

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

Revision V

Classifications used in the
Current Research Information System

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CONTENTS

Research Problem Area (RPA)

Activity

Commodity, Resource, or Technology not
Associated with Specific Commodities

Field of Science

RPA Descriptions

RESEARCH PROBLEM AREA (RPA)

RPA TITLE

GOAL I: INSURE A STABLE AND PRODUCTIVE AGRICULTURE FOR THE FUTURE THROUGH WISE MANAGEMENT OF NATURAL RESOURCES

- 101 Appraisal of Soil Resources
- 102 Soil, Plant, Water, Nutrient Relationships
- 103 Management of Saline and Sodic Soils and Salinity
- 104 Alternative Uses of Land

- 105 Conservation and Efficient Use of Water
- 106 Efficient Drainage and Irrigation Systems and Facilities
- 107 Watershed Protection and Management
- 108 Economic and Legal Problems in Management of Water and Watersheds
- 109 Adaptation to Weather and Weather Modification

- 110 Appraisal of Forest and Range Resources
- 111 Biology, Culture, and Management of Forests and Timber-Related Crops
- 112 Improvement of Range Resources
- 113 Remote Sensing
- 114 Research on Management of Research

GOAL II: PROTECT FORESTS, CROPS, AND LIVESTOCK FROM INSECTS, DISEASES, AND OTHER HAZARDS

- 201 Control of Insects Affecting Forests
- 202 Control of Diseases, Parasites, and Nematodes Affecting Forests
- 203 Prevention and Control of Forest and Range Fires

- 204 Control of Insects, Mites, Slugs, and Snails on Fruit and Vegetable Crops
- 205 Control of Diseases and Nematodes of Fruit and Vegetable Crops
- 206 Control of Weeds and Other Hazards of Fruit and Vegetable Crops

- 207 Control of Insects, Mites, Snails, and Slugs Affecting Field Crops and Range
- 208 Control of Diseases and Nematodes of Field Crops and Range
- 209 Control of Weeds and Other Hazards of Field Crops and Range

- 210 Control of Insects and External Parasites Affecting Livestock, Poultry, Fish, and Other Animals
- 211 Control of Diseases of Livestock, Poultry, Fish, and Other Animals
- 212 Control of Internal Parasites of Livestock, Poultry, Fish, and Other Animals
- 213 Protect Livestock, Poultry, Fish, and Other Animals from Toxic Chemicals, Poisonous Plants, and Other Hazards
- 214 Protection of Plants, Animals, and Man from Harmful Effects of Pollution

RPA TITLE

GOAL III: PRODUCE AN ADEQUATE SUPPLY OF FARM AND FOREST PRODUCTS AT DECREASING REAL PRODUCTION COSTS

- 301 Genetics and Breeding of Forest Trees
- 302 New and Improved Forest Engineering Systems
- 303 Economics of Timber Production

- 304 Improvement of Biological Efficiency of Fruit and Vegetable Crops
- 305 Mechanization of Fruit and Vegetable Crop Production
- 306 Production Management Systems for Fruits and Vegetables
- 307 Improvement of Biological Efficiency of Field Crops
- 308 Mechanization of Production of Field Crops
- 309 Production Management Systems for Field Crops

- 310 Reproductive Performance of Livestock, Poultry, Fish, and Other Animals
- 311 Improvement of Biological Efficiency in Production of Livestock, Poultry, Fish, and Other Animals
- 312 Environmental Stress in Production of Livestock, Poultry, Fish, and Other Animals
- 313 Production Management Systems for Livestock, Poultry, Fish, and Other Animals

- 314 Bees and Other Pollinating Insects
- 315 Improvement of Structures, Facilities, and General Purpose Farm Supplies and Equipment
- 316 Farm Business Management
- 317 Mechanization and Structures Used in Production of Livestock, Poultry, Fish, and Other Animals
- 318 Non-Commodity-Oriented Biological Technology and Biometry

GOAL IV: EXPAND THE DEMAND FOR FARM AND FOREST PRODUCTS BY DEVELOPING NEW AND IMPROVED PRODUCTS AND PROCESSES AND ENHANCING PRODUCT QUALITY

- 401 New and Improved Forest Products

- 402 Production of Fruit and Vegetable Crops with Improved Acceptability
- 403 New and Improved Fruit and Vegetable Products and Byproducts
- 404 Quality Maintenance in Storing and Marketing Fruits and Vegetables

- 405 Production of Field Crops with Improved Acceptability
- 406 New and Improved Food Products from Field Crops
- 407 New and Improved Feed, Textile, and Industrial Products from Field Crops
- 408 Quality Maintenance in Storing and Marketing Field Crops
- 409 Production of Animal Products with Improved Acceptability
- 410 New and Improved Meat, Milk, Eggs, and Other Animal Food Products

RPA TITLE

GOAL IV (Cont'd)

- 411 New and Improved Non-Food Animal Products
- 412 Quality Maintenance in Marketing Animal Products

GOAL V: IMPROVE EFFICIENCY IN THE MARKETING SYSTEM

- 501 Improvement of Grades and Standards--Crop and Animal Products
- 502 Development of Markets and Efficient Marketing of Timber and Related Products
- 503 Efficiency in Marketing Agricultural Products and Production Inputs
- 506 Supply, Demand, and Price Analysis--Crop and Animal Products
- 507 Competitive Interrelationships in Agriculture
- 508 Development of Domestic Markets for Farm Products
- 509 Performance of Marketing Systems
- 510 Group Action and Market Power
- 511 Improvement in Agricultural Statistics
- 512 Improvement of Grades and Standards--Forest Products
- 513 Supply, Demand, and Price Analysis--Forest Products

GOAL VI: EXPAND EXPORT MARKETS AND ASSIST DEVELOPING NATIONS

- 601 Foreign Market Development
- 602 Evaluation of Foreign Food Aid Programs
- 603 Technical Assistance to Developing Countries
- 604 Product Development and Marketing for Foreign Markets

GOAL VII: PROTECT CONSUMER HEALTH AND IMPROVE NUTRITION AND WELL-BEING OF THE AMERICAN PEOPLE

- 701 Insure Food Products Free of Toxic Contaminants, Including Residues from Agricultural and Other Sources
- 702 Protect Food and Feed Supplies from Harmful Microorganisms and Naturally Occurring Toxins
- 703 Food Choices, Habits, and Consumption
- 704 Home and Commercial Food Service
- 705 Selection and Care of Clothing and Household Textiles
- 706 Control of Insect Pests of Man and His Belongings
- 707 Prevent Transmission of Animal Diseases and Parasites to Man
- 708 Human Nutrition
- 709 Reduction of Hazards to Health and Safety

GOAL VIII: ASSIST RURAL AMERICANS TO IMPROVE THEIR LEVEL OF LIVING

- 801 Housing
- 802 Individual and Family Decision Making and Resource Use and Family Functioning

RPA TITLE

GOAL VIII (Cont'd)

- 803 Causes of Poverty Among Rural People
- 804 Improvement of Economic Potential of Rural People
- 805 Communication and Education Processes
- 806 Individual and Family Adjustment to Change
- 807 Structural Changes in Agriculture
- 808 Government Programs to Balance Farm Output and Market Demand

GOAL IX: PROMOTE COMMUNITY IMPROVEMENT INCLUDING DEVELOPMENT OF BEAUTY, RECREATION, ENVIRONMENT, ECONOMIC OPPORTUNITY, AND PUBLIC SERVICES

- 901 Alleviation of Soil, Water, and Air Pollution and Disposal of Wastes
- 902 Outdoor Recreation
- 903 Multiple Use Potential of Forest Land and Evaluation of Forestry Programs
- 904 Fish and Other Aquatic Life, Fur-Bearing Animals, and Other Wildlife
- 905 Trees to Enhance Rural and Urban Environment
- 906 Culture and Protection of Ornamentals and Turf

- 907 Improved Income Opportunities in Rural Communities
- 908 Improvement of Rural Community Institutions and Services

ACTIVITY

Conservation, development, and use of soil, water, and other natural resources

- 4100 Resource description and inventory
- 4300 Resource development, conservation, and management
- 4400 Evaluation of alternative uses and methods of use

Protection of man, commodities, resources, and their products from losses, damage, or discomfort

- 4500 Protection against insects, mites, snails, and slugs and their control agents
- 4600 Protection against diseases, parasites, and nematodes and their control agents
- 4700 Protection against weeds and their control agents
- 4810 Protection against fire
- 4820 Protection against flood
- 4830 Protection against pollutants
- 4840 Protection against climatic extremes (frost, hail, wind, drought, etc.)
- 4850 Protection against birds
- 4860 Protection against rodents and other mammals
- 4870 Protection against molds, fungi, and other spoilage organisms
- 4880 Protection against allergens, toxins, and poisonous plants
- 4890 Protection against radiation, noise, and other hazards

Efficient production and quality improvement

- 4900 Biology of plants and animals
- 5000 Improving biological efficiency of plants and animals
- 5100 Increasing consumer acceptability of farm and forest products
- 5200 Mechanization, improvement of physical efficiency, and development of structures and facilities
- 5300 Management of labor, capital, and other inputs

Food product development and processing

- 5410 Chemical and physical properties of food
- 5420 Biochemical and chemical reactions in food
- 5430 Sensory properties of food

- 5510 Food physical processes (canning, freezing, dehydration, milling, separation, extraction)
- 5520 Food bioprocesses (enzyme and microbial applications)
- 5530 Food chemical processes (salt, sugar, acid)
- 5540 Food processing efficiencies (management of energy, water, wastes)
- 5550 Food product handling, packaging, and storage

Non-food product development and processing

- 5600 Chemical and physical properties of non-food products
- 5700 Developing new and improved non-food products and processes

Efficient marketing, including pricing and quality

- 5800 Identification, measurement, and maintenance of quality
- 5900 Improving economic and physical efficiency in marketing, including analysis of market structure and functions
- 6000 Analysis of supply, demand, and price, including interregional competition
- 6100 Developing domestic markets, including consumer preference and behavior
- 6200 Foreign trade, market development, and competition

Improvement of human nutrition and consumer satisfaction

- 6310 Nutrient composition of food
- 6320 Human nutrient requirements
- 6330 Food fortification, enrichment, and improvement
- 6340 Food consumption patterns and use
- 6360 Metabolism and function of nutrients in food
- 6370 Human nutrition and behavior
- 6380 Human nutritional monitoring and surveillance
- 6390 Eating quality of food

Improvement of family life, housing, and management and use of personal, domestic, and other resources

- 6410 Quality of family living
- 6420 Quality of housing
- 6430 Improvement of domestic and community water and waste systems
- 6450 Quality of management and use of personal, domestic, and other resources

Development of human resources and economies of communities, areas, and nations

- 6500 Description, inventory, and trends
- 6600 Economic development and adjustment

- 6710 Improvement of social well-being
- 6720 Improvement of social services and facilities
- 6730 Community, family, and individual adjustment to social change
- 6740 Community, family, and individual adjustment to economic change

General methodology, technology, and evaluation

- 7000 Design of experiments and methods of statistical analysis
- 7100 Improvement of research administration
- 7200 Information documentation and retrieval

- 7300 Evaluation of public programs, policies, and services
- 7400 Improvement of agricultural statistics
- 7500 Development of research equipment and technology

COMMODITY, RESOURCE, OR TECHNOLOGY NOT ASSOCIATED WITH SPECIFIC COMMODITIES

COMMODITIES AND THEIR PRODUCTS AND NATURAL RESOURCES

PRIME* SUB**

0100 Soil and Land

0110 Soil
0120 Land
0199 Soil and Land, General

0200 Water

0300 Watersheds and River Basins

0310 River Basins
0320 Watersheds
0330 Irrigation and Drainage Districts
0399 Watersheds and River Basins, General

0400 Air and Climate

0500 Recreational Resources

0510 Wilderness (Roadless Areas)
0520 Campgrounds and Picnic Areas
0530 Parks and Urban Greenspace
0590 Other Recreational Resources
0599 Recreational Resources, General

0600 Trees, Forests, and Forest Products (Excluding Edible Tree Nut Crops
1050)

0610 Conifers, General
0611 Christmas Trees
0612 Douglas Fir
0613 Other Western Conifers
0614 Naval Stores
0615 Ornamental, Shade, and Landscape Conifers
0616 Southern Pine
0617 Other Eastern Conifers
0619 Other Conifers

* Primary Commodities

** Subcommodities

PRIME SUB

- 0620 Hardwoods, General
- 0621 Black Walnut
- 0622 Other Fine Hardwoods (Ash, Black Cherry, Yellow Birch, Select White and Red Oaks)
- 0623 Poplars, Aspen, and Cottonwoods
- 0624 Elms (Ornamental, Shade, and Landscape only)
- 0625 Other Ornamental, Shade, and Landscape Hardwoods
- 0626 Maple (For Syrup and Sugar only)
- 0629 Other Hardwoods

- 0630 Both Conifers and Hardwoods, General
- 0631 Shelterbelts and Windbreaks
- 0632 Medicinal (For Agricultural Drug and Chemurgic Crops see 2820)
- 0639 Other Conifers and Hardwoods
- 0699 Trees, Forests, and Forest Products, General

0700 Range

- 0710 Sagebrush
- 0720 Desert Shrub
- 0730 Southwestern Shrubsteppe
- 0740 Chaparral Mountain Shrub
- 0750 Pinyon-Juniper
- 0760 Mountain Grassland
- 0770 Mountain Meadows and Alpine
- 0780 Desert Grassland
- 0781 Annual Grassland
- 0790 Shinnery
- 0791 Texas Savanna
- 0792 Plains Grassland
- 0793 Prairie
- 0798 Other Rangelands
- 0799 Range, General

0800 Fish, Shellfish, Game and Fur-Bearing Animals, and other Wildlife and their Habitats

- 0810 Game Fish
 - Includes: Bass, Bluegill, Muskellunge, Pike, Shad, Trout
- 0820 Commercial Fish and Shellfish/Aquaculture, General
- 0821 Freshwater Fish and Shellfish
 - Includes: Catfish, Carp, Salmon, Trout, Striped Bass, Crayfish
- 0822 Saltwater Fish and Shellfish
 - Includes: Clams, Cod, Cusk, Flounder, Haddock, Hake, Herring, Lobsters, Menhaden, Oysters, Shrimp, Whiting

PRIME SUB

- 0830 Game Birds
Includes: Wild Ducks, Wild Geese, Grouse, Partridges, Pheasants, Quail, Wild Turkeys
- 0840 Non-Game Birds
Includes: Ostriches, Emus
- 0850 Game Animals
Includes: Antelopes, Bison, Bobcats, Deer, Elk, Moose
- 0860 Fur-Bearing Animals
Includes: Beavers, Foxes, Martens, Minks, Muskrats, Nutria, Rabbits
- 0870 Fish Habitats
- 0880 Wildlife Habitats
- 0890 Other Wildlife
- 0899 Fish, Shellfish, Game and Fur-Bearing Animals, etc., General

0900 Citrus and Tropical/Subtropical Fruit

- 0910 Citrus, General
- 0911 Grapefruit
- 0913 Oranges
- 0914 Lemons
- 0919 Other Citrus
Includes: Limes, Mandarin Oranges

- 0920 Tropical/Subtropical Fruit, General
- 0921 Bananas
- 0922 Pineapples
- 0923 Papayas
- 0924 Mangoes
- 0925 Dates
- 0926 Kiwis
- 0929 Other Tropical/Subtropical Fruit
Includes: Avocados, Coconuts, Figs, Guavas, Olives, Passion Fruits, Soursops)

- 0999 Citrus and Tropical/Subtropical Fruit, General

1000 Deciduous and Small Fruits and Edible Tree Nuts

- 1010 Deciduous Tree Fruits, General
- 1011 Apples
- 1012 Apricots
- 1013 Cherries
- 1014 Nectarines
- 1015 Peaches
- 1016 Pears
- 1017 Plums

