COGGO	Final Report COGGO Research Fund 2014
Council of Grain Grower Organisations Limited ACN 091 122 039	**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	**Development of web based tool to interpret and quantify spray coverage obtained from commercial pesticide applications**
Commencement Date	January 2013
Completion Date	December 2014

Name of Proponent	The University of Western Australia
ACN/Legal Name or ABN	37 882 817 280
Mailing Address	Animal Biology, 35 Stirling Highway

Administrative Contact	Robert Roche
Position	Manager (Research Grants)
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Project Supervisor/Principal Researcher	Christian Nansen
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COGGO Use Only

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

Outcome 1 - Collection of large data set on spray coverage from commercial and experimental spray applications under varying agronomic variables, weather conditions, and spray settings

Field methodology. We were able to collect additional spray card data, and the final number of data points or individual combinations of spray cards, weather variables and spray application settings was 1796. In other words, the total data collection far exceeded what had been estimated in the initial project proposal.

Outcome 2 - A regression based model that describes how spray coverage is associated with agronomic variables, weather conditions, and spray settings

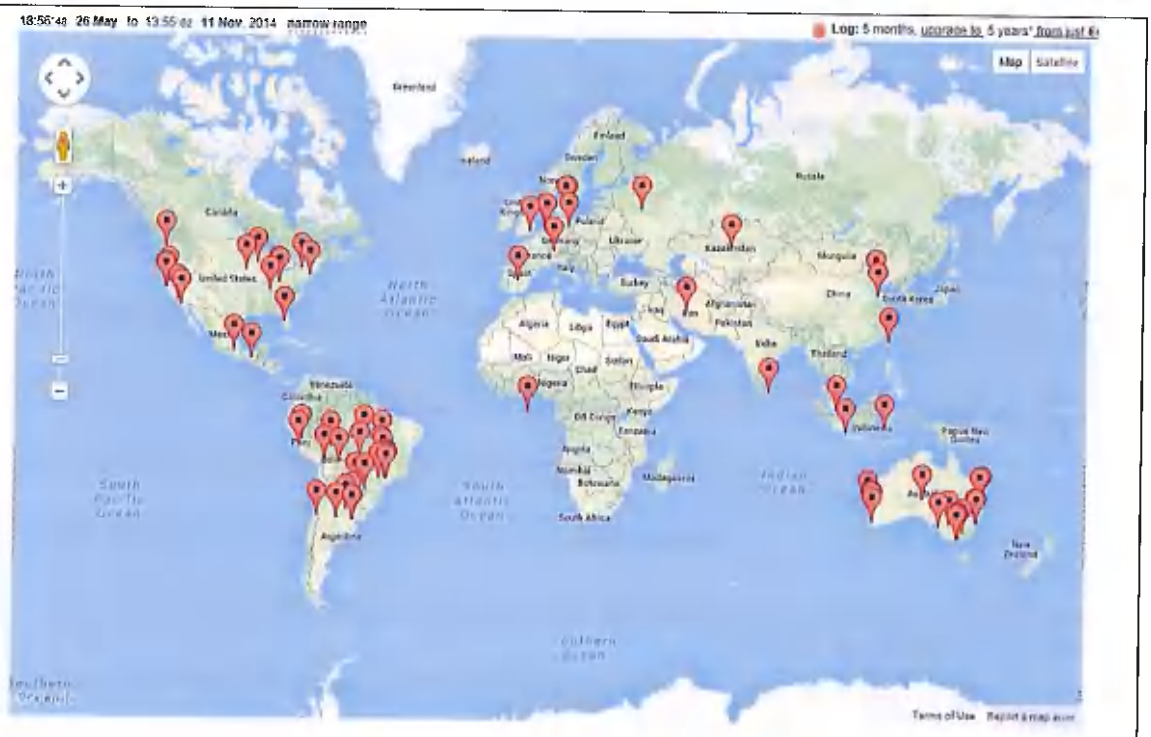
General results. During the past 6 months, we have promoted the current version of a phone app and a website (http://agspsrap31.agric.wa.gov.au/snapcard/). However, we have also developed regression models for a new version, in which type of nozzle is included and four outputs will be produced for each combination of weather data and spray settings – one for each of the following nozzle types: TT, XR, TP, and AIX. This new version will become publicly available before the end of the year.

