

# COGGO

Council of Grain Grower Organisations Limited  
ACN 091 122 039

## Final Report

### COGGO Research Fund for 2017 projects

**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	Should Western Australia be worried about weak wheat?
Commencement Date	1/2/2017
Completion Date	31/12/2017

Name of Proponent	groIQ
ACN/Legal Name or ABN	68 748 277 051
Mailing Address	PO Box 490 Mount Hawthorn WA 6915

Administrative Contact	Dr Richard Williams
Position	Managing Director
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Project Supervisor/Principal Researcher	As per Administrative Contact
Position	
Telephone	
Fax	
Email	

### COGGO Use Only

Project Number	
Date Received	

<b>2. Project results</b>	This section provides a final report against the Project Aim and the Planned Outputs for the Project.
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<b>Achievement of the Project Aim</b>	Brief statement of achievement in relation to the aim of the project
<p>The aim of the project was to try and determine the cause of observed dough weakness of WA wheat.</p> <p>A multi-season (6), multi-variable (i.e. wheat quality, genotype and climate) data set was accumulated. This was used to successfully identify, at an aggregated level, four climatic variable that have an impact on dough strength, as measured by extensograph maximum resistance (Rmax). The available data was divided into northern, central and southern aggregations for the WA wheatbelt. A strong negative relationship was observed between Rmax and percentage of total rainfall during the period 60 days after flowering (estimated as Zadok growth scale 65 or Z65). Analysis also found evidence of a weaker relationship between Rmax and minimum temperature from seeding to Z65. Strong positive relationships were observed between Rmax: and two consecutive days of maximum temperature <math>\geq 28^{\circ}\text{C}</math> for the period 30 days after Z65; and daily mean temperature (as calculated by <math>(T_{\text{max}}+T_{\text{min}})/2</math>).</p> <p>At an individual site or trail level the above relationships were also evident. Proposed reasons for the weaker relationships at a site level are (a) 25% of the quality data was from composite sample testing (made up of either 2 or 3 sites); (b) a reliance on estimated plant development and climatic information and (c) other variables such as differences in soil, fertilizer regimes, disease between trial locations. A disadvantage of recycling quality data was that associated plant development phases and climatic information were not readily available. Therefore, for consistency purpose the analysis used predictions (i.e. flowering time predictions using Flower Power and interpolated Data Drill climatic information from SILO).</p> <p>It was observed, as proposed by Blumenthal et al (1995), that varieties with the glutenin subunit 2+12 combination for Glu-D1 seemed more susceptible to having weaker dough profiles than varieties with the 5+10 combination.</p> <p>Fortunately, discussions by the Principal Researcher with industry parties during the course of the project, has attracted the possibility of capturing real development phase and climatic information by way of DPIRD time of sowing trials. DPIRD (Brenda Shackley) are currently assessing how existing samples from the 2017/18 harvest might be quality tested, and planning ahead for how 2018/19 trials could be used in terms of capturing plant development phases and climate data along with targeted quality testing. GRDC (Clare Johnson) have also expressed tentative interest in such work. This is in addition to a general review of quality that DPIRD is conducting for CBH Group (Rob Dickie).</p> <p>There is also the opportunity for the data set assembled to be worked on further by climate modelers like Dr Fiona Evans (Premier's Midcareer Fellow, 'Big data in agriculture') who might be able to drill deeper into possible environmental cause(s) for the weak wheat as this was beyond the capacity of the existing project.</p>	

<b>Project Outputs</b>		Please provide a report on the achievement, or otherwise, of the project outputs as per the planned outputs provided in the Project Proposal.
Output	1	Scientific article on whether varieties, growing conditions or some other factor(s) are causing weak dough strength wheat to be produced in WA.
		Based on the findings a journal article is currently being drafted with the aim of submitting it by the end of March 2018.

Output	2	Communication with stakeholders (and this depends on the findings of output 1) such as farmers via representative groups such as SEPWA, Liebe, West Midlands and Stirlings to Coast challenged through Grower Group Alliance; industry representative bodies such as GIWA, Wheat Quality Australia; and wheat breeding companies directly and/or via the Wheat Breeders Assembly
		A submission was made to present the findings at the upcoming 2018 GRDC Research Updates but this was unsuccessful. There is operational budget remaining for travel to regional locations for discussion but this is not planned to be used.  As indicated, in the preceding Achievement of the Project Aim section, communication by the project's Principal Researcher has lifted the profile of the weak wheat concern. It is hoped that DPIRD, CBH and/or CBH Group will be able to build on the findings made possible by the COGGO investment.

<b>Project results</b>	Please provide brief statements on the results of the Project
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This section should cover aspects identified in *Section 7.3* of the Research Agreement.

**1. The results of the Project, including discoveries made and other achievements (including any Project IP and Project Confidential Information)**

The research found that at an aggregated level weaker dough strength or Rmax was negatively linked with increasing amounts of rainfall post flowering. There was also evidence that increasing minimum temperatures between seeding and flowering might have an impact on Rmax. A positive relationship was identified between Rmax and: two consecutive days  $\geq 28^{\circ}\text{C}$  maximum temperature post flowering; and mean daily temperature (as calculated by  $(T_{\text{max}} + T_{\text{min}})/2$ ).