PRIME SUB

- 1019 Other Deciduous Tree Fruits

- 1030 Berries and Cane Fruits, General
 - 1031 Blueberries
 - 1032 Cranberries
 - 1033 Strawberries
 - 1034 Raspberries
 - 1039 Other Berries and Cane Fruits
 - Includes: Blackberries, Boysenberries, Currants, Elderberries

- 1040 Grapes, General
 - 1041 Table Grapes
 - 1042 Wine Grapes
 - 1043 Raisin Grapes
 - 1049 Other Grapes

- 1050 Edible Tree Nuts, General
 - 1051 Filberts
 - 1052 Pecans
 - 1054 Almonds
 - 1055 Walnuts
 - 1059 Other Edible Tree Nuts
 - Includes: Cashews, Chestnuts, Macadamia Nuts, Pistachios

- 1090 Other Deciduous and Small Fruits and Edible Tree Nuts
- 1099 Deciduous and Small Fruits and Edible Tree Nuts, General

1100 Potatoes

1200 Vegetables

- 1210 Leguminous Vegetables, General
 - 1211 Beans (Dry)
 - 1212 Beans (Fresh, Fresh-Processed)
 - 1213 Peas (Dry)
 - 1214 Peas (Fresh, Fresh-Processed)
 - 1215 Lentils
 - 1219 Other Leguminous Vegetables

- 1220 Melons and Other Cucurbits, General
 - 1221 Melons
 - Includes: Cantaloupes, Muskmelons, Watermelons
 - 1222 Cucumbers
 - 1223 Other Cucurbits
 - Includes: Pumpkins, Squash, Gourds

PRIME SUB

- 1230 Greens and Leafy Vegetables
Includes: Endive, Lettuce, Spinach, Turnip-Greens, Celery,
Rhubarb, Parsley, Asparagus
- 1240 Cabbage and Other Cole Crops
Includes: Cabbage, Kale, Broccoli, Brussels Sprouts, Cauliflower,
Kohlrabi

- 1250 Rhizomes, Tubers, Bulbs, and Root Crops, General (For Potatoes
use 1100)
- 1251 Sweet Potatoes
- 1252 Onions, Garlic, Leeks, Shallots
- 1253 Carrots
- 1254 Yams
- 1255 Taro
- 1256 Cassava (or Manioc)
- 1259 Other Rhizomes, Tubers, Bulbs, and Root Crops
Includes: Beets, Radishes, Turnips

- 1260 Solanaceous and Related Crops, General (For Potatoes use 1100)
- 1261 Tomatoes
- 1262 Peppers
- 1263 Eggplant
- 1264 Other Solanaceous and Related Crops

- 1270 Mushrooms and Other Edible Fungi
- 1280 Sweetcorn
- 1291 Herbs and Spices
Includes: Dill, Fennel, Mustard, Basil, Ginger, Sage, Tarragon,
Thyme
- 1298 Vegetables, General
- 1299 Other Vegetables
Includes: Okra, Bamboo Shoots

- 1300 **Ornamentals and Turf** (For Shade, Ornamental, and Landscape Trees
use 0600)**

- 1310 Woody Shrubs

- 1320 Florist Crops, General
- 1321 Perennials (Herbaceous) and Decorative Greens
- 1322 Cut Flowers
- 1323 Cut Foliage and Greens
- 1324 Potted Flowering Plants
- 1325 Potted Foliage Plants
- 1326 Bedding/Garden Plants

<u>PRIME</u>	<u>SUB</u>
	1330 Lawns and Turf Includes: Bentgrass, Bermudagrass, Bluegrass, Dichondra, Fescue, Ryegrass, Zoysia
	1340 Ground Covers
	1350 Aquatic Plants
	1391 Arboreta and Botanical Gardens
	1398 Ornamentals and Turf, General
	1399 Other Ornamentals and Turf Includes: Cacti
1400	Corn (For Sweetcorn use 1280)
	1410 Corn
	1430 Popcorn
1500	Grain Sorghum
1600	Rice
1700	Wheat (For Wheat as Forage use 2090)
	1710 Hard Red Winter Wheat
	1720 Hard Red Spring Wheat
	1730 Soft Red Winter Wheat
	1740 White Wheat Includes: Club, Western, and Soft White
	1750 Durum Wheat
	1790 Other Wheat
	1799 Wheat, General
1800	Other Small Grains
	1810 Barley
	1820 Oats
	1830 Rye
	1890 Other Specific Small Grains Includes: Buckwheat, Millet, Triticale
	1899 Other Small Grains, General
1900	Pasture
2000	Forage Crops
	2010 Perennial Grasses, General
	2011 Warm Season Perennial Grasses Includes: Dallisgrass, Bluestems, Bermudagrass

<u>PRIME</u>	<u>SUB</u>
2012	Cool Season Perennial Grasses Includes: Bluegrass, Bromegrass, Fescue, Orchardgrass, Perennial Ryegrass, Timothy, Wheatgrass
2020	Annual Grasses, General
2021	Summer Annual Grasses Includes: Forage Sorghums, Sudangrass, Sorghum-Sudangrass Hybrids
2022	Winter Annual Grasses Includes: Annual Ryegrass
2030	Legumes, General
2031	Alfalfa
2032	Trefoil
2033	Red Clover
2034	Crownvetch
2035	Winter Annual Legumes Includes: Subterranean Clover, Arrowleaf Clover
2039	Other Legumes Includes: Crimson Clover, Ladino Clover, Sweet Clover, Lespedeza
2040	Forage Seeds, General
2041	Grass Seeds
2042	Legume Seeds
2090	Other Forage Crops Includes: Cereal Crops used for Forage
2099	Forage Crops, General
2100	Cotton (Including Cottonseed for Planting Purposes)
2110	Upland Cotton
2120	Long Fiber Cotton
2190	Other Cotton
2199	Cotton, General
2200	Cottonseed (For Meal, Oil, etc.)
2300	Soybeans
2400	Peanuts
2500	Other Oilseed and Oil Crops
2510	Castor
2520	Crambe
2530	Flax

PRIME SUB

2540 Safflower
2550 Sunflower
2560 Jojoba
2570 Coconut
2580 Palm

2590 Other Specific Oilseed and Oil Crops
2591 Canola
2592 Cuphea
2593 Lesquerella
2594 Meadowfoam
2595 Rape
2596 Sesame
2597 Chinese Tallow
2598 Tung
2599 Other Oilseed and Oil Crops, General

2600 Tobacco

2610 Flue-Cured
2620 Burley
2630 Cigar Types
2690 Other Tobacco
2699 Tobacco, General

2700 Sugar Crops

2710 Sugar Beets
2720 Sugar Cane
2730 Sweet Sorghum
2790 Other Sugar Crops
2799 Sugar Crops, General

2800 Miscellaneous and New Crops

2810 Fiber Plants, General
2811 Kenaf
2812 Hemp
2813 Ramie
2814 Agave
2819 Other Fiber Plants
 Includes: Abaca, Roselle, Sansevieria

2820 Drug and Chemurgic Crops, General
 Includes: Dioscorea, Saponaria, Senna, Tephrosia
2821 Narcotic Plants

PRIME SUB

2830 Flavoring and Beverage Plants, General
2831 Hops
2832 Mint
2833 Coffee
2834 Cocoa
2835 Tea
2839 Other Flavoring and Beverage Plants
 Includes: Vanilla

2860 Rubber, Gum, and Resin Plants, General
2861 Guayule
2862 Hevea
2863 Gums
 Includes: Arabic
2869 Other Rubber and Resin Plants

2890 Other Miscellaneous and New Crops
2899 Miscellaneous and New Crops, General

2900 Poultry

2910 Egg Type Chickens
2920 Eggs
2930 Meat Type Chickens
2940 Ducks and Geese
2950 Turkeys
2960 Poultry Meat
2990 Other Poultry
2999 Poultry, General

3000 Beef Cattle

3010 Meat
3020 Hides
3030 Other Beef Cattle Products
3040 Beef Cattle, Live Animal
3090 Beef Cattle, General

3100 Dairy Cattle

3110 Butter
3120 Cheese
3130 Meat
3140 Milk
3150 Ice Cream
3160 Dairy Cattle, Live Animal
3190 Other Dairy Cattle Products

PRIME SUB

3199 Dairy Cattle, General

3200 Swine

3210 Meat
3220 Hides
3230 Other Swine Products
3240 Swine, Live Animal
3299 Swine, General

3300 Sheep and Wool

3310 Meat
3320 Hides
3330 Wool Fiber
3340 Sheep, Live Animal
3399 Sheep and Wool, General

3400 Other Animals (See 0800 for Fish, Shellfish, Game and Fur-Bearing Animals)

3410 Horses, Ponies, and Mules
3420 Goats and Mohair
3430 Pets
 Includes: Dogs, Cats
3440 Laboratory Animals
 Includes: Guinea Pigs, Mice, Rats, Rabbits
3490 Other Specific Animals
3491 Other Animal Fibers
3499 Other Animals, General

3500 Bees and Honey and Other Pollinating Insects

3510 Honey Bees
3530 Honey and Honey Products
3550 Non-Honey Apiary Products
3590 Other Pollinating Insects
3599 Honey Bees and Other Pollinating Insects, General

MANMADE RESOURCES

3600 General Purpose Supplies

Includes: Machinery, Equipment, Fertilizers, Feedstuffs, and Pesticides

3700 Clothing and Textiles

3800 Food (Not readily associated with specific Plant and Animal Products)

PRIME SUB

3900 Structures and Facilities

- 3910 Houses (People), Furniture, Household Equipment, and Non-Textile
 Furnishings
- 3920 Other Farm Structures and Related Facilities
- 3930 Nonfarm Structures and Related Facilities including those used in the
 Marketing, Storing, Processing, and Distributing Functions, and for
 Recreation Uses
- 3940 Domestic and Community Water Supply Facilities and Systems
- 3950 Drainage and Irrigation Facilities and Systems
- 3960 Sewage and Waste Disposal Facilities and Systems
- 3990 Other Structures and Facilities (such as Trails, Roads, Telephone,
 and
 Electricity)
- 3999 Structures and Facilities, General

HUMAN RESOURCES, ORGANIZATIONS AND INSTITUTIONS

4000 People as Individual Workers, Consumers, and Members of Society

4100 The Family and its Members

4200 The Farm as a Business Enterprise

**4300 Communities, Areas, and Regions, including Counties and States, and
 their Institutions and Organizations**

**4400 Agricultural Economy of the United States and Sectors thereof,
 including Interrelationships with the Total Economy**

**4500 Agricultural Economy of Foreign Countries and Sectors thereof,
 including Interrelationships with the Total Economy**

4600 Farmer Cooperatives

4700 Marketing, Processing, and Supply Firms other than Cooperatives

4800 Marketing Systems and Sectors thereof

TECHNOLOGY NOT ASSOCIATED WITH SPECIFIC COMMODITIES OR
 RESOURCES

6100 Weeds

6200 Seed Research

PRIME SUB

6300 Biological Cell Systems

6400 Experimental Design and Statistical Methods

6500 Invertebrates

6510 Insects

6520 Spiders, Mites, Ticks, and other Arthropods

6530 Nematodes

6590 Other Invertebrates

 Includes: Snails, Slugs, Leeches

6599 Invertebrates, General

6600 Microorganisms, Viruses, etc.

6620 Bacteria

6630 Fungi

6640 Viruses

6650 Viroids, Mycoplasmas, Spiroplasmas, etc.

6660 Protozoa

6690 Other Microorganisms

6699 Microorganisms, General

6700 Plants

6710 Cross-Commodity Research--Multiple Crops

6720 Noncrop Plant Research

6799 Plant Research, General

6800 Animals (Vertebrates)

6810 Cross-Commodity Research--Multiple Animal Species

6899 Animal Research, General

**6900 Research on Research Management (Not Research Management
 per se)**

7000 Research Equipment and Technology

7090 Remote Sensing Equipment and Technology

7098 Research Equipment and Technology, General

7099 Other Research Equipment and Technology

FIELD OF SCIENCE

Biological

0110	Biochemistry and biophysics - animal	0914	Nutrition and Metabolism - other
0112	Biochemistry and biophysics - plant	1010	Parasitology - animal
0113	Biochemistry and biophysics - human	1012	Parasitology - plant
0114	Biochemistry and biophysics - other	1013	Parasitology - other
0210	Biology - Environmental, systematic, applied - animal	1110	Pathology - animal
0212	Biology - Environmental, systematic, applied - plant	1112	Pathology - plant
0213	Biology - Environmental, systematic, applied - human	1113	Pathology - human
0214	Biology - Environmental, systematic, applied - other	1114	Pathology - other
0310	Biology - Molecular - animal	1210	Pharmacology
0312	Biology - Molecular - plant	1310	Physiology - animal
0313	Biology - Molecular - other	1312	Physiology - plant
0410	Entomology - animal	1313	Physiology - other
0412	Entomology - plant	1410	Virology - animal
0413	Entomology - human	1412	Virology - plant
0414	Entomology - other	1413	Virology - human
0510	Animal Genetics and Breeding	1414	Virology - other
0512	Plant Genetics and Breeding		
0513	Genetics - other		
0610	Immunology - animal		
0612	Immunology - plant		
0613	Immunology - human		
0710	Microbiology - animal		
0712	Microbiology - plant		
0713	Microbiology - human		
0714	Microbiology - soils		
0790	Microbiology - other		
0810	Nematology - animal		
0812	Nematology - plant		
0813	Nematology - other		
0910	Nutrition and Metabolism - animal		
0912	Nutrition and Metabolism - plant		
0913	Nutrition and Metabolism - human		

Physical

1524	Chemistry - analytical
1525	Chemistry - inorganic
1526	Chemistry - organic
1527	Chemistry - physical
1528	Chemistry - soils
1529	Chemistry - other
1920	Engineering - agricultural
1924	Engineering - mechanical
1925	Engineering - electrical
1926	Engineering - civil
1927	Engineering - chemical
1928	Engineering - industrial
1929	Engineering - other

Physical (Cont'd)

2020 Geology and geography
2120 Hydrology
2220 Mathematics
2230 Statistics and biometry
2320 Meteorology and climatology
2420 Physics
2421 Physics - soils

Social and Behavioral

2530 Anthropology
2630 Economics
2730 Education
2740 Information and Communication
2830 History
2930 Law
3030 Political Science
3130 Psychology
3230 Sociology
3310 Art and Architecture

RESEARCH PROBLEM AREAS (RPA'S)

DESCRIPTIONS

GOAL I

INSURE A STABLE AND PRODUCTIVE AGRICULTURE FOR THE FUTURE THROUGH WISE MANAGEMENT OF NATURAL RESOURCES

The Nation's natural resources, including soil, water, forest, and range, provide the basis for economic growth and an adequate supply of farm and forest products. Essential natural resources must be maintained, developed, and used to meet production and general welfare needs. This involves reducing soil erosion and controlling water runoff. It includes increasing our efforts to improve forest management.

RPA's 101-114, inclusive.

RPA 101. APPRAISAL OF SOIL RESOURCES

Agricultural agencies make appraisals of the nation's soil resources through soil classification and mapping the classified soil types. Research in support of soil mapping is concerned with identifying the parameters to be measured including the correlation of soil map information with the use to be made of the data (e.g., crop production, housing developments, zoning), and the development of effective and economic ways of reporting the results.

In recent years the use of these findings has extended far beyond that made by farmers and ranchers. For example, sanitarians and home builders are using the information for judging the capacity of soils to absorb septic tank effluent; architects and developers use the information for site evaluation and foundation design; urban planners and other public officials use soil surveys for both general and operational planning of land use in rapidly expanding areas. Soil surveys can also be used to show soil characteristics such as 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 which affect suitability of a site for specific uses.

Areas of research include:

- (a) Physical, chemical, mechanical, and biological characteristics of soils needed in soil classification and management.
- (b) Identification of soil types and their suitability for specific uses.
- (c) 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, and non-agricultural uses. This type of research indicates the general type and level of intensity of use to which a tract of land is suited.

