

Carlos D. Messina

2500 Kenway Drive, Des Moines, IA 50310 • Voice: +1 (478) 960-0967 • +1 (515) 314-8521 • charlie.messina@corteva.com • charlie.messina@gmail.com

1. Current Position

Senior Scientist, Corteva Agriscience, Agriculture Division DowDuPont. 2018 - present

2. Degrees Received

Ph.D. University of Florida. (United States). 2003. Agricultural & Biological Engineering

M.Sc. University of Buenos Aires (Argentina). 1999. Crop Science

B.Sc. University of Buenos Aires (Argentina). 1995. Agronomy

3. Professional Positions held

Senior Scientist, DuPont Pioneer. 2014 - 2018

Research Scientist, DuPont Pioneer 2006 - 2013

Senior Research Associate, DuPont Pioneer. 2004 - 2006

Postdoc. University of Florida. 2004

Graduate Research Associate. University of Florida. 1999 - 2003

Graduate Research Scholar. University of Buenos Aires. 1998 - 1999

Graduate Research Fellow. Interamerican Institute for Global Change. 1997 - 1998

Research & Teaching Assistant. University of Buenos Aires. 1992-1999

4. Honors and awards

2016. Achievements in Research. The Henry A. Wallace Agricultural Revolution Impact Award. Precision Phenotyping, Managed-Environment, Stress-Testing Infrastructure. DuPont Pioneer

2011 Business Achievement Award. Contribution to drought tolerance innovation and the official launch of AQUAmax® hybrids. DuPont Pioneer.

2006. Crop Genetics Research and Development Contribution Award Program. Methodology to characterize drought stress tolerance in maize using a mixed-model framework and crop model based environmental characterization. DuPont Pioneer.

2003 Outstanding International Student, College of Agricultural and Life Sciences, University of Florida.

2002. Who's Who among Students in American Universities and Colleges, University of Florida.

2002. CALS Dean's Leadership Award, College of Agricultural and Life Sciences, University of Florida.

1998. Fellowship award from the Interamerican Institute for Global Change Research (IAI).

1998. Scholarship award from the University of Buenos Aires.

5. Membership

Crop Science Society of America (member since 2006)

American Society of Agronomy (member since 2008)

Soil Science Society of America (member since 2018)

North America Plant Phenotyping Network (member since 2018)

2003. Inducted into Gamma Sigma Delta (Florida Chapter).

6. Achievements in Teaching, Extension, and Industrial Education

10%

2017—present. Plant Symposia Series. Work with students on the organization of the symposia. Speaker at the Universities of Wageningen, Edinburgh, Sao Paulo, Kansas State University, University of Florida, Universidad Catolica de Chile, and University of Queensland. Also, participate on forums to talk about career opportunities and professional development at various Universities invited by students.

Lecture at Pioneer Learning Institute (Spanish and English) and provide training in crop ecophysiology and modeling for Agronomists, Research Associates and Senior Research Associates (sessions 20-50 people)

Committee member for 5 PhD students at University of Buenos Aires (Argentina), University of Queensland (Australia), Kansas State University (USA), Universiteit van die Vrystaat (South Africa) and Purdue (USA)

Other activities include lectures (e.g., Advance Training Institute on Climate Variability and Food Security, International Research Institute for Climate Prediction, University of Columbia, 2002), extension publications (e.g., Díaz Zorita, M et al. Manual practico para el cultivo de girasol [Sunflower production]. AACREA; Magrin et al. Impacto del fenómeno “El Niño” sobre la producción de cultivos en la región Pampeana. INTA.)

1992-1999 Teaching and Research Assistant. Agricultural Climatology. University of Buenos Aires.

7. Achievements in Investigative Competency

60%

AQUAmax® Drought tolerant maize: Crop physiology and prediction modeling team Lead. One of the coleaders of the AQUAmax development and deployment team that delivered the first generation of maize AQUAmax hybrids for the 2011 launch. Directly involved in all aspects of the breeding programs to support and enable the selection of superior inbreds and hybrids. I was responsible for several of the AQUAmax maize hybrids. These are still grown today on millions of acres in the US corn-belt and Europe. Following the US launch of the maize AQUAmax hybrids, I subsequently led teams to develop infrastructure and capabilities to deploy drought tolerance breeding methodology for maize to other global regions.

