

**MANUAL OF CLASSIFICATION
OF
AGRICULTURAL AND FORESTRY
RESEARCH**

Revision VI

Classifications used in the
Current Research Information System

Issued by

U.S. Department of Agriculture
Cooperative State Research, Education, and Extension Service
Science and Education Resources Development
Current Research Information System

December 1998

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SUBJECT OF INVESTIGATION

NATURAL RESOURCES AND THEIR PRODUCTS

Code Subject

Soil and Land

0110 Soil
0120 Land
0199 Soil and land, general

Water

0210 Water resources

Watersheds and River Basins

0310 River basins
0320 Watersheds
0330 Wetland and riparian systems
0399 Watersheds and river basins, general

Atmosphere

0410 Air
0420 Weather
0430 Climate
0440 Solar radiation
0499 Atmosphere, general/other

Recreational Resources

0510 Wilderness
0520 Campgrounds and picnic areas
0530 Parks and urban green space
0599 Recreational resources, general/other

Trees, Forests, and Forest Products (excluding edible tree nut crops)

0610 Conifer forests of the North
0611 Conifer forests of the South
0612 Conifer forests of the West
0613 Mixed conifer-broadleaf forests
0620 Broadleaf forests of the North
0621 Broadleaf forests of the South
0622 Broadleaf forests of the West

- 0630 Chaparral and shrub lands
- 0640 Tropical forests
- 0650 Wood and wood products
- 0660 Paper and pulp derived products
- 0670 Short rotation woody crops, including holiday trees
- 0680 Other products of the forest
- 0699 Trees, forests, and forest products, general

Rangelands and Grasslands

- 0710 Desert and semidesert shrub land and shinnery
- 0720 Pinyon-juniper
- 0730 Mountain grasslands, meadow, and alpine
- 0780 Grasslands, other
- 0790 Rangelands, other
- 0799 Rangelands and grasslands, general

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- 0810 Finfish
- 0811 Shellfish
- 0812 Fish habitats
- 0819 Natural fisheries, other
- 0820 Wild birds
- 0830 Wild animals
- 0840 Fur-bearing animals
- 0850 Wildlife habitats
- 0860 Endangered species
- 0899 Wildlife and natural fisheries, general/other

PLANTS AND THEIR PRODUCTS

Code Subject

Citrus

- 0910 Grapefruit
- 0920 Orange
- 0930 Lemon
- 0999 Citrus, general/other

Tropical/Subtropical Fruit

- 1010 Banana
- 1020 Pineapple
- 1030 Papaya
- 1040 Mango

- 1050 Date
- 1060 Kiwi
- 1099 Tropical/subtropical fruit, general/other

Deciduous and Small Fruits

- 1110 Apple
- 1111 Apricot
- 1112 Cherry
- 1113 Nectarine
- 1114 Peach
- 1115 Pear
- 1116 Plum
- 1119 Deciduous tree fruits, general/other
- 1120 Blueberry
- 1121 Cranberry
- 1122 Strawberry
- 1123 Raspberry
- 1129 Berries and cane fruits, general/other
- 1130 Table grapes
- 1131 Wine grapes
- 1132 Raisin grapes
- 1139 Grapes, general/other
- 1199 Deciduous and small fruits, general/other

Edible Tree Nuts

- 1210 Filbert
- 1211 Pecan
- 1212 Almond
- 1213 Walnut
- 1219 Edible tree nuts, general/other

1310 Potato

Vegetables

- 1410 Beans (dry)
- 1411 Beans (fresh, fresh-processed)
- 1412 Peas (dry)
- 1413 Peas (fresh, fresh-processed)
- 1414 Lentil
- 1419 Leguminous vegetables, general/other
- 1420 Melons (includes cantaloupe, muskmelon, watermelon)
- 1421 Cucumber
- 1429 Cucurbits, other (includes pumpkin, squash, gourd)
- 1430 Greens and leafy vegetables (includes endive, lettuce, spinach, turnip-greens, celery,

- rhubarb, parsley, asparagus)
- 1440 Cole crops (includes cabbage, kale, broccoli, brussels sprouts, cauliflower, kohlrabi)
- 1450 Sweet potato
- 1451 Onion, garlic, leek, shallot
- 1452 Carrot
- 1453 Yam
- 1454 Taro
- 1455 Cassava (or manioc)
- 1459 Rhizomes, tubers, bulbs, and root crops, general/other (for potato use 1310)
- 1460 Tomato
- 1461 Peppers
- 1462 Eggplant
- 1469 Solanaceous and related crops, general/other (for potato use 1310)
- 1470 Mushrooms and other edible fungi
- 1480 Sweetcorn
- 1499 Vegetables, general/other

Grain Crops

- 1510 Corn (for sweetcorn use 1480)
- 1511 Popcorn
- 1520 Grain sorghum
- 1530 Rice
- 1540 Hard red winter wheat
- 1541 Hard red spring wheat
- 1542 Soft red wheat
- 1543 Soft white wheat (includes club, western)
- 1544 Hard white wheat
- 1545 Durum wheat
- 1549 Wheat, general/other
- 1550 Barley
- 1560 Oats
- 1570 Rye
- 1599 Grain crops, general/other (includes buckwheat, millet, triticale)

Pasture and Forage Crops

- 1610 Pasture
- 1620 Warm season perennial grasses (includes dallisgrass, bluestems, bermudagrass)
- 1621 Cool season perennial grasses (includes bluegrass, brome grass, fescue, orchardgrass, perennial ryegrass, timothy, wheatgrass)
- 1629 Perennial grasses, other
- 1630 Summer annual grasses (includes forage sorghums, sudangrass, sorghum-sudangrass hybrids)
- 1631 Winter annual grasses (includes annual ryegrass)
- 1639 Annual grasses, other
- 1640 Alfalfa
- 1641 Trefoil

- 1642 Red clover
- 1643 Crownvetch
- 1644 Winter annual legumes (includes subterranean clover, arrowleaf clover)
- 1649 Forage legumes, general/other
- 1699 Pasture and forage crops, general/other

Fiber Crops

- 1710 Upland cotton
- 1711 Long fiber cotton
- 1719 Cotton, other
- 1720 Kenaf
- 1730 Hemp
- 1740 Ramie
- 1750 Agave
- 1799 Fiber crops, general/other

Oilseed and Oil Crops

- 1810 Cottonseed (for meal, oil, etc.)
- 1820 Soybean
- 1830 Peanut
- 1840 Castor
- 1841 Crambe
- 1842 Flax
- 1843 Safflower
- 1844 Sunflower
- 1845 Jojoba
- 1846 Coconut
- 1847 Palm
- 1848 Canola
- 1849 Cuphea
- 1850 Lesquerella
- 1851 Meadowfoam
- 1852 Rape
- 1853 Sesame
- 1854 Chinese tallow
- 1855 Tung
- 1899 Oilseed and oil crops, general/other

Tobacco

- 1910 Flue-cured tobacco
- 1920 Burley tobacco
- 1930 Cigar-type tobacco
- 1999 Tobacco, general/other

Sugar Crops

- 2010 Sugar beet
- 2020 Sugar cane
- 2030 Sweet sorghum
- 2099 Sugar crops, general/other

Ornamentals and Turf

- 2110 Ornamental trees and shrubs
- 2120 Herbaceous perennials and decorative greens
- 2121 Cut flowers, foliage, and greens
- 2122 Potted plants
- 2123 Bedding/garden plants
- 2129 Florist crops, other
- 2130 Turf (includes bentgrass, bermudagrass, bluegrass, dichondra, fescue, ryegrass, zoysia)
- 2140 Ground covers
- 2150 Aquatic plants
- 2160 Arboreta and botanical gardens
- 2199 Ornamentals and turf, general/other (includes cacti)

Miscellaneous and New Crops

- 2210 Chemurgic crops
- 2220 Medicinal crops, non-narcotic
- 2221 Narcotic plants
- 2230 Hops
- 2231 Mint
- 2232 Coffee
- 2233 Cocoa
- 2234 Tea
- 2235 Herbs and spices
- 2239 Flavoring and beverage plants, general/other
- 2240 Guayule
- 2241 Hevea
- 2242 Gums
- 2249 Rubber, gum, and resin plants, general/other
- 2299 Miscellaneous and new crops, general/other

2300 Weeds

Plants

- 2410 Cross-commodity research--multiple crops
- 2420 Noncrop plant research
- 2499 Plant research, general

ANIMALS, INCLUDING INVERTEBRATES, AND THEIR PRODUCTS

Code Subject

Bees, Honey, and Other Pollinators

- 3010 Honey bees
- 3020 Honey and honey products
- 3030 Non-honey apiary products
- 3090 Other Pollinators
- 3099 Bees, honey, and other pollinators, general

Invertebrates

- 3110 Insects
- 3120 Spiders, mites, ticks, and other arthropods
- 3130 Nematodes
- 3199 Invertebrates, general/other

Poultry

- 3210 Egg-type chicken, live animal
- 3220 Meat-type chicken, live animal
- 3230 Turkey, live animal
- 3240 Duck and goose, live animal
- 3250 Ratites (e.g., ostrich, emu, rhea), live animal
- 3260 Poultry meat
- 3270 Eggs
- 3280 Other poultry products
- 3299 Poultry, general/other

Beef Cattle

- 3310 Beef cattle, live animal
- 3320 Meat, beef cattle
- 3330 Other beef cattle products
- 3399 Beef cattle, general/other

Dairy Cattle

- 3410 Dairy cattle, live animal
- 3420 Butter
- 3430 Cheese
- 3440 Meat, dairy cattle
- 3450 Milk
- 3460 Ice cream
- 3470 Other dairy cattle products

3499 Dairy cattle, general/other

Swine

3510 Swine, live animal
3520 Meat, swine
3530 Other swine products
3599 Swine, general/other

Sheep and Wool

3610 Sheep, live animal
3620 Meat, sheep
3630 Wool fiber
3699 Sheep and wool, general/other

Cultured Aquatic Animals

3710 Catfish
3711 Trout
3712 Salmon
3713 Striped bass
3714 Tilapia
3715 Baitfish (minnows and shiners)
3716 Ornamental finfish
3719 Other cultured finfish
3720 Crawfish
3721 Marine shrimp
3722 Freshwater shrimp
3723 Oysters
3724 Clams and mussels
3725 Ornamental shellfish
3729 Other cultured shellfish
3799 Cultured aquatic animals, general/other

Other Animals

3810 Horses, ponies, and mules
3820 Goats, meat and mohair
3830 Pets (companion animals)
3840 Laboratory animals
3899 Other animals, general

Animals

3910 Cross-commodity research--multiple animal species
3999 Animal research, general

MICROORGANISMS

Code Subject

- 4010 Bacteria
- 4020 Fungi (includes yeast)
- 4030 Viruses
- 4040 Viroids, mycoplasmas, spiroplasmas, etc.
- 4050 Protozoa
- 4099 Microorganisms, general/other

FOOD AND MANUFACTURED RESOURCES

Code Subject

- 5010 **Food** (not readily associated with specific plant and animal products)

Clothing and Textiles

- 5110 Clothing/apparel
- 5120 Textiles
- 5199 Clothing and textiles, general

Agricultural Supplies

- 5210 Fertilizers
- 5220 Pesticides (includes herbicides, insecticides, fungicides, etc.)
- 5230 Feed and feed additives
- 5240 Seeds and other plant propagules
- 5299 Agricultural supplies, general/other

Structures, Facilities, and Equipment

- 5310 Machinery and equipment
- 5320 Houses (human residences), furniture, household equipment, non-textile furnishings
- 5330 Farm structures and related facilities
- 5340 Nonfarm structures and related facilities, including those used in marketing, storing, processing, and distributing functions, and for recreational uses
- 5350 Domestic and community water supply facilities and systems
- 5360 Drainage and irrigation facilities and systems
- 5370 Sewage and waste disposal facilities and systems
- 5399 Structures, facilities, and equipment, general/other

HUMAN RESOURCES, ORGANIZATIONS, AND INSTITUTIONS

Code Subject

People and Communities

- 6010 Individuals (as workers, consumers, members of society)
- 6020 The family and its members
- 6030 The farm as an enterprise
- 6040 Real estate
- 6050 Communities, areas, and regions, including states and their institutions and organizations
- 6099 People and communities, general/other

