

Ciro Velasco Cruz, PhD

 Statistics

 (575) 646-2672

 cvelasco@nmsu.edu

Professional Profile

I am a statistician with expertise in Bayesian statistics and demonstrated experience in statistical consulting, interdisciplinary research collaborations, and academic teaching.

Research Interests

My current research focuses on the modeling of agricultural and biological data. Specifically, I am interested in the following areas:

1. Spatial Statistics 2. Dynamic linear and nonlinear models 3. Latent variable models and Hidden Markov models 4. Nonparametric Bayesian analysis 5. Bayesian variable selection methods 6. Supervised and unsupervised learning and classification methods 7. Graphical models 8. Dimension reduction methods

Areas of Applications

The following topics have been central to my collaborations with scientists from diverse disciplines. They are especially relevant for modeling biological and agricultural data:

1. Linear and nonLinear regression 2. Bayesian Analysis of Variance (BANOVA) 3. Fixed, random and mixed models 4. Modeling of ordinal, nominal and count data modeling 5. Nonparametric regression 6. Multivariate analysis 7. Variable selection in regression models 8. Spatial statistics 9. Naive bayes for statistical learning or machine learning 10. Random Forest

Education

Virginia Tech, Blacksburg, Virginia US: *PhD. Statistics, 2012*

Colegio de Postgraduados, México: *M.S. Statistics, 2000*

Universidad Autónoma Chapingo, México: *B.S. Irrigation Engineering, 1997*

Professional Experience

New Mexico State University, NM:

- *Assistant Professor.* Joint appointment at the Agricultural Economics and Agricultural Business, and Agricultural and Extension Education Departments, NMSU, Las Cruces, NM. Since October, 2025.

- *Research Scientist, Sr.* Department of Extension Plant Sciences, NMSU, Las Cruces, NM. From 2021 to 2025.
- *Research Assistant Professor.* Department of Extension Plant Sciences. Las Cruces, NM. From 2018 to 2021.

Mexico:

- *Professor of Statistics.* Statistics Program, Colegio de Postgraduados. From 2012 to 2018.
- *Statistical Consultant.* International Maize and Wheat Improving Center (CIMMYT). 2017.

Virginia Tech, Blacksburg, VA:

- *Lead Statistics Consulting.* Laboratory for Interdisciplinary Statistical Analysis (LISA), Department of Statistics, Virginia Tech. From 2008 to 2012.
- *Instructor.* Department of Statistics, Virginia Tech. From 2010 to 2011.

Courses Taught

- Experimental Designs
- Regression Analysis
- Mathematical Statistics
- Statistical Modeling
- SAS for data analyses

Consulting Experience

- Agricultural Statistical Consulting Center, ACES-NM, since 2024.
- International Maize and Wheat Improving Center (CIMMYT), Mexico, 2017.
- Laboratory for Interdisciplinary Statistical Analysis (LISA), Department of Statistics, Virginia Tech, 2008 to 2021

Computation Skills

- ✓ MATLAB
- ✓ R software
- ✓ SAS software
- ✓ JMP software
- ✓ Armadillo C++

Publications

Peer-reviewed scientific articles:

