

Report

Master Class in

Collaborative Breeding

22 November – 3 December 2010
International Centre for Plant Breeding Education and Research (ICPBER),
The University of Western Australia (UWA), Perth WA



Australian Government
Australian Centre for
International Agricultural Research



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The Master Class in Collaborative Breeding (CB) aimed to improve the efficiency of plant breeding in the developing world especially in those marginal lands untouched by the Green Revolution. The focus was on optimizing farmer interaction in plant breeding trials, and improving experimental design and analysis for selection of improved varieties which would lead to productivity gains and more rapid new variety uptake.

Course Aims:

- Increase participants understanding of CB
- Introduce CB best-practice approaches for adoption
- Increase the precision of on-farm varietal trials from improved statistical design and analysis

Participants

There were more than 20 participants in the Master Class - all experienced and practicing plant breeders from a wide range of different developing countries: Afghanistan, Bangladesh, China, East Timor (3), Ethiopia, India (2), Indonesia (2), Iran, Nepal and Tanzania - together with six Australians (Annexure 1). Twenty percent of participants were female. Participants were working with a highly diverse group of crop plants: wheat, rubber, maize, lentil, barley, cassava, peanuts, canola, rice, sweet potato, almonds, vetch and *Jatropha*.

Co-sponsorship

In addition to the Crawford Fund, co-sponsors of the Master Class were the Australian Centre for International Agricultural Research (ACIAR), Grains Research and Development Corporation (GRDC), the International Center for Agricultural Research in the Dry Areas (ICARDA), Syria and ICPBER/UWA. Participants from China, Iran and Indonesia (2) covered their airfares from other sources.

Schedule

The main themes of the Master Class were the concept of collaborative breeding (otherwise known as participatory or client-oriented breeding), and improved experimental design and analysis of on-farm trials. Dr Salvatore Ceccarelli is an acknowledged global expert in the first theme, while the group of Australian statisticians (represented by Dr Alison Smith) in the Statistics for the Australian Grains Industry (SAGI) project are global leaders in the second theme. The schedule was arranged around these two themes with Dr Salvatore Ceccarelli as the key presenter and several invited speakers (Annexure 2). Participants were provided with a set of relevant data, papers and software for use in the Class (see CD enclosed). The entire course was highly interactive and participants had opportunities to refer to their specific situations. The main teaching venue was arranged with several separate tables to maximise interactions within small groups of people with different backgrounds. Talks by invited speakers were in a different lecture theatre, advertised for a wider audience, and scheduled to break up each day. Participants were invited to bring their own data for analysis and also to present a mini-seminar on an aspect of their work related to the Master Class theme.

A Field Day was organized to Wongan Hills (3 hrs by bus) to see and gain a basic understanding of farming in the WA wheat belt (in a drought year), to explore the interaction of researchers with

growers in WA, and to see well-managed research plots and small-plot harvesting of cereals and the scale of a private breeding company - InterGrain.

The Master Class was opened on 22 Nov 2010 by the Hon. Terry Redman, WA Minister of Agriculture and Food, and representatives of the Crawford Fund (Mr Terry Enright), GRDC (Mr Neil Young) and UWA (Prof Willie Erskine, Director ICPBER, Prof Hans Lambers, Head of School of Plant Biology, and Prof Kadambot Siddique, Director of the UWA Institute of Agriculture). Representation at course closure was from the Crawford Fund (Dr Eric Craswell), ACIAR (Dr Paul Fox) and both GRDC and UWA (as above).

Resource persons (see Annexure 1)

- The major presenter was Dr Salvatore Ceccarelli formerly Senior Barley breeder at the International Center for Agricultural Research in the Dry Areas (ICARDA), Syria, who has been practicing participatory plant breeding for two decades primarily in the Near East.
- Dr Chris Johansen CLIMA, UWA, previously with The International Crops Research Institute for the Semi-Arid-Tropics (ICRISAT), has been undertaking client-oriented breeding in South Asia for 15 years.
- Dr Harry Nesbitt (CLIMA - Seeds of Life project) has experience in Cambodia and East Timor of participatory varietal selection.
- Professor Rob Melis, Associate Professor in Plant Breeding at the African Center for Crop Improvement (ACCI) at the University of KwaZulu Natal, sponsored by the Alliance for a Green Revolution in Africa (AGRA), which in turn is funded by the Bill and Melinda Gates Foundation.
- Dr Alison Smith is a Senior Research Scientist in the Biometrics Unit of NSW I&I based at Wagga Wagga and is a major player in the GRDC-funded Statistics for the Australian Grains Industry (SAGI) project.
- Prof Wallace Cowling is Deputy Director of ICPBER and Research Director of Canola Breeders Western Australia Pty Ltd.
- Dr Ken Flower is Lecturer in Production Agronomy and Farming Systems at UWA, and has experience as a researcher in a WA Grower Group and with small-holders in Southern Africa.
- Ms Susan Hall is Project leader of the Grower Group Alliance.
- Dr Cameron Beeck is Honorary Research Fellow in the School of Plant Biology at UWA and breeder with Canola Breeders Western Australia Pty Ltd, was both a presenter and participant.
- Eleven of the participants presented mini-seminars on related aspects of their breeding programs.

