Extension/UAES - Sustainable Plant Communities

Plant Genome, Genetics, and Genetic Mechanisms
This area focuses on development and dissemination of fundamental information in plant genetics and plant breeding technology with the purpose of making plant breeding more efficient and productive, and includes related technologies such as genomic database management.
Areas of work include but are not limited to:
• Genome sequencing and mapping
• Genetic structure, organization, and function
• Comparative and translational genomics
• Gene identification and manipulation
• Genetic markers and marker assisted selection for breeding
• Quantitative Trait Loci (QTL) analysis
• Genetic structures and mechanisms
• Inheritance of traits
• Bioinformatics and databases.
Exclude:
• Breeding for specific traits with direct purpose of releasing a crop variety or breeding line, even when using molecular tools such as molecular markers, expressed sequence tags, and QTL
• Use of genomic technology to characterize or evaluate germplasm
• Population genetics associated with germplasm preservation
• Forest and range plants

Plant Genetic Resources
This area focuses on discovery, acquisition, preservation, characterization, and development of plant genetic resources for plant production or protection. Both in-situ and ex-situ preservation methods are included, as well as preservation of species and within-species variation.
Areas of work include but are not limited to:
• Acquisition and preservation of genetic resources
• Germplasm characterization and evaluation, including screening for diversity or specific traits for production or protection
• Biosystematics/taxonomy
• Population genetics associated with germplasm preservation
• Gene pool enrichment and pre-breeding activities such as interspecific crosses, introgression of traits into breeding lines, increasing frequencies of desirable within crop gene pools, and adaptation of material to day length or other cultural requirements
• Long-term storage of genetic materials, including seeds and vegetatively propagated materials.
Exclude:
• Breeding for specific traits, including the use of molecular tools such as molecular markers, expressed sequence tags, and Quantitative Trait Loci
• Seed processing for short-term storage or commercial use
• Forest and range plants
• Natural resources biodiversity

Plant Biological Efficiency and Abiotic Stresses
This area focuses on understanding and improving plant productivity and quality affected by reduced inputs or abiotic stresses such as water, temperature, or nutrients.
Areas of work include but are not limited to:
• Biological mechanisms that affect actual or potential yields
• Biological mechanisms related to water use and survival of water stresses (e.g., drought, flooding)
• Biological mechanisms related to the use of nutrients and survival of nutrient stress
• Biological mechanisms related to survival of temperature stress (including freezing, chilling, and heat)
• Breeding (including genetic engineering) for biological efficiency or stress tolerance
• Cultural practices to improve biological efficiency or stress tolerance.
Exclude:
• Basic plant biology
• Integration into production management systems
• Breeding (including genetic engineering) for quality improvement
• Breeding (including genetic engineering) for host plant resistance
• Breeding (including genetic engineering) for crop-weed management
• Evaluation of germplasm for variation in biological efficiency or stress tolerance
• Effects of abiotic factors on pests
• Effects of pollution stress on plants
• Forest and range plants

Plant Product Quality and Utility (Preharvest)
This area focuses on maintaining or improving specific quality or utility parameters within biological material before harvest.
Areas of work include but are not limited to:
• Biological processes that affect product quality and utility
• Breeding (including genetic engineering) for product quality and utility
• Cultural practices that affect product quality and utility
• Maintenance of seed quality.
Exclude:
• Basic plant biology
• Postharvest quality and utility
• Integration of education, research, and extension results into production management systems
• Evaluation of germplasm for variation in specific quality or utility
• Fundamental areas of genetics
• Seed processing technology
• Forest and range plants
• Nutrient composition of plant products

Plant Management Systems
This area focuses on integration of production practices into an integrated system for managing annual and perennial plant population densities, fertility, irrigation, precision agriculture, and other cultural practices in an efficient and effective manner.

Areas of work include but are not limited to:
• Application of remote sensing and other automated sampling methodologies in managing plant population densities, fertility, irrigation, and other cultural practices
• Modeling and decision support systems for use in managing plant population densities, fertility, irrigation, and cultural practices
• Evaluation of integrated production management systems
• Organic agriculture – plant production management systems
• Sustainable agriculture – plant production systems
• Scale (size) related plant production systems that may affect farm viability
• Biosecurity in plant production systems
• Gardening and Master Gardening programs.
Exclude:
• Development of integrated pest management systems
• Application of remote sensing and other automated sampling methodologies for pest management
• Modeling and decision support systems for pest management
• Basic studies and information related to improving, maintaining, or restoring the inherent production capability of soils
• Forest and range plants
• Biodiversity in plant production systems