1. Melissa Meyers, Ciro Velasco-Cruz, April Ulery, Brian J. Schutte, Brandi Wheeler, and Erik A. Lehnhoff. Plant–Soil Feedbacks and Competition of *Bouteloua eriopoda* and *Eragrostis lehmanniana*, Featuring a new Method for Comparison of Replacement Series Competition Studies. *Weed Research*, 65(2):e70012, 2025
2. Tatiana Kardashina, Ciro Velasco-Cruz, Alex Ranvik, Tom Egelhoff, and Bernd Leinauer. Accuracy of Remote Soil Moisture Sensing Using Sentinel-1A Satellite. *International Turfgrass Society Research Journal*, n/a(n/a), 2025
3. Mino Sportelli, Matteo Serena, Ciro Velasco-Cruz, and Bernd Leinauer. Bermuda-grass Quality Affected by Irrigation Level, Fertilization, a Soil Surfactant, and Trinexapac-Ethyl. *International Turfgrass Society Research Journal*, NA(NA), 2025
4. María Elena Loera Alvarado, Alberto E. Becerril-Román, Ciro Velasco-Cruz, Hilda Araceli Zavaleta Mancera, G. Calderón Zavala, and David Jaén-Contreras. Zinc Oxide Nanoparticles vs Zn- EDTA in the Growth and Production of Strawberry Crops (*Fragaria x ananassa* Duch). *Agroproductividad*, NA(NA), 2025
5. Israel Joukhadar, Mariela Estrada, Ciro Velasco-Cruz, Danise Coon, Olga Lavrova, Marisa Thompson, Ivette Guzman, and Stephani Walker. Impact of Agrivoltaic Shade on Beet Curly Top Virus and Yield in Chile Pepper (*Capsicum annuum*). *HortScience*, 60(6):841–851, 2025
6. Israel Joukhadar, Franchesca Ortega, Ciro Velasco-Cruz, Derek Barchenger, Theresa Hill, Allen Van Deynze, and Stephanie Walker. Correlations among New Mexico pod-type green chile (*Capsicum annuum*) fruit morphology characteristics with destemming force. *Crop Science*, 64(5):2698–2708, 2024
7. Dayna P. Saldaña Zepeda, Richard Heerema, Ciro Velasco Cruz, William Giese, and Joshua Sherman. Delaying bud-break on pecan trees: a Bayesian longitudinal multinomial regression approach. *Journal of Applied Statistics*, 0(0):1–21, 2024
8. Ryan W. R. Schroeder, Molly M. Reichenborn, Erik A. Lehnhoff, David Hooper, Ciro Velasco-Cruz, Joshua Weinstein, and Akasha M. Faist. Impact of Soil Residual Auxin Herbicide on Seedling Emergence and Biomass Differs Between Soil Types, Water Pulse Event, and Seedling Species. *Restoration Ecology*, page e14043, 2023
9. Josué S. González-Pérez, Alberto E. Becerril-Román, Ma. de Lourdes Arévalo-Galarza, Alfredo López-Jiménez, César San Martín-Hernández, and Ciro Velasco-Cruz. Problemas de Manejo de Solución Nutritiva y Dosel en Arándano (*Vaccinium corymbosum* L.) Cultivado Hidropónicamente. *Agro-Divulgación*, 3(4), 2023
10. Irene Quintero-Echeverría, Roney Solano-Vidal, Alberto E. Becerril-Román, Ciro Velasco-Cruz, and David Jaén-Contreras. Alternativa de Control Biológico del Moho Gris (*Botrytis cinerea*) en el Cultivo de Fresa. *Agro-Divulgación*, 3(4), 2023
11. Emily F. Creegan, Robert Flynn, Catherine E. Brewer, Richard J. Heerema, Murali Darapuneni, and Ciro Velasco-Cruz. Pecan Biomass and Dairy Manure Utilization: Compost Treatment and Soil In-Situ Comparisons of Selected Pecan Crop and Soil Variables. *Processes*, 11(7), 2023