Economy

- 6110 Economy of the United States and sectors thereof
- 6120 International economy and sectors thereof
- 6199 Economy, general/other

Marketing

- 6210 Farmer cooperatives
- 6220 Marketing, processing, and supply firms other than cooperatives
- 6230 Marketing systems and sectors thereof
- 6299 Marketing, general/other

OTHER TECHNOLOGIES

(Use the following classifications only if the research is not targeted at one or more previously listed specific commodities/products or resources)

Code Subject

- 7010 **Biological Cell Systems**
- 7110 **Research on research management** (not research management per se)

Research Equipment and Methods

- 7210 Remote sensing equipment and technology
- 7220 Sensory evaluation/analysis methods (human senses)
- 7299 Research equipment and methods, general/other

- 7310 **Experimental design and statistical methods**

- 7410 **General technology**

FIELD OF SCIENCE

Code Subject

Biological

1000	Biochemistry and biophysics
1010	Nutrition and metabolism
1020	Physiology
1030	Cellular biology
1040	Molecular biology
1050	Developmental biology
1060	Biology (whole systems)
1070	Ecology
1080	Genetics (includes breeding)
1090	Immunology
1100	Bacteriology
1101	Virology
1102	Mycology
1103	Other microbiology (includes protozoology, phycology, etc.)
1110	Parasitology
1120	Nematology
1130	Entomology and acarology
1140	Weed science
1150	Toxicology
1160	Pathology
1170	Epidemiology
1180	Pharmacology
1190	Limnology

Physical

2000	Chemistry
2010	Physics
2020	Engineering
2030	Geology
2040	Mineralogy
2050	Hydrology
2060	Geography
2061	Pedology
2070	Meteorology and climatology
2080	Mathematics and computer sciences
2090	Statistics, econometrics, and biometrics

Social and Behavioral

3000 Anthropology
3010 Economics
3020 Education
3030 Information and communication
3040 History
3050 Law
3060 Political science
3070 Psychology
3080 Sociology
3090 Sensory science (human senses)
3100 Management
3110 Art and architecture
3111 Landscape architecture

RESEARCH PROBLEM AREA

TOPIC AREA I. NATURAL RESOURCES AND ENVIRONMENT

SOIL

RPA 101. APPRAISAL OF SOIL RESOURCES

Research in support of soil mapping is concerned with identifying the important soil parameters for use in crop production, site-specific management, forest and range resource evaluation, housing developments, zoning, waste management, environmental urban planning, and other land uses. Soil surveys can also be used to show soil characteristics such as spatial and temporal variability, susceptibility to frost heave or slippage, depth to water table, depth to rock or other impermeable barriers, bearing strength, flood hazard, and soil erosion potential that affect suitability of a site for specific uses.

Areas of research include but are not limited to:

- Physical, chemical, mechanical, and biological characteristics of soils needed in soil classification and management.
- Identification of soil types and their suitability for specific uses.
- Appraisal of how soils behave under different levels of management and use such as crop production, logging, grazing, water utilization and yield, and other agricultural, forestry, waste disposal, and non-agricultural uses.
- Soil resource description and inventory, including their spatial and temporal variability.
- Use of geographic information systems and remote sensing technologies.

RPA 102. SOIL, PLANT, WATER, NUTRIENT RELATIONSHIPS

This problem area is concerned with the chemical and physical nature of interrelationships among soils, plants, water, and nutrients. The objective is to improve, maintain, or restore the inherent production capability of soils.

Areas of research include but are not limited to:

- Soil testing and plant analysis.
- Resource development, conservation, and management.
- Factors that limit root development of plants.
- Development of practical methods for ameliorating unfavorable conditions, such as tillage pans, nutrient deficiencies, and improper air-water relationships.
- Ways to maintain and improve soil structure by soil amendments and by soil, crop, tillage, and management systems.
- The effect of physical, chemical, and biological properties of soils on soil structure, resistance to erosion, availability of plant nutrients, and the general environment for plant roots.
- Chemical changes of nutrient elements in different kinds of soils and the factors affecting uptake by various crops.

- Methods to make beneficial changes in energy dissipation and utilization in the soil-plant-atmosphere relationships.
- Interrelationships between soil properties and their impacts on water storage and movement in the soil profile.
- Effects and actions of biological organisms on soil and organic matter function and plant relationships.
- Use of manures and other organic materials as plant nutrient sources.

Exclude research on:

- Precision farming methodology. (Use RPA 205 or 402)
- Response of plant species to variables of soil, plant, water, and nutrient conditions. (Use appropriate RPA under PLANTS AND THEIR SYSTEMS or FOREST AND RANGE RESOURCES)
- Effects of erosion, fire, flood, and other natural hazards on the soil resource. (Use RPA 104)

RPA 103. MANAGEMENT OF SALINE AND SODIC SOILS AND SALINITY

Injurious accumulations of salts may occur in the root zone of soil because salts move upward in the soil with water and are left behind as the water evaporates. Salts can be leached downward to the groundwater or to a drainage system as the result of heavy rainfall or irrigation. Salts generally come from irrigation water, but some soils naturally contain excessive quantities. Many complex problems are created by the combination of salts, soils, and climatic conditions and quality of irrigation or leaching water. Disposal of salts without degrading water quality for the downstream user is a critical problem. In the arid west, injurious concentrations of salts in the soil have impaired the use of up to 25 percent of irrigated land. Salinity and brackish water problems also occur in seaboard areas.

Areas of research include but are not limited to:

- Leaching theory and methods to predict rates and amounts of various qualities of leaching waters and related drainage system requirements to reclaim soils having salt accumulations.
- Methods of treating and managing saline irrigation water and leaching effluents.
- Management criteria for use of brackish water of various qualities under a wide range of soil, crop, and environmental conditions.
- Tillage, crop, soil amendment, leaching, and profile modification practices for crop production on saline and sodic soils.
- Interactions of soil structure, dissolved and adsorbed ions, microbial activity, organic matter, and moisture movement in the root zone of salt affected soils.
- Procedures and equipment for determining the salinity status of soils and irrigation waters.
- Studies on plants or cropping sequences to manage or improve saline soils.
- Breeding and selection of salt tolerant varieties.

Exclude research on:

- Effects of human-caused salt pollution such as that from industrial sources. (Use RPA 133)

RPA 104. PROTECT SOIL FROM HARMFUL EFFECTS OF NATURAL ELEMENTS

This research focuses on protection of soils from impairment as a result of natural events.

Areas of research include but are not limited to:

- Effects of wind and water erosion.
- Effects of floods.
- Effects of landslides.
- Effects of wildfire.
- Subsidence of organic soils.

Exclude research on:

- Resource development and conservation management. (Use RPA 102, 112, or 131)

WATER

RPA 111. CONSERVATION AND EFFICIENT USE OF WATER

Research in this area attempts to increase efficiency in collecting, storing, conveying, using, and reusing available water resources.

Areas of research include but are not limited to:

- Procedures to monitor and improve effectiveness of water storage in the soil profile and underground aquifers.
- Improved water conservation practices such as residue management that will be compatible with modern mechanized agricultural practices.
- Selection and breeding of plant varieties to make efficient use of water through the various stages of plant growth.
- Alternative practical techniques for reducing water loss from plant, soil, and water surfaces.
- Practices to enhance water infiltration, transmission, and use by plants.
- Methods to conserve, replenish, and effectively use water in underground storage.
- Studies designed to control phreatophytes and aquatic weeds to reduce the damage or losses they cause.
- Water in wetland and riparian systems.

Exclude research on:

- Aquatic weeds as a pollutant. (Use RPA 133)
- Economic and policy issues of water. (Use RPA 605 or 610)

RPA 112. WATERSHED PROTECTION AND MANAGEMENT

This research program area is intended to focus on soil and water management problems at whole watershed scales, as opposed to problems of more localized scale. These watersheds include the

cropland of the U.S. as well as range and forest lands. Watershed research can encompass one or more of the following: flood prevention systems, sediment control, wind and water erosion control, and management strategies oriented toward water yield and quality.

Areas of research include but are not limited to:

- New concepts and mathematical expressions of the erosion processes by wind and water at the watershed scale.
- Procedures for identifying sediment sources, predicting and measuring sediment deposition, and methods for sediment control.
- Measures for controlling erosion on watershed lands and stream channel systems in rural and urban environments, and methods for reclaiming eroded lands.
- Methods for quantifying the role of soil and vegetation in the hydrologic performance of watersheds and river basins, and the impact of management practices which change topographic and vegetative characteristics.
- Improved procedures for use of watersheds and river basins to assure needed agricultural and forest products, keep soil erosion and sedimentation to an acceptable minimum, and supply reliable quantities of good quality water for domestic, agricultural, municipal, and industrial uses.
- Alternative land and water management practices including cover manipulation to improve the quality, quantity, and timing of surface and subsurface water yields from watersheds and river basins.
- Alternative systems for managing water storage and movement to reduce floods and dispose of excess water, maintain stable stream channels, and provide water for beneficial uses.
- Design and implementation of practices for the reclamation of soil that have been drastically disturbed due to construction, surface mining, mineral extraction, and other causes.

Exclude research on:

- Economic and policy issues of watershed management. (Use RPA 605 or 610)

FOREST AND RANGE RESOURCES

RPA 121. MANAGEMENT OF RANGE RESOURCES

Research in this area includes investigations of biological processes and ecological relationships, improved range management techniques, and better appraisals of range conditions for production of livestock forage, water yield, and wildlife habitat.

Areas of research include but are not limited to:

- Determination of types of information needed and standards of estimation.
- Improvement of rangeland evaluation methods to reduce costs and increase the usefulness of information obtained, including aerial photography, geographic information systems (GIS), trend projections, and computers for data analysis.
- Appraisal to provide up-to-date information on the quality, quantity, and productivity of range resources.

- Appraisals for use in development of resource programs.
- Projecting future demand for range forage and other benefits normally related to the wise use of rangelands.
- Physiology and ecology of rangeland plant communities.
- Range characteristics, including identification, physiological requirements, and nutritive value of forage plants.
- Understanding range ecosystems and their biotic and physical components.
- Improvement through breeding and selection of browse plants for forage, protection, and aesthetic purposes.
- Revegetation of deteriorated areas by seeding desirable species.
- Systems for managing ranges including fertilization, mechanization, grazing pressure, and drainage to increase yields.
- Management practices that harmonize grazing with timber growing, wildlife, recreation, and other land uses.
- Riparian areas and wetlands associated with rangeland habitats and their importance to these ecosystems.
- Forested range management.
- Protection against insects and diseases.
- Invasive/alien plant deterioration of rangelands.

Exclude research on:

- Studies focused on improvement of wildlife habitat. (Use RPA 135)
- Watershed systems and cumulative effects. (Use RPA 112)
- Protection against fire. (Use RPA 122)
- Agroforestry. (Use RPA 125)
- Economic and policy issues of range management. (Use RPA 605 or 610)
- Use of prescribed fire for maintenance of range ecosystems. (Use RPA 122)
- Biological control of pests. (Use RPA 215)
- Integration of pest control tactics into an integrated pest management (IPM) system. (Use RPA 216)

RPA 122. MANAGEMENT AND CONTROL OF FOREST AND RANGE FIRES

Fire research determines where, when, and how to use prescribed fire to maintain fire-dependent ecosystems without unduly endangering other resources and facilities. This research develops new wildfire prevention methods, new technology for fuel hazard reduction, improved systems for wildfire detection, and effective attack methodology for threatening fires.

Areas of research include but are not limited to:

- Fire-related biology and ecology of plants and animals.
- Atmospheric and ecosystem dynamics, patterns, and characteristics.
- Physics and chemistry of combustion.
- Behavior of fire as influenced by fire-starting agents, atmospheric circulation, and local weather, fuels, and topography.
- Fire intelligence systems, including electronic methods, remote sensing, automatic measurement of fire environment, and computer integration of these factors into a fire danger

rating system.

- Reduction of fuel hazards through physical, chemical, and prescribed fire treatments.
- Aerial and ground procedures for fighting fires.
- Integrated prescribed fire control and forest management systems which minimize wildfire losses.
- Use of prescribed fire to maintain the integrity and function of range ecosystems.