Insects, Mites, and Other Arthropods Affecting Plants
This area focuses on yield and quality affected by indigenous and exotic insects, mites, and other arthropods (including bees and other pollinators).
Areas of work include but are not limited to:
• Population dynamics, ecology, and behavior
• Biosystematics/taxonomy
• Impact of climate and other abiotic factors on pest biology and behavior
• Cultural practices to reduce infestations or effects
• Mechanisms of host plant resistance
• Breeding (including genetic engineering) for host plant resistance
• Pest resistance to control methods or strategies
• Efficacy, product performance, application technology, and population management with conventional pesticides and biopesticides (including pheromones and growth regulators)
• Development of sampling protocols (including economic injury levels, action thresholds, and remote sensing and other automated sampling methodologies) and predictive models for single pests
• Population and molecular genetics (e.g., physical linkage maps, gene expression, regulation, proteomics, mutagenesis, gene discovery)
• Nutrition, management, and productivity of bees and other pollinators
• Biosecurity measures to limit invasive insects, mites, and other arthropods in plant management systems.
Exclude:
• Integration of control tactics into systems for managing single pests or pest complexes
• Development of sampling protocols or predictive models for pest complexes
• Biological control
• Development of remote sensing instruments

• Evaluation of germplasm for genetic variation in resistance to pests
• Forest insects when work is not at the IPM systems level
• The role of insects, mites, and other arthropods in disease transmission
• Insect pests affecting humans
• Movement and dispersal resulting from airborne transport of pests

Pathogens and Nematodes Affecting Plants

This area focuses on yield and quality affected by indigenous and exotic bacteria, fungi, nematodes, viruses, and other pathogens.

Areas of work include but are not limited to:

• Mechanisms of infection, reproduction, systemic spread, and pathogenesis
• Epidemiology, ecology, and behavior
• Biosystematics/taxonomy
• Mechanisms of host plant resistance
• Breeding (including genetic engineering) for host plant resistance
• Cultural practices to reduce incidence, severity, or impacts
• The role of insects, mites, and other arthropods in pathogen transmission
• Efficacy, product performance, application technology, and population management with conventional pesticides and biopesticides (including pheromones and growth regulators)
• Pathogen resistance to control methods and strategies
• Development of sampling protocols (including economic injury levels, action thresholds, and remote sensing and other automated sampling methodologies) and predictive models for pathogen or nematode species
• Population and molecular genetics of nematodes (e.g., sequencing, proteomics, gene expression, regulation)
• Biosecurity measures to limit invasive pathogens and nematodes in plant management systems.

Exclude:

• Integration of control tactics into systems for managing pathogen or nematode species complexes
• Development of sampling protocols and predictive models for pathogen or nematode species complexes
• Biological control
• Development of remote sensing instruments
• Evaluation of germplasm for genetic variation in resistance to pathogens or nematodes
• Fundamental areas of plant genetics
• Movement and dispersal resulting from airborne transport of pathogens or Nematodes

Weeds Affecting Plants

This area focuses on yield and quality affected by competition from indigenous and exotic weeds, including aquatic weeds and parasitic plants.

Areas of work include but are not limited to:

• Population dynamics and ecology
• Biosystematics/taxonomy
• Effects of abiotic factors such as temperature, water, or nutrients
• Weed seed studies, including dormancy, survival, and depredation

• Cultural practices (including solar sterilization) to reduce weed populations or effects
• Breeding (including genetic engineering) for crop-weed management
• Efficacy, product performance, application technology, and population management with conventional pesticides and biopesticides (including growth regulators)
• Pest resistance to weed control methods and strategies
• Development of sampling protocols (including economic injury levels and remote sensing and other automated sampling methodologies) and predictive models for weeds
• Biosecurity measures to limit invasive weeds in plant management systems.
Exclude:
• Integration of control tactics into systems for managing single weed species or weed complexes
• Biological control
• Breeding (including genetic engineering) for biological efficiency
• Control of competing vegetation in urban forestry and agroforestry
• Protection of wildlife and natural resources from aquatic weeds
• Development of sampling protocols and predictive models for weed complexes
• Development of remote sensing instruments
• Toxic effects of weeds on animals
• Effects of weeds on human health, including allergies and toxicity
• Fundamental areas of plant genetics
• Movement and dispersal resulting from airborne transport of