Potential Impacts

Annexures 3 and 4 provide summaries of the responses of participants to a series of questions about the impact of the Master Class on them as individuals, on their work and on their institutions as part of a standard post-course survey. The responses to specific questions concerning the impact directly on individuals (Annexure 3 section A) is strongly positive, but subsequent impacts on a person's work (Section B) and organisation (Section C) are somewhat less positive, presumably because of organisational factors beyond the individual's control. In the comments section (Annexure 4) participants indicated that after the Master Class they intended to make changes to the conduct of their on-farm trials through various combinations of farmer involvement and/or different statistical design and analysis. These changes will lead to major gains in the efficiency of breeding through:

- an increase in the precision of heritability measurements and estimates of the genetic value of test lines,
- reduced costs,
- better targeting of the field trials to relevant environments for future new varieties

- often a reduced time lag following the identification of superior genetic material from seed multiplication until it gets into the hands of growers.

The value of the 'Australian' SAGI biometrics approach to plant breeding in the developing world was tested within the Master Class. To explore its further use in Africa and also the use of that of CB, a group (Prof Melis from S Africa, Cam Beeck (who will work in Malawi starting in early 2012), Erskine and Cowling from ICPBER, Paul Fox of ACIAR and Alison Smith of SAGI, met to discuss the possibility of an ACIAR project to assist African breeders. A concept note was written, with the goal of building a project which will piggy-back and value-add to extensive on-going investment from the Bill and Melinda Gates Foundation in crop improvement in Africa, by adding a dimension that springs from an Australian comparative advantage – the analysis and design of on-farm trials.

Lessons Learned

1. The need for a very long lead-up time to such a Master Class (12 months minimum for visa issues particularly).
2. Selection of active practitioners as participants is crucial. Even nomination is fallible: The nomination from the Nepal Agriculture Research Council was the boss of the breeders and not a practising breeder himself. (In the end he was interested to simplify the Varietal Release legislation in Nepal so this was positive outcome!). There is no substitute for personal contacts.
3. In the run up to the course many suitable potential participants fell by the wayside for multifarious reasons, so it's vital to have a much larger (double the number) group of possible attendees in the frame to finally fill all the seats.
4. For participants from China, India, Indonesia and Iran, I requested their coverage of airfare costs in the first instance and offered to cover other costs; and we only covered the airfare if this proved impossible.
5. Australian entry visa approvals took far longer than anticipated. Different visa types were proposed by different Australian Embassies/High Commissions for Master Class participants. For the future it would be better to advise the organiser on the most appropriate visa to advise potential participants to apply for.
6. Participants were all lodged at St Georges Residential College, UWA, which is within walking distance of the course venue. This arrangement halved accommodation costs and obviated the need for daily participant transportation. Clearly, such accommodation is only available in semester breaks.
7. The key ingredients were all present to spark an exciting two weeks:
 - a world-class and sympathetic anchor (Salvatore Ceccarelli)
 - a schedule that was themed but sufficiently broad to be challenging
 - a really diverse group of very bright participants with a strong common interest (in breeding)
 - a learning environment (away from everyday work) with time for discussion
8. The mixing of participants from developing countries with those from Australia proved successful. Although individuals within each group started from different base levels of familiarity with the statistics and with participatory approaches, the active dialogue and exchange of knowledge during the Master Class encouraged mutual learning to the benefit of all, including the resource persons.