Classification Guidelines:

Activities:

4100 Resource description and inventory

Commodities, etc.:

0100 Soil and land

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:

- (a) Factors which limit root development of plants.
- (b) Development of practical methods for ameliorating unfavorable conditions, such as tillage pans, nutrient deficiencies, and improper air-water relationships.
- (c) Ways to maintain and improve soil structure by soil amendments and by soil, crop, tillage, and management systems.
- (d) 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.
- (e) Chemical changes of nutrient elements in different kinds of soils and the factors affecting uptake by various crops.
- (f) Methods to make beneficial changes in energy dissipation and utilization in the soil-plant-atmosphere relationships.
- (g) Interrelationships between soil properties and aspects of plant physiology.
- (h) Subsidence and fire damage to organic soils.

Exclude: (1) Research that can be considered as "improvement of biological efficiency" when the primary orientation is to the response made by particular plant types (e.g., corn) to variables of soil, plant spacing, fertilizer, water, etc. (Use RPA 304 or 307).

Classification Guidelines:

Activities:

- 4300 Resource development, conservation, and management
- 4810 Protection against fire
- 4820 Protection against flood
- 4840 Protection against climatic extremes (frost, hail, wind, drought, etc.)
- 5000 Improving biological efficiency of plants and animals

Commodities, etc.:

- 0100 Soil and land
- 0200 Water
- 0300 Watersheds and river basins
- 0600, 0700, 0900-2100, 2300-2800 (See Commodity Classification)
- 6100-6400, 6600, 6700 (See Commodity Classification)

RPA 103. MANAGEMENT OF SALINE AND SODIC SOILS AND SALINITY

Injurious accumulations of salts may occur in the root zone of the 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 ground water 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 25 percent of the 34 million acres of irrigated land. Salinity and brackish water problems also occur in seaboard areas.

Areas of research include:

- (a) 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.
- (b) Methods of treating and managing saline irrigation water and leaching effluents.
- (c) Management criteria for use of brackish water of various qualities under a wide range of soil, crop, and environmental conditions.
- (d) Tillage, crop, soil amendment, leaching, and profile modification practices for crop production on saline and sodic soils.
- (e) The interactions of soil structure, dissolved and absorbed ions, microbial activity, organic matter, and moisture movement in the root zone of salt-affected soils.
- (f) Procedures and equipment for determining the salinity status of soils and irrigation waters.
- (g) Research on plants or cropping sequences to manage or improve saline soils.
- (h) Breeding and selection of salt tolerant varieties.

Classification Guidelines:

Activities:

- 4300 Resource development, conservation, and management
- 4900 Biology of plants and animals
- 5000 Improving biological efficiency of plants and animals

Commodities, etc.:

- 0100 Soil and land
- 0200 Water
- 0600, 0700, 0900-2100 (See Commodity Classification)
- 2300-2800, 6700 (See Commodity Classification)

RPA 104. ALTERNATIVE USES OF LAND

Alternative uses of land need to be evaluated to determine which ones will provide the greatest short- and long-range social and economic benefits. Population growth, advances in agricultural technology, changing consumer demands, urban and suburban growth, needs of people at home and abroad, recreational needs, and other factors result in changing demands upon our nation's fixed supply of land. Soil conservation, forestry and water, watersheds, recreation, and community development programs and policies should be based upon the relative advantages of alternative land uses.

Areas of research include:

- (a) Inventory and appraisal of current and potential land uses.
- (b) Parameters and models for evaluating economic benefits.
- (c) Appraisal of future land requirements for non-agricultural uses such as forestry, recreation, highway, urban, and industrial development.
- (d) Economics of conservation and management programs and practices.
- (e) Factors affecting land use such as:
 - (1) Government programs
 - (2) Tax policies
 - (3) New technology
 - (4) Laws and ordinances
 - (5) Land ownership patterns and trends
 - (6) Population changes

Classification Guidelines:

Activities:

- 4100 Resource description and inventory
- 4400 Evaluation of alternative uses and methods of use
- 7300 Evaluation of public programs, policies, and services

Commodities, etc.:

- 0100 Soil and land
- 0200 Water
- 0300 Watersheds and river basins

RPA 105. CONSERVATION AND EFFICIENT USE OF WATER

Virtually all of the nation's water supply arrives as precipitation upon the land. Seventy percent of this supply is lost through evaporation and transpiration. The remaining 30 percent is subject to increasing competition among agricultural, industrial, and domestic users. Increased efficiency in collecting, storing, conveying, using, and reusing available supplies becomes essential.

One example of a reclaimable supply is on irrigated farms where about 76 million acre feet of water are lost by evaporation, seepage, wasteful runoff during irrigation, and use by non-beneficial plants.

Areas of research include:

- (a) Moisture and heat flow in soils for more effective procedures to monitor and improve effectiveness of water storage in the soil profile and underground aquifers.
- (b) Improved soil and water conservation systems and residue management systems which will be compatible with modern mechanized agricultural practices.
- (c) Management practices, breeding and selecting of plant varieties, and environmental management practices to make efficient use of water through the various stages of plant growth.
- (d) Alternative practical techniques for reducing water loss from plant, soil, and water surfaces.
- (e) Practices to enhance water infiltration, transmission, and use by plants.
- (f) Methods to conserve, replenish, and effectively use water in underground storage.
- (g) Research designed to control phreatophytes and aquatic weeds to reduce the damages or losses they cause.

Exclude: (1) Research on aquatic weeds as a pollutant. (Use RPA 901).

Classification Guidelines:

Activities:

- 4100 Resource description and inventory
- 4300 Resource development, conservation, and management
- 4700 Protection against weeds and their control agents (aquatic and phreatophytes only)
- 4840 Protection against climatic extremes (frost, hail, wind, drought, etc.)

Commodities, etc.:

- 0100 Soil and land
- 0200 Water
- 0300 Watersheds and river basins
- 0600, 0700, 0900-2100, 2300-2800 (See Commodity Classification)
- 6100 Weeds
- 6700 Plants

RPA 106. EFFICIENT DRAINAGE AND IRRIGATION SYSTEMS AND FACILITIES

Excess water is a problem on nearly 60 million acres of cropland. Almost 40 million acres of land are under irrigation management. Water control structures represent expensive features of irrigation and drainage systems. Improved design of facilities and systems will result in more efficient use of land, water, and capital resources.

Areas of research include:

- (a) Theory of water flow for more efficient irrigation system design.
- (b) Methods of automating irrigation systems to reduce labor and increase efficiency.
- (c) New concepts and improved design of drainage systems.
- (d) New materials, systems, equipment, and installation techniques to reduce construction and maintenance costs of drainage and irrigation systems.
- (e) Use of solar energy and air turbulence to speed the drying of poorly drained soils.
- (f) Methods for combining irrigation and drainage systems to increase efficiency of water and system use.
- (g) Improved hydraulic design of water control structures to reduce construction cost and maintain safety of structures.
- (h) Methods for determining irrigation water requirements giving consideration to water use by plants, effective rainfall, and water losses during the following application.
- (i) Equipment for uniform distribution of irrigation water with particular emphases on overhead and subsurface systems.

Classification Guidelines:

Activities:

4300 Resource development, conservation, and management

Commodities, etc.:

0100 Soil and land

0200 Water

0600, 0700, 0900-2100, 2300-2800 (See Commodity Classification)

3900 Structures and facilities

6100-6400 (See Commodity Classification)

6600 Microorganisms, viruses, etc.

6700 Plants

RPA 107. WATERSHED PROTECTION AND MANAGEMENT

Nearly 12,000 agricultural and forested watersheds in the country are in the size category commonly encompassed in developments under the Watershed Protection and Flood Prevention Act, the Small Reclamation Projects Act, and similar programs. These watersheds include the cropland of the U.S. as well as the range and forest lands. Many of these watersheds need one or more of the following: flood prevention systems, sediment control, wind and water erosion control, and improved management for water yield and quality.

Erosion control is needed to protect the productive capacity of the land. Sediment control is needed to prevent unwanted deposition of eroded material in reservoirs, harbors, stream channels, streets and highways, or on flood-plain lands. Sediment in streams damages recreational values and must be removed from domestic and industrial water supplies.

Areas of research include:

- (a) New concepts and mathematical expressions of the erosion processes by wind and water.
- (b) Procedures for identifying sediment sources, predicting and measuring sediment deposition, and methods for sediment control.
- (c) Measures for controlling erosion on watershed lands and stream channel systems in both rural and urban environments and methods for reclaiming eroded lands.
- (d) 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.
- (e) 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.
- (f) 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.
- (g) 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.
- (h) Design of watershed structures and runoff control systems.

Classification Guidelines:

Activities:

- 4300 Resource development, conservation, and management
- 4820 Protection against flood
- 4840 Protection against climatic extremes (frost, hail, wind, drought, etc.)

RPA 107 (Cont'd)

Commodities, etc.:

- 0100 Soil and land
- 0200 Water
- 0300 Watersheds and river basins
- 0600 Trees, forests, and forest products
- 0700 Range
- 0900-2100, 2300-2800 (See Commodity Classification)
- 3900 Structures and facilities
- 6700 Plants

RPA 108. ECONOMIC AND LEGAL PROBLEMS IN MANAGEMENT OF WATER AND WATERSHEDS

Economically sound watershed and river basin plans are needed because of: (1) an expanding economy pressing on available water resources in some areas while in others, resources are under-employed, (2) production and income stabilization needs, (3) advancing technology, and (4) large capital investments made by public agencies in water resources projects. Also, efficient use of land and water resources is conditioned by laws, administrative regulations, and other institutional arrangements which prescribe rules and procedures for transfer, use, and management of resources. Economic management of water in agriculture is an important factor in balanced development and growth of all water-using industries.

Areas of research include:

- (a) Identifying and quantifying the benefits and costs of projects, especially intangible and non-market values such as recreation, beauty, and depressed area redevelopment.
- (b) Zoning of water bodies and river basins for most desirable uses (flood-plain occupancy, techniques for minimizing damages and adjusting to floods).
- (c) Identification of potentials for developing major water resources to meet emerging national and regional requirements and objectives.
- (d) Analyses of non-structural alternatives to reduce economic losses from flooding and other water-caused damage.
- (e) Legal and institutional arrangements to achieve equitable and orderly water use and river basin development.
- (f) Advantageous allocation of water among competitive uses.
- (g) Determining benefits derived from wise management and multiple usage of water.
- (h) Evaluating alternatives in watershed and river basin development.

Classification Guidelines:

Activities:

- 4100 Resource description and inventory
- 4300 Resource development, conservation, and management
- 4400 Evaluation of alternative uses and methods of use
- 7300 Evaluation of public programs, policies, and services

Commodities, etc.:

- 0200 Water
- 0300 Watersheds and river basins

RPA 109. ADAPTATION TO WEATHER AND WEATHER MODIFICATION

The future holds many possibilities for changes in weather and climate ranging from dramatic major changes to micro-environmental changes around plants and animals. Research in agriculture has three tasks: (1) characterize existing climatic patterns and propose more effective ways of adjusting to these patterns, (2) specify modifications that are clearly desirable to farm and forest, and (3) learn how modifications proposed by others will affect agriculture or natural ecology.

Areas of research include:

- (a) Understanding the sequences and duration of weather events and the response of relevant biota.
- (b) Probabilities of occurrence of weather conditions critical to agricultural operations.
- (c) Methods for incorporating climatology in the strategy, forecasts, and decision-making tactics of agriculture.
- (d) Techniques for direct modification of weather events and elements.
- (e) The biological consequences of weather modification.
- (f) The phenomena of hail and other severe storms.
- (g) Micro-climate and ways to modify it.
- (h) Legal and economic implications and consequences of particular weather modifications.

Exclude: (1) Research on lightning and other weather-related forest fire research. (Use RPA 203).

Classification Guidelines:

Activities:

- 4100 Resource description and inventory
- 4300 Resource development, conservation, and management
- 4500 Protection against insects, mites, snails, and slugs and their control agents
- 4820 Protection against flood
- 4840 Protection against climatic extremes (frost, hail, wind, drought, etc.)
- 4900 Biology of plants and animals
- 7300 Evaluation of public programs, policies, and services
- 7500 Development of research equipment and technology

Commodities, etc.:

- 0100 Soil and land
- 0200 Water
- 0300 Watersheds and river basins
- 0400 Air and climate
- 0600, 0700, 0900-2800 (See Commodity Classification)
- 6500, 6700 (See Commodity Classification)
- 7000 Research equipment and technology (such as remote sensing)

RPA 110. APPRAISAL OF FOREST AND RANGE RESOURCES

Periodic appraisals of forest and range resources of the nation are essential to determine the adequacy of public conservation policies and programs and to guide the development of private forest and range enterprises.

The timber resources of the nation, including some 500 million acres of commercial forest land, vary greatly in productivity and availability for industrial use. They show widely divergent trends in growth, depletion, and quality. The increasing use of resource data to evaluate future needs for Federal and State forestry programs and to provide guidance for the continuing expansion of wood-using industries in various regions makes it imperative that appraisals of timber resources be intensified and kept up-to-date.

The range and wildlife habitat resources of the nation vary widely in productivity, condition, and potential importance for sustaining livestock and wildlife. There is a growing need for a comprehensive appraisal of range conditions and opportunities for improving capacity and use to meet future demands for livestock forage, water yield, and wildlife habitat.

Areas of research include:

- (a) Determination of types of information needed and standards of estimate.
- (b) Improvement of survey methods to reduce costs and increase the usefulness of information obtained, including emphasis on aerial photography, trend projections, and more effective use of computers for analysis of data.
- (c) Appraisals in each State to provide up-to-date information on the quantity, quality, and productivity of forest and range resources to be used in evaluating the nation's timber and range situation.
- (d) Appraisals for use in development of resource programs.
- (e) Analysis of the timber outlook resulting from alternative management regimes for use in projection systems.

Exclude: (1) Research on use of remote sensing. (Use RPA 113).

Classification Guidelines:

Activities:

- 4100 Resource description and inventory
- 7500 Development of research equipment and technology

Commodities, etc.:

- 0100, 0200, 0500 (See Commodity Classification)
- 0600 Trees, forests, and forest products
- 0700 Range
- 0800 Fish, shellfish, game and fur-bearing animals, and other wildlife and their habitats
- 7000 Research equipment and technology (such as remote sensing)

RPA 111. BIOLOGY, CULTURE, AND MANAGEMENT OF FORESTS AND TIMBER-RELATED CROPS

Culture and management are directed at producing adequate supplies at reasonable cost, by methods that harmonize with other forest uses. For the 40 important commercial timber types in the United States, it is necessary to develop techniques for intensive culture and for combining timber culture with other uses. The major job is to find out how to convert wild forests to forests managed for single or multiple objectives, in the shortest time and at least cost. Each type has distinctive silvicultural characteristics.

Research includes investigations of biological processes and ecological relationships, improved cultural techniques for commercial and other timber species, including Christmas trees, and better methods for forecasting growth and quality changes in relation to management practices. Thus it provides the basis for selection of economic alternatives.

Improved management of existing and improved varieties offers many opportunities for improving the biological efficiency of trees.

Areas of research include:

- (a) Physiology and ecology of forest trees and plant communities.
- (b) Seed orchard management, seed harvesting, processing, and storage methods.
- (c) Nursery culture, planting, and direct seeding.
- (d) Cheaper ways to convert brushfields to timber stands.
- (e) Techniques to encourage natural regeneration to perpetuate desirable forest species.
- (f) Use of prescribed fire and other measures to control competing vegetation and stand composition.
- (g) Planning and techniques for long-term management of forests for timber production in harmony with other uses including wilderness and parks.
- (h) Theory, instrumentation, and methods of mensuration for estimating timber growth, yield, and quality.
- (i) Cultural techniques including spacing, fertilization, liming, and irrigation for the production of timber-related crops from improved strains.
- (j) Christmas tree culture.

Exclude: (1) Research on improvement of biological efficiency through breeding and selection. (Use RPA 301).
(2) Research on trees to enhance rural and urban environment. (Use RPA 905).

