College of Agricultural, Consumer and Environmental Sciences

Department of Plant and Environmental Sciences Profile

aces.nmsu.edu/academics/pes/ • 575-646-3405

Quick Facts

- Plant and Environmental Sciences has experienced and internationally recognized faculty with varied research specialties, including plant breeding, biotechnology, ornamental plant production, landscape horticulture, turfgrass management, sustainable and organic crop production, forestry and soil remediation, soil ecology, and soil mapping.
- Over the past five years, PES faculty have published more than four books and 400 refereed journal articles, and have had five papers appear as cover articles on scientific journals!
- The department is home to many research and outreach programs, such as the alfalfa, chile, cotton, and onion breeding programs; the State Climatology Office; and the Partnership for the Advancement of Cancer Research.
- PES's award-winning faculty have received 60 academic awards and 10 service awards, released 111 cultivars, and been awarded four patents. The department has two Regents Professors and four endowed chairs. Over the last three years, faculty have attracted nearly $8 million in external grants and contracts.

ACES Pillars for Economic and Community Development

Mission Statement

The Department of Plant and Environmental Sciences' (PES) mission at New Mexico State University is to improve the quality of life for the citizens of New Mexico through multiple duties: teaching, research, Extension, outreach, and service in the study and application of plant, soil, water, and environmental sciences.

Selected Program Impacts

- **Water-Efficient, Low-Input, Well-Adapted, Alternative Crops to Diversify Cropping Systems in the Southern High Plains.** The Ogallala Aquifer, the major irrigation resource in the Great Plains, is declining rapidly. If current use of the aquifer continues, more than 35% of irrigated acreage producing $2.5 billion worth of agricultural products will be dryland farming in two decades. Our research on alternative crops like winter canola, safflower, and guar is developing rotational cropping systems that require less irrigation water and are more economically viable, resource-efficient, and climate-resilient.

- **Genetic Improvement of Chile Pepper (*Capsicum*) Germplasm for New Mexico.** Breeding new, higher-yielding, pest- and disease-resistant, heat- and drought-tolerant chile pepper cultivars will preserve New Mexico's heritage and ensure economic development. In New Mexico, chile pepper processing is nearly a $500 million industry. Chile wilt caused by *Phytophthora capsici* and *Verticillium dahliae* can destroy up to 100% of a field. Resistant cultivars, which do not add cost to the seed, are arguably the best way to manage disease. For the plant breeder, molecular markers linked to resistance genes can obviate the need for testing to identify resistant individuals from early generations, leading to an effective breeding procedure. The increase in efficiency can shave years off a breeding program, saving literally thousands of dollars. This past year, our program published a molecular marker for Verticillium wilt resistance that will be used by seed companies worldwide.

Selected Program Impacts (cont.)

- **Ecological studies contribute to the management of SW USA rangelands and to the sustainability of arid and semi-arid ecosystems worldwide.** The grasslands and shrublands of the Southwest United States are a vital part of the region's economy and culture, and such ecosystems support meat and milk production for upwards of 4 billion people worldwide. NMSU scientists are using multiple approaches, including field studies, remote sensing, and modeling, to understand how changing management and weather patterns impact the productivity and sustainability of grasslands subject to shrub encroachment, loss of grazing resources, and declining productivity.
- **Genetically engineered alfalfa that is high-yielding and possesses high forage quality.** Transgenic alfalfa plants containing a maize gene encoding for a key enzyme in carbon metabolism have been produced. These alfalfa plants exhibit a twofold increase in growth rates, creating additional cuttings, greater biomass, and a positive economic impact. These plants have high protein content and reduced fiber—desirable traits for dairy farmers. The plants also have more and larger root nodules, which leads to increased nitrogen transfer from the atmosphere to the soil.

Selected Partnerships and Collaborators

- Alforex Seeds
- Bureau of Land Management
- Cotton Incorporated
- Dow AgroSciences
- U.S. Forest Service
- Fred Hutchinson Cancer Research Center
- J. Frank Schmidt & Son Nurseries
- Local farmers
- National Cancer Institute
- New Mexico Acequia Association
- New Mexico Chile Growers Association
- New Mexico Environment Department
- Oak Ridge National Laboratory
- USDA–ARS, USDA–NRCS
- Other universities, including Arizona State University, University of California, and the University of Arizona

Faculty and Areas of Expertise

Agronomy and Soils

Sangamesh Angadi, crop physiology
Colby Brungard, pedology
Murali Darapuneni, semi-arid cropping systems
Koffi Djaman, soil and water resources, irrigation engineering
Robert Flynn, Extension Agronomist; soil and water quality
Rajan Ghimire, soil quality, soil fertility, conservation systems
Kulbhushan Grover, agroecology, sustainable crop production
Steven Guldan, sustainable agriculture
John Idowu, Extension Agronomist; agronomy and land management
Leonard Lauriault, forage agronomy
Mark Marsalis, Extension Agronomist; forage agronomy

Environmental Science

Owen Burney, silviculture and forest biology
Kenneth C. Carroll, hydrology and water resources
David DuBois, State Climatologist; atmospheric science
Brandon Edwards, geomorphology, aeolian processes, hydrology
Rajan Ghimire, soil quality, soil fertility, conservation systems
Niall Hanan, dryland ecology
F. Omar Holguin, biochemical analysis
Jacqueline Jarvis, chemical analysis, analytical instrumentation
Nicole Pietrasiak, microbiology, phycology, soil ecology
Manoj Shukla, environmental soil physics
Caitriana Steele, climate change, GIS remote sensing
Blair Stringam, biological and agricultural engineering
April Ulery, soil chemistry, soil mineralogy, phytoremediation, soil quality
Nicholas Webb, aeolian processes, land degradation processes

Genetics and Biotechnology

Paul W. Bosland, chile breeding and genetics, Chile Pepper Institute
Christopher Cramer, onion breeding and genetics, quantitative genetics
Champa Gopalan, biotechnology
Richard C. Pratt, germplasm development, maize improvement
Naveen Puppala, peanut breeding and genetics
Ian Ray, alfalfa breeding and genetics
Laura Rodríguez-Uribe, molecular genetics
Jinfa Zhang, cotton breeding and genetics

Horticulture and Turf Science and Management

William Giese, Extension Viticulturist; grapes
Rachel Gioannini, ornamental horticulture, landscape design
Ryan Goss, turf science
Ivette Guzmán, organic horticulture, functional foods
Richard Heerema, Extension Pecan Specialist; pecans
Bernd Leinauer, Extension Turfgrass Specialist; turfgrass
Kevin Lombard, horticulture
Geno Picchioni, plant-mineral relations
Rolston St. Hilaire, environmental stress physiology, landscape horticulture
Marisa Thompson, Extension Urban Horticulture specialist
Stephanie Walker, Extension Vegetable Specialist
Shengrui Yao, Extension Fruit Specialist; pomology

3/2019