Anexure 1
Trainees

Name	Position	Country	Gender	Address
Cameron Beeck	Canola Breeder	Australia	M	Canola Breeder, CBWA, Shenton Park, WA Australia
Chen Chunyu	Canola breeder	China	M	National Key Laboratory of Crop Genetic Improvement, Huazhong Agricultural University, Wuhan 430070, China
C. Narayanan	Senior Scientist (Clone Evaluation)	India	M	Crop Improvement Group, Botany Division, Rubber Research Institute of India, Rubber Board P.O. Kottayam 686 009, Kerala, India
Col Douglas	Mung bean breeder	Australia	M	Agri-Science Department of Employment, Economic Development and Innovation, QLD Australia
Graeme Wright	Peanut Breeder	Australia	M	Manager, Peanut Company of Australia, PO Box 26, Kingaroy QLD 4610, Australia
Greg Buzza	Research Leader Plant Breeding - Canola Nuseed	Australia	M	Nuseed, Nufarm Australia Ltd, Laverton, Victoria, Australia 3026
Ida Astarani	Lecturer in Plant Breeding	Indonesia	F	Biology Department, Udayana University, Kampus Bukit Jimbaran, Bali, Indonesia
Kiddo Mtunda	Root crop breeder	Tanzania	F	Sugarcane Research Institute, Kibaha, Tanzania
Luis Pereira	On-Farm Demo. Trial Coordinator	E Timor	M	Seeds of Life project, Ministry of Agriculture and Fisheries, E Timor
Mahmudur Rahman	Pulse breeder	Bangladesh	M	Pulses Research Centre, Bangladesh Agricultural Research Institute, Ishurdi, Pabna, Bangladesh
Martin Browne	Research and extension advisor	E Timor	M	Seeds of Life Project, Ministry of Agriculture and Fisheries, E Timor
Michelle Wirthenson	Almond breeder, SA	Australia	F	Australian Almond Breeding Program, School of Agriculture, Food & Wine, University of Adelaide, SA, Australia
Mulugeta Atnaf	Cereal breeder and Director - Pawe Agricultural Research Centre	Ethiopia	M	Pawe Agricultural Research Centre of Ethiopian Institute of Agricultural Research (EIAR), Pawe, Ethiopia
Myrtille Lacoste	Research and extension advisor	E Timor	F	Seeds of Life project, Ministry of Agriculture and Fisheries, E Timor
NP Adhikari	Director, Crop and Horticulture	Nepal	M	Crop and Horticulture, Nepal Agricultural Research Council

				(NARC) , Kathmandu, Nepal
Ravikesavan Rajasekaran	Head - Maize Breeder	India	M	Maize Research Station, Tamil Nadu Agricultural University Vagarai – 624 613 Dindigul District, India
Reza Haghparast	Head of Cereal Research Department	Iran	M	Dryland Agricultural Research Sub-Institute, Kermanshah 67145-1164, Iran
Shakieb Ahmad Attai	Cereal Breeder	Afghanistan	M	Chief of Cereal Crop Improvement, Sheesham Bagh Research Station, Ministry of Agriculture, Afghanistan
Stuart Nagel	Vetch Breeder	Australia	M	PIRSA-SARDI, SA, Australia
Teguh Wijayanto	Lecturer	Indonesia	M	Agronomy Department, Agriculture Faculty, University of Haluoleo, Kendari, Indonesia

Presenters

Name	Position	Country	Gender	Affiliation
Salvatore Ceccarelli	Consultant - Formerly Senior Barley breeder ICARDA	Syria	M	ICARDA
William Erskine	Director of ICPBER	Australia	M	ICPBER, UWA
Chris Johansen	CLIMA Adjunct Formerly ICRISAT Legume Physiologist	Australia	M	CLIMA
Harry Nesbitt	CLIMA Adjunct - Seeds of Life E. Timor	Australia	M	CLIMA/Seeds of Life, East Timor
Alison Smith	Senior Research Scientist in the Biometrics Unit	Australia	F	NSW I & I Wagga Wagga & SAGI
Susan Hall	Project Leader of the Grower Group Alliance	Australia	F	Grower Group Alliance at UWA
Wallace Cowling	Research Director - CBWA & ICPBER Deputy Director	Australia	M	CBWA & ICPBER, UWA
Rob Melis	Associate Professor in Plant Breeding	South Africa	M	African Centre for Crop Improvement (ACCI) at the University of KwaZulu Natal
Ken Flower	Lecturer in Production Agronomy and Farming Systems	Australia	M	UWA
Cameron Beeck	Honorary Research Fellow at UWA	Australia	M	Canola Breeders Western Australia Pty Ltd and UWA

Anexure 2

**Program for Master Class in
Collaborative Breeding:
Improved on-farm testing with grower interaction**
ICPBER, University of Western Australia, Perth
CLIMA Seminar Room, Ground Floor, CRC Wing

Monday 22 November

08.30 - 09.00	Registration in CLIMA Seminar Room, Ground Floor, CRC Wing	All participants
09.00 – 09.30	Opening <ul style="list-style-type: none">• Crawford Fund Terry Enright• GRDC Neil Young• WA Minister of Agriculture and Food Hon Terry Redman	
	<i>Venue:</i> Molecular and Chemistry Sciences Lecture theatre (G.33)	
09.30 - 10.00	Break	
10.00 - 12.00	Participant Introductions ICPBER: The host organization Introduction and Definitions, Historical perspective, Plant breeding (Self-pollinated, Cross-pollinated and vegetatively propagated crops), Who is a Plant Breeder? Participatory Plant Breeding (PPB), Participatory Variety Selection (PVS), A General Model of Participatory Plant Breeding <i>Venue:</i> CLIMA Seminar Room, Ground Floor, CRC Wing	William Erskine Salvatore Ceccarelli
12 - 13.00	Lunch	
13.00 - 14.00	<i>Seminar:</i> Client orientated plant breeding: Tailoring plant breeding to resource poor farming systems in South Asia <i>Venue:</i> Molecular and Chemical Sciences Lecture Theatre (G33)	Chris Johansen
14.00 - 15.00	How to get started: organizational issues Setting criteria to identify target environments and target users, Choice of the target environment and user, Type of participation, Choice of genetic material, Choice of parental material, Choice of breeding method	Salvatore Ceccarelli
15 - 15.30	Break	
15.30 - 17.00	When farmer participation should start, Naming of varieties, Management of trials in farmers' fields, managing equipment Software up-loading	Salvatore Ceccarelli
17.00	Close	