12. Molly Kelly, W. Gill Giese, Ciro Velasco-Cruz, and Bruce Zoecklein. Effect of Foliar Nitrogen and Sulfur Applications on Aroma and Flavor Profile of Petit Manseng (*Vitis vinifera* L.) Using Descriptive Analysis. *Journal of Wine Research*, 34(2):155–167, 2023
13. Hormat Shadgou Rhein, Avinash Sreedasyam, Peter Cooke, Ciro Velasco-Cruz, Jane Grimwood, Jeremy Schmutz, Jerry Jenkins, Sajal Kumar, Mingzhou Song, Richard J. Heerema, L. J. Grauke, and Jennifer J. Randall. Comparative Transcriptome Analyses Reveal Insights into Catkin Bloom Patterns in Pecan Protogynous and Protandrous Cultivars. *PLOS ONE*, 18(2):1–22, 02 2023
14. Rosa Angela Pacheco-Gil, Ciro Velasco-Cruz, Paulino Pérez-Rodríguez, Juan Burgueño, Sergio Pérez-Elizalde, Francelino Rodrigues, Ivan Ortiz-Monasterio, David H. del Valle-Paniagua, and Fernando Toledo. Bayesian Modelling of Phosphorus Content in Wheat Grain Using Hyperspectral Reflectance Data. *Plant Methods*, 19(1):6, 2023
15. Kimberly Cervantes, Ciro Velasco-Cruz, L. J. Grauke, Xinwang Wang, Patrick Conner, Lenny Wells, Clive H. Bock, Cristina Pisani, and Jennifer J. Randall. Influence of Geographical Orchard Location on the Microbiome from the Progeny of a Pecan Controlled Cross. *Plants*, 12(2), 2023
16. Richard C. Pratt, Lois Grant, Ciro Velasco-Cruz, and Leonard Lauriault. Field Performance of Selected and Landrace Tepary Bean Varieties in Diverse Southwestern USA Irrigated Production Environments. *Legume Science*, 5(1):e157, 2023
17. Shadai Martin, Ciro Velasco-Cruz, and Lacey McCormack. Eating Behaviors and Body Image Perception among College Students. *Health Behavior and Policy Review*, 9(5):1052–1062, 2022
18. Richard C. Pratt, Ciro Velasco-Cruz, Murali Darapuneni, Randall Montgomery, and Lois Grant. Southwest-Adapted Maize Germplasm as a Potential Genetic Resource for Selection of Salinity Tolerant Cultivars. *Crop Science*, 62(1):286–300, 2022
19. Matteo Serena, Bernhard Leinauer, Ciro Velasco-Cruz, and Elena Sevostianova. Optimizing Frequency and Amount of Irrigation Needed to Establish Cool-Season Turfgrasses. *Agronomy Journal*, 114(3):1851–1858, 2022
20. Gill Giese, Dayna P. Saldaña Zepeda, Jacquelin Beacham, and Ciro Velasco Cruz. Modeling Nematode Population Dynamics Using a Multivariate Poisson Model with Spike and Slab Variable Selection. *Journal of Applied Statistics*, 49(12):3195–3214, 2022
21. Dayna P. Saldaña-Zepeda, Ciro Velasco-Cruz, and Víctor H. Torres-Preciado. Variable Selection in Switching Dynamic Regression Models. *Revista Colombiana de Estadística*, 45:231 – 263, 06 2022
22. Elena Sevostianova, Ciro Velasco-Cruz, Bernd Leinauer, Matteo Serena, Rossana Sallenave, Isabelle Horvath, and Jenny Beth Skerker. Establishing Three Warm-Season Turfgrasses with Tailored Water: I. Growth, Cover, and Nitrate Leaching Losses. *Journal of Environmental Quality*, 51(2):228–237, 2022

23. Bernd Leinauer, Elena Sevostianova, Ciro Velasco-Cruz, Rossana Sallenave, Matteo Serena, Isabelle Horvath, and Jenny Skerker. Establishing Three Warm-Season Turfgrasses with Tailored Water: II. Root Development, Nitrate Accumulation in Plant Tissue and Soil, and Relationship with Leaching. *Journal of Environmental Quality*, 51(2):238–249, 2022
24. Daniel Hahn, Alejandro Morales, Ciro Velasco-Cruz, and Bernd Leinauer. Assessing Competitiveness of Fine Fescues (*Festuca L. spp.*) and Tall Fescue (*Schedonorus arundinaceus* (Schreb.) Dumort) Established with White Clover (*Trifolium repens* L., WC), Daisy (*Bellis perennis* L.) and Yarrow (*Achillea millefolium* L.). *Agronomy*, 11(11), 2021
25. Daniel S. Hahn, Peter Roosjen, Alejandro Morales, Jelmer Nijp, Leslie Beck, Ciro Velasco Cruz, and Bernd Leinauer. Detection and Quantification of Broadleaf Weeds in Turfgrass Using Close-Range Multispectral Imagery with Pixel- and Object-Based Classification. *International Journal of Remote Sensing*, 42(21):8035–8055, 2021
26. Diana Caamal-Pat, Paulino Pérez-Rodríguez, José Crossa, Ciro Velasco-Cruz, Sergio Pérez-Elizalde, and Mario Vázquez-Peña. lme4GS: An R-Package for Genomic Selection. *Frontiers in Genetics*, 12, 2021
27. Calen McKenzie, Ivette Guzman, Ciro Velasco-Cruz, and Paul W. Bosland. Photosynthetic Pigments Profiled in Capsicum Lutescens Mutants. *Journal of the American Society for Horticultural Science J. Amer. Soc. Hort. Sci.*, 146(4):233 – 240, 2021
28. M. Giolo, R. Sallenave, C. Pornaro, C. Velasco-Cruz, S. Macolino, and B. Leinauer. Base Temperatures Affect Accuracy of Growing Degree Day Model to Predict Emergence of Bermudagrasses. *Agronomy Journal*, 113(3):2960–2966, 2021
29. Rafael Rojas-Rojas, Carlos De León-García de Alba, Víctor Heber Aguilar-Rincón, Ciro Velasco-Cruz, Ernestina Valadez-Moctezuma, and Javier Hernández-Morales. Herencia de la Resistencia a Phytophthora Parasitica Dastur en Jamaica. *Revista Mexicana de Ciencias Agrícolas*, 11(5):1189–1195, 2020
30. Shadai Martin and Ciro Velasco-Cruz. The Nutrition Environment, Food Choices and Body Image Among College Students. *Journal of Social Health*, 3(2):26–38, 2020
31. Angel M. Gamero-Gamero, Julian Delgadillo-Martinez, Jose I. Cortes-Flores, Joel Velasco-Velasco, and Ciro Velasco-Cruz. Propiedades del Suelo Afectadas por el Tiempo de Descanso en un Sistema de Roza-Tumba-Quema. *Ecosistemas y Recursos Agropecuarios*, 7(1), 2020
32. Santo Angel Ortega-Acosta, Jose Antonio Mora-Aguilera, Ciro Velasco-Cruz, Daniel Leobardo Ochoa-Martínez, Santos Gerardo Leyva-Mir, and Javier Hernández-Morales. Temporal Progress of Roselle (*Hibiscus sabdariffa* L.) Leaf and Calyx Spot Disease (*Corynespora cassiicola*) in Guerrero, México. *Journal of Plant Pathology*, 102(4):1007–1013, 2020
33. Matteo Serena, Ciro Velasco-Cruz, Joshua Friell, Marco Schiavon, Elena Sevostianova, Leslie Beck, Rossana Sallenave, and Bernd Leinauer. Irrigation Scheduling