Outcome 3 - A web based tool with two user-friendly functionalities (Outcome 3): 1) prediction of spray coverage based on agronomic variables, weather conditions, and spray settings and 2) quantification and interpretation obtained spray coverage

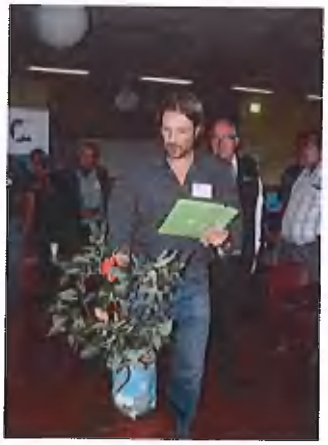
Nov 10, 2014 a scientific publication was submitted to the journal, Agronomy for Sustainable Development, entitled: "SnapCard: a tool to increase the sustainability of pesticide spray applications".

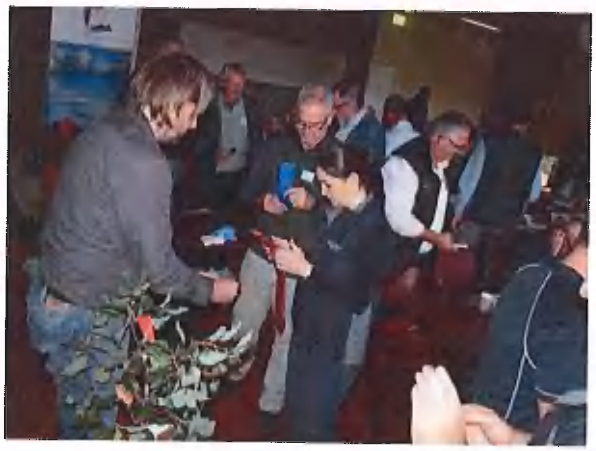
The abstract: Several recent reviews predict that increased use of pesticide applications will be one of the consequences of growing global food demand. In this context, it is important to mention that pesticides are often applied excessively and with fairly inconsistent or even poor application performance. As part of contributing to more sustainable pesticide application practices, we have developed "SnapCard" (http://agspsrap31.agric.wa.gov.au/snapcard/), a user-friendly website and smartphone app, which is readily available (free) via the iOS and Android App stores. SnapCard is a decision support tool for farmers and agricultural consultants to predict quality and performance of spray applications based on weather conditions and spray settings. Over three growing seasons at three locations in Western Australia, we quantified spray coverage based on 1,796 water sensitive spray cards, measured weather conditions, and recorded spray settings, including: sprayer forward speed, nozzle type and flow rate, spray application volume rate, and spray pressure). We demonstrate that spray coverage obtained during pesticide spray applications can be predicted based on a combination of linear, quadratic and cubic responses of spray settings [nozzle flow rates (02, 03, or 04), sprayer speed (km per hour), spray application volume rate (liters per ha), and a commonly used adjuvant (yes = 1, no = 0)] and readily available weather variables [barometric pressure (mm Hg), relative humidity (%), temperature (^{o}C), and wind speed (km per hour) at ground level]. The presentation of SnapCard is used to discuss the sustainability of pesticide applications. Optimization of pesticide spray applications should be considered a fundamental pillar of successful sustainable pest management programs to increase the efficiency of sprays, reduce the risk of spray drift, and reduce risks of resistance development in target pest populations.

In June, SnapCard phone app had been downloaded by over 700 users and the corresponding website had been visited 474 times since January 2014. Around Nov 12, when this report was written - SnapCard phone app had been downloaded by over 700 users and the corresponding website had been visited 692 times since January 2014. In other words, SnapCard continues to create interest, both nationally and internationally. The map below shows the location of the 200 most recent visits to the website. Regarding actual downloads and installations of Snapcard onto smartphone devices, it has been downloaded 938 to Iphone devices and 433 to Android devices, so 1371 users. We wish to point out that a user may have it installed on several devices and/or forwarded the download to friends and colleagues, so the actual number of users may be even higher.



Regarding outreach and presentation in Western Australia, we have conducted a considerable number of presentations at grower group events. The photos below show the engagement of Christian Nansen with 70 trainers, in which they received both a theoretical presentation and a practical session on how to use SnapCard. The hands-on session was based on spraying of "a simulated crop" (some branches) with a squirt bottle and spray cards mounted within the "canopy".





For the entire project, Nansen has presented project results at the following venues:

Nansen C, 2014. SnapCard and factors affecting the performance of pesticide applications. West Midland Group, Badgingarra, August 20th, 2014.

Nansen C. 2014. Pest Management Technologies & SnapCard. 2014 AUSCHEM - Annual Trainers Conference Program. The University of Melbourne, Dookie Campus, Victoria. May 29th, 2014.

Nansen C. 2014. Pest Management Technologies & SnapCard – how to use it! 2014 AUSCHEM - Annual Trainers Conference Program. The University of Melbourne, Dookie Campus, Victoria. May 29th, 2014.