Tuesday 23 November

08.30 – 10.00	Farmer selection, Visits to farmers, managing the transition phase, Sharing and Dissemination of Findings	Salvatore Ceccarelli
10 - 10.30	Break	
10.30 - 12.00	Data Collection	Salvatore Ceccarelli
12 - 13.00	Lunch	
13.00 - 14.00	<i>Seminar:</i> Participatory varietal selection in East Timor <i>Venue:</i> Molecular and Chemical Sciences Lecture Theatre (G33)	Harry Nesbitt et al
14.00 - 15.00	Experimental designs for PPB trials, Stage 1 trials, Stage 2 and 3 trials, Stage 4 trials	Salvatore Ceccarelli
15 - 15.30	Break	
15.30 - 17.00	Experimental designs - cont'd	Salvatore Ceccarelli
17.00	Close	

Wednesday 24 November

08.30 –	Preparation of Data Files and Data Entry, Randomization	Salvatore Ceccarelli
10.00		
10 - 10.30	Break	
10.30 -	Preparation of a File for Data Recording	Salvatore Ceccarelli
12.00		
12 - 13.00	Lunch	
13.00 -	<i>Mini-seminars:</i>	
14.00	Participatory Plant Breeding of cassava in Tanzania	Kiddo Mtunda
	Technologies to speed varietal development: A case study in peanuts	Graeme Wright M.
	Almond breeding	Wirthensohn
14.00 -	Unreplicated or partially replicated trials	Salvatore Ceccarelli
15.00		
15 - 15.30	Break	
15.30 -	Unreplicated or partially replicated trials - cont'd	Salvatore Ceccarelli
17.00		
17.00	Close	

Thursday 25 November

08.30 –	Replicated trials , Data Entry, Data Storage, Data Analysis	Salvatore Ceccarelli
10.00		
10 - 10.30	Break	
10.30 -	Updating a File for Data Analysis: Unreplicated trials	Salvatore Ceccarelli
12.00		
12 - 13.00	Lunch	
13.00 -	<i>Mini-seminars:</i>	
14.00	- Participatory experience on rubber in India	C. Narayanan
	- Participatory Plant Breeding of cereals in Iran	Reza Haghparast
	- Participatory varietal selection II in East Timor	Myrtille Lacoste
	Venue: Molecular and Chemical Sciences Lecture Theatre (G33)	
14.00 -	Spatial Analysis of an unreplicated trial, Updating a File for Data Analysis: replicated trials in	Salvatore Ceccarelli
15.00	rows and columns	
15 - 15.30	Break	
15.30 -	Cont'd	Salvatore Ceccarelli
17.00		
17.00	Close	

Friday 26 November

All Day Field Trip to Wongan Hills in the Wheat Belt with pick-up at St Georges at 07.00 am

- How grower groups interact with researchers in WA - Ken Flower
- Visit to small-plot harvesting - InterGrain
- Visit to plot equipment machinery - InterGrain

Saturday 27 November - Rest day

Sunday 28 November - Rest day

Monday 29 November

08.30 –	Spatial Analysis of a replicated trials in rows and columns, Updating a File for Data	Salvatore Ceccarelli
10.00		
10 - 10.30	Break	
10.30 -	Analysis: replicated trials, Spatial Analysis of a replicated trials, Data Analysis of a replicated	Salvatore Ceccarelli
12.00	trials with ALPHANAL	
12 - 13.00	Lunch	
13.00 -	<i>Seminar:</i> Statistics for the Australian Grains Industry: overview and methodology part I	Alison Smith
14.00	(single site spatial analysis using ASReml-R)	
	<i>Venue:</i> Agriculture Lecture Theatre (G.013)	
14.00 -	Importing the Results of the Analysis, Discussion of results and farmers' final selection	Salvatore Ceccarelli
15.00		
15 - 15.30	Break	