Classification Guidelines:

Activities:

- 4300 Resource development, conservation, and management
- 4700 Protection against weeds and their control agents
- 4820 Protection against flood
- 4850 Protection against birds

RPA 111 (Cont'd)

Activities:

- 4860 Protection against rodents and other mammals
- 4890 Protection against radiation, noise, and other hazards
- 4900 Biology of plants and animals
- 5000 Improving biological efficiency of plants and animals
- 5200 Mechanization, improvement of physical efficiency, and development of structures and facilities
- 7500 Development of research equipment and technology

Commodities, etc.:

- 0600 Trees, forests, and forest products
- 7000 Research equipment and technology (such as remote sensing)

RPA 112. IMPROVEMENT OF RANGE RESOURCES

Research seeks to maintain and improve the productive capacity of range ecosystems. Native range in the United States includes over 900 million acres. It represents a continuum of sites and productivity potential from the deserts of the Southwest to the prairies of the Midwest and from the sea-level grasslands of Florida to the Alpine herblands of the high Rockies. Rangelands are important as a source of feed for beef cattle and sheep, in watershed protection, soil stabilization, wildlife habitat, and recreation.

Areas of research include:

- (a) Range characteristics including identification, physiological requirements, and nutritive value of forage plants.
- (b) Understanding range ecosystems and their biotic and physical components.
- (c) Projecting future demand for range forage and other benefits normally related to the wise use of rangelands.
- (d) Improvement through breeding and selection of browse plants for forage as well as for protection and aesthetic purposes.
- (e) Practices for conversion of brush and low-value trees to grassland.
- (f) Revegetation of deteriorated areas by seeding desirable species, including improvement through breeding and selection of range forage plants.
- (g) Systems for managing ranges including fertilization, mechanization, grazing pressure, and drainage so as to increase forage yields.
- (h) Management practices that will harmonize grazing with timber growing, wildlife, recreation, and other land uses.

Exclude: (1) Research on protection against insects, etc. (Use RPA 207).
(2) Research on protection against diseases, etc. (Use RPA 208).
(3) Research on protection against weeds, etc. (Use RPA 209).
(4) Research on protection against fire. (Use RPA 203).
(5) Research on protection against poisonous plants. (Use RPA 213).

Classification Guidelines:

Activities:

- 4300 Resource development, conservation, and management
- 4900 Biology of plants and animals
- 5000 Improving biological efficiency of plants and animals
- 5200 Mechanization, improvement of physical efficiency, and development of structures and facilities
- 7500 Development of research equipment and technology

Commodities, etc.:

- 0700 Range

RPA 113. REMOTE SENSING

Programs in agriculture and forestry are heavily dependent on having timely information for decision-making. Opportunities for increasing and sustaining the productivity of natural resources and for facilitating product flows in agriculture are dependent on accurate, comprehensive, and timely information on resource use, availability, productivity potential, and other characteristics. The paucity of such information is a major obstacle in the economic development of the undeveloped regions of the world and a significant obstacle to the formulation of important policies and programs in the more fully developed regions.

Generally such information on natural resources has been obtained from ground surveys. These surveys are costly, and, in the more remote and inaccessible regions of the world, they are difficult if not impossible to make.

The space age offers new, potentially powerful tools for use in the development of information gathering systems. Ways to exploit the advantages of earth-orbiting spacecraft, in addition to high flying aircraft, in acquiring many types of data need to be explored.

Areas of research include:

- (a) Identifying and describing emittance and reflectance properties of biological and physical materials through spectrophotometric analyses.
- (b) Identifying the single or combined wavelengths in the electromagnetic spectrum that will yield unique and consistent imagery as it is acquired from progressively higher altitudes.
- (c) Specifying the minimum accuracy standards of data required for various agricultural and forestry applications.
- (d) Identification and analyses of economic benefits of the application of remote sensing technology to agriculture, forestry, and community planning.
- (e) Integrating remote sensing components, sampling devices, and data analysis methods into workable information gathering systems.

Exclude: (1) Research on remote sensing of fire, lightning, and fire-related phenomena. (Use RPA 203).
(2) Research on specific problem identification, such as insect infestations, and inventories and surveys. (Use appropriate RPA).

Classification Guidelines:

Activities:

- 4100 Resource description and inventory
- 4300 Resource development, conservation, and management
- 7500 Development of research equipment and technology

Commodities, etc.:

- 0100-2800, 3900, 6100, 6700 (See Commodity Classification)
- 7000 Research equipment and technology (such as remote sensing)

RPA 114. RESEARCH ON MANAGEMENT OF RESEARCH

The resources which would be required to effectively conduct the research on all the researchable problems confronting us greatly exceed those available. Thus, it is necessary to decide which research should be supported and the level of funding. To date there is a paucity of information available to make such decisions. Consequently, it is essential to conduct research which will lead to more reliable estimates of the benefits and costs of specific research proposals so that the objectivity of the decision-making process can be improved. Research on research management also involves such things as studies on maximizing employee and research facility productivity, and on coordination of research effort among scientists throughout the nation.

Areas of research include:

- (a) Developing criteria and techniques for evaluating research accomplishments and research proposals.
- (b) Developing methods to measure the productivity of individual scientists and of research organizations.
- (c) Exploring ways to create the kind of climate and incentives for researchers that will motivate them toward more effective research productivity.
- (d) Exploring ways to maximize the productive use of costly, specialized facilities and equipment.
- (e) Determining the needs and methods for developing, maintaining, and renewing the level of proficiency of scientists.
- (f) Examining the interrelationships between teaching and research.
- (g) Developing more effective means of communication among scientists, and between scientists and potential users of research findings.
- (h) Evaluating the roles of cooperation and competition among scientists and research organizations in striving for productivity and efficiency in the research effort of the nation as a whole.

Classification Guidelines:

Activities:

- 7100 Improvement of research administration
- 7200 Information documentation and retrieval

Commodities, etc.:

- 6900 Research on research management (not research management per se)

GOAL II

PROTECT FORESTS, CROPS, AND LIVESTOCK FROM INSECTS, DISEASES, AND OTHER HAZARDS

Lower unit costs and reduced risks result from eradication or control of diseases and pests and elimination of such hazards of the environment as climatic extremes, pollution, and other stresses. Serious fluctuations in farm and forest product supplies can be avoided when these production hazards are reduced or eliminated.

RPA's 201-214, inclusive.

RPA 201. CONTROL OF INSECTS AFFECTING FORESTS

Insects exact a heavy toll of trees of all ages each year killing many, and damaging and reducing the growth of surviving trees. Wildlife habitats are changed and fire danger is increased. Water yield may be altered and recreation use of forests reduced. Forest insect research can provide the information needed to reduce the continuing losses in productivity and value of forests and forest products, including Christmas trees. A sustained flow of new information provides the basis for safe, effective methods of control.

Areas of research include:

- (a) The biosystematics, biology, ecology, physiology, pathology, and genetics of forest insects and associated organisms.
- (b) Factors that predispose forest trees to insect attack.
- (c) Population dynamics of forest insects for early detection of trends and the role of biological and environmental factors affecting outbreaks.
- (d) Early detection of potentially damaging outbreaks of insect populations by remote sensing, biological sensors, and other techniques.
- (e) Cultural techniques and integrated control systems to reduce insect damage.
- (f) Parasites, predators, and diseases for control of damaging insects.
- (g) Safer and more specific chemical and biotic insecticides including systemics.
- (h) Identifying and synthesizing insect attractants and repellents.
- (i) Direct and indirect control through radiation, chemical sterilization, hormonal disturbance, and sound.
- (j) Equipment and methods for applying controls.
- (k) Protecting Christmas trees against insects.
- (l) Breeding and selection of trees for resistance to insects.

Exclude: (1) Research on control of disease vectors. (Use RPA 202).
(2) Research on trees to enhance the environment. (Use RPA 905).

Classification Guidelines:

Activities:

4500 Protection against insects, mites, snails, and slugs and their control agents

Commodities, etc.:

0600 Trees, forests, and forest products

6500 Invertebrates

RPA 202. CONTROL OF DISEASES, PARASITES, AND NEMATODES AFFECTING FORESTS

Forest disease research is essential to protect and enhance the social and economic value of trees in forests and farm woodlots. Diseases reduce the utility of trees for recreation, wildlife habitat, and timber production. They kill trees, discolor foliage, retard growth, and cause decay leading to breakage and windfall. Prolonged droughts, wet periods, and changing climatic conditions accentuate tree disease problems.

Areas of research include:

- (a) Taxonomy, cultural characteristics, nutritional requirements, enzyme systems, physiology and ecology of pathogens (fungi, bacteria, viruses, nematodes, and mistletoes), and associated organisms in trees and in the soil in which they grow.
- (b) Epidemiology of major destructive diseases and methods of quantifying their impact on trees and forests.
- (c) Nature and action of noninfectious causes of tree diseases (climatic and weather variations, environmental stresses, and nutritional imbalances).
- (d) Cultural practices which deter the spread and increase of pathogens.
- (e) Effectiveness of parasitic, predatory, and antagonistic organisms for biological control of pathogens.
- (f) Physiological and biochemical bases for safe and effective biological and chemical disease control measures.
- (g) Equipment for application of spray materials.
- (h) Control of insect vectors of disease pathogens.
- (i) Protection of forest nurseries and Christmas trees against diseases.
- (j) Breeding and selection of trees for resistance to diseases.

Exclude: (1) Research on trees to enhance the environment. (Use RPA 905).

Classification Guidelines:

Activities:

4600 Protection against diseases, parasites, and nematodes and their control agents

Commodities, etc.:

0600 Trees, forests, and forest products

6500 Invertebrates

6600 Microorganisms, viruses, etc.

RPA 203. PREVENTION AND CONTROL OF FOREST AND RANGE FIRES

Fire research develops the knowledge for safeguarding more than one billion acres of public and private forest and range lands. Fires create air and water pollution, damage outdoor recreation, destroy natural beauty, injure natural resource-based industries, sweep rural communities and even cities, and take human lives. More than 150,000 forest fires occur annually. Development of new fire prevention methods to reduce the number of fires, new technology for fuel hazard reduction, and improved systems for fire detection and effective attack on threatening fires is needed.

Areas of research include:

- (a) Atmospheric system dynamics, patterns, and characteristics.
- (b) The physics and chemistry of combustion.
- (c) The behavior of fires as influenced by fire-starting agents, atmospheric circulation, and local weather, fuels, and topography.
- (d) 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.
- (e) Prevention of lightning fires and alteration of precipitation through weather modification.
- (f) Reduction of fuel hazards through physical, chemical, and prescribed fire treatments.
- (g) Aerial and ground procedures for fighting fires.
- (h) Integrated fire control and forest management systems which minimize fire losses.

Classification Guidelines:

Activities:

4810 Protection against fire

Commodities, etc.:

0600 Trees, forests, and forest products

0700 Range

0800 Fish, shellfish, game and fur-bearing animals, and other wildlife and their habitats

RPA 204. CONTROL OF INSECTS, MITES, SLUGS, AND SNAILS ON FRUIT AND VEGETABLE CROPS

Control of these pests is a major item in production costs of fruits, vegetables, and edible tree nuts. Growers currently spend large sums each year for control measures and still sustain serious losses. The problem is made more difficult by the large number of plant species involved and by the diversity among the insects attacking these species. Associated with the insect problems are insecticide residue problems.

Areas of research include:

- (a) Biological control through use of predators, parasites, diseases, male sterility techniques, and chemical and physical attractants to lure insects into areas where they can be destroyed.
- (b) Breeding and selection of fruits and vegetables for resistance to insects, mites, slugs, and snails.
- (c) Studies on the genetic, nutritional, and environmental factors that govern the activities of these pests.
- (d) Methods to prevent introduction of new pests from foreign sources.
- (e) Studies on the mechanisms by which these pests become resistant to chemical controls.
- (f) Search for effective, safe, non-persistent chemical controls.
- (g) Development of improved methods and equipment for applying chemical controls.

Exclude: (1) Research on control of insect vectors. (Use RPA 205).

(2) Research to alleviate soil, water, and air pollution. (Use RPA 901).

Classification Guidelines:

Activities:

4500 Protection against insects, mites, snails, and slugs and their control agents

Commodities, etc.:

0900 Citrus and tropical/subtropical fruit

1000 Deciduous and small fruits and edible tree nuts

1100 Potatoes

1200 Vegetables

2800 Miscellaneous and new crops

6500 Invertebrates

6700 Plants

RPA 205. CONTROL OF DISEASES AND NEMATODES OF FRUIT AND VEGETABLE CROPS

Control of diseases of fruits, vegetables, and edible tree nuts is expensive, imperfect and sometimes extremely difficult. Growers spend large sums each year in order to achieve partial control of the fungi, bacteria, viruses, and nematodes that cause diseases. Even with these efforts, diseases reduce crop yields substantially.

Areas of research include:

- (a) Breeding and selection of fruits and vegetables for resistance to diseases.
- (b) Crop sequence and soil management in relation to soil borne diseases.
- (c) Micro-ecological studies of the soil in relation to soil borne diseases.
- (d) Non-chemical control methods, such as use of hot water, dry heat, or irradiation of seed and tissues for propagation of disease-free stock.
- (e) Crop sanitation and cultural technique studies including use of soil amendments.
- (f) Methods of detecting minute traces of disease inoculum.
- (g) Effective and less hazardous fungicides, bactericides, and nematicides.
- (h) Methods and equipment for applying soil fumigants, sprays, or dusts to soils or plants.
- (i) Control or elimination of vectors of plant disease.
- (j) Exclusion of foreign diseases.
- (k) Physiological studies of noninfectious diseases.
- (l) Epidemiological and related meteorological studies as aids to disease avoidance and control.
- (m) Environmental control to suppress disease development.
- (n) Improved methods of producing, indexing, and distributing virus-free propagating stocks.

Classification Guidelines:

Activities:

4600 Protection against diseases, parasites, and nematodes and their control agents

Commodities, etc.:

0900 Citrus and tropical/subtropical fruit
1000 Deciduous and small fruits and edible tree nuts
1100 Potatoes
1200 Vegetables
2800 Miscellaneous and new crops
6500 Invertebrates
6600 Microorganisms, viruses, etc.
6700 Plants

RPA 206. CONTROL OF WEEDS AND OTHER HAZARDS OF FRUIT AND VEGETABLE CROPS

Control of weeds and other hazards of fruits, vegetables, and edible tree nuts is a major item in the cost of producing these crops. Other hazards include mice, birds, rabbits and other forms of wildlife, hail, frost, and other climatic extremes.

Areas of research include:

- (a) Biological control of weeds.
- (b) The relationship of plant anatomy, morphology, and physiology to the absorption and translocation of herbicides.
- (c) Mechanism of action of herbicides.
- (d) Search for more effective, faster degrading, and less hazardous herbicides.
- (e) Production practices to inhibit or prevent weed growth.
- (f) Improved methods and equipment for herbicide application with special attention to control of drift.
- (g) Control methods including attractants and repellents for rabbits, rodents, birds, deer, and other destructive forms of wildlife.
- (h) More effective methods of minimizing losses from factors such as frost, hail, wind, and other environmental extremes.

Classification Guidelines:

Activities:

- 4700 Protection against weeds and their control agents
- 4840 Protection against climatic extremes (frost, hail, wind, drought, etc.)
- 4850 Protection against birds
- 4860 Protection against rodents and other mammals

Commodities, etc.:

- 0900 Citrus and tropical/subtropical fruit
- 1000 Deciduous and small fruits and edible tree nuts
- 1100 Potatoes
- 1200 Vegetables
- 2800 Miscellaneous and new crops
- 6100 Weeds
- 6700 Plants

RPA 207. CONTROL OF INSECTS, MITES, SNAILS, AND SLUGS AFFECTING FIELD CROPS AND RANGE

Control of insects, mites, snails, and slugs adds greatly to production costs. In spite of large outlays, it is estimated that insects destroy about 10 percent of all field crops each year. It has become necessary to abandon many well established control practices because of residue and pollution problems.