Exclude research on:

- Protecting soil from fire damage. (Use RPA 104)
- Protection from pollution. (Use RPA 133)
- Control of hazards to fire fighting personnel. (Use RPA 723)
- Economic and policy issues of forest and range fire. (Use RPA 605 or 610)

RPA 123. MANAGEMENT OF FOREST RESOURCES

Research includes investigations of biological processes and ecological relationships, improved silvicultural techniques for commercial and other timber species, and better methods for forecasting growth and quality changes in relation to management practices. Sustainability of forest production related to improved management practices includes improving biological efficiency of forest trees. Development of new techniques for intensive culture and for combining timber culture with other management objectives are included. Research includes forest resources extractable or usable by society, including timber, mushrooms, boughs, medicinal plants, berries, etc.

Areas of research to include but are not limited to:

- Intensive forest management.
- Studies of forest ecosystem and community structure and function.
- Physiology and ecology of forest trees and plant communities.
- Selection and breeding of trees.
- Protection against insects and diseases.
- Determination of types of information needed and standards of estimation.
- Improvement of inventory methods to reduce costs and increase usefulness of information obtained, including emphasis on geographic information systems (GIS), aerial photography, trend projections, and use of computers for data analysis.
- Appraisals and inventories for use in development of resource programs.
- Seed orchard management, seed harvesting, processing, and storage methods.
- Nursery culture, planting, and direct seeding.
- Invasive/alien plant deterioration of timberlands.
- Techniques to encourage natural regeneration.
- Use of prescribed fire and other measures to control competing vegetation, stand composition, and habitat characteristics.
- Planning and techniques for long-term management of forests for timber production in harmony with other uses, including wildlife and recreation.
- Theory, instrumentation, and methods of mensuration for estimating timber growth, yield, and quality.
- Cultural techniques, including spacing, fertilization, liming, and irrigation for the production of

timber-related crops from improved strains.

- Effects of environment and genetics on wood properties.
- Relation of timber species and quality to wood properties and use.

Exclude research on:

- Forest watersheds. (Use RPA 112 or 605)
- Protection against wildfire and fire-related biology and ecology of biota. (Use RPA 122)
- Agroforestry. (Use RPA 125)
- Urban forestry. (Use RPA 124)
- Forest recreation. (Use RPA 134)
- Forested range. (Use RPA 121)
- Economic and policy issues of forests and forestry. (Use RPA 605, 610, or 611)
- Biological control of pests. (Use RPA 215)
- Integration of pest control tactics into an integrated pest management (IPM) system. (Use RPA 216)

RPA 124. URBAN FORESTRY

This research concentrates on the use of trees to improve or maintain the quality of urban and suburban environments and to enhance natural beauty through tree plantings. Tree plantings for special purposes include: visual screening, noise suppression, air quality improvement, shade, and beautification. Identification and development of species capable of living under adverse conditions such as smoke, air pollution, compacted soils, deficient or excessive moisture, and other unfavorable conditions associated with urban environments is included in this category.

Areas of research include but are not limited to:

- Selection and breeding of trees for urban environments, shade, and other special characteristics.
- Protection of trees from damage by animals, wildfire, floods, insects, diseases, or other harmful agents.
- Methods of site preparation and tree establishment appropriate for special-purpose plantings.
- Urban tree biology, including culture and maintenance of urban trees and stands.
- Soil and site requirements of species needed to improve the environment.
- Physical, biological, wildlife, and social benefits of urban trees/forests, including psychological and physical health.
- Multiple effects of urban forests such as lowering the "heat island" effect, reduction of air and water pollution, and improvement of property values.

Exclude research on:

- Commercial products. (Use RPA 123)
- Studies specific to pollution. (Use RPA 133)
- Agroforestry. (Use RPA 125)
- Economic and policy issues of urban forests. (Use RPA 605)
- Biological control of pests. (Use RPA 215)
- Integration of pest control tactics into an integrated pest management (IPM) system. (Use RPA

216)

RPA 125. AGROFORESTRY

Agroforestry is a group of practices that intentionally combine trees or shrubs with crop or livestock operations, or use trees at the agriculture/community interface to help create more integrated, diverse, and sustainable farms, non-industrial forests, ranches, and rural communities. Agroforestry practices are designed to incorporate the use of trees into agricultural settings to accomplish social, economic, and environmental objectives. The main types of agroforestry include alley cropping, riparian buffers, forest farming, windbreaks, and silvopasture.

Areas of research include:

- Biological interactions created or altered by agroforestry plantings.
- Ecological roles of agroforestry systems at the landscape level.
- Techniques for establishment, management, and renovation of agroforestry practices.
- Enhancing performance of agroforestry plantings for economic, social, and environmental services, and rural development.
- Selection and breeding of plant materials for agroforestry.
- Protection of trees and shrubs in agroforestry plantings from damage by animals, wildfire, floods, insects, diseases, or other harmful agents.
- Identification of new and innovative woody plant species and arrangements to enhance economic returns from agroforestry practices (e.g., specialty crops: medicinal herbs, floral products, Christmas trees, wood products).
- Generating income-producing opportunities from land devoted to conservation-oriented agroforestry.
- Integrating agroforestry technologies and plant materials into appropriate conservation or production systems for farms, ranches, communities, and non-industrial forests.
- Identifying social and economic constraints to agroforestry adoption.
- Land use planning tools to integrate agroforestry practices into watersheds.
- Role of agroforestry systems (e.g., crop production, biodiversity, and carbon sequestration) to mitigate hypothesized negative impacts of climate change.

Exclude research on:

- Management of forests. (Use RPA 123)
- Biological control of pests. (Use RPA 215)
- Integration of pest control tactics into an integrated pest management (IPM) system. (Use RPA 216)

NATURAL RESOURCES, GENERAL

RPA 131. ALTERNATIVE USES OF LAND

Research in this area is concerned with evaluation of alternative uses of land to determine short- and long-term benefits. Changes in land use in response to population growth, urban and suburban growth, recreational needs, and other factors affecting the fixed supply of land are

included in this research.

Areas of research include but are not limited to:

- Inventory and appraisal of current and potential land uses.
- Parameters and models for evaluating benefits.
- Appraisal of future land requirements for non-agricultural uses such as forestry, recreation, highway, urban, and industrial development.
- Conservation and management practices.

Exclude research on:

- Economic (i.e., cost-benefit analysis) alternative evaluations. (Use RPA 605)
- Economic and policy issues affecting land use. (Use RPA 605 or 610)

RPA 132. WEATHER AND CLIMATE

Research on the impact of weather and climate on agriculture has three tasks: (1) characterize existing climatic patterns and propose more effective ways of adjusting to these patterns, (2) specify modifications in management approaches that are desirable to farm and forest managers, and (3) learn how potential modifications affect agriculture or natural ecology.

Areas of research include but are not limited to:

- Understanding the sequences and duration of weather events and the response of relevant biota.
- Probabilities of occurrence of weather conditions critical to agricultural operations.
- Methods for incorporating climatology in the strategies, forecasts, and decision-making tactics of agriculture.
- Biological consequences of climatic changes.
- Drivers of weather, climate, or climate change.
- Mechanisms by which micrometeorology controls the reentry of pesticides, herbicides, and other agricultural chemicals into the atmosphere.
- Micro- and meso-climatological conditions regulating the airborne transport of insects, bacteria, fungi, and other particulates.
- Mechanisms by which micrometeorology affects gas and water exchange at the plant-atmosphere boundary layer.

Exclude research on:

- Lightning and other weather-related forest fire studies. (Use RPA 122)
- Weather/climate data obtained from integrated pest management research. (Use RPA 216)

RPA 133. POLLUTION PREVENTION AND MITIGATION

Agricultural research is concerned with preventing, alleviating, and mitigating pollution initiated by agricultural and forestry practices and its detrimental effects on agricultural plants, animals, soil, air, water, and humans. Potential pollutants include: organic pesticides, radio-nuclides, fertilizer

chemicals, growth regulating chemicals, animal and crop wastes, mulching materials, pathogenic microorganisms, heavy metals, salts used on roads for de-icing, allergens, airborne particulates, dust, ozone, odors, volatile compounds, gases, combustion products, smoke, and smog. This research focuses on agricultural production, not on health hazards to humans, which are covered in RPA 723, Hazards to Human Health and Safety.

Areas of research include but are not limited to:

- Sources, character, intensity, and causes of pollution from agricultural and forest practices and frequency of occurrence.
- Behavior and fate of pesticides and other pollutants in air, soil, and water.
- Tolerance of plants, animals, humans, and insects to pollutants, including low levels of pollutants for prolonged periods of time.
- Breeding and selection of forest and range plants resistant to pollution.
- Public policy that would reduce pollution.
- New or alternative agricultural and forestry practices and methods of reducing and controlling pollution to levels that are not harmful to natural resources, plants, animals, and humans, or methods that will prevent emission of the pollutant.
- Role and use of living organisms in removing pollutants from the environment.
- Minimum environmental quality standards for natural resource health and integrity.
- Methodology and instrumentation for detection of pollutants and methods of analysis.
- Methods of monitoring air, water, soil, and other media for pollutants and maintenance of networks that conduct this monitoring.
- Methods and equipment for protecting plants and animals from pollutants.
- Effects and remedial measures related to atmospheric deposition.
- Protection against radiation and other hazards.
- Remediation of polluted areas.
- Alleviating odors, dust, and noise.
- Aquatic weeds as a pollutant.
- Modeling pollutant load and delivery to air, soil, and water resources.

Exclude research on:

- Trees to enhance rural and urban environments. (Use RPA 124)
- Protecting humans from harmful effects of microorganisms and naturally-occurring toxins. (Use RPA 712)
- Collecting, moving, storing, recycling, or disposing of plant, animal, and radioactive or industrial wastes. (Use RPA 403)
- Safe methods for disposing of pesticides or other agricultural chemicals. (Use RPA 403 or 723)
- Methods and equipment to protect humans from pollutants. (Use RPA 723)
- Protection of humans from non-food allergens and toxins, and poisonous plants. (Use RPA 723)
- Protection of humans from radiation. (Use RPA 723)
- Mitigation of odors, dust, and noise hazardous to humans. (Use RPA 723)

RPA 134. OUTDOOR RECREATION

Outdoor recreation research develops information to guide the management of rural lands for recreation and help coordinate this use with other land resources. Research involves problems in management of physical resources, as well as socioeconomic relationships of users of the resources.

Areas of research include but are not limited to:

- Determining the demand for outdoor recreation.
- Criteria for selecting sites that will attract and support heavy recreation use.
- Developing practical methods to maintain existing recreation sites and restoring those depleted by heavy use.
- Requirements for aesthetic landscapes and means for producing and maintaining them.
- Methods for the protection, management, and recreational use of wilderness-type historical and archeological areas and scenic landscapes.
- Management systems and special equipment and facilities that will minimize dangers from fire, avalanches, and other natural hazards.
- Understanding of visitor preferences and attitudes regarding outdoor recreation opportunities.

Exclude research on:

- Economic evaluation of recreation and recreation resources. (Use RPA 605)
- Recreation policy. (Use RPA 610)

RPA 135. AQUATIC AND TERRESTRIAL WILDLIFE

Research on wildlife includes threatened and endangered species, fur-bearing animals, fish, and other aquatic life. Research includes maintaining and enhancing habitats for wildlife, and determination of the biological requirements and relationships between and among species, including cover and food requirements.

Areas of research include but are not limited to:

- Life histories and population dynamics of fish, fur-bearing animals, and wildlife, including non-game and threatened or endangered species, aquatic organisms, and plants that provide wildlife food and shelter.
- Ecological and physiological requirements of wildlife.
- Adaptation of plants to sites, and selection and genetic improvement of both native and exotic food and cover plants.
- Improving wildlife habitat through such measures as seeding, planting, prescribed burning, spraying, fertilizing, and manipulation of native vegetation.
- Improving fish habitat and food supplies through management and restoration of streamside vegetation, stream channels, and spawning beds.
- Breeding habits, selection, feeding habits, and management of wildlife.
- Breeding, selection, and management of fish and other aquatic animals.
- Biology and environmental requirements of aquatic life and possibilities of environmental habitat enhancement.
- Protection of wildlife against insects, diseases, and other hazards, except pollutants.
- Management of vertebrate pests to protect property, endangered species, and community

well-being.