15.30 -	Cont'd	Salvatore Ceccarelli
17.00		
17.00	Close	
<u>Tuesday 30 November</u>		
08.30 –	Spatial Analysis of a replicated trials in rows and columns, Updating a File for Data	Salvatore Ceccarelli
10.00		
10 - 10.30	Break	
10.30 -	Analysis: replicated trials, Spatial Analysis of a replicated trials, Data Analysis of a replicated	Salvatore Ceccarelli
12.00	trials with ALPHANAL	
12 - 13.00	Lunch	
14.00 -	<i>Mini-seminars:</i>	
16.00	- Variety release and registration system in Nepal: Constraints & opportunities	N.P Adhikari
	-Lentil breeding in Bangladesh	
	-Selecting <i>Jatropha curcas</i> accessions/ clones suitable for dryland areas	M. Rahman
	-Ethiopian agricultural research system from participatory perspective	Ida Astarini
	-Agriculture and Agricultural research activities in Afghanistan	Mulugeta Atnaf
	Venue: Agriculture Lecture Theatre (G.013)	Shakieb Attai
16 - 16.20	Break	
16.20 -	Importing the Results of the Analysis, Discussion of results and farmers' final selection	Salvatore Ceccarelli
17.00		
17.00	Close	
<u>Wednesday 1 December</u>		
08.30 –	Stage 1 trials, Stage 2 trials, Stage 3 trials, Stage 4 trials	Salvatore Ceccarelli
10.00		
10 - 10.30	Break	
10.30 -	Cont'd	Salvatore Ceccarelli
12.00		
12 - 13.00	Lunch	
13.00 -	<i>Seminar:</i> Statistics for the Australian Grains Industry: methodology part II (multi-	Alison Smith
14.00	environment trial analysis using ASReml-R)	
	Venue: Agriculture Lecture Theatre (G.013)	
14.15 -	<i>Seminar:</i> How to start a grower group	Susan Hall
15.00	Venue: Agriculture Lecture Theatre (G.013)	
15 - 15.30	Break	
15.30 -	Cont'd	Salvatore Ceccarelli
17.00		
17.00	Close	
18.45	Course Dinner - Jojos Restaurant, Nedlands	
<u>Thursday 2 December</u>		
08.30 –	Genotype x Environment Interactions, GGE biplot software, Input Data Format, Computer	Salvatore Ceccarelli
10.00	requirement and software availability	
10 - 10.30	Break	
10.30 -	Cont'd	Salvatore Ceccarelli
12.00		
12 - 13.00	Lunch	
13.00 -	<i>Seminar:</i> Use of pedigree information in the analysis of MET trials using factor analysis and	Wallace Cowling
14.00	spatial analysis	
	Venue: Agriculture Lecture Theatre (G.013)	
14.00 -	An Example of multi-environment data analysis using the GGEbiplot software	Salvatore Ceccarelli
15.00		
15 - 15.30	Break	
15.30 -	Analysis of participants data sets	Salvatore Ceccarelli
16.00		
16.00 -	<i>Seminar:</i> Experience with participatory breeding in Africa	Rob Melis
17.00	Venue: Agriculture Lecture Theatre (G.013)	
17.00	Close	

Friday 3 December

08.30 –	Genotype x Location and Genotype x Traits Interactions in stage 1 trials, Genotype x	Salvatore Ceccarelli
10.00	Location x Year Interactions in stage 2, 3 and 4 trials, Relationships between traits,	
10- 10.30	Break	
10.30 -	<i>Seminar</i> : Use of spatial design and analysis in a commercial plant breeding program	Cam Beeck
11.30		
11.30 -	Farmers' selection criteria, Variety Release and Seed Production	Salvatore Ceccarelli
12.00		
12 - 13.00	Lunch	
13.00 -	Individual participants: Wrap-Up Discussion	Participants
15.00	<ul style="list-style-type: none">• What do I take home from the Master Class?• What will I do differently on my return?• How could such a course be improved?	(5 minutes each)
15 - 15.30	Break	
15.30 -	Closing and presentation of certificates	
17.00	<ul style="list-style-type: none">• Crawford Fund• ACIAR• GRDC• UWA	

Venue: Molecular and Chemical Sciences Lecture Theatre (G35)

Farewell Reception outside Seminar Room

Anexure 3

Follow-up course participants' survey

This part of the questionnaire relates to the application of the knowledge/skills acquired during the Master Class.