Technologies Reduce Water Use and Maintain Turfgrass Quality. *Agronomy Journal*, 112(5):3456–3469, 2020

34. Dayna P. Saldaña-Zepeda, Ciro Velasco-Cruz, and Víctor H. Torres-Preciado. Mexican Peso-USD Exchange Rate: A Switching Linear Dynamical Model Application. *International Economics*, 162:80–91, 2020
35. Santo Ángel Ortega-Acosta, Daniel Leobardo Ochoa-Martínez, Santos Gerardo Leyva-Mir, Ciro Velasco-Cruz, José Antonio Mora-Aguilera, and Javier Hernández-Morales. Control Químico del Manchado de Hojas y Cálices de Jamaica en Guerrero, México. *Summa Phytopathologica*, 45(1):38–43, 2019
36. Josué S. González-Pérez, Abel Quevedo-Nolasco, Alberto E. Becerril-Román, Ciro Velasco-Cruz, and David Jaén-Contreras. Tiempo Fisiológico del Ciruelo Japonés (*Prunus cerasifera EHRH*) cv. Methley, Calculado en un Clima Templado de Altura Intertropical. *Agroproductividad*, 12(3):33–39, 2019
37. Josué S. González-Pérez, Alberto E. Becerril-Román, Abel Quevedo-Nolasco, Ciro Velasco-Cruz, and David Jaén-Contreras. Area Foliar y Eficiencia en el Uso de la Radiación del Ciruelo Japonés (*Prunus salicina*) Durante un Ciclo Fenológico. *Agroproductividad*, 11(10):19–26, 2018
38. Josué S. González-Pérez, Alberto E. Becerril-Román, Abel Quevedo-Nolasco, Ciro Velasco-Cruz, and David Jaén-Contreras. Peso Específico de Hoja y Concentración de Nitrógeno Durante la Fenología del Ciruelo Japonés cv. Methley. *Agroproductividad*, 11(10):43–50, 2018
39. Josué S. González-Pérez, Abel Quevedo-Nolasco, Alberto E. Becerril-Román, Ciro Velasco-Cruz, and David Jaén-Contreras. Fenología del Ciruelo Japonés cv. Methley Injertado Sobre Ciruelo Mirobolano, en Texcoco, México. *Agroproductividad*, 11(10), 2018
40. Paulino Pérez-Rodríguez, Rocío Acosta-Pech, Sergio Pérez-Elizalde, Ciro Velasco Cruz, Javier Suárez Espinosa, and José Crossa. A Bayesian Genomic Regression Model with Skew Normal Random Errors. *G3 (Bethesda)*, 8(5):1771–1785, 2018
41. Diana E. Trujano-Fragoso, Antonio Trinidad-Santos, Rosa M. López-Romero, Ciro Velasco-Cruz, Alberto E. Becerril-Román, and Consuelo de J. Cortés-Penagos. Pomological Characteristics, Antioxidant Capacity and Ellagic Acid in Raspberry (*Rubus idaeus L.*). *Revista Fitotecnia Mexicana*, 40(3):261–269, 2017
42. Molly Kelly, W. Gill Giese, Ciro Velasco-Cruz, Laura Lawson, Sihui Ma, Melissa Wright, and Bruce Zoecklein. Effect of Foliar Nitrogen and Sulfur on Petit Manseng (*Vitis vinifera L.*) Grape Composition. *Journal of Wine Research*, 28(3):165–180, 2017
43. Santo Ángel Ortega-Acosta, Ciro Velasco-Cruz, Javier Hernández-Morales, Daniel Leobardo Ochoa-Martínez, and Javier Hernández-Ruiz. Diagrammatic Logarithmic Scales for Assess the Severity of Spotted Leaves and Calyces of Roselle. *Revista mexicana de fitopatología*, 34(3):270–285, Septiembre 2016
44. Ciro Velasco-Cruz, Luis Fernando Contreras-Cruz, Eric P. Smith, and JoséE. Rodríguez. A Varying Coefficients Model For Estimating Finite Population Totals: A Hierar-