Exclude research on:

- Pollution prevention and mitigation. (Use RPA 133)
- New and improved animal products. (Use RPA 308, 502, or 511)
- Farm-raised fish, shellfish, game and fur-bearing animals, and other wildlife. (Use appropriate RPA under ANIMALS AND THEIR SYSTEMS)
- Economics and monetary valuing of wildlife. (Use RPA 605)
- Protection of crops from vertebrate pests. (Use RPA 214)
- Protection of livestock from vertebrate pests. (Use RPA 314)
- Protection of humans from diseases transmitted from wildlife. (Use RPA 722)
- Wildlife policy. (Use RPA 610)

TOPIC AREA II. PLANTS AND THEIR SYSTEMS

PLANT PRODUCTION

RPA 201. PLANT GENOME, GENETICS, AND GENETIC MECHANISMS

This research is focused on development 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 research include but are not limited to:

- Sequencing of plant genomes and development or identification of molecular tools such as molecular markers, expressed sequence tags, and quantitative trait loci (QTL).
- Genetic structures and mechanisms.
- Genetic engineering technology, including development of regeneration and tissue culture techniques.
- Genetics of plant populations.
- Inheritance of traits.
- Plant genome databases and associated bioinformatics.

Exclude research on:

- 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 RPAs 203, 204, 211-214)
- Use of genomic technology to characterize or evaluate germplasm. (Use RPA 202)
- Population genetics associated with germplasm preservation. (Use RPA 202)
- Forest and range plants. (Use RPA 121, 123, 124, or 125)

RPA 202. PLANT GENETIC RESOURCES AND BIODIVERSITY

This research is focused 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 research 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 genes within crop gene pools, and adaptation of material to daylength or other cultural requirements.
- Long-term storage of genetic materials, including seeds and vegetatively propagated materials.

Exclude research on:

- Breeding for specific traits, including the use of molecular tools such as molecular markers, expressed sequence tags, and QTL. (Use RPAs 203, 204, 211-214)
- Seed processing for short-term storage or commercial use. (Use RPA 512)
- Forest and range plants. (Use RPA 121, 123, 124, or 125)

RPA 203. PLANT BIOLOGICAL EFFICIENCY AND ABIOTIC STRESSES AFFECTING PLANTS

This research is focused on understanding and improving plant productivity and quality affected by reduced inputs or abiotic stresses such as water, temperature, or nutrients.

Areas of research 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 research on:

- Basic plant biology. (Use RPA 206)
- Integration of this research into production management systems. (Use RPA 205)
- Breeding (including genetic engineering) for quality improvement. (Use RPA 204)
- Breeding (including genetic engineering) for host plant resistance. (Use RPA 211, 212, or 214)
- Breeding (including genetic engineering) for crop-weed management. (Use RPA 213)
- Evaluation of germplasm for variation in biological efficiency or stress tolerance. (Use RPA

202)

- Effects of abiotic factors on pests. (Use RPAs 211-214)
- Effects of pollution stress on plants. (Use RPA 133)
- Forest and range plants. (Use RPA 121, 123, 124, 125, or 133)

RPA 204. PLANT PRODUCT QUALITY AND UTILITY (PREHARVEST)

This research is focused on maintaining or improving specific quality or utility parameters within biological material before harvest.

Areas of research 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 research on:

- Basic plant biology. (Use RPA 206)
- Postharvest quality and utility. (Use RPA 502, 503, 511, 711, or 712)
- Integration of research results into production management systems. (Use RPA 205)
- Evaluation of germplasm for variation in specific quality or utility parameters. (Use RPA 202)
- Fundamental areas of genetics. (Use RPA 201)
- Seed processing technology. (Use RPA 512)
- Forest and range plants. (Use RPA 121, 123, 124, or 125)

RPA 205. PLANT PRODUCTION MANAGEMENT SYSTEMS

This research is focused on integration of production practices into an integrated system for managing annual and perennial plant population densities, fertility, irrigation, and other cultural practices in an efficient and effective manner.

Areas of research 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.

Exclude research on:

- Development of integrated pest management systems. (Use RPA 216)
- Application of remote sensing and other automated sampling methodologies for pest management. (Use RPAs 211-216)
- Modeling and decision support systems for pest management. (Use RPA 216)
- Basic studies related to improving, maintaining, or restoring the inherent production capability

- of soils. (Use RPA 102)
- Forest and range plants. (Use RPA 121, 123, 124, or 125)

RPA 206. BASIC PLANT BIOLOGY

This research is focused on inquiry into fundamental processes and mechanisms in plants and model organisms basic to the life of the plant.

Areas of research 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.

Exclude research on:

- Genetic structures and mechanisms. (Use RPA 202)
- Plant population genetics. (Use RPA 202)
- Biological mechanisms that affect actual or potential yields. (Use RPA 203)
- Biological mechanisms related to biotic stress. (Use RPAs 211-214)
- Forest and range plants. (Use RPA 121, 123, 124, or 125)

PLANT PROTECTION

RPA 211. INSECTS, MITES, AND OTHER ARTHROPODS AFFECTING PLANTS

This research is focused on reducing yield and quality loss due to indigenous and exotic insects, mites, and other arthropods.

Areas of research include but are not limited to:

- Population dynamics and ecology.
- 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.
- Genetics, behavior, and management (health and productivity) of bees and other pollinators.

Exclude research on:

- Integration of control tactics into systems for managing single pests or pest complexes. (Use RPA 216)
- Development of sampling protocols or predictive models for pest complexes. (Use RPA 216)
- Biological control. (Use RPA 215)
- Development of remote sensing instruments. (Use RPA 404)
- Evaluation of germplasm for genetic variation in resistance to pests. (Use RPA 202)
- Fundamental areas of genetics. (Use RPA 201)
- Forest insects when research is not at the IPM systems level. (Use RPA 121, 123, 124, or 125)
- The role of insects, mites, and other arthropods in disease transmission. (Use RPA 212)
- Insect pests affecting humans. (Use RPA 721 or 722)
- Movement and dispersal resulting from airborne transport of pests. (Use RPA 132 or 133)

RPA 212. DISEASES AND NEMATODES AFFECTING PLANTS

This research is focused on reducing yield and quality loss due to indigenous and exotic bacteria, fungi, nematodes, viruses, and other pathogens.

Areas of research include but are not limited to:

- Mechanisms of infection, reproduction, systemic spread, and pathogenesis.
- Epidemiology and ecology.
- 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 disease transmission.
- Efficacy, product performance, application technology, and population management with conventional pesticides and biopesticides (including pheromones and growth regulators).
- Pest 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 single pests.

Exclude research on:

- Integration of control tactics into systems for managing single pests or pest complexes. (Use RPA 216)
- Development of sampling protocols and predictive models for pest complexes. (Use RPA 216)
- Biological control. (Use RPA 215)
- Development of remote sensing instruments. (Use RPA 404)
- Evaluation of germplasm for genetic variation in resistance to pests. (Use RPA 202)
- Fundamental areas of plant genetics. (Use RPA 201)
- Movement and dispersal resulting from airborne transport of pests. (Use RPA 132 or 133)

RPA 213. WEEDS AFFECTING PLANTS

This research is focused on reducing yield and quality losses due to competition from indigenous and exotic weeds, including aquatic weeds and parasitic plants.

Areas of research 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.

Exclude research on:

- Integration of control tactics into systems for managing single pests or pest complexes. (Use RPA 216)
- Biological control. (Use RPA 215)
- Breeding (including genetic engineering) for biological efficiency. (Use RPA 203)
- Control of competing vegetation in urban forestry and agroforestry. (Use RPA 124 or 125)
- Protection of wildlife and natural resources from aquatic weeds. (Use RPA 135)
- Development of sampling protocols and predictive models for pest complexes. (Use RPA 216)
- Development of remote sensing instruments. (Use RPA 404)
- Toxic effects of weeds on animals. (Use RPA 314)
- Effects of weeds on human health, including allergies and toxicity. (Use RPA 723)
- Fundamental areas of plant genetics. (Use RPA 201)
- Movement and dispersal resulting from airborne transport of pests. (Use RPA 132 or 133)

RPA 214. VERTEBRATES, MOLLUSKS, AND OTHER PESTS AFFECTING PLANTS

This research is focused on reducing yield and quality losses due to indigenous and exotic vertebrate pests (including birds and mammals), mollusks (including slugs and snails), and other plant pests.

Areas of research 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 single pests.

Exclude research on:

- Integration of control tactics into systems for managing single pests or pest complexes. (Use RPA 216)
- Biological control. (Use RPA 215)
- Evaluation of germplasm for genetic variation in resistance to pests. (Use RPA 202)
- Development of sampling protocols and predictive models for pest complexes. (Use RPA 216)
- Development of remote sensing instruments. (Use RPA 404)
- Fundamental areas of plant genetics. (Use RPA 201)
- Management of vertebrate pests in rangeland and forest systems, including agroforests and urban forests. (Use RPA 121, 123, 124, or 125)
- Management of vertebrate pests to protect property, endangered species, and community well-being. (Use RPA 135)

RPA 215. BIOLOGICAL CONTROL OF PESTS AFFECTING PLANTS

This research is focused on classical, augmentative, or inundative use of natural enemies (including microbial biological control agents) to manage plant pests (diseases, insects, mites, nematodes, weeds, vertebrates, etc.).

Areas of research 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 research on:

- Management of plant pests using methods other than biological control, including chemical, cultural, physical, and host plant resistance. (Use RPAs 211-214)
- Integration of control tactics into systems for managing single pests or pest complexes. (Use RPA 216)
- Development of sampling protocols and predictive models for pest management complexes. (Use RPA 216)
- Development of remote sensing instruments. (Use RPA 404)

RPA 216. INTEGRATED PEST MANAGEMENT SYSTEMS

This research is focused 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 research include but are not limited to:

- Understanding the biology of crop-pest-beneficial interactions (system ecology).
- Interactions among pest control 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.

Exclude research on:

- Single pest control tactics. (Use RPAs 121, 123, 124, 125, or 211-215)
- Evaluation of germplasm for genetic variation in resistance to pests. (Use RPA 202)
- Application of remote sensing and other automatic sampling methodologies in managing plant population densities, fertility, irrigation, and other cultural practices. (Use RPA 205)
- Development of sampling protocols and predictive models for single pests or natural enemies. (Use RPAs 121, 123, 124, 125, or 211-215)
- Movement and dispersal resulting from airborne transport of pests. (Use RPA 132)
- Development of remote sensing instruments. (Use RPA 404)
- Determination of economic and social impacts of IPM systems. (Use RPA 601, 605, or 803)
- Impacts of pest management policies. (Use RPA 610)
- Consumer economics, including response to product labeling. (Use RPA 607)

TOPIC AREA III. ANIMALS AND THEIR SYSTEMS

ANIMAL PRODUCTION

RPA 301. REPRODUCTIVE PERFORMANCE OF ANIMALS

Animal reproductive biology involves a multi-disciplinary approach to solve costly reproductive problems and improve reproductive efficiency. Understanding factors that control reproduction provides methodologies for improving reproduction. New reproductive technologies will evolve from research on puberty, ovarian function and cycles, gamete formation and maturation, fertilization, establishment and maintenance of pregnancy, and placental function, including maternal-fetal interactions, fetal development and growth, and parturition.

Areas of research include but are not limited to:

- Reducing the age of first breeding in females.
- Improving libido and reducing physical and psychological barriers to mating.
- Methods to control estrus and ovulation.
- Semen metabolism and preservation, and artificial insemination techniques.
- Effects of stress factors on reproductive performance.
- Controlling sex of offspring through sperm separation and other means.
- Increasing the fertilization and conception rate of available ova.
- Increasing the number of potentially fertilizable ova.
- Reducing prenatal, natal, and postnatal mortality.
- Improving mothering ability.
- Methods for early diagnosis of pregnancy.
- Fundamental studies to determine molecular, cellular, and metabolic mechanisms regulating reproduction.
- Development of reproductive technologies.
- Methods to improve spawning efficiency in fish and shellfish.
- Methods to enhance larval rearing in fish and shellfish.