A As a result of the Master Class I:

	Strongly Agree	Agree	Neutral	Disagree	Strongly Disagree	Not Relevant
(1) Was able to apply the skills/knowledge from the training to my work		15	4			
(2) Was able to continue to apply the skills/knowledge from the training to my work for a period after the training	13	6				
(3) Will continue to use the skills/knowledge learnt in the training in my current employment	16	3				
(4) Work more effectively and efficiently	9	10				
(5) Increased my competency and confidence in my work	13	6				
(6) Initiated my own projects/work activities	8	5	5			1
(7) Increased my professional collaboration with organisations both nationally and internationally	9	7	3			
(8) Increased my professional collaboration with people both nationally and internationally	12	7				
(9) Increased my ability to continue to research in my subject area	9	10				
(10) Was able to improve my research processes due to the training	10	8	1			
(11) Was able to build on my knowledge of the course content as a result of the networks made during the course.	6	12				1
(12) As a result of the training my employer has sent staff to further training	4	5	8			2
(13) Was able to secure resources for further research	8	3	5	1		2
(14) The knowledge gained from the course enabled me to interpret government policy	1	8	7	2		1
(15) The knowledge gained from the course enabled me to influence government policy		6	8	2	1	2
(16) The networks made during the training will enable me to produce better research outputs	9	9	1			
(17) The networks made during the training will enable me to produce better policy outputs	3	6	6	2		1

B Personal - What sort of impact has the Crawford Fund training had on your current work situation? Please rate the statements below

	Strongly Agree	Agree	Neutral	Disagree	Strongly Disagree
(1) The training had no impact on my work situation	1		3	3	12
(2) The training enabled me to perform better at work	14	5			
(3) The training enabled me to move to another position in my workplace	1	1	15	1	1
(4) The training enabled me to move to another institution or private company	1		11	4	3
(5) I have more opportunities to collaborate with international and national organisations	6	11	2		
(6) I was offered a promotion		1	12	4	2
(7) I have changed my work situation for the better due to the training	3	6	9	1	
(8) The training gave me motivation to research further in the field	11	6	2		
(9) I have pursued work opportunities in the field of the training	4	7	7	1	
(10) The training gave me the confidence to pursue other work opportunities	3	7	7	2	
(11) The training gave me the confidence to pursue other research opportunities	4	10	3	1	
(12) The training motivated me to participate in other trainings	9	9	1	1	
(13) My life has changed significantly due to the training	3	3	11		1
(14) I was given the opportunity to train others in my organisation the skills/knowledge learnt during the training	4	11	3		1
(15) My employer offered me work which used the new skills I acquired during the training	3	7	9		
(16) My managerial duties increased due to the training	3	6	6	2	
(17) My new level of skill/knowledge was rewarded by my employer	1	3	11	2	1

C Organisation - What sort of impact has the Crawford Fund training had on your organisation? Please rate the statements below

	Strongly Agree	Agree	Neutral	Disagree	Strongly Disagree
(1) The training had no impact on my organisation or the work it performs		2	1	10	6
(2) The quality of internal training programs has been improved	2	11	5	1	
(3) The organisation has increased its R&D outputs	1	13	4	1	
(4) The uptake of new/improved technology has increased in the organisation	3	10	3	1	
(5) The adoption of new/improved technology by the organisation's clients (eg farmers or industry) has increased	4	11	3		

(6) The organisation is more innovative and prepared to fund new approaches	4	8	5	1	1
(7) There is an improved flow of information within the organisation	4	8	7		
(8) The quality of discussion about work has improved in my department/organisation	4	14	1		
(9) The policies developed by the organisation are more considered and well informed about potential impact	2	8	6	3	
(10) The extension services provided are more efficient and effective	2	8	8	1	
(11) The quality of the advice provided to clients has improved	4	11	4		
(12) The training increased the organisations ability to influence and inform policy decisions made by government	1	6	7	4	1
(13) The training has improved the management processes of the organisation		8	7	2	1
(14) The training has added to the quality of research our organisation produces	6	13			
(15) The organisation has changed significantly for the better due to the training	4	9	4	2	