Areas of research include:

- (a) Study of heritable traits, breeding, and selection to improve resistance to insects, mites, snails, and slugs.
- (b) Biological control of insects, etc., through use of predators.
- (c) Insect population suppression through use of techniques to induce male sterility and through use of chemical and physical attractants to lure insects into areas where they can be destroyed.
- (d) Search for more effective and safer insecticides.
- (e) Improved methods and equipment for applying insecticides.
- (f) Genetic, nutritional, and environmental factors that govern the activities of insects.
- (g) Production and cultural practices that minimize losses from insects.
- (h) Studies of the mechanisms by which insects become resistant to insecticides.
- (i) Methods to prevent introduction of harmful insects from foreign sources.

Exclude: (1) Research on control of insect vectors. (Use RPA 208).

(2) Research to alleviate soil, water, and air pollution. (Use RPA 901).

Classification Guidelines:

Activities:

4500 Protection against insects, mites, snails, and slugs and their control agents

Commodities, etc.:

0700 Range

1400 Corn (For Sweetcorn use 1280)

1500 Grain sorghum

1600 Rice

1700 Wheat

1800 Other small grains

1900 Pasture

2000 Forage crops

2100 Cotton (including cottonseed for planting purposes)

2300 Soybeans

2400 Peanuts

2500 Other oilseed and oil crops (excluding cottonseed)

2600 Tobacco

RPA 207 (Cont'd)

Commodities, etc.:

- 2700 Sugar crops
- 2800 Miscellaneous and new crops
- 6500 Invertebrates
- 6700 Plants

RPA 208. CONTROL OF DISEASES AND NEMATODES OF FIELD CROPS AND RANGE

Control of diseases is essential in order to provide an adequate supply of food, feed, and fiber. Growers currently are spending large sums to achieve partial control of the fungi, bacteria, nematodes, and viruses that attack field, range, and pasture crops. Even at this level of effort, diseases reduce yields substantially. Man is constantly challenged by newly developed races of disease organisms.

Areas of research include:

- (a) Study of heritable traits, breeding, and selection of field and range crops to improve resistance to diseases.
- (b) Crop sequence and soil management in relation to soil borne diseases.
- (c) Effective and less hazardous fungicides, bactericides, and nematicides.
- (d) Methods and equipment for applying soil fumigants, sprays, or dusts to soils or plants.
- (e) Micro-ecological studies of the soil in relation to soil borne diseases.
- (f) Non-chemical control methods, such as use of hot water, dry heat, or irradiation to obtain disease-free seed and tissue for propagation.
- (g) Crop sanitation and cultural technique studies.
- (h) Methods of detecting minute traces of disease inoculum.
- (i) Control or elimination of vectors of plant disease.
- (i) Exclusion of foreign diseases.
- (k) Environmental control to suppress disease development.
- (l) Epidemiological and related meteorological studies as aids to disease avoidance and control.

Exclude: (1) Research on breeding and selection of plants for reduced content of inherent toxic components. (Use RPA 405).

Classification Guidelines:

Activities:

4600 Protection against diseases, parasites, and nematodes and their control agents

Commodities, etc.:

0700 Range
1400 Corn (For Sweetcorn use 1280)
1500 Grain sorghum
1600 Rice
1700 Wheat
1800 Other small grains
1900 Pasture
2000 Forage crops
2100 Cotton (including cottonseed for planting purposes)

RPA 208 (Cont'd)

Commodities, etc.:

- 2300 Soybeans
- 2400 Peanuts
- 2500 Other oilseed and oil crops (excluding cottonseed)
- 2600 Tobacco
- 2700 Sugar crops
- 2800 Miscellaneous and new crops
- 6500 Invertebrates
- 6600 Microorganisms, viruses, etc.
- 6700 Plants

RPA 209. CONTROL OF WEEDS AND OTHER HAZARDS OF FIELD CROPS AND RANGE

Weeds and other hazards of field crops and their control adds substantially to costs per unit of production. Research is directed at ways to reduce these costs. Hazards other than weeds include birds, other wildlife, frost, and other environmental factors.

Areas of research include:

- (a) Biological control of weeds.
- (b) Effective, less hazardous herbicides.
- (c) The relationship of plant anatomy, morphology, and physiology to the absorption and translocation of herbicides.
- (d) Mechanism of action of herbicides.
- (e) Production practices including cultivation and flaming to inhibit or prevent weed growth.
- (f) Control methods including repellents and attractants for birds, rabbits, rodents, deer, and other destructive forms of wildlife.
- (g) Techniques for application of herbicides with special attention to control of drift.
- (h) More effective methods of minimizing losses from factors such as frost, hail, wind, and other environmental extremes.

Classification Guidelines:

Activities:

- 4700 Protection against weeds and their control agents
- 4840 Protection against climatic extremes (frost, hail, wind, drought, etc.)
- 4850 Protection against birds
- 4860 Protection against rodents and other mammals

Commodities, etc.:

- 0700 Range
- 1400 Corn (For Sweetcorn use 1280)
- 1500 Grain sorghum
- 1600 Rice
- 1700 Wheat
- 1800 Other small grains
- 1900 Pasture
- 2000 Forage crops
- 2100 Cotton (including cottonseed for planting purposes)
- 2300 Soybeans
- 2400 Peanuts
- 2500 Other oilseed and oil crops (excluding cottonseed)
- 2600 Tobacco
- 2700 Sugar crops
- 2800 Miscellaneous and new crops

RPA 209 (Cont'd)

Commodities, etc.:

6100 Weeds

6700 Plants

RPA 210. CONTROL OF INSECTS AND EXTERNAL PARASITES AFFECTING LIVESTOCK, POULTRY, FISH, AND OTHER ANIMALS

A variety of pests and external parasites reduce animal productivity or act as vectors in the transmission of livestock and poultry diseases. Pests irritate and torment livestock throughout the year in all parts of the United States. 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. Methods of control have been developed, but they are less than adequate, either because of difficulty and expense or lack of effectiveness. Suppression of the screw worm by release of males made sterile by nuclear radiation is an example of successful application of research.

Areas of research include:

- (a) Biology and life history of the pest.
- (b) Use and development of irradiation, chemosterilants, attractants, repellents, and other non-insecticidal approaches to insect control.
- (c) Absorption, metabolism, and excretion of insecticides by insects feeding on or in animals.
- (d) Biological control of insects through use of predators.
- (e) The nature of insect resistance to chemical controls.
- (f) Evaluation of alternative control methods.
- (g) Development of methods and equipment for applying or using control materials.

Exclude: (1) Research on control of insect vectors of disease. (Use RPA 211).
(2) Research on nonfarm-raised fish, shellfish, game and fur-bearing animals, and other wildlife. (Use RPA 904).

Classification Guidelines:

Activities:

4500 Protection against insects, mites, snails, and slugs and their control agents

Commodities, etc.:

0800 Fish, shellfish, game and fur-bearing animals, and other wildlife and their habitats
2900 Poultry
3000 Beef cattle
3100 Dairy cattle
3200 Swine
3300 Sheep and wool
3400 Other animals
6500 Invertebrates
6800 Animals (Vertebrates)

RPA 211. CONTROL OF DISEASES OF LIVESTOCK, POULTRY, FISH, AND OTHER ANIMALS

Diseases represent a major hazard to the production of an adequate and wholesome supply of animal products. They 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:

- (a) The nature of the causative agents involved in animal diseases.
- (b) Mechanisms of disease resistance and immunity.
- (c) The interrelationship of environment, genetics, and infectious agents in the etiology of diseases.
- (d) Methods of diagnosis, prevention, treatment, control, and eradication of diseases, including development of equipment.
- (e) Methods of keeping infectious diseases, such as foot-and-mouth disease and rinderpest, out of this country.
- (f) Evaluation of alternative control methods.
- (g) Development of information on disease transmission by insects and other ectoparasites.
- (h) Breeding and selection for disease resistance.
- (i) Control of insect vectors of disease.

Exclude: (1) Research on disorders due to improper nutrition. (Use RPA 311).
(2) Research on disorders resulting from pollution. (Use RPA 214).
(3) Research on bloat and disorders due to ingestion of toxic plants, etc. (Use RPA 213).
(4) Research on environmental stress. (Use RPA 312).
(5) Research on nonfarm-raised fish, shellfish, game and fur-bearing animals, and other wildlife. (Use RPA 904).

Classification Guidelines:

Activities:

4600 Protection against diseases, parasites, and nematodes and their control agents

Commodities, etc.:

0800 Fish, shellfish, game and fur-bearing animals, and other wildlife and their habitats
2900 Poultry
3000 Beef cattle
3100 Dairy cattle
3200 Swine
3300 Sheep and wool
3400 Other animals
6500 Invertebrates

RPA 211 (Cont'd)

Commodities, etc.:

- 6600 Microorganisms, viruses, etc.
- 6800 Animals (Vertebrates)

RPA 212. CONTROL OF INTERNAL PARASITES OF LIVESTOCK, POULTRY, FISH, AND OTHER ANIMALS

Parasites, such as various kinds of worms, flukes, and coccidia cause losses in all parts of the country and in all seasons. Severe infestations of parasites may cause heavy direct losses to the livestock or fish producer. Losses include mortality, reduced yield, condemnation of meat, feed wastage, and cost of drugs. Available treatments or control measures are still inadequate even for the parasites that have been the subject of considerable research.

Areas of research include:

- (a) Biotic relationships in parasitism.
- (b) Control by biological methods and management practices that minimize reliance on chemicals.
- (c) Safe chemical means including systemics for combating parasites.
- (d) Effective means of diagnosing parasitic infestation.
- (e) Evaluation and development of control methods and equipment.
- (f) Study of heritable traits, breeding, and selection to improve resistance to parasites.

Exclude: (1) Research on nonfarm-raised fish, shellfish, game and fur-bearing animals, and other wildlife. (Use RPA 904).
(2) Research on insects, ticks, leeches, and mites. (Use RPA 210).

Classification Guidelines:

Activities:

4600 Protection against diseases, parasites, and nematodes and their control agents

Commodities, etc.:

0800 Fish, shellfish, game and fur-bearing animals, and other wildlife and their habitats
2900 Poultry
3000 Beef cattle
3100 Dairy cattle
3200 Swine
3300 Sheep and wool
3400 Other animals
6500 Invertebrates
6600 Microorganisms, viruses, etc.
6800 Animals (Vertebrates)

RPA 213. PROTECT LIVESTOCK, POULTRY, FISH, AND OTHER ANIMALS FROM TOXIC CHEMICALS, POISONOUS PLANTS, AND OTHER HAZARDS

Livestock, poultry, and fish may suffer losses in productivity from toxic chemicals, pesticides, poisonous plants, predators, ingestion of metal and other foreign bodies, and other hazards. Poisonous plants can cause heavy losses, particularly when pasture or range feed supplies are short or at seasons of the year when these plants are not discriminated against by the grazing animal. Predators cause heavy damage to sheep, turkeys, and farm-raised fish. Bloat is a serious problem among ruminants.

Areas of research include:

- (a) Determining the specific sites and mechanisms of poisoning, bloat, and other disorders in order to learn the bases of these phenomena.
- (b) The toxicology and safe levels of residues of pesticides and other chemicals, natural or synthetic, used directly on or ingested by livestock and poultry.
- (c) Methods of reducing the ingestion of pesticides or other chemicals in or on animal feeds.
- (d) The specific reasons for inter-species differences in detoxication mechanisms and sensitivity to poisoning by pesticides and other chemicals.
- (e) Developing animal management practices that minimize the use of pesticides and other chemicals that leave toxic residues or that reduce the level of such residues.
- (f) Prevention or alleviation of "hardware disease," and the effects of plants that cause bloat, poisoning, or deformities of livestock.
- (g) Developing methods for combating nuclear radiation hazards to livestock.
- (h) Methods for reducing animal losses from predators.
- (i) Developing necessary equipment.

- Exclude:
- (1) Breeding and selection of feed crops for reduced content of toxic components. (Use RPA 405).
 - (2) Research on pesticides applied to or ingested by livestock and poultry when the emphasis is clearly on reduction of the toxic content of foods. (Use RPA 701).
 - (3) Research on nonfarm-raised fish, shellfish, game and fur-bearing animals, and other wildlife. (Use RPA 904).

Classification Guidelines:

Activities:

- 4500 Protection against insects, mites, snails, and slugs and their control agents
- 4600 Protection against diseases, parasites, and nematodes and their control agents
- 4700 Protection against weeds and their control agents
- 4860 Protection against rodents and other mammals
- 4880 Protection against allergens, toxins, and poisonous plants
- 4890 Protection against radiation, noise, and other hazards

RPA 213 (Cont'd)

Commodities, etc.:

- 0800 Fish, shellfish, game and fur-bearing animals, and other wildlife and their habitats
- 2900 Poultry
- 3000 Beef cattle
- 3100 Dairy cattle
- 3200 Swine
- 3300 Sheep and wool
- 3400 Other animals
- 6800 Animals (Vertebrates)

RPA 214. PROTECTION OF PLANTS, ANIMALS, AND MAN FROM HARMFUL EFFECTS OF POLLUTION

Pesticides, salts, sewage, cannery, textile, and animal wastes are generally considered objectionable when they occur as pollutants. Under some conditions they may be detrimental or cause effects detrimental to specific plants or animals.

Air pollutants such as sulfur dioxide, ethylene, and fluorides have long been recognized as harmful to vegetation. Recently, increasing importance has been attached to photochemical air pollution. Examples of plant damage are: fluoride damage to corn, citrus, and trees; ethylene damage to cotton; and ozone damage to cotton, grapes, tobacco, and trees.

Fluorides cause a serious malady in cattle known as fluorosis. Laboratory experiments with animals show that certain irritants common in polluted air can increase susceptibility to respiratory infection and increase mortality.

The pollutants which affect plants and animals may also affect man. Smog may cause eye irritation and increase the severity of respiratory ailments. Air borne allergens, such as pollens, cause suffering to those susceptible to them.

Areas of research include:

- (a) Sources and concentrations of damaging pollutants and the intensity and frequency of occurrence of damage.
- (b) Methodology and instrumentation for detection of pollutants and methods of analysis.
- (c) Tolerance of plants, animals, man, and insects to pollutants, singly and in combinations, especially to low-level pollution for prolonged periods of time.
- (d) Methods and equipment for protecting plants, animals, and man from pollutants.
- (e) Breeding and selection of plants and animals resistant to pollution.

Exclude: (1) Research on noise. (Use RPA 312).
(2) Research on trees to enhance rural and urban environment. (Use RPA 905).
(3) Research on alleviation of pollution. (Use RPA 901).
(4) Research on ornamentals and turf. (Use RPA 906).

Classification Guidelines:

Activities:

4830 Protection against pollutants
4900 Biology of plants and animals
5000 Improving biological efficiency of plants and animals
7500 Development of research equipment and technology

Commodities, etc.:

0500-1200, 1400-2100, 2300-3400, 4000 (See Commodity Classification)

RPA 214 (Cont'd)

Commodities, etc.:

6500 Invertebrates

6700 Plants

6800 Animals (Vertebrates)

7000 Research equipment and technology (such as remote sensing)

GOAL III

PRODUCE AN ADEQUATE SUPPLY OF FARM AND FOREST PRODUCTS AT DECREASING REAL PRODUCTION COSTS

Food and fiber supplies must be increased in order to meet rising domestic needs of our growing population and allow for expansion of exports of food and fiber to other nations. Consumption of farm and forest products can be increased and their competitive position in domestic and foreign markets improved by reducing production costs. Of particular concern are those farm products which are under pressure from synthetics and imports.

RPA's 301-318, inclusive.

RPA 301. GENETICS AND BREEDING OF FOREST TREES

Forest practice today is based largely on unimproved forest trees. Unlike crop plants, trees have not undergone centuries of controlled selection and breeding to make them more useful to man. There is strong evidence that through application of genetic principles we can produce tree varieties that grow faster, resist most major destructive pests, have specified wood properties, or yield more sap or gum. It should be feasible to develop straighter form, fewer limbs, and resistance to insects, diseases, and climatic extremes. Quality and yield of timber-related crops such as naval stores, maple sap, and Christmas trees can be improved through application of research findings.