Exclude research on:

- Nonfarm-raised fish and shellfish, game and fur-bearing animals, and other wildlife. (Use RPA 135)
- Genetic studies to improve reproductive performance. (Use RPA 303)
- Identification of genes that have an effect on reproduction and how they are controlled or regulated. (Use RPA 304)

RPA 302. NUTRIENT UTILIZATION IN ANIMALS

The efficiency with which animals convert feedstuffs to human food and other products varies among species, animal products produced, and types of diets. Enhancing the efficiency of nutrient utilization for animal productivity will require fundamental knowledge on a wide range of science areas such as molecular and cellular biology, digestion, metabolic processes, and feed processing technology.

Areas of research include but are not limited to:

- Digestion and metabolism.
- Nutrients required for specific life processes and longevity.
- Hormone and nutrient interactions for maintenance, growth, lactation, and other productivity functions.
- Composition and biological availability of nutrients of animal feed.
- Effects of processing and feeding system on nutritive values of animal feed.
- Alternate sources of nutrients, including forages and agricultural byproducts.

Exclude research on:

- Reduction of waste carcass fat and proportion of low meat yield cuts. (Use RPA 308)

RPA 303. GENETIC IMPROVEMENT OF ANIMALS

A critical component for improving production efficiency of agriculturally important animal species is through more effective genetic improvement programs. Achieving this requires the development and application of expanded genetic information and technology ranging from molecular to quantitative and statistical.

Areas of research include but are not limited to:

- Estimation of genetic parameters (e.g., heritability, genetic variances and covariances, heterosis, and breeding values).
- Selection studies.
- Breed evaluation studies.
- Mating systems.
- Development of breeding goals and strategies.
- Identification of genetic defects.
- Incorporation of molecular and genomic information into applied genetic improvement programs.
- Acquisition and preservation of genetic resources.

Exclude research on:

- Reduction of waste carcass fat and proportion of low meat yield cuts. (Use RPA 308)
- Gene mapping and fundamental molecular genetic and genomic information. (Use RPA 304)
- Gene identification, regulation, and control. (Use RPA 304)

RPA 304. ANIMAL GENOME

New developments in molecular biology and the emergence of mapping the human genome have led to the development of research to map and understand the genome of agriculturally important animal species. A more complete understanding of animal genome will provide fundamental information important to genetics, physiology, nutrition, and related sciences relevant to animal production.

Areas of research include but are not limited to:

- Gene mapping, linkage and physical.
- Gene identification, function repetition, and control.
- Genetic engineering and gene manipulation.
- DNA cloning and sequencing.
- QTL identification and development of marker assisted selection procedures.

Exclude research on:

- Application of marker assisted selection in applied breeding programs. (Use RPA 303)

RPA 305. ANIMAL PHYSIOLOGICAL PROCESSES

The overall productivity, efficiency, and well-being of agricultural animals is determined by numerous complex and interactive biological processes and interconversions. Research in this

area includes studies of the fundamental physiological processes within the animal at the organismal, organ system, cellular, and molecular level.

Areas of research include but are not limited to:

- Chemical and structural organization of animal cells and their specialized properties and functions, including enzymatic machinery and biochemical conversions.
- Organization, structure, and function of organ systems, including endocrine, circulatory/vascular, urinary, nervous, muscular, and skeletal systems, the sense organs, the common integument and its derivatives, and body fluids.
- Physiology of vital life processes and mechanisms of function and control.
- Neural, hormonal, or other chemical messengers that serve as regulators of physiologic processes and perform integrative functions in the animal.
- Prenatal, neonatal, and postnatal development and growth of animals, including genetic control mechanisms and accretion, deposition, and degradation of proteins and fats in animal tissues.
- Lactation physiology, including alveolar development and involution, milk synthesis, secretion and ejection, milk composition, and patterns of lactation.

Exclude research on:

- Physiology of reproduction and reproductive processes. (Use RPA 301)

RPA 306. ENVIRONMENTAL STRESS IN ANIMALS

This area includes research on stresses from the effects of climate, handling, and other environmental factors that decrease productivity. Extremes in temperature, humidity, air movement, and noise may lead to lower reproduction, reduced feed efficiency, anorexia, reduced disease resistance, and increased mortality.

Areas of research include but are not limited to:

- Environmental factors that reduce productivity.
- Facilities and equipment that reduce environmental stress.
- Management techniques that enable animals to adapt to stress conditions.

Exclude research on:

- Stress factors that affect reproductive performance. (Use RPA 301)
- Nonfarm-raised fish, shellfish, game and fur-bearing animals, and other wildlife. (Use RPA 135)
- Genetic factors of animal response or adaptability to environmental stress. (Use RPA 303)
- Physiological responses to environmental stress. (Use RPA 305)
- Behavioral responses to environmental stress. (Use RPA 315)

RPA 307. ANIMAL PRODUCTION MANAGEMENT SYSTEMS

Animal-based research to compare total production systems is limited due to cost and resource

requirements. The development of computer technology, analytic methods, and computer models that simulate animal production systems provide a methodology for critically evaluating alternative production systems and management decisions.

Areas of research include but are not limited to:

- Animal-based studies that compare production systems or segments of production systems.
- Computer simulation models of animal production systems that allow comparisons of various alternative management components and decisions.

Exclude research on:

- Nonfarm-raised fish, shellfish, game and fur-bearing animals, and other wildlife. (Use RPA 135)

RPA 308. IMPROVED ANIMAL PRODUCTS (BEFORE HARVEST)

Research on the composition of animal products, factors influencing product quality, and determination of consumer preferences will guide efforts to maximize animal product quality.

Areas of research include but are not limited to:

- Physiology and biochemistry of fats, proteins, and flavor components of animal products.
- Factors responsible for development of flavor and other components of product quality.
- Reduction in undesired fat in animal products.
- Improving wool, hides, and other non-food animal products.
- Determination of consumer preferences and factors influencing product acceptability.

Exclude research on:

- Bees and honey. (Use RPA 211)
- Processing techniques for improvement or development of food and non-food products from animals. (Use RPA 502 or 511)

ANIMAL PROTECTION

RPA 311. ANIMAL DISEASES

Research in this area includes studies to manage animal diseases that represent a major hazard to the production of an adequate and wholesome supply of animal products. Diseases are a constant threat to the economic welfare of the livestock, poultry, and fish producer. Losses result from mortality, reduced productivity, cost of treatment or immunization, cost of regulatory programs, and condemnation of meat at the processing plant.

Areas of research include but are not limited to:

- The nature of causative agents involved in animal diseases.

- Mechanisms of disease resistance and immunity.
- Interrelationships among environment, genetics, and infectious agents in the etiology of diseases.
- Methods of diagnosis, prevention, treatment, control, and eradication of diseases, including development of equipment.
- Methods of keeping infectious diseases, such as foot-and-mouth disease and rinderpest, out of this country.
- Evaluation of alternative control methods.
- Understanding mechanisms involved in transmission of diseases to animals, including the role of vectors such as insects, ticks, and mites.
- Integrated control systems.

Exclude research on:

- Disorders due to improper nutrition. (Use RPA 302)
- Disorders resulting from pollution. (Use RPA 133)
- Bloat and disorders due to ingestion of toxic plants, etc. (Use RPA 314)
- Disorders due to environmental stress. (Use RPA 306)
- Nonfarm-raised fish, shellfish, game and fur bearing animals, and other wildlife. (Use RPA 135)

RPA 312. EXTERNAL PARASITES AND PESTS OF ANIMALS

This research area includes studies of pests and external parasites, including insects, ticks, mites, and other parasitic arthropods that reduce animal productivity. Economic losses result from reduced efficiency of weight gains and milk and egg production, as well as the added expense of labor charges and drug costs. Studies include research on more cost effective methods of control.

Areas of research include but are not limited to:

- Biology and life history of pests.
- Biosystematics/taxonomy.
- Use and development of irradiation, chemosterilants, attractants, repellents, and other non-insecticidal approaches to insect control.
- Absorption, metabolism, and excretion of insecticides by insects feeding on or in animals.
- Biological control of insects.
- The nature of insect resistance to chemical controls.
- Evaluation of alternative control methods.
- Development of methods and equipment for applying or using control materials.
- Integrated control systems.

Exclude research on:

- The role of insects, mites, and other arthropods in disease transmission. (Use RPA 311)
- Nonfarm-raised fish, shellfish, game and fur-bearing animals, and other wildlife. (Use RPA 135)

RPA 313. INTERNAL PARASITES IN ANIMALS

Research in this area includes studies of internal parasites such as various kinds of worms, flukes, and protozoa. Emphasis is on reducing losses, including those due to mortality, reduced yield, condemnation of meat, feed wastage, and cost of drugs.

Areas of research include but are not limited to:

- Biotic relationships in parasitism.
- Biosystematics/taxonomy.
- Biocontrol and management practices that minimize reliance on chemicals.
- Safe chemical means including systemics for combating parasites.
- Effective means of diagnosing parasitic infestation.
- Evaluation and development of control methods and equipment.
- Study of heritable traits, breeding, and selection to improve resistance to parasites.
- Integrated control systems.

Exclude research on:

- Nonfarm-raised fish, shellfish, game and fur-bearing animals, and other wildlife. (Use RPA 135)
- Insects, ticks, leeches, and mites. (Use RPA 312)

RPA 314. TOXIC CHEMICALS, POISONOUS PLANTS, NATURALLY OCCURRING TOXINS, AND OTHER HAZARDS AFFECTING ANIMALS

Research in this area focuses on reduction of losses in productivity in livestock, poultry, and fish operations due to toxic chemicals, pesticides, poisonous plants, predators, ingestion of metal and other foreign bodies, and other hazards.

Areas of research include but are not limited to:

- Determining the specific sites and mechanisms of poisoning, bloat, and other disorders to learn the bases of these phenomena.
- Toxicology and safe levels of residues of pesticides and other chemicals, natural or synthetic, used directly on or ingested by livestock and poultry.
- Methods of reducing ingestion of pesticides or other chemicals in or on animal feeds.
- Reasons for inter-species differences in detoxification mechanisms and sensitivity to poisoning by pesticides and other chemicals.
- Developing animal management practices that minimize use of pesticides and other chemicals that leave toxic residues or that reduce the level of residues.
- Prevention or alleviation of "hardware disease," and effects of plants that cause bloat, poisoning, or deformities of livestock.
- Developing methods for combating nuclear radiation hazards to livestock.
- Methods for reducing animal losses from predators.

Exclude research on:

- Breeding and selection of feed crops for reduced content of toxic components. (Use RPA 203)
- Pesticides and other toxic substances applied to or ingested by livestock and poultry when the

emphasis is clearly on reduction of the toxic content of foods consumed by humans. (Use RPA 711)

- Disorders resulting from pollution. (Use RPA 133)
- Nonfarm-raised fish, shellfish, game and fur-bearing animals, and other wildlife. (Use RPA 135)

RPA 315. ANIMAL WELFARE/WELL-BEING AND PROTECTION

The proper stewardship and care of food animals requires research to understand the husbandry needs of each animal species in a variety of management systems and physical accommodations. Scientific knowledge, professional judgment, and humane concerns are essential to developing effective animal care and use programs, and research related to and contributing to the welfare/well-being of food animals encompasses many broad areas of scientific study.

Areas of research include but are not limited to:

- Fundamental studies related to the assessment of animal well-being, including measures of adaptation and adaptiveness, measures of social behavior and spacing, physiological measures, and measures of cognition and motivation.
- Management/confinement production systems related to animal welfare/well-being.
- Controlled environments and environmental factors, including temperature, relative humidity, ventilation, lighting, and sound related to animal welfare/well-being.
- Housing and equipment design; pen/cage design and densities; feeding, watering, and bedding practices related to animal welfare/well-being.
- Handling, restraint, transport, and husbandry practices, such as castration, tail docking, debeaking, and others related to animal welfare/well-being.
- Humane slaughter, euthanasia, and analgesia related to animal welfare/well-being.
- Behavior patterns related to animal welfare/well-being.
- Disease prevention techniques and practices, including management practices, disease detection and surveillance, assessing disease risks, vaccine development, parasite control, and others specifically related to animal welfare/well-being.