Anexure 4

Survey Masterclass Participatory Plant Breeding - comments

A18	<i>Please specify other skills acquired during this master class</i>
	<ul style="list-style-type: none"> • The master class enabled me to acquire training in the latest statistical software which will help me in handling data from participatory trials more efficiently. It has also helped me improve my appraisals towards planning of our future participatory plant breeding strategies. I can now handle such things with more confidence; • Will implement a lot of new breeding strategies and principles in my own program (e.g. special analysis G&E analysis and partial replication); • I gained knowledge about ppb, how to conduct field trials and the analysis of data, and as a senior lecturer I will use these as teaching materials for a masters degree programme in Bali, concentrating on ppb; • Good balance between general and theoretical and applicable tools of direct use for our particular area; • Will probably be able to ask for help in the future with some of the contacts made, and thus save on money paid to consultants who not always share their methodology; • Will conduct more on-farm research; increase the relevance of my projects' contents. Will definitely improve collaboration between my project and developing country institutions (AVRDC and ICRISAT). Would also increase my likelihood to work again on ACIAR projects and my mungbean work.
B18	<i>What was the most significant impact of the training for you personally?</i>
	<ul style="list-style-type: none"> • My perception on working with farmer groups has changed and impacted on my personality. Even with small scale farmer groups like in Africa I can still drive changes in terms of new varieties introduced to farmers. As a person I am more confident with what I will be doing with regard to my work; • The training in techniques on statistical methods as well as ppb strategies has given me more confidence, that I will be able to achieve more quality output from our present programme. And ultimately, I can now give a quality service to our growers/ farmers in India; • The class confronted some ingrained ideas in my research and opened up ideas and opportunities for improvement of the research methods I currently use, hopefully enabling me to be a better researcher; • Intro to ppb principles, and their applications in developing and developed countries; • Met some great people/scientists who I will stay in contact with; • It has opened a wider global perspective on agriculture and results, not only on international levels but also ourselves. Continuous contact with global community is very necessary. New technologies are out there; the hard part is finding them and then adapting them to the local circumstances; • On a personal note the training has provided an opportunity to learn more about ppb and new statistical packages which are more useful for the ongoing research programmes; • The training was most helpful in teaching me how to organise data and how to design layouts. This training also taught us how to change from the confused situation we had before the training; • More confidence in giving lectures on ppb, increased confidence in conducting trials and analysing data; • Get to know scientists working on different crops, aspects of plant breeding, which will all be beneficial to future work; • It impacts my understanding, perception and so the way I do things; • Definitely increased my competencies, (new tools , new knowledge); • Met very interesting people with whom I will probably stay in contact with in the future;

	<ul style="list-style-type: none"> • As a consequence of the training, my chances in getting a better job have increased greatly; • To meet fellow breeders from many different nations and keeping those friendships is very special for me; • Empowerment. Also studied plant population breeding some years ago. Both courses have enhanced my knowledge and likelihood of staying in plant production and agriculture research.
C16	<i>We welcome any further comments about the training</i>
	<ul style="list-style-type: none"> • The training has impacted on the following: <ul style="list-style-type: none"> ○ Database management ○ Data-analysis and interpretation ○ How to improve participatory plant breeding for the benefit of the farmers. Involving farmers in earlier stages ○ Data presentation by GGE biplot was very exciting and very good, however the software is very expensive ○ I have extended my network internationally, met new people and initiated networking with them; • The training in ppb mc has helped me to achieve the following: <ul style="list-style-type: none"> ○ I am now well equipped with the knowledge on appropriate statistical designs and methodology for effective ppb strategies ○ I would now have more clean approach towards attaining the goals of my institute in India ○ The MC has given me a wonderful opportunity to interact with the high level breeders from other countries. There was an enormous amount of diversity in terms of ideas approaches and views and I got these in one place! ○ The resource persons who gave us lectures and training were able to impart the modules very successfully; • I have additional knowledge about No Till wheat being practiced in WA for last two decades. This is very relevant to my country, where 80% is rain fed. This is due to field visit during MC; • Great workshop with hands on training and use of statistical analysis of plant breeding trials, with emphasis on ppb; • Appreciation of other groups requirements and approaches in developing country context; • I will use many of the principles learnt in MC in my breeding program, esp. row by column design and analysis, partial replication of stage 1 trial and biplot analysis of G X E interaction; • Overall a great program well thought out and a great opportunity for all involved. • I would highly recommend these courses for breeders for developing and developed countries; • A range of analysis/design software tools; • It would be better if we were able to practice breeding and seeding activities in the field as training on emasculation and pollination of wheat and other cereals is very important for us; • It will provide a platform for interactive collaborations <ul style="list-style-type: none"> ○ The statistical techniques learned can be used for improving HRD programmes in the institute through training other scientists ○ Was helpful in learning about the breeding programmes being implemented in other countries, which will be useful to improve upon the existing programme in the motherland; • Of course this training is important and has an impact on our future;