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Interviewed by Tara Delandgrafft from ABC Radio on February 26 2014. Podcast available.

Interviewed by Varnya Bromilow from ABC Radio on February 24 2014. Podcast available.

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Nansen C. 2013. Spray coverage phone App. Presentation at Southern D.I.R.T field day in Kojonup. October 17, 2013.

Nansen C. 2013. Spray coverage phone App. Presentation at Bodallin Catchment Group field day in Moorine Rock. September 19, 2013.

Nansen C. 2013. Spray coverage phone App. Presentation at Street Market in CranBrook. September 15, 2013.

Nansen C. 2013. Spray coverage phone App. Presentation at West Midland Group field day in Dandaragan. September 10, 2013.

Nansen C. 2013. Spray coverage phone App. Presentation at Mingenew-Irwin field day in Mingenew. September 5, 2013.

Nansen C. 2013. The logic behind sometimes not spraying pesticides.. Crop Update in Fitzgerald Biosphere Group. March 13th, 2013.

Nansen C. 2013. Insecticides—the reality and ways to reduce risks of resistance. Crop Update in Mingenew-Irwin Group. March 8th, 2013.

Nansen C. 2013. Insecticides—the reality and ways to reduce risks of resistance. Crop Update in Liebe Group. March 6th, 2013.

Nansen has also presented the project results at two scientific conferences:

Nansen C. 2013. Use of a phone App to optimize pesticide spray applications and reduce risk of resistance development in target pest populations. Nansen C, Emery R, Garel N, Baissac O, Gumley J. 2013. 61ST annual meeting of the Entomological Society of America, November 10–13, Austin, Texas, USA. COGGO funding was NOT used to support this presentation – it was funded through other means.

Nansen C, Emery R, Baissac O, Garel N. 2013. Use of a phone App to optimize pesticide spray applications and reduce risk of resistance development in target pest populations. Annual meeting of the Australian Entomological Society, Adelaide Sept 29- October 2nd, 2013. Funded by COGGO.

In addition, Rob Emery has included presentation of this project at the following venues:

November 20, 2013 at the Dongboo Farm Company at their research centre in Nonsan, South Korea. The presentation was titled "Reducing methyl bromide use in Australia through phosphine resistance monitoring, management and eradication".

October 9, 2013 at the GIWA AGM at Technology Park on. The presentation was title "Community Engagement in Plant Pest Surveillance".

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	-	Milestone (from Project proposal) - Initiation of data collection as part of Outcome 1
		Completed: almost 1800 data points have been collected.
2	-	Milestone (from Project proposal) - Preliminary regression model as part of Outcome 2

RAT/508/15

		Completed: The predictive model has been completed and it has been converted into a user-friendly and tested tool to be used by growers and consultants. A new model with nozzle-specific outputs has been developed and will become publicly available later this year.
3	-	Milestone (from Project proposal) - Development of web based platform and initial app interface as part of Outcome 3
		Completed: The final version is being developed by the programmer and it has been described in a scientific journal article, which has been submitted.
	-	Milestone (from Project proposal) - Initiation of data collection as part of Outcome 1
		Completed: almost 1800 data points have been collected.

Project results	Prefer to Section 2 Project Results

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 2013	$ Total funds Budgeted 2014	$ Total funds requested from COGGO*	$ Total COGGO funds expended	$ Refund due to COGGO of any unexpended COGGO funds
Salary/Contractors	35,000	35,000	57,500	39,660	
Operating costs	15,000	15,000	30,000	47,840	
Capital					
TOTAL	**50,000**	**50,000**	**87,500**	**87,500**	**0.00**

*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.

None

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.

Jeremy Foster CPA
Research Grants Audit Officer
Research Services M459
The University of Western Australia

10-3-2015
certified expenditure of funds

Received Acceptance 20/03/2015

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.

For the entire project, Nansen has presented project results at the following venues:

Nansen C, 2014. SnapCard and factors affecting the performance of pesticide applications. West Midland Group, Badgingarra, August 20th, 2014.

Nansen C. 2014. Pest Management Technologies & SnapCard. 2014 AUSCHEM - Annual Trainers Conference Program. The University of Melbourne, Dookie Campus, Victoria. May 29th, 2014.

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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) Kadambot Siddique

Date: 10/3/2015

Research Organisation signature

Name and title of authorised signatory (in Capitals)

Robert Roche
Manager, Research Grants
Office of Research Enterprise, M459
The University of Western Australia
35 Stirling Hwy, Crawley WA 6009

Date: ~~9 MAR 2015~~ 10 MAR 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.