

**ICARDA**  
**Office of Deputy Director General-Research (DDG-R)**  
**Biometrics and Statistics Section (BSS)**

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A report of trip to Rabat, 29-30 September 2016 for 1<sup>st</sup> International Symposium on Genomic Selection for Crop Breeding (<http://www.cropps.com/international-symposium-on-genomic-selection-for-crop-breeding/>) by Murari Singh

**i) Purpose of travel (A statement)**

- To participate in the 1<sup>st</sup> International Symposium on Genomic Selection for Crop Breeding, 29-30 September, 2016 and discuss Biometrics and Statistics support with ICARDA scientists at Rabat.

**ii) Principal contacts with address (for a program database)**

- Dr. José Luis Francisco, Crossa Hiriart, Consultant, GRP/Biometrical & Statistical Unit, CIMMYT, former Biometrician at CIMMYT, Mexico (Email: [J.CROSSA@CGIAR.ORG](mailto:J.CROSSA@CGIAR.ORG))

**iii) Summary of the visit (2-3 paragraphs on the main activities of your visit only)**

- Attended all the presentations made during the two days of symposium and commented on a couple of contexts. At the end of each session there were round table discussions. The titles and speakers are listed in the Appendix.
- The meeting focussed on genomic selection (GS) for crop breeding to increase genetic gains (GG), and presented tools and techniques to enhance GG in terms of increased heritability (genetic variability) through breeding populations, shortening of cycles of reproduction, and increased accuracy using efficient biometrical models based on the phenotypic and genetic marker data for the training population/samples, and reduced cost.
- A number of new statistical models were presented for their performance in terms of accuracy (correlation between observed and the predicted breeding values) taking into account pedigree information and genotypic covariances between environments, and a number of methods of estimation (Ridge regression, LASSO, Bayesian approaches, etc.) -- for a single trait and multi-traits from a single environment and multi-environments.
- A number of interesting issues arose that may need to be studied include:
  - Accounting spatial variability in GS
  - Repeated measurements over time
  - Modelling physiological traits in GS
  - GS for climate change
- Dr. Jose Crossa, CIMMYT's former biometrician was duly recognized with an inscribed plaque for his pioneering contributions to the research in prediction methods for breeding values of crop genotypes.
- I took the opportunity to discuss BSS support with scientists available.

**iv) Implications for ICARDA**

- Depending on the data availability, it would be worth exploring biometrical techniques and tools for GS for Climate Change (CC). An approach would be to examine the training datasets from climatically diverse environments and develop a GS model in terms of phenotypic response, influential genetic marker information, influential climatic variable and interaction between such markers and climatic variables. It is the interaction part that will lead to selection of genetic material for CC. We can either predict the extreme events for the used climatic variables or set them a priori to develop various scenarios. The model can be used to evaluate the breeding values of the lines to choose from.

## **Appendix**

(<http://www.cropgs.com/uploads/files/GS%20SYMPOSIUM%20-%20PROGRAM.pdf> )

### **Program:**

Sept, 29, 2016

8:30 Bus departs from Hotel Atlantic Agdal

### **Welcome address**

Moderator: Wayne Powell

9:00 INRA representative

9:30 Michael Baum: CWANA, a target region to increase genetic gain

10:00 Wayne Powell: Role of genomic selection in the future of plant breeding

10:30 Coffee Break

### **Examples of successful GS**

Moderator: Alison Bentley

11:00 John Hickey: The past, present and future of genomic selection in livestock and crops

11:30 Paulino Perez : Single-step genomic and pedigree prediction GxE interaction models of wheat lines in international environments

12:00 Zakaria Kehel: Genomic-enabled prediction of historical CIMMYT wheat international trials using information on dense molecular markers, pedigree, and environment covariables

12:30 Lunch break

### **Moving forward in GS**

Moderator: Conxita Royo

13:30 Jose' Crossa: Theory and practical results of genomic selection at CIMMYT

14:00 Gregor Gorjanc: Leveraging imputation for cost-effective genomic selection

14:30 Rodomiro Ortiz: Genomic-wide prediction in plant breeding: beyond the state of the art

15:00 Coffee break

### **15:30 Round table 1 - The biometric balance**

Moderator: Jose' Crossa, John Hickey, Zakaria Kehel, Paulino Perez, Gregor Gorjanc

### **16:15 Round table 2 – Summary of day one**

Moderator: Curtis Pozniak, Rodomiro Ortiz, Wayne Powell, Conxita Royo

17:00 Bus departs for the hotel Atlantic

19:00 Bus departs to restaurant Borg'Eddar by the beach for sunset wine and dinner

Sept, 30, 2016

8:30 Bus departs from Hotel Atlantic Agdal

### **Genotyping platforms for GS**

Moderator: Filippo Bassi

9:00 Andrzej Kilian (remote connection) DArTSeq: an ideal tool for GS in plants 9:30 TBD (remote connection)

10:00 Darshna Vyas: Practical processing for GS methodology

10:30 Coffee Break

### **Considerations for GS**

Moderator: Gregor Gorjanc

11:00 Luigi Cattivelli: New tools for GS in durum wheat: what a sequenced genome can offer

11:30 Filippo M Bassi: What if GS was designed by wheat breeders: practical considerations

12:00 Veronique Alary: The social side of selection indexes for GS in wheat

12:30 Lunch break

### **Effective integrations of GS**

Moderator: Roberto Tuberosa

13:30 Alison R Bentley: From SNP to GEBV: the use of marker and trait data in genomic prediction

14:00 Thomas Wood: GS in fava bean: a long way ahead

14:30 Curtis J Pozniak: Genomic Selection in Wheat – Genome Sequences, SNPs, and Drones

15:00 Coffee break

### **15:30 Round table 3 - The tools we want**

Moderator: Michael Baum, Darshna Vyas, Roberto Tuberosa, Thomas Wood

### **16:15 Round table 4 - tomorrow's GS**

Moderator: John Hickey, Alison R Bentley, Curtis J Pozniak, Filippo M Bassi

17:00 Bus departs for the hotel Atlantic

19:00 Bus departs to restaurant Ziriab inside the old Median of Rabat