Biological Control of Pests Affecting Plants
This area focuses on classical, augmentative, or inundative use of natural enemies (including microbial biological control agents) to manage plant pests (pathogens, insects, mites, nematodes, weeds, vertebrates, etc.).
Areas of work include but are not limited to:
• Basic biology and genetic improvement of natural enemies
• Ecology and conservation of natural enemies
• Population dynamic-epidemiologic-multitrophic interactions among natural enemies
• Collection and discovery of natural enemies
• Biosystematics/taxonomy
• Maintenance, mass production, quality control, and delivery systems for natural enemies
• Development of sampling protocols (including remote sensing and other automated sampling methodologies) and predictive models for natural enemies.
Exclude:
• Management of plant pests using methods other than biological control, including chemical, cultural, physical, and host plant resistance
• Integration of control tactics into systems for managing single pest species or pest complexes
• Development of sampling protocols and predictive models for pest management complexes
• Development of remote sensing instruments

Integrated Pest Management Systems
This area focuses on the integration of one or more control tactics into a system for managing single plant pests or pest complexes in an economically, socially, and environmentally sound manner.
Areas of work include but are not limited to:
• Understanding the biology of crop-pest-beneficial interactions (system ecology)
• Interactions among pest control tactics (may include cultural, mechanical, biological, and pesticide application tactics) and impacts on crop productivity
• Implementation of new knowledge and technologies on an area-wide or regional scale
• Impact of climate and other abiotic factors on pest management systems
• Determination of environmental impacts resulting from the use of IPM systems
• Development of sampling protocols (including economic injury levels, action thresholds, and remote sensing and other automated sampling methodologies) and predictive models for use in managing pest complexes and natural enemy populations
• Pest management problem specification in affected communities including growers/producers, processors, marketers, and consumers
• Determination of constraints to adoption of IPM methods, barriers to progress along the IPM continuum, and impacts.
• Acceptance of pest management systems.
Exclude:
• Single pest control tactics
• Evaluation of germplasm for genetic variation in resistance to pests
• Application of remote sensing and other automatic sampling methodologies in managing plant population densities, fertility, irrigation, and other cultural practices
• Development of sampling protocols and predictive models for single pests or natural enemies
• Movement and dispersal resulting from airborne transport of pests
• Development of remote sensing instruments
• Determination of economic and social impacts of IPM systems
• Impacts of pest management policies
• Consumer economics, including response to product labeling

Primary Program Emphasis Areas – Areas of Work Defined

2007 Addendum

Sustainable Plant Communities

Basic Plant Biology
This area focuses on inquiry into fundamental processes and mechanisms in plants and model organisms basic to the life of the plant.
Areas of work include but are not limited to:
• Characterization of structure-function relationships and metabolic pathways
• Mechanisms of energy transduction, conversion, and dissipation
• Mechanisms of uptake, transport, and storage of nutrients and gases
• Mechanisms of response to and transduction of biotic and abiotic factors
• Processes in endophytic or free-living microorganisms related to basic processes

in plants
• Processes related to seed development, respiration, and germination
• Mechanisms of cell division, expansion, and differentiation
• Processes related to the development of vegetative and reproductive structures.
Exclude:
• Genetic structures and mechanisms
• Plant population genetics
• Biological mechanisms that affect actual or potential yields
• Biological mechanisms related to biotic stress
• Forest and range plants

Vertebrates, Mollusks, and Other Pests Affecting Plants
This area focuses on yield and quality affected by indigenous and exotic vertebrate pests (including birds and mammals), mollusks (including slugs and snails), and other plant pests.
Areas of work include but are not limited to:
• Population dynamics and ecology
• Biosystematics/taxonomy
• Breeding (including genetic engineering) for host plant resistance
• Impact of climate and other abiotic factors on pest management
• Cultural practices to reduce infestations or effects
• Efficacy, product performance, application technology, and population management with conventional pesticides and biopesticides (including pheromones and growth regulators)
• Pest resistance to control methods or strategies
• Development of sampling protocols (including economic injury levels, action thresholds, and remote sensing and other automated sampling methodologies) and predictive models for an individual species
• Biosecurity measures to limit invasive vertebrates, mollusks, and other pests in plant management systems.
Exclude:
• Integration of control tactics into systems for managing single pests or pest complexes
• Biological control
• Evaluation of germplasm for genetic variation in resistance to pests
• Development of sampling protocols and predictive models for pest complexes
• Development of remote sensing instruments
• Fundamental areas of plant genetics
• Management of vertebrate pests in rangeland and forest systems, including agroforests and urban forests
• Management of vertebrate pests to protect property, endangered species, and community well-being