Exclude research on:

- Etiology of disease, disease agents, internal and external parasites, and toxic hazards. (Use RPAs 311-314)
- Genetics of disease resistance. (Use RPA 303 or 304)
- Production management systems as related to production efficiency and economic viability. (Use RPA 307)
- Nonfarm-raised fish, shellfish, game and fur-bearing animals, and other wildlife. (Use RPA 135)

TOPIC AREA IV. ENGINEERING AND SUPPORT SYSTEMS

RPA 401. STRUCTURES, FACILITIES, AND GENERAL PURPOSE FARM SUPPLIES

Research on the design, construction, and cost of facilities for animals, agricultural products,

agricultural inputs, equipment, and other materials is included. The properties and behavior of the above animals, products, equipment, and materials while in various facilities and during transport or processing is a part of this research.

Areas of research include but are not limited to:

- Engineering aspects of design and construction of structures and facilities.
- Physical, chemical, and biological aspects of the production of fertilizers, pesticides, feeds, and hormones.
- Engineering aspects of materials handling, transport, land use, and storage of crop, forest, and range products.
- Studies on biological, chemical, and physical properties of materials.
- Behavior of chemical and biological materials in storage systems.
- Determining costs and benefits of construction or engineered systems.
- Determining maintenance needs and costs of agricultural systems.
- Facilities for handling, processing, and storing new food and fiber products, animal feeds, forage, and bedding.
- Structures and facilities for housing and handling animals.
- Facilities for handling and storing fuel, fertilizers, pesticides, and other farm supplies.
- Environmental control of structures for animals, plants, or agricultural products.

Exclude research on:

- Safe handling and use of materials and equipment. (Use RPA 723)
- Facilities that reduce environmental stress in animals. (Use RPA 306)

RPA 402. ENGINEERING SYSTEMS AND EQUIPMENT

Research on mechanization to increase efficiency and decrease labor requirements in agricultural and forestry production such as: grain, fruit and vegetable crops, timber, livestock, poultry, fish, and other animals is included. Machinery and power units for the pre- and post-harvest of various animal and plant products are included in this research.

Areas of research include but are not limited to:

- Tillage, planting, chemical application, and harvesting systems for agricultural and range systems.
- Harvesting systems for forestry, including roads, transportation, and access for in-woods processing.
- Systems for establishment and regeneration of crop, forest, and range systems.
- Handling methods for animals and animal products.
- Design and evaluation of equipment used in production of agricultural, forest, and range systems.
- Application of sensors and robotics.
- Application of pesticides and crop nutrients.

Exclude research on:

- Structures and facilities. (Use RPA 401)
- Irrigation and drainage systems. (Use RPA 405)
- Safety of humans. (Use RPA 723)
- Equipment that reduces environmental stress in animals. (Use RPA 306)

RPA 403. WASTE DISPOSAL, RECYCLING, AND REUSE

Research in this area includes all aspects of collecting, storing, transporting, treating, recycling, and utilizing waste products from agriculture, forestry, and other origins. The development of value-added or alternative products from waste products is included.

Areas of research include but are not limited to:

- Methods of collecting, storing, moving, treating, and disposing of animal, plant, food processing, municipal, and industrial wastes.
- Development of products from waste materials, including biofuels.
- Engineering and analysis of projected and existing waste disposal systems and pesticide containers.
- Recycling pre- and post-consumer wastes.
- Improved methods for mitigating environmental impacts of land application of agricultural, forestry, municipal, and industrial wastes.

Exclude research on:

- Pollution prevention and mitigation. (Use RPA 133)
- First use of under-utilized co-products. (Use RPA 502 or 511)

RPA 404. INSTRUMENTATION AND CONTROL SYSTEMS

Instrumentation and information systems are important elements in all aspects of pre- and post-production agriculture. Sensors for detecting and monitoring and processing of the collected data can provide improved control of the production and processing of biological and non-biological materials.

Areas of research include but are not limited to:

- Development of instruments, research technologies, and procedures that enhance agricultural efforts.
- Determining accurate and precise standards of measurement.
- Development of sensors, image processing techniques, automation, decision support systems, controls, and models.

Exclude research on:

- Experimental design and statistics. (Use RPA 901)

RPA 405. DRAINAGE AND IRRIGATION SYSTEMS AND FACILITIES

Water management, to include surface and subsurface drainage and all irrigation systems, is part of this research. Equipment, system design, theory, modeling, installation, operation, and maintenance of drainage and irrigation systems for more efficient use of land, water, and capital resources are included.

Areas of research include but are not limited to:

- Theory of water flow for more efficient water management system design.
- Methods of automating water management systems to reduce labor and increase efficiency.
- New concepts and improved design of drainage systems for more efficient production and environmental improvement.
- New materials, systems, equipment, and installation techniques to reduce construction and maintenance costs of drainage and irrigation systems.
- Use of solar energy and air turbulence to speed drying of poorly drained soils.
- Methods for combining irrigation, drainage, and tailwater return flow systems to increase efficiency of water and system use.
- Improved design of water management systems to reduce planning and construction costs and assure public safety.
- Methods for determining irrigation water requirements giving consideration to water use by plants, effective rainfall, and water losses during and following application.
- Equipment for uniform distribution of irrigation water with particular emphases on overhead and subsurface systems.
- Improved technology to measure and control losses of agri-chemicals from irrigated lands.

Exclude research on:

- Drainage related to controlling salinity. (Use RPA 103)

TOPIC AREA V. FOOD AND NON-FOOD PRODUCTS: DEVELOPMENT, PROCESSING, QUALITY, AND DELIVERY

FOOD

RPA 501. NEW AND IMPROVED FOOD PROCESSING TECHNOLOGIES

Development or improvement of methods, techniques, or processes to maintain or improve quality or functionality, stabilize or preserve foods, or prepare foods for further processing may yield new processing technologies and equipment as well as improved and new food products.

Areas of research include but are not limited to:

- Food physical processes (i.e., thermal and non-thermal pasteurization/preservation, size reduction, separation, concentration).
- Food bioprocesses (i.e., enzyme and microbial applications, genetic engineering of foods and food ingredients).
- Food chemical processes (i.e., salt, sugar, acid, preservatives, antioxidants).
- Food processing efficiencies (i.e., management of energy, water, wastes).

- Improved or new food packaging technologies.
- Food process modeling, automation, and sensors.

RPA 502. NEW AND IMPROVED FOOD PRODUCTS

Improvement or development of new food products requires knowledge of the factors that influence quality and functionality and how they interact in complex food systems.

Areas of research include but are not limited to:

- Chemical and biochemical reactions in foods.
- Measuring/characterizing food components and functions.
- Identifying, characterizing, and measuring chemical, physical, and sensory properties of foods.
- Determining relationships among the chemistry, structure, and quality parameters of food components and their functionality and end use properties in foods.
- Designing and formulating foods for improved human nutrition or for enhancement of human health (i.e., nutraceuticals, functional foods).
- Quality and safety parameters affecting development of new and improved food products.
- Developing new food products from process stream co-products.

Exclude research on:

- Live food plants and animals to improve food quality or functionality (i.e., breeding, feeding, cultural, or production management practices). (Use RPA 204 or 308)
- Development of foreign markets. (Use RPA 606)
- Quality maintenance during storing and marketing of food products. (Use RPA 503)
- Utilization of food processing wastes. (Use RPA 403)
- Nutrient composition of foods. (Use RPA 701)

RPA 503. QUALITY MAINTENANCE IN STORING AND MARKETING FOOD PRODUCTS

Understanding and minimizing food quality losses during storage, distribution, and marketing can enhance the quantity and quality of foods delivered to consumers, keep food costs low, and enhance profitability for food producers and marketers.

Areas of research include but are not limited to:

- Chemical and biochemical changes after harvest/slaughter or during storage.
- Effective ways to reduce physiological deterioration and losses due to insects, spoilage microorganisms, rodents, and other pests.
- Effects and means of controlling temperature, humidity, and atmosphere in storage and transportation.
- Containerization/packaging or storage and handling methods to maintain optimum conditions for quality maintenance.
- Relationships among variables of handling and storage and loss in quality.

Exclude research on:

- Prevention, reduction, or elimination of pathogenic microorganisms, mycotoxins, and naturally occurring toxins in foods. (Use RPA 712)
- Characterization of quality parameters and their interactions for new and improved food products. (Use RPA 502)
- Quality maintenance of non-food agricultural and forest products. (Use RPA 512)

RPA 504. HOME AND COMMERCIAL FOOD SERVICE

Guidelines are necessary to ensure the wholesomeness, nutritional value, taste, and appearance of commercially and home prepared foods. Methods for improved preparation and storage of food that reduce waste and assure quality of food are needed to increase consumer appeal.

Areas of research include but are not limited to:

- Factors affecting quality of food prepared at home or commercially.
- Improving methods of preparing, holding, and serving food, including automation and/or computerization.
- Development of methods to provide effective, efficient management in institutional and commercial food services.
- Product labeling to improve consumer information about product quality, preparation and storage, nutritional values, and unit cost of foods for home and commercial use.

Exclude research on:

- Safety of commercially and home prepared foods. (Use RPA 711 or 712)

NON-FOOD

RPA 511. NEW AND IMPROVED NON-FOOD PRODUCTS AND PROCESSES

Industrial uses have absorbed significant quantities of agricultural commodities in such consumer products as paper, textiles, fuels, adhesives, and paints. Animal byproducts have traditionally contributed significantly to our livestock economy as raw materials for the textile, leather, soap, feed, pharmaceutical, and other industries. Research on alternate, non-food uses for agricultural commodities and timber products may expand markets for these products, yielding new, improved, or less expensive consumer products and providing additional sources of income to producers, processors, and marketers. Improved wood utilization also provides greater use of low-quality timber and little-used species.

Areas of research include but are not limited to:

- Developing new non-food products from agricultural and forest resources.
- Developing ethanol and biofuels from agricultural materials.
- Identifying, characterizing, and measuring chemical, physical, and sensory properties of non-food products.
- Determining the relationships among the chemistry, structure, and quality parameters of raw materials and their functionality and end use properties in non-food products.

- Development or improvement of applications for non-food products to enhance utilization, including structural wood engineering, performance evaluations, and environmental impacts.
- Development or improvement of methods, techniques, or processes to produce or manufacture non-food products.
- Efficiency in converting agricultural and forest commodities to new and improved non-food products (i.e., management of energy, water, wastes).
- New non-food products from underutilized co-products from process streams.

Exclude research on:

- Improvements in products through production practices or breeding. (Use RPA 204 or 308).
- Evaluation and utilization of textiles and textile products. (Use RPA 804)
- Utilization of waste materials. (Use RPA 403).
- Development of foreign markets. (Use RPA 606)

RPA 512. QUALITY MAINTENANCE IN STORING AND MARKETING NON-FOOD PRODUCTS

This research focuses on maintenance of quality of feeds, seeds, and other non-food agricultural and forest products during handling, storage, and marketing.

Areas of research include but are not limited to:

- Chemical and biochemical changes after harvest/slaughter or during storage.
- Reducing physiological deterioration and losses due to insects, spoilage microorganisms, rodents, and other pests.
- Effects and means of controlling temperature, humidity, and atmosphere in storage and transportation.
- Containerization/packaging or storage and handling methods to maintain optimum conditions for quality maintenance.
- Relationship among variables of handling and storage and loss in quality.
- Seed processing technology, including seed separation, cleaning, storage, and treatment.

Exclude research on:

- Quality maintenance of food products. (Use RPA 503)

TOPIC AREA VI. ECONOMICS, MARKETS, AND POLICY

RPA 601. ECONOMICS OF AGRICULTURAL PRODUCTION AND FARM MANAGEMENT

Research in production economics concerns choices farmers and ranchers make to produce commodities, services, and products. Management economics research focuses on resource endowments and allocations at the farm or ranch level.

Areas of research include but are not limited to:

- Farm production economics.

- Farm management.
- Farm and firm growth, including economies of size and scale.

Exclude research on:

- Production and management studies not related to economics. (Use appropriate RPA)
- Real estate, and land values and prices. (Use RPA 602)
- Farm financial management. (Use RPA 602)
- Economics of environmental risk and impacts. (Use RPA 605)

RPA 602. BUSINESS MANAGEMENT, FINANCE, TAXATION, AND ESTATE PLANNING

This research focuses on the management and administrative techniques applied to farming, agricultural business, and other businesses and enterprises to enhance planning, decision making, and resource use. It includes economic analysis on taxation and financial topics.

