's most important cool season grain legume, according to the ABARES 2012 season crop data - and new disease-resistant varieties are expected to revive and develop a profitable chickpea industry in Western Australia.

The industry was decimated in the late 1990s by ascochyta blight disease, which thrived in WA's cool and humid conditions. The disease also affected chickpea crops in Victoria.

Three new ascochyta-resistant varieties have recently been released. Of these, two varieties (Ambar and Neelam) were developed by an international chickpea breeding alliance between The University of Western Australia (UWA), the Department of Agriculture and Food Western Australia (DAFWA), the Council of Grain Growers Organisation (COGGO), and the International Crop Research Institute for Semi-Arid Tropics (ICRISAT). The third variety, (PBA Striker), was developed by Pulse Breeding Australia (PBA), a consortium of state government research organisations, industry bodies and the Grains Research and Development Corporation (GRDC).

The new varieties all give high yield and good quality grain.

To enhance the chickpea industry and accelerate the uptake of the disease-resistant varieties in Western Australia, UWA's Institute of Agriculture in association with Pulse Australia has launched a project that is financially supported by the COGGO.

The three new chickpea varieties - Ambar, Neelam and PBA Striker - along with older varieties were sown in partnership with grower groups in demonstration plots at Mullewa, Mingenew, Wubin, Merredin, Kellerberrin and Corrigin during the 2013 growing season.

The trials were sown and managed using broad-acre machinery in collaboration with grower groups and DAFWA.

Project personnel attended a series of field walks and field days to speak to growers about the new opportunities for chickpea production. These demonstration trials enabled hundreds of growers to examine the new varieties first-hand. Each variety, while high yielding and disease resistant, have differing growth structures and characteristics. The demonstration trials will be continued in the 2014 season with the support from COGGO, grower groups and the industry.

More than half a million hectares of chickpea were grown in 2012, mostly in the North Eastern parts of New South Wales and southern Queensland. Chickpea is a high-value grain with on-going and stable demand from the Indian subcontinent, which will absorb any increase in production from Western Australia.

Media references

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Michael Sinclair-Jones (UWA Public Affairs) (+61 8) 6488 3229 / (+61 4) 00 700 783

Attachment 7

Desi Chickpea field walk

PULSE AUSTRALIA

Thursday
17th October 2013
Wubin

Come along to an informal field walk anytime from 10am to noon

2km west of Wubin on the Gunyidi- Wubin Road
(Look for signs)

Which variety will suit your operation?

Neelam

Ambar

PBA Striker

Genesis 836

Sown with broadacre equipment, you can evaluate the performance of chickpea in 2013 as it could be on your farm.

Speakers:

Alan Meldrum, Pulse Australia

Dr Tanveer Khan, chickpea breeder of Neelam and Ambar

With thanks to Rob Nankivell

All welcome - any queries call Alan Meldrum on 0427 384 760

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