



**Australian Government**

**Department of Agriculture, Fisheries and Forestry**  
**ABARES**



Mr Bruce Finney  
Executive Director  
Cotton Research and Development Corporation  
PO Box 282  
NARRABRI NSW 2390

Dear Mr Finney

**RE: 12-month and final report from James Hereward, recipient of the CRDC supported 2011 Science and Innovation Award for Young People in Agriculture, Fisheries and Forestry**

Thank you for CRDC's support of the 2011 Science and Innovation Awards for Young People in Agriculture, Fisheries and Forestry.

As the recipient of the CRDC Award, James Hereward has now provided his 12 month and final milestone report for his project on: *Can genetic diversity predict the potential for emergent glyphosate resistance in weeds?* Please find a copy of James's final report enclosed. This concludes James's obligations with this Award.

In reading James's report I note that his research has identified that Barnyard grass has a mutation at the target site of glyphosate and James plans to review this mutation if it can be used to design assays to screen for resistance in this species. I was also pleased to read that the CRDC has committed to supporting James in a three year postdoctoral project at the University of Queensland for his project using genomic approaches to better understand the evolution of glyphosate resistance in agricultural weeds.

As James notes, his 2011 Science Award has not only enabled him to continue his science career but form the foundation for a further three years of research work. This is one of the objectives of the Science Awards and it is pleasing to hear it realised.

We hope that CRDC will continue its contact with, and support of James, in communicating his research results to industry.

On behalf of ABARES, I thank you for your ongoing support of these Awards.

Yours sincerely,

Dr Kim Ritman  
Chief Scientist

23<sup>rd</sup> August 2012



## Science and Innovation Awards for Young People in Agriculture, Fisheries and Forestry

### 2011 Round

### 12-MONTH PROGRESS AND FINAL REPORT

As part of your 2011 Science Award grant you are required to provide 6-month and 12-month progress reports, which will be circulated to ABARES and your Award sponsor. This is the 12-month and final progress report template. Please complete this progress report accurately and provide as much information as possible regarding the status of your project. Where possible, limit the use of technical language noting that some readers may not be familiar with the terminology. A copy of the final report will also be provided to your Award sponsor.

We hope that you have found your involvement in the 2011 Science and Innovation Awards to be a valuable and worthwhile experience. We wish you success in the next stages of your career.

<b>Name: James Hereward</b>
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<b>Award Sponsor: CRDC</b>
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#### 1. Brief description of your proposal

Please provide a short paragraph describing your project. If your project has changed from your original application please explain how and why (note that any variations to your project scope and/or budget must be approved by ABARES in advance).

Resistance to glyphosate poses a threat to the continued sustainable production of cotton that transgenic agriculture has enabled. This project provided preliminary genomic data to investigate the evolution of resistance to glyphosate in agricultural weeds. With the Science award funding I sequenced the transcriptome (expressed genes) and also part of the genome of two weed species that have recently developed resistance to glyphosate; Fleabane ( <i>Conyza bonariensis</i> ) and Awnless Barnyardgrass ( <i>Echinochloa colona</i> ). These data form the basis of a post-doc project exploring the role of genetic diversity in the evolution of resistance, and methods that use genomic approaches to identify novel resistance mechanisms.
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## 2. Project activities

Please describe what activities you have completed as part of your project. If any activities were not undertaken, please provide an explanation. (Provide as much detail as possible).

DNA extraction of resistant weeds – 100% complete for both species (*Conyza bonariensis* and *Echinochloa colona*)  
454 sequencing of genomic DNA – 100% complete for both species  
RNA extraction of resistant weeds – 100% complete for both species  
Illumina sequencing of transcriptome (RNA represents the parts of the genome that are transcribed) – 100% complete for both species

## 3. Budget Expenditure (note - you must contact ABARES in advance to request approval to modify your project scope and budget)

How has your Award grant funding has been expended? (Refer to attached budget information from your original application)

Do you have any unspent funds?

454 sequencing - \$15,750  
Transcriptome sequencing - \$5,900  
Analysis software - \$250  
Total \$21,900

No funds unspent.

## 4. Project outcomes

Have the original aims and objectives of your project been achieved? Please describe.

If not, please indicate what factors may have caused difficulties in achieving the aims and objectives.

Please describe how your industry will benefit from your results.

The sequencing of these two species has been completed and this has already identified that Barnyardgrass has a mutation at the target site of glyphosate (the EPSPS gene). This mutation can now be used to design assays to screen for resistance in this species. There may, however, be other resistance mechanisms in each of these two weeds, and the genomic data obtained through this project will be extended in a subsequent project to further our understanding of the factors that allow weeds to develop resistance to herbicides. This further work will contribute to the effective and informed management of resistance in agricultural weeds.



## 5. Dissemination

Please describe any communication activities you have undertaken for your project, e.g. attending conferences, media articles, hosting workshops etc.

How effective were these activities in raising awareness of your project and/or your career?

An article was produced for the cotton grower magazine detailing the project activities and the opportunities that the Science award has provided. This raised awareness of my project and science within the cotton industry.

## 6. Future Work

Have you identified any future work opportunities to build on your project outcomes? If so, do you intend to pursue these opportunities? Please provide details.

What will you do in your career over the next 12 months? Please provide details.

Has this Award helped you to continue working in your chosen field of research? Please provide details.

Half way through the Science award I submitted a proposal to the CRDC to extend this project into a 3 year Post-Doc position. The application was successful, and I am going to spend the next 3 years working at The University of Queensland using genomic approaches to better understand the evolution of glyphosate resistance in agricultural weeds.

As such, this award has not only enabled me to continue my career in science, but to gain valuable data that forms the basis of my next 3 years of research.

## 7. Contact with sponsors

Have you maintained contact with your Award sponsor during your project? If yes, please describe the nature and frequency of your contact. Do you intend to continue this contact in the future?

I have maintained contact with the CRDC throughout the project, and the proposal for its extension into a fully funded post-doc. I'm looking forward to maintaining this rewarding relationship with the CRDC and the industry in the future.



**8. Declaration and signature**

I certify that the information presented in this report is an accurate statement of my project and progress to date, in accordance with the 2011 Science and Innovation Awards for Young People in Agriculture, Fisheries and Forestry.

<b>Signature:</b>	
<b>Date:</b>	

**Please return one hardcopy and one electronic copy of your completed report within two weeks of receiving this template.**

**Hardcopy:**

Maree Finnegan  
Science Awards Manager  
ABARES  
GPO Box 1563  
Canberra ACT 2601

**Electronic:**

[scienceawards@daff.gov.au](mailto:scienceawards@daff.gov.au)

Thank you