	<ul style="list-style-type: none"> • Create ideas for future development of breeding in Bali (in particular) and Indonesia (in general); • With VWA and CF I found this chance to come to this very useful training course. Learnt a lot about software that can be used in ppb. I have also been familiar with agricultural system and research in great country of Australia, and made a good relationship with one of the scientists that can help us in Iran; • It would have been good to collect impact data after some time with the trainers; • All very interesting; • One thing: as much as the teachers and participants tried to answer particular questions and understanding that the training is not to be tailored to individual needs, it would have been great if we could have asked particular technical issues (design efficiency, proper analysis and tools to do so) and then discussed it all together. So for instance – asking questions and making a list of them; selecting what is the most representative of the whole group; an afternoon, at the end, to answer them with the right person (the teachers, a biometrician, etc); • It would have helped if there was more focus on the particular needs of the vastly different countries that were present at the meeting. I know this is difficult; • The statistical component has been invaluable as it has delivered a large amount of new software for me to try on my data set; • The idea of farmer participation is quite novel for me and I will be implementing this as much as I can; • I will be very keen to do another MC on topics which are appropriate for me; • The training appears to have had a considerable impact on most participants. The sharing of ideas, methods and techniques was significant and free flowing between everyone involved; • While I am not about to conduct classical PPB the concepts will benefit my research in other ways. The statistical training was a really good refresher and demonstrated some new analysis techniques which I will incorporate into my ongoing research; • Started slowly. Coverage of trials, analysis tools was a little out of date compared to my own program. However, the concepts, examples and breadth of knowledge and experience were relevant and in discussing with Australian participants we agree that the process and reflection on my own program have been very useful; • Would benefit from some more preparation – compatibility, versions of windows. Sharing of participants’ datasets or email prior to commencement of course; • Course will enable me to reinvigorate my two programs, work more efficiently and improve my skills and enthusiasm to one day work in breeding in a developing country. I am travelling to ICRISAT in 2010/11 and will take new theory, practices and tools to collaborate in chickpea research and develop projects with AVRDC;
C17	<p><i>We welcome any other comments with regard to the Crawford Fund, the survey, or the Master Class</i></p>
	<ul style="list-style-type: none"> • Statistical analysis presented by Alison Smith was impressive but very short to capture essence. I would suggest that it could be extended to one full day with a statistician; • Master Class program is unknown at African research organisations or to plant breeders. I would love to see the announcements extended to CG centres in Africa such as IITA; • The number of female participants 4/20 = 20% is encouraging but still very low compared to the number of male participants. I would suggest that selection for next master classes considers increasing the number of female participants; • The CF did a wonderful job, world class training in ppb; • Prof. William Erskine, director, ICPBER and UWA and team done a commendable job in helping to secure participants in the programme through the CF; • The group undertaking the MC comprised a very good mix of individuals from different backgrounds in terms of research capacity and their home countries;

- Very much appreciated that it brought together researchers from different countries, greatly improving chance of networking;
- Guest speakers and topics were all excellent, and greatly complemented the main workshop. Rob Melis' Speech was particularly interesting, and is a great model for plant breeding programs, particularly in developing countries;
- Intensive statistical analysis ASREM was of interest, but I feel application of many of these principles may be beyond the average breeding program in developing nations;
- Future courses could consider intensive training in the use of Kathmandu database – it seems to be a great tool for application in plant breeding programs. More hands on training would also be of great value;
- It would help also if the CF sent experts overseas to give training/workshops/seminars etc to a specific community (farmers or universities) who need them;
- This kind of training may be organised in the developing nations to train human resources in the needy areas;
- The techniques learnt will be put in to use in the teaching programmes of undergraduate and post graduate studies;
- I suggest CF also give training outside Australia. For e.g., expert from Australia in certain topics like tissue culture come to Indonesia and give training for Indonesian people and conditions;
- I appreciate the way the CF supports agricultural research especially in developing countries. With the help of the CF researchers from the developing nations can attend these training courses and they can change the current agricultural situation in these countries;
- We had a very good, interactive, experience sharing training. The diversity was good and it has to be continued for sustainable techniques, skill and knowledge particularly in developing countries;
- Everyone started at different levels in the training, with the Australians seeming to be further ahead than the rest of us; however by the end of the training we all seemed to be at the same level. We also learned a lot from each other;
- Good to know also what going on in different countries;
- The course was very enjoyable, which is fantastic both on a personal and professional level. This was particularly due to:
 - Perfect organisation
 - The diversity of the participants
 - The enthusiasm of the teachers, organisers and participants
 - The possibility for the participants to directly input some of their own knowledge and experience to the course
 - The course topic was focused enough while remaining flexible;
- All in all I would like to thank the CF and all the people who made this unique and enriching experience possible;
- It would have been great to have some hands on demonstration and practice on our computer of ARSEML. This software is probably more applicable to me as a breeder of cross pollinating perennials;
- This program also gives me the opportunity to discuss with participants who would like to do a PHD in Australia about possible projects I could help them with. The invited speakers were excellent. It was a broad range of topics and methods. Possibly Alison Smith could be more involved in future MCs;
- The mix of participants was excellent with everyone participating in all aspects of the training. The course could have been condensed somewhat, but I understand that getting everyone together for a shorter time may not be practical;
- Some more practical components may have been beneficial;
- I first thought that there was too much of a gap between the Australian participants and those from developing countries. However, it seems that everyone has learned significantly, in different ways. In addition everybody learned from each others' specific

	<p>situation and knowledge. So, very complementary at the end of the day. Great also to know a little bit of what is going on in other countries;</p> <ul style="list-style-type: none">• It would be great if we could get together every year and share our work experiences to improve our experience in different areas;• Thank you so much to the Crawford Fund for this opportunity as well as to UWA, CLIMA, GRDC and the presenters.
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