Areas of research include but are not limited to:

- Business administration.
- Managerial economics.
- Decision analysis, including expert systems.
- Risk management.
- Insurance.
- Human resource management.
- Economics of financial markets, financial management, and lending institutions.
- Real estate values and prices.
- Taxation.
- Estate planning and intergenerational transfer.

Exclude research on:

- Economics of production. (Use RPA 601)
- Markets and marketing. (Use RPA 603 or 604)
- Policy. (Use RPA 610 or 611)
- Personal and family finance. (Use RPA 801)

RPA 603. MARKET ECONOMICS

This RPA focuses on economic research that fosters understanding of markets, productivity, and interregional trade, and gives insight to the role and function of markets and their regulation primarily from the macroeconomic (industry) perspective.

Areas of research include but are not limited to:

- Market performance.
- Productivity analysis.
- Economics of processing, storage, and transportation.
- Economics of regulation and protection of markets, including firm- and processor-level

impacts.

- Local, regional, and national trade patterns.
- Economics of marketing and pricing systems, and institutions.
- Regulation of markets.
- Economics of supply and demand.
- Economics of grades and standards.

Exclude research on:

- International trade and development, including foreign market development. (Use RPA 606)
- Economics of food assistance, welfare, and poverty. (Use RPA 607)
- Economics of consumer level food and production regulation and protection. (Use RPA 607)
- Regional economics, except trade patterns. (Use RPA 608)
- Policy. (Use RPA 610 or 611)

RPA 604. MARKETING AND DISTRIBUTION PRACTICES

This research and analysis concerns the distribution of products, goods, and services, the practices of buying and selling, and the development and improvement of markets primarily from the microeconomic (firm) perspective.

Areas of research include but are not limited to:

- Economic studies to determine and measure quality characteristics desired by processors.
- Effectiveness of group action.
- Institutional devices for bargaining and negotiation.
- Effectiveness of marketing structures, including cooperatives.
- Improvements in the marketing and distribution of products, goods, and services.
- Marketing orders.
- Futures and options markets, cash and forward contracts, and other marketing and pricing arrangements.
- Development of domestic markets.
- Direct marketing, alternative markets, and niche marketing.

Exclude research on:

- Economics of markets. (Use RPA 603)
- Economics of supply and demand. (Use RPA 603)
- Economics of pricing systems. (Use RPA 603)
- Commodity analysis and projections. (Use RPA 603)
- Foreign market development. (Use RPA 606 or 611)
- Policy. (Use RPA 610 or 611)

RPA 605. NATURAL RESOURCE AND ENVIRONMENTAL ECONOMICS

This research is economic inquiry to enhance, guide, and understand efforts to improve the relationships among agricultural production and processing, the environment, and natural resource use.

Areas of research include but are not limited to the economics of:

- Water resources.
- Forestry.
- Recreation and leisure.
- Land resources, use, and management.
- Wildlife and fisheries.
- Agrochemical management.
- Waste management, including animal wastes.
- Mineral resources and energy.
- Environment.
- Weather and climate change.

Exclude research on:

- Financial aspects of real estate. (Use RPA 602)
- Land use planning or zoning. (Use RPA 608)
- Policy. (Use RPA 610 or 611)

RPA 606. INTERNATIONAL TRADE AND DEVELOPMENT ECONOMICS

This research focuses on the economic components of international trade and development, trade performance of sectors of the U.S. economy and that of other countries, and trade and development impacts. This research may assist policy makers in the decision making process as it applies to international trade and development.

Areas of research include but are not limited to:

- Economics of international trade and development programs.
- Global and international commodity analysis and projections.
- Country, regional, and sector analysis.
- Economic growth and development.
- Foreign market development.

Exclude research on:

- Domestic commodity analysis and projections. (Use RPA 603)
- U.S. economic growth and development, including community development. (Use RPA 608)
- Policy. (Use RPA 610 or 611)

RPA 607. CONSUMER ECONOMICS

This area focuses on economic research that provides insight and understanding of the demands, preferences, behavioral responses, and needs of individuals and consumers.

Areas of research include but are not limited to:

- Consumer demand.

- Consumer level food and production regulation and protection, and food safety.
- Poverty, welfare, and assistance, including food assistance.
- Consumer response to biotechnology, organic products, labeling, etc.

Exclude research on:

- Economics of production technologies. (Use RPA 601)
- Finance and estate planning. (Use RPA 602)
- Dietary and nutritional aspects of food choices. (Use RPA 703)
- Human resource economics. (Use RPA 602)
- Economics of farm, firm, and processor level impacts of food and production regulation and protection. (Use RPA 603)
- Economics of product quality characteristics desired by consumers. (Use RPA 604)
- Policy. (Use RPA 610)
- Family economics. (Use RPA 801)

RPA 608. COMMUNITY RESOURCE AND DEVELOPMENT ECONOMICS

Economic research provides insight and understanding, and facilitates the analysis of, community needs and preferences.

Areas of research include but are not limited to:

- Economic planning, development, and industrialization.
- Regional economics and sector analysis.
- Land use planning and zoning.
- Entrepreneurship.
- Public administration.

Exclude research on:

- Natural resource and environmental issues. (Use RPA 605)
- Poverty and welfare programs, including food assistance. (Use RPA 607 or 703)
- Consumer issues. (Use RPA 607)
- Policy. (Use RPA 610)
- Family issues. (Use RPA 801)
- Public services. (Use RPA 805)

RPA 609. ECONOMIC THEORY AND METHODS

Work in this area is limited to economic theory and methodology.

Areas of research include but are not limited to:

- Microeconomics.
- Macroeconomics.
- Property rights, including intellectual property rights.
- Public choice.

- Labor economics.
- Welfare economics.
- Location and decision theory.
- Econometrics and simulation.
- Mathematics and statistics for economic research.
- Data collection and research methodology for economic research.
- Economic history and philosophy.

Exclude research on:

- Applied economics. (Use RPAs 601-608)

RPA 610. DOMESTIC POLICY ANALYSIS

Research in this area evaluates the effectiveness and economic and social impacts of domestic programs and policies. Also included is research to determine ways in which government actions impact the U.S.

Areas of research include but are not limited to:

- Agricultural production, price, and income policy, including commodity programs.
- Natural resource policy.
- Antitrust and market policy.
- Rural development policy.
- Science, research, and education policy.
- Consumer policy.
- Impacts and implications of macroeconomic policies.
- Public policy education, including methodology
- Evaluation of policy effectiveness, impacts, and outcomes.
- Risk assessment.

Exclude research on:

- Risk management. (Use RPA 602)
- Taxation. (Use RPA 602)
- Conflict resolution. (Use RPA 803)

RPA 611. FOREIGN POLICY AND PROGRAMS

Research in this area is designed to evaluate the effectiveness and impacts of U.S. foreign policy and programs and to determine ways to meet the nation's goals in these areas.

Areas of research include but are not limited to:

- Trade policy.
- Effects of policy on foreign market development.
- Foreign assistance policy, projects, and impacts.
- Interactions between foreign and domestic policies and global implications.

Exclude research on:

- International trade and development. (Use RPA 606)

TOPIC AREA VII. HUMAN NUTRITION, FOOD SAFETY, AND HUMAN HEALTH AND WELL-BEING

HUMAN NUTRITION

RPA 701. NUTRIENT COMPOSITION OF FOOD

This research is concerned with food composition, including determination of quantity of nutrients and other food components in food; development of analytical methods; development and maintenance of data banks of information on food composition; and development of software and other systems to facilitate use of data on food composition.

Areas of research include but are not limited to:

- Composition of food, including nutrients and other food components.
- Databank development and utilization systems.
- Analytical methods.

Exclude research on:

- Developing foods for improved health. (Use RPA 502)
- Production of improved food plants and animals. (Use RPA 204 or 308)

RPA 702. REQUIREMENTS AND FUNCTION OF NUTRIENTS AND OTHER FOOD COMPONENTS

Human nutrition research provides fundamental knowledge about relationships of food eaten by people to their physical and mental status and development and to the maintenance of optimal health. This research area is concerned with defining nutrient requirements and their functions throughout the life span. Functions include cellular and molecular regulation of gene expression by specific nutrients. Research is also concerned with development of methods to quantify relationships of nutritional status to well-being to provide a scientific basis for establishing Dietary Reference Intakes.

Areas of research include but are not limited to:

- Relationship of nutrients and other components of food (such as phytochemicals) to health, intellectual development, performance, and longevity.
- Requirements for energy, fat, protein, amino acids, fatty acids, minerals, and vitamins related to age, sex, activity, and physiological and environmental conditions.
- Interrelationships among nutrients and non-nutrient components of food as they affect absorption, metabolism, growth, and maintenance requirements.

- Molecular functions of nutrients.
- Biochemical methods of evaluating nutritional status.

Exclude research on:

- Developing foods for improved health. (Use RPA 502)

RPA 703. NUTRITION EDUCATION

This research is concerned with assessment of dietary status, factors that influence it, and development of guidance and methods for improving it. Research encompasses food consumption patterns of the population, especially those at high risk, and factors that promote or hinder healthful food choices and related consumer behavior. Research is also concerned with development of a theoretical base for behavior related to diet and dietary change and with development and assessment of strategies, programs, and policies to improve diets.

Areas of research include but are not limited to:

- Food consumption, use, patterns, and methods.
- Nutrition monitoring and surveillance.
- Factors that influence food consumption.
- Dietary status assessments, e.g., comparisons to standards.
- Development of standards and guidance to meet nutritional needs of the general population and population subgroups with special needs.
- Development and evaluation of education, communication, and food assistance strategies, programs, and policies that affect dietary status.

Exclude research on:

- Consumer economics, including food assistance. (Use RPA 607)
- Community resource management. (Use RPA 608)
- General education and information delivery. (Use RPA 903)
- Family resource management. (Use RPA 801)
- Home and commercial food service. (Use RPA 504)

FOOD SAFETY

RPA 711. ENSURE FOOD PRODUCTS FREE OF HARMFUL CHEMICALS, INCLUDING RESIDUES FROM AGRICULTURAL AND OTHER SOURCES

Research on toxic residues of agricultural origin is conducted to determine the levels and circumstances under which chemicals may be safely used in production of plant and animal food products. There is widespread public concern as to the nature and seriousness of the hazards caused by the use of chemicals in the production of farm products. The focus of research under this RPA is on human health.

Areas of research include but are not limited to:

- Safe or acceptable levels of residues and environmental contaminants on or in farm products for human consumption.
- Behavior and fate of pesticides, antibiotics, hormones, and other applied chemicals and environmental contaminants, on or in food plants and animals and their products.
- Methods to remove or mitigate the effects of harmful chemicals to human health.
- Rapid, accurate methods for monitoring pesticide residue, antibiotic, and environmental contaminant levels on or in food plants and animals and their products.
- Assessing risk to human health from harmful chemicals in food plants and animals and their products.
- Determining consumer attitudes and developing techniques to communicate relative risks of harmful chemicals in food plants and animals and their products.

Exclude research on:

- Studies focusing on food plant or animal productivity or economics, animal health, or fates and effects of chemicals on the environment. (Use appropriate RPA under PLANTS AND THEIR SYSTEMS or ANIMALS AND THEIR SYSTEMS)
- Economics of food safety. (Use RPA 603, 604, or 607)

RPA 712. PROTECT FOOD FROM CONTAMINATION BY PATHOGENIC MICROORGANISMS, PARASITES, AND NATURALLY OCCURRING TOXINS

Research includes studies on pathogenic foodborne microorganisms and parasites in raw, minimally processed, or inadequately processed and preserved foods. Research on mycotoxins and natural and induced toxicants in foods--including allergens and seafood toxins--is also included. The focus of research under this RPA is on human health.