chical Bayesian Approach. *Journal of Agricultural, Biological, and Environmental Statistics*, 21(3):548–568, 2016

45. Gill Giese, Tony K. Wolf, Ciro Velasco-Cruz, and Lucas Roberts. Cover Crop and Root Pruning Effects on the Rooting Pattern of SO4 Rootstock Grafted to Cabernet Sauvignon. *American Journal of Enology and Viticulture*, 67(1):105–115, 2016
46. Gill Giese, Tony K. Wolf, Ciro Velasco-Cruz, Lucas Roberts, and Josh Heitman. Cover Crop and Root Pruning Impacts on Vegetative Growth, Crop Yield Components, and Grape Composition of Cabernet Sauvignon. *American Journal of Enology and Viticulture*, 66(2):212–226, 2015
47. Gill Giese, Ciro Velasco-Cruz, Lucas Roberts, Josh Heitman, and Tony K. Wolf. Complete Vineyard Floor Cover Crops Favorably Limit Grapevine Vegetative Growth. *Scientia Horticulturae*, 170:256–266, 2014
48. Ciro Velasco-Cruz and Eric P. Smith. Using Benthic Indicators to Assess Status at HUC Levels: A Robust Hierarchical Modeling Approach. *Ecological Indicators*, 36:447–455, 2014
49. Ciro Velasco-Cruz, Scotland C. Leman, Mark Hudy, and Eric P. Smith. Assessing the Risk of Rising Temperature on Brook Trout: A Spatial Dynamic Linear Risk Model. *Journal of Agricultural, Biological, and Environmental Statistics*, 17(2):246–264, 2012

Book:

- Ciro Velasco-Cruz, Scotland Leman, and Eric P. Smith. *Spatially Correlated Model Selection Method*. Lambert Academic Publisher, 2017

Recent Posters:

- McLane, E., Lombard, K., Lavrova, O., Norris, S., Edgar, D. and Velasco-Cruz, Ciro. Establishing a Small-Scale Agrivoltaic Research and Demonstration Plot on the Navajo Nation: Evaluating PV/Panel Shading Effects on Radish Growth. American Society for Horticultural Sciences, New Orleans, LA (July 28, 2025).
- Lehnhoff, E.A., Schutte, B.J., and Velasco-Cruz, C. A new method for analyzing replacement series competition studies. Western Society of Weed Science. Seattle, WA. March 12, 2025.
- Lombard, K. A., Giese, W., and Velasco-Cruz, C. Field Evaluation and Marketability of Table Grape Cultivars for Northwest New Mexico. American Society for Horticultural Sciences, Orlando, FL. (August 4, 2023). HortScience, 58(9), S245. 2023.