EnCirca® N management services: Member of the team that developed a digital tool to enable farmers incorporate data driven predictions to their decisions making when managing N fertilization in maize. Directly involved in model development and evaluation, and on the underpinning basic research on N dynamics in corn and yield response to N applications.

Advanced Prediction methodology through biological modeling and genomic prediction integration. One of the co-leaders that conceived and reduced to practice a novel methodology that increase prediction skill through integration of mathematical models of plants, soils, agronomy and statistical learning algorithms. Involved in the design, evaluation, modeling and communication of the method. Currently leading the improvement of the methodology with internal and external collaborators.

8. Achievement in Service

% 10

Elmer G. Heyne Distinguished Crop Science Lecturer, Kansas State University (2018). Gave another 11 invited lectures in the United States, Brazil, Chile, The Netherlands, France, China, and Australia. Also, presented at the American Seed Trade Association and Illinois Breeders' school.

Industry Advisor for the NSF Genome-to-Phenome Prediction NSF EPSCoR (2018-) at Kansas State University

Participated in review panel for NIFA/USDA

Participant in workshops, summer schools and collaborative research with ICRISAT (comparative physiology of maize, sorghum and millet), CIMMYT (Predictive Agriculture), iPlant, NIFA (Digital Agriculture/ Big Data), and University of Miami and University of Columbia (Climate Prediction)

Reviewer for Nature Scientific Reports, Agronomy Journal, Crop Science, Trends Plant Science, Plant Science, Plant Physiology, Agricultural Systems, Field Crops Research, and Journal of Experimental Botany.

2018-19 Board member for the North American Plant Phenotyping Network

2018- CropM2020 (International Crop Modeling Symposium). Member of the Scientific Committee

2018- Interdrought VI. Assembly member.

Section Achievement in Leadership describes about involvement as PI in Industry-Academic projects.

Section Service to the Society describes contributions as reviewer and associate editor of Crop Science.

9. Achievements in Leadership

% 20

Corteva Agriscience Predictive Agriculture Division: Leads a team transdisciplinary team that develops advanced methods in predictive breeding and agronomy, and their application to the

design of novel cropping systems. The team includes agronomists, breeders, geneticists, engineers, mathematicians, statisticians, physicists and crop physiologists. I supervise and mentor 10 PhD level Research Scientists.

Lead and/or participate of teams that applied the NoWhere methodology to design programs to 1) improve efficiency and effectiveness of research and development of transgenics for improved drought tolerance, 2) increase yield stability, and 3) integration of mechanistic modeling and statistical learning methodologies to improve prediction. Outcomes from these projects lead to the improvement of the Drought Program, and the organization of the Predictive Agriculture Research program.

Industry-Academic relations: Corteva Agriscience Leader and/or Principal Investigator in research projects with the University of Queensland (>1.6M US\$), The European Commission funded project DROPS (5.6 M €), ICRISAT, Purdue, North Carolina State University, Kansas State University, FFAR - G2P Bridge with Kansas State University (2M US\$), and National Science Foundation funded project with Iowa State University (LEAP-HI/GOALI: Engineering Crops for Genetic Adaptation to Changing Environments, 2M US\$).

2007-08 Member of Steering Team of DuPont Pioneer Latin Diversity Network

2002-03 Member of the Teaching Technology Committee, College of Agricultural and Life Sciences, University of Florida.

2000-03. Graduate Student Council Representative of the Agricultural and Biological Engineering Department. University of Florida

10. Professional contributions Listing

Published 41 papers in peer-reviewed publications, 5 book chapters and 4 patent and patent applications. This research has been cited 3653 times (google h-index 29; i10-index 38, RG h-index 31.06). Most recent paper has been cited 15 times since publication in 2018.