Areas of research include but are not limited to:

- Production of food animals and crops free of microorganisms, parasites, or natural toxins harmful to humans.
- Prevention of transmission of pathogenic microorganisms and parasites from human carriers to livestock and food systems.
- Maintenance of microbiological safety in handling, processing, packaging, and distributing food products.
- Improved methods of food handling, processing, storage, and preparation for greater microbiological safety.
- Methods for preventing or eliminating mycotoxins in peanuts and other field crops.
- Methods for preventing, removing, or controlling naturally occurring and induced toxins and allergens in agricultural products.
- Assessing risk to human health from pathogenic microorganisms and natural toxins in food animals and crops and their products.
- Determining consumer attitudes and developing techniques to communicate relative risks of pathogenic microorganisms and natural toxins.
- Basic research on growth and mechanisms of pathogenesis of foodborne microbial pathogens.

Exclude research on:

- Studies focusing on animal health. (Use RPA 311 or 314)
- Prevention of transmission of non-foodborne parasites to humans through food animals. (Use RPA 722)
- Control of pests in food plants that is not focused on safeguarding human health. (Use appropriate RPA under PLANTS AND THEIR SYSTEMS)
- Economics of food safety. (Use RPA 603, 604, or 607)

HUMAN HEALTH

RPA 721. INSECTS AND OTHER PESTS AFFECTING HUMANS

Research includes studies on insects, ticks, mites, and other pests that are an annoyance to humans. The emphasis is on developing safe, effective, and economical ways of controlling these pests.

Areas of research include but are not limited to:

- Biology of insects, ticks, and mites affecting humans, including those important in forensic studies.
- Developing attractants and repellents.
- Developing and improving methods of pest control.

Exclude research on:

- The role of insects, ticks, and mites in disease transmission. (Use RPA 722)
- Management of insects affecting livestock and pets. (Use RPA 312)
- Management of insects affecting stored food products. (Use RPA 503)
- Management of insects affecting wood products. (Use RPA 512)
- Apparel and textiles to protect against insects. (Use RPA 804)

RPA 722. ZONOTIC DISEASES AND PARASITES AFFECTING HUMANS

Research in this area concerns animal diseases and parasites such as anthrax, encephalitis, leptospirosis, and rabies that pose potential threats to human health. Research includes studies on epidemiology, risk assessment, and evaluation of efficacy of control programs for disease vectors.

Areas of research include but are not limited to:

- Understanding mechanisms involved in transmission of diseases to humans, include the role of insects, ticks, and mites.
- Developing control programs to reduce animal reservoirs of zoonotic agents.
- Developing means of preventing transmission of zoonotic diseases and parasites from animals to humans.

Exclude research on:

- Animal diseases and parasites where the concern is the protection of the animal itself. (Use RPA 311, 312, or 313)
- Transmission of parasites and pathogenic microorganisms in animal food products consumed by humans. (Use RPA 712)

RPA 723. HAZARDS TO HUMAN HEALTH AND SAFETY

Research in this area is concerned with reducing hazards to the health and safety of people involved in the production, processing, and distribution of agricultural and forest products. Research includes safety aspects of agricultural injuries and illnesses and methods for effective intervention. The emphasis of this research is on immediate hazards to humans.

Areas of research include but are not limited to:

- Developing worker safety procedures for people handling agricultural products, supplies, and livestock.
- Developing methods for safe handling of agricultural chemicals, fuels, and other products.
- Determining health impact of pesticides on farmworkers.
- Determining need for and developing protective devices and procedures for safe usage and transportation of farm and forest machinery and equipment.
- Determining nature, frequency, and causes of agricultural injury and occupational illness.
- Developing methods to reduce fire risks and improve fire control measures for storage facilities, barns, and other farm structures or equipment.
- Characterizing, measuring, or mitigating potentially harmful compounds derived from agricultural products such as tobacco that have pharmacologic actions.
- Protection of humans against non-food allergens and toxins, and poisonous plants.
- Mitigation of pollutants such as pesticides, radio-nuclides, heavy metals, excess fertilizer chemicals, growth regulating chemicals, airborne particulates, dust, ozone, odors, volatile compounds, combustion products, and smog.
- Measuring and mitigating exposure to noise, vibration, sun, ergonomic, and other occupational hazards in agriculture.
- Equipment and techniques for fire-fighter safety and survival.

Exclude research on:

- Agricultural and forestry practices to achieve safe levels of pollutants. (Use RPA 133)
- Disposal of pesticide rinsate and surplus pesticides. (Use RPA 403)
- Toxic residues on or in food products. (Use RPA 711)
- Pathogenic microorganisms and naturally occurring toxins, including allergens, in food. (Use RPA 712)
- Transmission of parasites and zoonotic diseases to humans. (Use RPA 722)
- Development and evaluation of textiles and textile products for their protective properties. (Use RPA 804)
- Methods to reduce fire risks and to improve fire control measures for range and forests. (Use RPA 122)

TOPIC AREA VIII. FAMILY AND COMMUNITY SYSTEMS

RPA 801. FAMILY RESOURCE MANAGEMENT

Research provides an understanding of how individuals and families obtain and use resources of time, money, and human capital to achieve their standard of living and overall quality of life. Studies are concerned with factors affecting the decision-making process, such as availability of resources, life events, living patterns, values, goals, interests, and attitudes of families, and external forces such as public issues, policies, and programs.

Areas of research include but are not limited to:

- Resource management, including time, money, and human capital.
- Interrelationships between society and households to improve family well-being.
- Improvement of basic occupational skills.
- Families and work/business relationships.
- Workforce preparation (including school to work, welfare to work, work to work-retooling).

Exclude research on:

- Consumer economics. (Use RPA 607)
- Community economic development. (Use RPA 608)
- Poverty and economic analysis of welfare programs. (Use RPA 607)
- Business management and business estate planning. (Use RPA 602)
- Dietary status. (Use RPA 703)

RPA 802. HUMAN DEVELOPMENT AND FAMILY WELL-BEING

Research in family and human development provides an understanding of the social, cognitive, emotional, and physical development of individuals and families throughout the life cycle. Research also provides a better understanding of family systems, family performance, and well-being.

Areas of research include but are not limited to:

- Human (child, adolescent, adult) development throughout the life cycle.
- Parenting, parent-child relationships, and grandparents/relatives as caregivers.
- Child care and after-school programs.
- Aging and intergenerational issues, including elder care.
- Assessment of youth- and family-focused prevention and intervention programs.
- Family strengths/resiliency.
- Individual communication and family interactions.
- Youth development and 4-H programs.
- Youth and family policy.
- Marriage/couples relationships.
- Rural, high-risk, fragile, ethnic, underserved individuals and families.

Exclude research on:

- Family economics and resource management. (Use RPA 801)

- Workforce issues. (Use RPA 801)
- Social impacts on families. (Use RPA 803)

RPA 803. SOCIOLOGICAL AND TECHNOLOGICAL CHANGE AFFECTING INDIVIDUALS, FAMILIES, AND COMMUNITIES

Research provides an understanding of the technological, demographic, and social changes occurring in society. Research also provides an understanding of the current and historic ways in which individuals, families, and communities cope with sociological and technological change.

Areas of research include but are not limited to:

- Composition and trends in population.
- Sociology/psychology of the farm family and other aspects of rural life and living conditions.
- Social aspects of agrarian reform.
- Migration patterns of farm and rural populations.
- Migrant workers and social issues in local communities.
- Impact of cultural trends and technology on society.
- Impact of racial, ethnic, and gender issues on society.
- Social and educational factors affecting poverty.
- Acceptance of pest management systems.
- Social impact of environmental change.
- Conflict resolution.
- Political movements.
- Social aspects for planning and development of healthy communities.

Exclude research on:

- Land use. (Use RPA 131)
- Community services. (Use RPA 805)
- Policy analyses. (Use RPA 610)

RPA 804. HUMAN ENVIRONMENTAL ISSUES CONCERNING APPAREL, TEXTILES, AND RESIDENTIAL AND COMMERCIAL STRUCTURES

Research on social, aesthetic, and functional aspects of apparel and textiles provides a better understanding of the interface among producers, retailers, and consumers. This research provides knowledge about the products of agriculture used in apparel and textiles and on factors that affect consumer choice.

Housing and other structures have a significant impact on the quality of living. Research is needed on social, economic, and design aspects that contribute to affordability and sustainability.

Areas of research include but are not limited to:

- Developing and evaluating textile products for superior functional characteristics to meet consumer needs, aesthetics, and preferences.

- Determining properties of fibers that affect consumer satisfaction.
- Textiles and apparel for special physical needs.
- Preservation and storage of artifacts.
- Effect of textiles and apparel on human development.
- Development of textile products for production.
- Availability of goods, services, and product information to the producer, retailer, and consumer.
- Protection of structures and apparel from pests.
- Determining family housing requirements on the basis of selected characteristics such as age, income, size, stage in the life cycle, health, occupation, and ethnic background.
- Determining community, regional, and national needs for housing on the basis of user needs.
- Effect of housing environment on quality of life issues.
- Determining costs and benefits of construction systems and materials, giving special attention to consumer needs.
- Improved design, technology, materials, and construction methods for renovation, pest control, and construction.
- Housing environmental issues, including indoor air quality and “green” design.
- Reviewing and developing building codes and other legal requirements based on life safety issues, health, and welfare of users of a built environment.

Exclude research on:

- Improvements in agricultural practices to enhance raw materials. (Use RPA 204 or 308)
- Functioning of markets, including capital markets, related to real estate. (Use RPA 602)
- Development of new textiles. (Use RPA 511)
- Agricultural structures and facilities construction. (Use RPA 401)
- Health and safety hazards such as pesticides, fire, and sun exposure. (Use RPA 723)
- Disposal, recycling, and new development of textiles from waste products. (Use RPA 403)
- Market economics and practices related to apparel and textiles. (Use RPA 603 or 604)

RPA 805. COMMUNITY INSTITUTIONS AND SOCIAL SERVICES

This research addresses the development, quality, and functioning of community institutions and social services. The scope, scale, and effectiveness of public and private community institutions and services are enhanced by this type of research.

Areas of research include but are not limited to:

- Development, coordination, and adaptation of agencies and organizations.
- Provision of social services.
- Measuring the adequacy, quality, and cost of public services.
- Organizational and operational efficiency of government agencies and units.
- Community service institutions, including volunteer organizations, non-profit groups, and centers.

Exclude research on:

- Dietary status. (Use RPA 703)
- Public administration. (Use RPA 608)

- Policy analysis. (Use RPA 610)
- Workforce preparation. (Use RPA 801)

TOPIC AREA IX. RESEARCH SUPPORT, ADMINISTRATION, AND COMMUNICATION

RPA 901. RESEARCH DESIGN AND STATISTICS

This research focuses on experimental design, surveys, sampling, and statistical analysis.

Areas of research include but are not limited to:

- Design of experiments and statistical analysis of data.
- Improvement in agricultural statistical methodology.
- Development of research technologies and procedures.
- Sampling and design of survey instruments.

Exclude research on:

- Development of instrumentation. (Use RPA 404)
- Standards of measurement. (Use RPA 404)
- Studies on administration of research. (Use RPA 902)
- Development of economic research techniques. (Use RPA 609)

RPA 902. RESEARCH ON ADMINISTRATION OF RESEARCH

This research is focused on efficiency and effectiveness of research methods and proposals. Included in this is research on maximizing researcher and facility productivity, and on coordinating research efforts among scientists throughout the nation.

Areas of research include but are not limited to:

- Criteria and techniques for evaluating research proposals and accomplishments.
- Methods to measure productivity of researchers and research organizations.
- Promotion of research creativity and productivity.
- Developing and maintaining the proficiency of researchers.
- Relationships among research, teaching, and extension.
- Communication among researchers and dissemination of research results.
- Roles of cooperation and competition among scientists and organizations.

Exclude research on:

- Development of instrumentation. (Use RPA 404)
- Experimental design and statistics. (Use RPA 901)

RPA 903. COMMUNICATION, EDUCATION, AND INFORMATION DELIVERY

This area of research is focused on educational processes, needs, and methods to achieve

educational goals. Research includes development, use, and assessment of communication, information delivery, and technology transfer methods and systems.

Areas of research include but are not limited to:

- Techniques, procedures, and processes of education.
- Teaching, learning, and cognition.
- Communication and information systems and delivery, including electronic networks and distance education.
- Technology transfer.
- Assessment and evaluation of communication and education systems.
- Educational psychology and human motivation.

Exclude research on:

- Public services. (Use RPA 805)
- Conflict resolution. (Use RPA 803)
- Nutrition education and dietary impacts. (Use RPA 703)