Areas of research include:

- (a) Reproductive processes to induce early flowering and seed production.
- (b) Individual and geographic variation within important tree species.
- (c) Genetic and breeding methods, including the induction of mutations to improve forest species through breeding.
- (d) Selection and breeding of trees that are superior for the production of high quality timber and timber-related products.

Exclude: (1) Research on ornamentals. (Use RPA 906).
(2) Research on shade trees (0615, 0624, and 0625). (Use RPA 905 or 906).
(3) Research on management practices. (Use RPA 111).
(4) Breeding and selection of trees for insect resistance. (Use RPA 201).
(5) Breeding and selection of trees for disease resistance. (Use RPA 202).

Classification Guidelines:

Activities:

- 4500 Protection against insects, mites, snails, and slugs and their control agents
- 4600 Protection against diseases, parasites, and nematodes and their control agents
- 4900 Biology of plants and animals
- 5000 Improving biological efficiency of plants and animals
- 5100 Increasing acceptability of farm and forest products

Commodities, etc.:

- 0600 Trees, forests, and forest products

RPA 302. NEW AND IMPROVED FOREST ENGINEERING SYSTEMS

Improved forest engineering systems can reduce timber harvesting costs, increase and stabilize rural payrolls, reduce accidents, and provide higher returns to industry. Over 100 billion board feet of timber in Alaska and the western States are inaccessible due to the high cost of road construction, steep terrain, soil conditions, and lack of equipment suitable for timber harvesting. In other States, because of the high proportion of small-size timber and the high percentage of defective timber, the economic feasibility of harvesting is limited.

Areas of research include:

- (a) Harvesting systems for difficult access terrain.
- (b) Low-cost bulk transport of wood chips.
- (c) Harvesting systems for low-quality timber in areas such as Appalachia and the Lake States.
- (d) Mechanization of production of specialized timber crops such as naval stores and Christmas trees.
- (e) Mechanized systems for regeneration of timber.
- (f) Design of equipment for safe handling of timber and other forest products.

Exclude: (1) Research on design of watershed structures and runoff control systems. (Use RPA 107).
(2) Research on management systems and special equipment and facilities which will minimize dangers of fire, avalanches, and other natural hazards in outdoor recreation areas. (Use RPA 902).

Classification Guidelines:

Activities:

- 5200 Mechanization, improvement of physical efficiency, and development of structures and facilities
- 7500 Development of research equipment and technology

Commodities, etc.:

- 0300 Watersheds and river basins
- 0600 Trees, forests, and forest products
- 7000 Research equipment and technology (such as remote sensing)

RPA 303. ECONOMICS OF TIMBER PRODUCTION

Timber production efficiency research investigates how income can be increased through effective use of labor and capital. Such information is generally lacking for the wide variety of forestry investments possible in different areas. Returns of expenditures for planting, stand improvement, and other timber growing activities vary widely throughout the nation and depend on many cost factors, including the quantity and quality of timber yields and local market conditions. Identifying the most profitable opportunities for management of public forestry programs and for private investments on forest lands is basic to efficient allocation of the funds available for timber growing.

Areas of research include:

- (a) Evaluation of opportunities for profitable timber growing in relation to different combinations of forest types, site, types of ownership, size of holdings, and market factors.
- (b) Potential returns from investments in different areas in forest protection, road construction, planting, thinning, and other forestry measures.
- (c) Capital requirements for development of public and private forestry operations.
- (d) Effects of income and local taxation on economics of timber production.
- (e) Determining the most efficient combinations of practices for public and private timber production, including the effects of public programs and policies.
- (f) Economics of timber production on small holdings, including private institutional arrangements affecting management.

Exclude: (1) Research on evaluation of public assistance programs. (Use RPA 903).

Classification Guidelines:

Activities:

- 5300 Management of labor, capital, and other inputs
- 6000 Analysis of supply, demand, and price, including interregional competition
- 6500 Description, inventory, and trends
- 7300 Evaluation of public programs, policies, and services

Commodities, etc.:

- 0600 Trees, forests, and forest products

RPA 304. IMPROVEMENT OF BIOLOGICAL EFFICIENCY OF FRUIT AND VEGETABLE CROPS

Fruits, vegetables, and edible tree nuts are generally produced on high-value land and involve high capital and labor inputs. It is essential that biological efficiency be optimized in order that cost per unit of production be held down and the needs of the American consumer be met at a reasonable cost. The potential for developing an export market is largely dependent on the competitive price relationship of the crops.

Areas of research include:

- (a) The genetic and physiological mechanisms and processes affecting biological efficiency.
- (b) Searches for germplasm to maintain or improve biological efficiency.
- (c) Developing more effective breeding procedures for fruit and vegetable crops.
- (d) Developing improved varieties and strains which possess desired levels of biological efficiency along with other desirable attributes.
- (e) Developing better procedures for distributing desirable germplasm--either as seed or other propagating materials.
- (f) Improving the management and culture of fruits and vegetables, including research on cultural practices such as fertilization, plant spacing and population, time of seeding, soil preparation, and water or soil moisture management when the primary orientation is directed to the fruit or vegetable response to the environmental variable (fertilizer, water, soil, spacing, etc.).
- (g) Engineering work on instrumentation and equipment for studying the effects of environmental factors on growth and health of crops.

- Exclude:
- (1) Breeding and selection for resistance to diseases. (Use RPA 205).
 - (2) Breeding and selection for resistance to insects. (Use RPA 204).
 - (3) Breeding and selection for resistance to drought and excessive moisture. (Use RPA 105).
 - (4) Breeding, selection, and management for quality. (Use RPA 402).
 - (5) Research on plants or cropping sequences to manage or improve saline soils. (Use RPA 103).
 - (6) Engineering development of commercial scale machinery for control of plant environment. (Use RPA 305).
 - (7) Research on the interrelationship among soil properties, fertilizers, water, and plants when the primary emphasis is toward these interrelationships and not production of a particular crop (e.g., tomatoes). (Use RPA 102).
 - (8) Breeding and selection of varieties adapted to mechanization of production. (Use RPA 305).

Classification Guidelines:

Activities:

4900 Biology of plants and animals

5000 Improving biological efficiency of plants and animals

RPA 304 (Cont'd)

Activities:

7500 Development of research equipment and technology

Commodities, etc.:

0900 Citrus and tropical/subtropical fruit

1000 Deciduous and small fruits and edible tree nuts

1100 Potatoes

1200 Vegetables

2800 Miscellaneous and new crops

6200 Seed research

6700 Plants

7000 Research equipment and technology (such as remote sensing)

RPA 305. MECHANIZATION OF FRUIT AND VEGETABLE CROP PRODUCTION

An overriding consideration in mechanization of fruit, vegetable, and edible tree nut production is the requirement for timeliness in accomplishing the various operations from planting through harvesting and handling the harvested crop because of perishability of the product. Mechanization is needed to increase efficiency and decrease labor requirements in the production of fruit and vegetable crops. Mechanization in fruit and vegetable production is less extensive than in field crops.

Areas of research include:

- (a) Developing principles relative to mechanical and rheological properties of fruits and vegetables as they affect handling operations.
- (b) Developing machines and improved machine components to plant, cultivate, harvest, and handle specific crops.
- (c) Developing precision devices, such as for planting operations.
- (d) Developing tillage units to minimize power requirements and number of operations and to provide the optimum seed bed conditions.
- (e) Automating machine operations.
- (f) Breeding and selection of varieties adapted to mechanization of production.
- (g) Developing prototype machinery and equipment for control of plant environment.

Exclude: (1) Engineering work on instrumentation for studying the effects of environmental factors on growth and health of crops. (Use RPA 304).
(2) Development of specialized equipment for protection against insects, diseases, weeds, and other hazards. (Use RPA 204, 205, 206, or 214).

Classification Guidelines:

Activities:

5200 Mechanization, improvement of physical efficiency, and development of structures and facilities

Commodities, etc.:

0900 Citrus and tropical/subtropical fruit
1000 Deciduous and small fruits and edible tree nuts
1100 Potatoes
1200 Vegetables
2800 Miscellaneous and new crops
6700 Plants

RPA 306. PRODUCTION MANAGEMENT SYSTEMS FOR FRUITS AND VEGETABLES

Many of the management studies applied to the production of fruits, vegetables, and edible tree nuts in the past have dealt with such economic questions as the most profitable rate of fertilization, comparative net returns from various crops, the economy of hand vs. machine methods, and the relative costs of different machine sizes. Available methods of analysis severely limited the number of alternatives that could be compared. High-speed electronic computers and new analytical models have opened the way to more comprehensive analyses of alternatives. These new analytical tools provide a useful technique to the horticulturist and the engineer in devising or selecting the most effective production system. The joint efforts of the horticulturist, the engineer, and the economist will enable them to select the "best" production plan. This plan is made up of a "bundle" or compatible set of choices among alternative crops, production practices, and equipment.

Management systems analysis will include consideration and integration of choices within each of the following:

- (a) Crops, crop sequences, and crop varieties; and
- (b) Plant population, moisture management methods, fertilizer and pesticide rates, and time and method of application; and
- (c) Time and labor for performing each operation most effectively; and
- (d) Timeliness of operations permitted by alternative types and sizes of equipment, as well as their relative costs.

Classification Guidelines:

Activities:

- 5000 Improving biological efficiency of plants and animals
- 5200 Mechanization, improvement of physical efficiency, and development of structures and facilities
- 5300 Management of labor, capital, and other inputs

Commodities, etc.:

- 0900 Citrus and tropical/subtropical fruit
- 1000 Deciduous and small fruits and edible tree nuts
- 1100 Potatoes
- 1200 Vegetables
- 2800 Miscellaneous and new crops
- 6700 Plants

RPA 307. IMPROVEMENT OF BIOLOGICAL EFFICIENCY OF FIELD CROPS

Research to maintain or improve the biological efficiency of field crops is of paramount importance in determining the ability of agriculture to meet the feed, food, and fiber needs of the American people and provide vital amounts of these commodities for export.

Increased biological efficiency can provide the food and fiber needs of an expanding population. Efficient field crop production is basic to an efficient, economic livestock industry.

Areas of research include:

- (a) The genetic and biological determinants of biological efficiency.
- (b) Identification of superior germplasm and breeding and selection of improved varieties.
- (c) Cultural practices including fertilization, plant spacing and population, time of seeding, soil preparation, and water or soil moisture management when the primary orientation is directed to the specific crop, such as corn, and its response to the environmental variable (fertilizer, water, soil, spacing, etc.).
- (d) Procedures for multiplication and distribution of superior germplasm (seed or other propagating material).
- (e) Methods of adaptation to critical environmental factors, including engineering work on instrumentation for studying the effects of environmental factors on growth and health of crops.

- Exclude:
- (1) Breeding and management related to quality improvement. (Use RPA 405).
 - (2) Research to produce feed crops with a reduced content of toxic components. (Use RPA 405).
 - (3) Breeding and selection of field crops for disease resistance. (Use RPA 208).
 - (4) Breeding and selection of field crops for resistance to insects. (Use RPA 207).
 - (5) Breeding and selection of field crops for drought resistance. (Use RPA 105).
 - (6) Breeding and selection of field crops for tolerance to salinity and research on plants or cropping sequences to manage or improve saline soils. (Use RPA 103).
 - (7) Breeding and selection of range forage plants. (Use RPA 112).
 - (8) Development of machinery and equipment for control of plant environment suitable for commercial adaptation. (Use RPA 308).
 - (9) Research on the interrelationship among soil properties, fertilizers, water, and plants when the primary emphasis is toward these interrelationships and not production of a particular crop (e.g., corn). (Use RPA 102).
 - (10) Breeding and selection of varieties adapted to mechanization of production. (Use RPA 308).

Classification Guidelines:

Activities:

4900 Biology of plants and animals

5000 Improving biological efficiency of plants and animals

RPA 307 (Cont'd)

Activities:

7500 Development of research equipment and technology

Commodities, etc.:

1400 Corn (For Sweetcorn use 1280)

1500 Grain sorghum

1600 Rice

1700 Wheat

1800 Other small grains

1900 Pasture

2000 Forage crops

2100 Cotton (including cottonseed for planting purposes)

2300 Soybeans

2400 Peanuts

2500 Other oilseed and oil crops (excluding cottonseed)

2600 Tobacco

2700 Sugar crops

2800 Miscellaneous and new crops

6200 Seed research

6700 Plants

7000 Research equipment and technology (such as remote sensing)

RPA 308. MECHANIZATION OF PRODUCTION OF FIELD CROPS

Mechanization research is needed to increase efficiency and decrease labor requirements in the production of field crops. An important consideration in field crop production is the requirement for timeliness in accomplishing certain operations from planting through harvesting and handling the harvested crop. Mechanization in the production of field crops has increased substantially in recent years. A large increase in crop production has been accompanied by a significant decrease in man-hours of labor used. Opportunities for further improvements in mechanization are promising.

Areas of research include:

- (a) Improving machine components and developing machines to plant, cultivate, harvest, and handle specific crops.
- (b) Developing precision devices and automated systems of machine operations.
- (c) Developing tillage units to minimize power requirements and number of operations and to provide optimum seed bed conditions.
- (d) Determining mechanical and rheological properties of crop products to facilitate development of equipment and procedures of handling.
- (e) Breeding and selection of varieties and cultural practices to provide plants adapted to mechanized operations.
- (f) Engineering development of prototype machinery and equipment for control of plant environment.

Exclude: (1) Engineering work on instrumentation for studying the effects of environmental factors on growth and health of crops. (Use RPA 307).
(2) Development of specialized equipment for protection against insects, diseases, weeds, and other hazards. (Use RPA 207, 208, 209, or 214).

Classification Guidelines:

Activities:

5200 Mechanization, improvement of physical efficiency, and development of structures and facilities

Commodities, etc.:

1400 Corn (For Sweetcorn use 1280)
1500 Grain sorghum
1600 Rice
1700 Wheat
1800 Other small grains
1900 Pasture
2000 Forage crops
2100 Cotton (including cottonseed for planting purposes)
2200 Cottonseed (for meal, oil, etc.)
2300 Soybeans

RPA 308 (Cont'd)

Commodities, etc.:

- 2400 Peanuts
- 2500 Other oilseed and oil crops (excluding cottonseed)
- 2600 Tobacco
- 2700 Sugar crops
- 2800 Miscellaneous and new crops
- 6700 Plants

RPA 309. PRODUCTION MANAGEMENT SYSTEMS FOR FIELD CROPS

Farm operators must often choose among a number of crops and crop sequences, as well as methods of "systems" to be used in the production of each crop. Much of the economic analysis applied to the production of field crops in the past has dealt with such questions as the economy of hand vs. machine methods, relative costs of different machine sizes, the most profitable rate of fertilization, or the comparative net returns from various crops. Lack of data and available methods of analysis severely limited the number of alternatives that could be compared.

Many new analytical tools provide a useful technique to the agronomist and the engineer in devising or selecting the most effective production system. The joint efforts of the agronomist, the engineer, and the economist will enable them to select the "best" production plan. The plan is made up of a "bundle" or compatible set of choices among alternative crops, production practices, and equipment.

Management systems analysis will include consideration and integration of choices within each of the following:

- (a) Crops, crop sequences, and crop varieties; and
- (b) Fertilizer and pesticide rates, and time and methods of application, plant population, and moisture management; and
- (c) Time and labor available for performing each operation most effectively; and
- (d) Timeliness of operations permitted by alternative types and sizes of equipment, as well as their relative costs.