The findings are consistent with previous studies that proposed certain glutenin profiles are more susceptible to influences of climatic conditions. That protein component is common to many past and current wheat varieties.

**2. The potential application of the outputs of the Project to the Western Australian grains industry and broader community**

Highlights the possible impact a changing growing environment might have on wheat quality, especially when changes are also occurring with respect to sowing times.

**3. The actual or potential economic benefits flowing to the Western Australian grains industry and broader community from the Project**

The project has laid a platform from which further work can be conducted. This is important, as WA needs to maintain its international competitiveness by not having inferior quality wheat.

**4. The difficulties encountered**

A positive of this research project was the multiple party collaboration with in-kind support from AGT, Edstar Genetics, Intergrain Pty Ltd, LongReach Plant Breeders, DPIRD, Curtin University, Cargill Australia, CSIRO and SILO.

The challenge with the available quality data was that while it represented 6 growing seasons with multiple growing locations across WA, it was un-balanced and was made up of 25% composite sample results. While the quality data was extensive, associated plant development information was limited to sowing dates and this meant a reliance on predicted values for flowering and climatic information (i.e. rainfall and temperature).

**5. The conclusions reached**

Four climatic variables were identified as having an impact on wheat dough strength and go part way to explaining WA's recent history of weak wheat.

**6. The Researcher's recommendations for any further research**

There are two possible areas for further research.

The first is to confirm if the four climatic profiles have occurred in the past causing the expression of weak dough strength. If this happened in the past then it confirms that such climatic profiles could cause inferior quality in the future. Such an analysis can be conducted more broadly nationally with the cooperation of entities such as Cargill Australia through the provision of crop report results.

The second is a more precise investigation recording real time plant development phases, climatic information and quality sampling and testing (both during phases of grain development and at harvest). It is hoped based on initial discussion with DPIRD that their time of sowing trials can be used for this purpose and that GRDC might provide financial support.

**7. A list of scientific papers or publications resulting from the Project**

A paper for journal publication is currently being drafted.

**8. 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**

None attached.

<b>3. Project resources</b>	This section describes use of the funding listed in the initial plan and any refunds due to COGGO
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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	30,000	30,000	30,000	30,000	0
Operating costs	5,000	1,500	5,000	1,500	3,500**
Capital					
<b>TOTAL</b>					

\*Funding provided by COGGO.

\*\* This amount is not a rebate per se as it has not been invoiced.

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

<b>4. Commercialisation</b>	<p>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.</p> <p>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.</p>
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Not applicable
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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.

<p><b>5. Communication/ Extension</b></p>	<p>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.</p>
<p>See preceding comments made under Achievement of the Project Aim and Project Output sections. The use of DPIRD time of sowing trials arising from discussions by Principal Researcher with Agriculture Victoria staff when presenting at a wheat quality workshop in Horsham April 2017.</p>	

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)

RICHARD WILLIAMS

Date: 29 January 2018

Research Organisation signature



Name and title of authorised signatory (in Capitals) \_\_\_\_\_ RICHARD WILLIAMS

Date: 29 January 2018

### Completed Final Project reports

Email to [coggoresearchfund@giwa.org.au](mailto:coggoresearchfund@giwa.org.au) or mail to  
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For any further enquiries please email questions to [coggoresearchfund@giwa.org.au](mailto: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.

## **PROJECT SYNOPSIS SUITABLE FOR GENERAL PUBLICITY AND COGGO WEBSITE**

A desk top analysis supported by COGGO funding has identified several climatic profiles that might explain the recent weak dough strength of WA wheat. Dr Richard Williams from groIQ collaborated with Dr Dean Diepeveen from DPIRD in conducting the research. He compiled a multi-season quality data set representing trials from across WA with the support of wheat breeding companies AGT, Edstar, Intergrain and LongReach, along with variety information from CSIRO. Cargill Australia helped by providing historical crop reports and climate data was sourced from SILO.

WA growers rely on the international market to sell their wheat. One advantage in the market place is Australia's quality reputation. However, consecutive years of weaker than expected dough strength has placed a cloud on the consistency of WA wheat.

Dr Williams identified that rainfall and temperature profiles after flowering can have an impact on dough strength. A negative relationship was observed for rainfall and two positive relationships with dough strength identified with respect to temperature. Before getting too worried further work is warranted to confirm these findings.

“Recycling of previously collected quality results is an efficient first step to investigating a problem”, said Dr Williams, “but it has limitations. In this case the data was unbalanced. This means not all trial locations were the same each season, nor did they have the same set of varieties, and different laboratories conducted the quality testing. Fortunately, the latest statistics can get around such challenges but for this research I also relied on predictions for plant development phases and climate records.”

Useful follow up research would include confirming if the climate profiles matched with other seasons when weak dough strength was observed – both in WA and nationally. There is also the option of building on existing DPIRD time of sowing trials with the capture of additional information around climate, plant development phases and quality during grain development through to harvest.

Dr Williams concluded with the comment, “This is an issue that needs to be checked as it is important to understand how changing climate conditions might interact with production timing decisions to impact the quality reputation of WA wheat.”