Patents and patent applications (US20190019281A1, US20180044693A1, US20170245446A1, US 2010/0286973) teaches methods to improve plant breeding through prediction, crop modeling and phenotyping.

Selected publications sorted by number of citations

1. Hammer G.L., Z., Dong, G., McLean, A., Doherty, C., Messina, J., Schusler, C., Zinselmeier S., Paszkiewicz, and M., Cooper. 2009. Can changes in canopy and/or root system architecture explain historical maize yield trends in the US Corn Belt? *Crop Science* 49:299–312. **(476 citations)**
2. Lobell, D.B., G.L., Hammer, G., McLean, C., Messina, M.J., Roberts, and W., Schlenker. 2013. The critical role of extreme heat for maize production in the United States. *Nature Climate Change*. 3:497-501. **(380 citations)**
3. Jones, J.W., J.W., Hansen, F.S., Royce, and C.D., Messina. 2000. Potential benefits of climate forecasting to agriculture. *Agriculture, Ecosystems and Environment* 82:169-184. **(293 citations)**
4. Sinclair, T.R., C.D., Messina, A., Beatty, and M. Samples. 2010. Assessment across the United States of the benefits of altered soybean drought traits. *Agronomy Journal* 102:475–482. **(169 citations)**

5. Podesta, G.P., D., Letson, C. Messina, F., Royce, R.A., Ferreyra, J., Jones, J., Hansen, I., Llovet, M., Grondona, J.J., O'Brien. 2002. Use of ENSO-related climate information in agricultural decision making in Argentina: a pilot experience. *Agricultural Systems* 74: 371-392. (**165 citations**)
6. Messina, C.D., J.W., Hansen, and A.J., Hall. 1999. Land allocation conditioned on El Niño-Southern Oscillation phases in the pampas of Argentina. *Agricultural Systems* 60:197-212. (**134 citations**)
7. Cooper, M., F.A., van Eeuwijk, G.L., Hammer, D.W., Podlich, and C. Messina. 2009. Modeling QTL for complex traits: detection and context for plant breeding. *Current Opinion in Plant Biology* 12:231-240. (**134 citations**)
8. Messina, C.D., D. Podlich, Z. Dong, M. Samples, and M., Cooper. 2011. Yield-trait performance landscapes: from theory to application in breeding maize for drought tolerance. *Journal of Experimental Botany* 62: 855-868. (**127 citations**)
9. Messina, C.D., J.W., Jones, K.J., Boote, and C.E., Vallejos. 2006 A Gene-based model to simulate soybean development and yield responses to environment. *Crop Science* 46:456-466. (**95 citations**)
10. Technow, F., C.D. Messina, R.L., Totir, M., Cooper. 2015. Integrating crop growth models with whole genome prediction through approximate bayesian computation. *PLoS ONE* 10(6): e0130855. doi:10.1371/journal.pone.0130855 (**citations 73**)
11. Messina, C.D., T.R., Sinclair, G.L., Hammer, D., Curan, J., Thompson, Z., Oler, C., Gho, and M., Cooper. 2015. Limited-Transpiration trait may increase maize drought tolerance in the US Corn Belt. *Agronomy Journal* 107:1978-1986. (**citations 55**)
12. Messina, C.D., F., Technow, T., Tang, R., Totir, C., Gho, M., Cooper. 2018. Leveraging biological insight and environmental variation to improve phenotypic prediction: Integrating crop growth models (CGM) with whole genome prediction (WGP). *European Journal of Agronomy* 100: 151-162 (**15 citations**)

11. Service to the Society

Associate Editor for *Crop Science* since 2017

Reviewer of *Crop Science* and *Agronomy Journal*

Crop Science special issue. Editor with Cooper, Hammer, and Reynolds. *Crop science: The foundation of Predictive Agriculture*. Target publication October 2019

ASA/CSSA/SSSA 2019. Co-sponsored Symposium between Divisions C1, C2, C3 and A14 on Predictive Agriculture. Lead organizer.

Nominated for Industry Representative CSSA Board

Nominated for Division chair ASA Climatology and Modeling Section (2018 and 2019)