Classification Guidelines:

Activities:

- 5000 Improving biological efficiency of plants and animals
- 5200 Mechanization, improvement of physical efficiency, and development of structures and facilities
- 5300 Management of labor, capital, and other inputs

Commodities, etc.:

- 1400 Corn (For Sweetcorn use 1280)
- 1500 Grain sorghum
- 1600 Rice
- 1700 Wheat
- 1800 Other small grains
- 1900 Pasture
- 2000 Forage crops
- 2100 Cotton (including cottonseed for planting purposes)
- 2300 Soybeans
- 2400 Peanuts
- 2500 Other oilseed and oil crops (excluding cottonseed)

RPA 309 (Cont'd)

Commodities, etc.:

- 2600 Tobacco
- 2700 Sugar crops
- 2800 Miscellaneous and new crops
- 6700 Plants

RPA 310. REPRODUCTIVE PERFORMANCE OF LIVESTOCK, POULTRY, FISH, AND OTHER ANIMALS

Brood animals fail to come in heat, fail to conceive, abort with embryonic deaths, have stillbirths, or lose their offspring in postnatal deaths. Poultry men have no way of ensuring that all eggs incubated are fertile, nor of hatching all those which are fertile. Attainment of optimum reproductive efficiency could greatly decrease the cost of producing calves, pigs, lambs, chicks, poults, fry, and other young.

Areas of research include:

- (a) Reducing the age of first breeding in females.
- (b) Improving libido and reducing physical and psychological barriers to mating.
- (c) Methods to control estrus.
- (d) Semen metabolism and preservation, and artificial insemination techniques.
- (e) Effects of stress factors on reproductive performance.
- (f) Controlling sex of offspring through sperm separation and other means.
- (g) Increasing the fertilization and conception rate of available ova.
- (h) Increasing the number of potentially fertilizable ova, particularly for sheep and cattle.
- (i) Reducing prenatal, natal, and postnatal mortality.
- (j) Effects of herd management systems, such as time of calving and interval between calves, on reproductive performance.
- (k) Methods for storing, transplanting, fertilizing, and growing ova in vitro and in vivo.
- (l) Improving mothering ability.
- (m) Genetic studies to improve reproductive performance.
- (n) Methods for early diagnosis of pregnancy.

Exclude: (1) Research on nonfarm-raised fish, shellfish, game and fur-bearing animals, and other wildlife. (Use RPA 904).

Classification Guidelines:

Activities:

- 4900 Biology of plants and animals
- 5000 Improving biological efficiency of plants and animals

Commodities, etc.:

- 0800 Fish, shellfish, game and fur-bearing animals, and other wildlife and their habitats
- 2900 Poultry
- 3000 Beef cattle
- 3100 Dairy cattle
- 3200 Swine
- 3300 Sheep and wool
- 3400 Other animals
- 6800 Animals (Vertebrates)

RPA 311. IMPROVEMENT OF BIOLOGICAL EFFICIENCY IN PRODUCTION OF LIVESTOCK, POULTRY, FISH, AND OTHER ANIMALS

In the past 30 years, significant advances have been made in the improvement of production efficiency in livestock, poultry, and fish. Efficiencies have doubled and progress accelerated in fish, poultry, swine, beef cattle, and dairy cattle. Efficiency of conversion of feed to human food is 50 percent for fish; 25 percent for the dairy cow producing milk and hen laying eggs; 23 percent for broilers; 14 percent for pigs; and 10 percent for beef cattle. Attainment of even greater production efficiency will require research across a broad range of science areas from biotechnology to new production systems.

Areas of research include:

- (a) Digestion and metabolism.
- (b) Nutrient requirements for specific life processes and longevity.
- (c) Hormonal and nutritional interactions for maintenance and growth.
- (d) Genetic studies designed to evaluate the importance of heredity in the production of animal products (e.g., heritability, genetic correlations, methods of selection, mating systems).
- (e) Breeding and selection of improved strains.
- (f) Composition and biological availability of nutrients.
- (g) Effects of processing and feeding system variables on nutritive values of feed.
- (h) Alternate sources of nutrients, including forages.
- (i) Management of breeding stocks.

Exclude: (1) Research on reproductive performance. (Use RPA 310).
(2) Research on environmental stress. (Use RPA 312).
(3) Research on reduction of waste carcass fat and proportion of low meat yield cuts. (Use RPA 409).
(4) Research on nonfarm-raised fish, shellfish, game and fur-bearing animals, and other wildlife. (Use RPA 904).

Classification Guidelines:

Activities:

- 4900 Biology of plants and animals
- 5000 Improving biological efficiency of plants and animals
- 7500 Development of research equipment and technology

Commodities, etc.:

- 0800 Fish, shellfish, game and fur-bearing animals, and other wildlife and their habitats
- 2900 Poultry
- 3000 Beef cattle
- 3100 Dairy cattle
- 3200 Swine
- 3300 Sheep and wool

RPA 311 (Cont'd)

Commodities, etc.:

3400 Other animals

6800 Animals (Vertebrates)

7000 Research equipment and technology (such as remote sensing)

RPA 312. ENVIRONMENTAL STRESS IN PRODUCTION OF LIVESTOCK, POULTRY, FISH, AND OTHER ANIMALS

In spite of a heavy investment in buildings and structures for animal production, stresses from the effects of climate, handling, and other environmental factors decrease productivity substantially. Extremes in temperature, humidity, air movement, and noise may lead to poor feed efficiency, throw animals off feed, reduce resistance to disease, and even cause increased mortality.

Areas of research include:

- (a) Environmental factors which reduce productivity.
- (b) Genetic adaptability to extreme environments and breeding and selection for tolerance.
- (c) Facilities and equipment that reduce environmental stress.
- (d) Management systems that enable animals to adapt to stress conditions.
- (e) Physiological and behavioral responses of animals to various environmental conditions.

Exclude: (1) Research on effects of stress factors on reproductive performance. (Use RPA 310).

- (2) Research on nonfarm-raised fish, shellfish, game and fur-bearing animals, and other wildlife. (Use RPA 904).

Classification Guidelines:

Activities:

- 4840 Protection against climatic extremes (frost, hail, wind, drought, etc.)
- 4890 Protection against radiation, noise, and other hazards
- 4900 Biology of plants and animals
- 5000 Improving biological efficiency of plants and animals

Commodities, etc.:

- 0800 Fish, shellfish, game and fur-bearing animals, and other wildlife and their habitats
- 2900 Poultry
- 3000 Beef cattle
- 3100 Dairy cattle
- 3200 Swine
- 3300 Sheep and wool
- 3400 Other animals
- 6800 Animals (Vertebrates)

RPA 313. PRODUCTION MANAGEMENT SYSTEMS FOR LIVESTOCK, POULTRY, FISH, AND OTHER ANIMALS

Animal producers are faced with a wide variety of production alternatives. Lack of data and limitations of available methods of analysis have severely limited the number of alternatives that could be adequately evaluated. High speed electronic computers and newer analytical methods and models have opened the way to more comprehensive analyses of alternatives. The joint efforts of the scientist, the engineer, and the economist will enable them to select the "best" production plan. The plan is made up of a "bundle" or compatible set of choices among alternative production practices and equipment.

These new analytical tools provide a useful technique to the scientist and the engineer in devising or selecting the most effective production system.

Management systems analysis will include consideration and integration of choices within each of the following:

- (a) Production or purchase of a particular feed; and
- (b) Stocking rates, grazing systems, breeding systems, and other practices; and
- (c) Kinds of livestock, breeds, and strains; and
- (d) Labor versus mechanization alternatives.

Exclude: (1) Research on nonfarm-raised fish, shellfish, game and fur-bearing animals, and other animals. (Use RPA 904).

Classification Guidelines:

- 5000 Improving biological efficiency of plants and animals
- 5200 Mechanization, improvement of physical efficiency, and development of structures and facilities
- 5300 Management of labor, capital, and other inputs

Commodities, etc.:

- 0800 Fish, shellfish, game and fur-bearing animals, and other wildlife and their habitats
- 2900 Poultry
- 3000 Beef cattle
- 3100 Dairy cattle
- 3200 Swine
- 3300 Sheep and wool
- 3400 Other animals
- 6800 Animals (Vertebrates)

RPA 314. BEES AND OTHER POLLINATING INSECTS

Pollinating insects and honey represent a small but highly significant segment of the agricultural economy. Sale of honey, beeswax, package bees and queens, and rental of colonies to seed producers are important items of farm income. The value of pollinators is very great. There are at least 50 agricultural crops that would fail to produce a commercial crop of fruit or seed if pollinating insects were not present to insure pollination. All research on bees is included under this RPA.

Areas of research include:

- (a) Nutritional substitutes to maintain strong colonies.
- (b) Strains of honey bees for maximum efficiency in the pollination of different crops.
- (c) Strains resistant to American and European foulbrood, nosema, and other diseases.
- (d) Nonswarming strains.
- (e) Improved systems of extracting, filtering, and packaging honey.
- (f) Improved methods of protecting combs from wax moths.
- (g) Diagnostic techniques to identify the kinds of plants from which the honey was produced.
- (h) New and improved food products containing honey.
- (i) Methods of protecting bees from the harmful effects of pesticides.
- (j) Evaluation of the medicinal and therapeutic value of honey and of bee venom.
- (k) Identification, assessment of the value, and studies to improve other pollinating insects through selection, breeding, and management.
- (l) Improved equipment and methods for reducing labor in handling and transporting bee colonies.
- (m) Relevant marketing activities.

Classification Guidelines:

Activities:

4500 Protection against insects, mites, snails, and slugs and their control agents
4600 Protection against diseases, parasites, and nematodes and their control agents
4810-6390 (See Activity Classification)

Commodities, etc.:

3500 Bees and honey and other pollinating insects

RPA 315. IMPROVEMENT OF STRUCTURES, FACILITIES, AND GENERAL PURPOSE FARM SUPPLIES AND EQUIPMENT

Research on farm supplies, equipment, and buildings is needed to lower production costs in agriculture and prices paid by farmers for purchased production inputs.

Areas of research include:

- (a) Physical, chemical, and biological aspects of the production of fertilizers, pesticides, feed constituents, and hormones.
- (b) Engineering aspects of design and development of structures, building materials, and facilities.
- (c) Engineering aspects of the design and development of general purpose machinery, equipment and tools for production, materials handling, and warehousing of farm production inputs.
- (d) The physical, chemical, and biological behavior, including effects on containers, machinery, and buildings of farm inputs in production and market channels.
- (e) Studies on the properties of materials.

Exclude: (1) Research related to safe handling and use of materials and equipment. (Use RPA 709).

Classification Guidelines:

Activities:

- 5200 Mechanization, improvement of physical efficiency, and development of structures and facilities
- 5600 Chemical and physical properties of non-food products

Commodities, etc.:

- 3600 General purpose supplies (including machinery, equipment, fertilizers, feedstuffs, and pesticides)
- 3900 Structures and facilities
- 6700 Plants
- 6800 Animals (Vertebrates)

RPA 316. FARM BUSINESS MANAGEMENT

Farm business management research is needed to help farm operators adjust to technological, economic, institutional, and social changes which occur continuously. Purchased inputs are increasingly being substituted for scarcer and more costly labor and land in production. New technology changes the competitive position of alternative production methods. New ways of doing business with suppliers and marketing firms require new types of decisions of the farm operator, and open up new sources of financing to him. Changing market demands require adjustments in the type of product produced.

Areas of research include:

- (a) Size and enterprise combination of the farm business (what and how much to produce).
- (b) Relative advantages of alternatives, such as purchasing or renting land and individual or joint ownership of machinery vs. hiring custom machines.
- (c) Sound financial management in the use of credit, what insurance to carry, the maintenance of nonfarm financial reserves, and the use of vertical coordination arrangements.
- (d) Analyses of where, how, and when to sell farm products and buy production inputs.
- (e) Analysis of managerial ability as it relates to the quality of decision making and the efficiency of the farm operation.
- (f) Impact of public policy and regulation on farm business management.

Classification Guidelines:

Activities:

- 5300 Management of labor, capital, and other inputs
- 7300 Evaluation of public programs, policies, and services

Commodities, etc.:

- 4200 The farm as a business enterprise

RPA 317. MECHANIZATION AND STRUCTURES USED IN PRODUCTION OF LIVESTOCK, POULTRY, FISH, AND OTHER ANIMALS

Many new mechanization problems and opportunities have arisen as a result of increasing numbers of animals in a single enterprise coupled with the decreasing availability of labor. There is need and justification to devise ways to reduce drudgery and manual effort in animal production. Such problems include the handling of feed and forage, milk, and wastes. Research is needed not only for beef, sheep, dairy, swine, poultry, and fish, but also for pets, laboratory animals, goats, and horses.

Areas of research include:

- (a) Methods, facilities, and equipment for farm handling, processing, and storing inputs such as feeds, forage, and bedding.
- (b) Methods, facilities, and equipment for animal waste collection and removal from barns, feedlots, and aquaculture production systems.
- (c) Milking and milk handling methods.
- (d) Equipment, structures, facilities, and methods for housing and handling animals.
- (e) Egg collection and handling.

Exclude: (1) Research on nonfarm-raised fish, shellfish, game and fur-bearing animals, and other wildlife. (Use RPA 904).
(2) Research on waste disposal, including possible salvage. (Use RPA 901).
(3) Development of specialized equipment for protection against insects, internal and external parasites, diseases, and other hazards. (Use RPA 210, 211, 212, 213, or 214).

Classification Guidelines:

Activities:

5200 Mechanization, improvement of physical efficiency, and development of structures and facilities

Commodities, etc.:

0800 Fish, shellfish, game and fur-bearing animals, and other wildlife and their habitats
2900 Poultry
3000 Beef cattle
3100 Dairy cattle
3200 Swine
3300 Sheep and wool
3400 Other animals
3600 General purpose supplies (including machinery, equipment, fertilizers, feedstuffs, and pesticides)
3900 Structures and facilities
6800 Animals (Vertebrates)

RPA 318. NON-COMMODITY-ORIENTED BIOLOGICAL TECHNOLOGY AND BIOMETRY

The better understanding of cell systems, experimental design, and other improvements in general science technology make a significant contribution to other, more specific, research on individual plants and animals. While such research may use one of the commodities as an experimental tool, it is not commodity oriented.

Research on experimental designs and statistical analyses; purification of RNA and DNA and of structures such as ribosomes, mitochondria, and endoplasmic reticula; and elucidation of metabolic pathways and biochemical reactions involved in energy transfer, growth, synthesis, and breakdown of organic compounds are examples.

Areas of research include:

- (a) Design of experiments and statistical analysis of data.
- (b) Pathways in plant and animal metabolism.
- (c) Genetic studies with yeast, Neurospora, mice, Drosophila, etc., solely for elucidation of genetic principles.
- (d) Whole cell biology studies of algae, bacteria, yeasts, molds, phages, viruses, protozoans.
- (e) Studies on weeds, not commodity oriented.
- (f) Seed research, not commodity oriented.
- (g) Insect, tick, and mite research, not commodity oriented.
- (h) Plant growth responses, not commodity oriented.

Exclude: (1) All research which can be identified under one or more of the other RPA's. (Use appropriate RPA).

Classification Guidelines:

Activities:

- 4500 Protection against insects, mites, snails, and slugs and their control agents
- 4600 Protection against diseases, parasites, and nematodes and their control agents
- 4700 Protection against weeds and their control agents
- 4900 Biology of plants and animals
- 5410 Chemical and physical properties of food
- 5420 Biochemical and chemical reactions in food
- 5430 Sensory properties of food
- 5600 Chemical and physical properties of non-food products
- 7000 Design of experiments and methods of statistical analysis
- 7500 Development of research equipment and technology

Commodities, etc.:

- 0600 Trees, forests, and forest products
- 3800 Food

RPA 318 (Cont'd)

Commodities, etc.:

- 6100 Weeds*
- 6200 Seed research*
- 6300 Biological cell systems
- 6400 Experimental design and statistical methods
- 6500 Invertebrates*
- 6600 Microorganisms, viruses, etc.*
- 6700 Plants*
- 6800 Animals (Vertebrates)*
- 7000 Research equipment and technology (such as remote sensing)

* Use only when the specific commodities affected cannot be identified or when the research is applicable to a broad range of commodities.

GOAL IV

EXPAND THE DEMAND FOR FARM AND FOREST PRODUCTS BY DEVELOPING NEW AND IMPROVED PRODUCTS AND PROCESSES AND ENHANCING PRODUCT QUALITY

Increasing domestic demand and improving markets abroad depends upon satisfying consumer preferences for high quality food, fiber, and forest products. This means tailoring products to meet consumer desires. More effort should be given to producing products with characteristics that meet consumer or processor needs and maintaining these qualities to point of use. New and improved uses and processes will result in more variety, reduced costs, and increased utilization of farm and forest products.

RPA's 401-412, inclusive.

RPA 401. NEW AND IMPROVED FOREST PRODUCTS

The objectives of forest products research are to develop (1) lower cost products with greater desirability, serviceability, and performance, and (2) greater use of low-quality timber, little-used species, and materials now remaining as waste.

There is a continuing decline in quality of available timber because of the lack of adequate replacements for the larger and better quality trees. Demand for timber products is expected to go up 80 percent by the year 2000. Research is needed to develop ways to convert more low-grade material into useful products. Where such timber is abundant it may be possible to establish new industries and enhance economic growth. Improved wood utilization also provides a profitable means for upgrading residual stands. Removal and use of low-quality timber frees space for better growing stock.

Areas of research include:

- (a) Anatomical, mechanical, physical, and chemical properties of wood and its components, and performance in use.
- (b) Effects of environmental factors such as heat, light, and moisture on wood, wood products, and other forest products in use.
- (c) Relation of timber species, grades, and quality to wood properties and use.
- (d) More efficient design of wood members for structural purposes.
- (e) Better ways to use wood in panels, laminates, and assemblies.
- (f) New and improved processes for production of chemicals and other products, including those from bark and wood extractives.
- (g) Improved products and reduction of waste through development of more effective manufacturing processes such as sawing, drying, machining, pulping, and assembling.
- (h) Effect of fungi and insects on wood and treatments to impart resistance.
- (i) Methods for removing moisture from wood and for stabilizing its dimensions and shape.
- (j) Methods for improving fire resistance of wood products.
- (k) New and improved products from wood resins, naval stores, and maple sap.

Classification Guidelines:

Activities:

- 4500 Protection against insects, mites, snails, and slugs and their control agents
- 4870 Protection against molds, fungi, and other spoilage organisms
- 5410 Chemical and physical properties of food
- 5420 Biochemical and chemical reactions in food
- 5430 Sensory properties of food
- 5510 Food physical processes (canning, freezing, dehydration, milling, separation, extraction)
- 5520 Food bioprocesses (enzyme and microbial applications)
- 5530 Food chemical processes (salt, sugar, acid)
- 5540 Food processing efficiencies (management of energy, water, wastes)
- 5550 Food product handling, packaging, and storage

RPA 401 (Cont'd)

Activities:

- 5600 Chemical and physical properties of non-food products
- 5700 Developing new and improved non-food products and processes
- 6310 Nutrient composition of food
- 6330 Food fortification, enrichment, and improvement
- 6390 Eating quality of food

Commodities, etc.:

- 0600 Trees, forests, and forest products
- 3900 Structures and facilities

RPA 402. PRODUCTION OF FRUIT AND VEGETABLE CROPS WITH IMPROVED ACCEPTABILITY

When consumers buy fruits, vegetables, and edible tree nuts in the market, they look for external characteristics that appeal to them. At home they expect these products, whether fresh, frozen, or processed, to have eating qualities they like. Such qualities must be inherent in the products farmers produce. Fruits and vegetables are expected to withstand the rigors of mechanical harvesting and of shipment; have superior color, flavor, texture, nutritive value; retain good quality through processing and storage; and meet requirements for specific food purposes such as potatoes for baking, frying, or chipping.

Areas of research include:

- (a) Enhancement of quality attributes desired by consumers and processors.
- (b) Discovery of the genetic, chemical, and physiological determinants of preferred attributes and the relationships among them.
- (c) Breeding and selecting new and improved varieties that have favored quality characteristics.
- (d) Development of improved production practices to achieve optimum quality of product harvested.

Classification Guidelines:

Activities:

- 4900 Biology of plants and animals
- 5000 Improving biological efficiency of plants and animals
- 5100 Increasing consumer acceptability of farm and forest products
- 5410 Chemical and physical properties of food
- 5420 Biochemical and chemical reactions in food
- 5430 Sensory properties of food
- 5510 Food physical processes (canning, freezing, dehydration, milling, separation, extraction)
- 5520 Food bioprocesses (enzyme and microbial applications)
- 5530 Food chemical processes (salt, sugar, acid)
- 5540 Food processing efficiencies (management of energy, water, wastes)
- 5550 Food product handling, packaging, and storage
- 5600 Chemical and physical properties of non-food products
- 5700 Developing new and improved non-food products and processes
- 5800 Identification, measurement, and maintenance of quality
- 7500 Development of research equipment and technology

Commodities, etc.:

- 0900 Citrus and tropical/subtropical fruit
- 1000 Deciduous and small fruits and edible tree nuts
- 1100 Potatoes

RPA 402 (Cont'd)

Commodities, etc.:

- 1200 Vegetables
- 2800 Miscellaneous and new crops
- 3800 Food (not readily associated with specific fruits and vegetables)
- 6200 Seed research
- 6700 Plants
- 7000 Research equipment and technology (such as remote sensing)

RPA 403. NEW AND IMPROVED FRUIT AND VEGETABLE PRODUCTS AND BYPRODUCTS

Product development and processing research can provide better fruit, vegetable, and edible tree nut products. Product research can make available new and more attractive products tailored to the requirements of specific domestic markets.

New food products may reduce preparation time and effort and may reduce costs to the consumer. New food products and methods of processing can achieve economies in storage and transportation.

Areas of research include:

- (a) Identification of the chemical constituents of each product that determine its color, flavor, texture, and nutritive value.
- (b) Techniques for stabilization through freezing, sterilization, dehydration, or combinations of these.
- (c) Fortification to increase the nutritional value of foods.
- (d) Development of new or improved products and improved processing techniques to maintain or improve the stability and nutritional value of foods.
- (e) Chemical and biochemical reactions which occur among the constituents of the product and the factors which determine their rates of reaction.

Exclude: (1) Research on product development for foreign markets. (Use RPA 604).

Classification Guidelines:

Activities:

- 5410 Chemical and physical properties of food
- 5420 Biochemical and chemical reactions in food
- 5430 Sensory properties of food
- 5510 Food physical processes (canning, freezing, dehydration, milling, separation, extraction)
- 5520 Food bioprocesses (enzyme and microbial applications)
- 5530 Food chemical processes (salt, sugar, acid)
- 5540 Food processing efficiencies (management of energy, water, wastes)
- 5550 Food product handling, packaging, and storage
- 5600 Chemical and physical properties of non-food products
- 5700 Developing new and improved non-food products and processes
- 5800 Identification, measurement, and maintenance of quality
- 6310 Nutrient composition of food
- 6330 Food fortification, enrichment, and improvement
- 6390 Eating quality of food

RPA 403 (Cont'd)

Commodities, etc.:

- 0900 Citrus and tropical/subtropical fruit
- 1000 Deciduous and small fruits and edible tree nuts
- 1100 Potatoes
- 1200 Vegetables
- 2800 Miscellaneous and new crops
- 3800 Food (not readily associated with specific fruits and vegetables)
- 6700 Plants

RPA 404. QUALITY MAINTENANCE IN STORING AND MARKETING FRUITS AND VEGETABLES

Many of the desirable quality characteristics that fruits, vegetables, and edible tree nuts possess when they leave the farm may be lost by the time they are purchased by the consumer. Inroads of molds and other microorganisms, insects, moisture, and unfavorable temperatures, result in quality deterioration and also make a portion of the produce unsalable. Some of the serious losses in end use quality occur as a result of chemical, physical, and physiological changes during transportation and storage. Prevention of such losses will give consumers a more attractive product and will eliminate the costs involved in discarding unsalable merchandise. Maintenance of quality in storage and distribution, whether on or off the farm, is included.

Areas of research include:

- (a) Characterization of the biochemical reactions that occur after harvest and determination of the enzyme systems involved.
- (b) Effective ways to reduce physiological deterioration and losses due to microorganisms and insects in market channels.
- (c) Effects and means of controlling temperature, humidity, and other atmospheric variables in storage and transportation.
- (d) Systems of storage and handling conducive to the development or retention of desired color, flavor, texture, and nutritive value.
- (e) Packaging and other types of protection needed to maintain conditions necessary to maintain or develop quality.

Classification Guidelines:

Activities:

- 4500 Protection against insects, mites, snails, and slugs and their control agents
- 4600 Protection against diseases, parasites, and nematodes and their control agents
- 4860 Protection against rodents and other mammals
- 4870 Protection against molds, fungi, and other spoilage organisms
- 4890 Protection against radiation, noise, and other hazards
- 5410 Chemical and physical properties of food
- 5420 Biochemical and chemical reactions in food
- 5430 Sensory properties of food
- 5550 Food product handling, packaging, and storage
- 5600 Chemical and physical properties of non-food products
- 5800 Identification, measurement, and maintenance of quality
- 5900 Improving economic and physical efficiency in marketing, including analysis of market structure and functions
- 6310 Nutrient composition of food
- 6330 Food fortification, enrichment, and improvement
- 6390 Eating quality of food

RPA 404 (Cont'd)

Commodities, etc.:

- 0900 Citrus and tropical/subtropical fruit
- 1000 Deciduous and small fruits and edible tree nuts
- 1100 Potatoes
- 1200 Vegetables
- 2800 Miscellaneous and new crops
- 3800 Food (not readily associated with specific fruits and vegetables)
- 6700 Plants

RPA 405. PRODUCTION OF FIELD CROPS WITH IMPROVED ACCEPTABILITY

Acceptability of field crops means acceptability of such crops, or portions thereof, for particular uses. These include food, fiber, and feed use. Concern must be directed to domestic and foreign preferences if the full market potential of field crops is to be realized.

Areas of research include:

- (a) Enhancing product attributes that influence acceptability by animals, processors, or consumers.
- (b) Determining the physical, chemical, and genetic bases of determinants of preferred qualities.
- (c) Breeding and selecting new and improved varieties of field crops that have favored characteristics including reduced contents of naturally occurring toxins.
- (d) Developing improved production practices to achieve optimum quality of product.

Classification Guidelines:

Activities:

- 4900 Biology of plants and animals
- 5000 Improving biological efficiency of plants and animals
- 5100 Increasing consumer acceptability of farm and forest products
- 5410 Chemical and physical properties of food
- 5420 Biochemical and chemical reactions in food
- 5430 Sensory properties of food
- 5510 Food physical processes (canning, freezing, dehydration, milling, separation, extraction)
- 5520 Food bioprocesses (enzyme and microbial applications)
- 5530 Food chemical processes (salt, sugar, acid)
- 5540 Food processing efficiencies (management of energy, water, wastes)
- 5550 Food product handling, packaging, and storage
- 5600 Chemical and physical properties of non-food products
- 5700 Developing new and improved non-food products and processes
- 5800 Identification, measurement, and maintenance of quality
- 7500 Development of research equipment and technology

Commodities, etc.:

- 1400 Corn (For Sweetcorn use 1280)
- 1500 Grain sorghum
- 1600 Rice
- 1700 Wheat
- 1800 Other small grains
- 1900 Pasture
- 2000 Forage crops

RPA 405 (Cont'd)

Commodities, etc.:

- 2100 Cotton (including cottonseed for planting purposes)
- 2200 Cottonseed (for meal, oil, etc.)
- 2300 Soybeans
- 2400 Peanuts
- 2500 Other oilseed and oil crops (excluding cottonseed)
- 2600 Tobacco
- 2700 Sugar crops
- 2800 Miscellaneous and new crops
- 3800 Food (not readily associated with specific field crops)
- 6200 Seed research
- 6700 Plants
- 7000 Research equipment and technology (such as remote sensing)

RPA 406. NEW AND IMPROVED FOOD PRODUCTS FROM FIELD CROPS

New or improved food products and processes can provide better foods from field crops. They can make available new and more attractive products tailored to the requirements of specific domestic markets.

Areas of research include:

- (a) The chemistry of color, flavor, texture, and nutritive value.
- (b) The chemical and biochemical reactions which occur among constituents of foods and the factors which determine their rates.
- (c) Improvement of edible oils through removal or inactivation of constituents responsible for adverse quality effects.
- (d) Fortification to increase the nutritional value of foods.
- (e) Development of products and processing techniques to maintain or improve the stability and nutritional value of foods.

Exclude: (1) Research on new and improved maple products. (Use RPA 401).
(2) Research on new and improved feed, textile, and industrial products from field crops. (Use RPA 407).
(3) Research on product development for foreign markets. (Use RPA 604).

Classification Guidelines:

Activities:

- 5410 Chemical and physical properties of food
- 5420 Biochemical and chemical reactions in food
- 5430 Sensory properties of food
- 5510 Food physical processes (canning, freezing, dehydration, milling, separation, extraction)
- 5520 Food bioprocesses (enzyme and microbial applications)
- 5530 Food chemical processes (salt, sugar, acid)
- 5540 Food processing efficiencies (management of energy, water, wastes)
- 5550 Food product handling, packaging, and storage
- 5800 Identification, measurement, and maintenance of quality
- 6310 Nutrient composition of food
- 6330 Food fortification, enrichment, and improvement
- 6390 Eating quality of food

Commodities, etc.:

- 1400 Corn (For Sweetcorn use 1280)
- 1500 Grain sorghum
- 1600 Rice
- 1700 Wheat
- 1800 Other small grains
- 1900 Pasture

RPA 406 (Cont'd)

Commodities, etc.:

- 2000 Forage crops
- 2200 Cottonseed (for meal, oil, etc.)
- 2300 Soybeans
- 2400 Peanuts
- 2500 Other oilseed and oil crops (excluding cottonseed)
- 2700 Sugar crops
- 2800 Miscellaneous and new crops
- 3800 Food (not readily associated with specific field crops)
- 6700 Plants

RPA 407. NEW AND IMPROVED FEED, TEXTILE, AND INDUSTRIAL PRODUCTS FROM FIELD CROPS

Increasing the potential of our agricultural land requires full utilization of its products. Industrial uses have traditionally absorbed significant quantities of grains and oilseeds in such consumer products as paper, textiles, adhesives, and paints. With more sophisticated processing, these crops could be converted to a great variety of non-food uses.

Agricultural products such as cotton, starch, and oils have been challenged in the market place by non-agricultural products. To retain and expand markets, agricultural raw materials may need to be modified chemically and/or physically to provide desired properties at competitive prices. New end use opportunities include plastics, adhesives, plasticizers, lubricants, drugs, feed additives, and paper sizes and additives. The feed value of oilseed meats and of processed forages can be improved and costs of their processing and distribution reduced.

Areas of research include:

- (a) Chemical and physical properties of constituents of field crops.
- (b) Preparation of chemical derivatives.
- (c) Adaptation of derivatives for use in industrial products.
- (d) Development of improved engineering and processing methods.
- (e) Pharmacology of constituents and derivatives.
- (f) Modifications and treatments to improve textile characteristics such as flame resistance.
- (g) Chemical reactions that constituents undergo under conditions such as those encountered in feed processing.

Exclude: (1) Research on protection of feed supplies from harmful microorganisms, and processing to reduce or inactivate naturally occurring toxins in feeds. (Use RPA 702)

Classification Guidelines:

Activities:

- 5600 Chemical and physical properties of non-food products
- 5700 Developing new and improved non-food products and processes
- 5800 Identification, measurement, and maintenance of quality

Commodities, etc.:

- 1400 Corn (For Sweetcorn use 1280)
- 1500 Grain sorghum
- 1600 Rice
- 1700 Wheat
- 1800 Other small grains
- 1900 Pasture
- 2000 Forage crops

RPA 407 (Cont'd)

Commodities, etc.:

- 2100 Cotton (including cottonseed for planting purposes)
- 2200 Cottonseed (for meal, oil, etc.)
- 2300 Soybeans
- 2400 Peanuts
- 2500 Other oilseed and oil crops (excluding cottonseed)
- 2600 Tobacco
- 2700 Sugar crops
- 2800 Miscellaneous and new crops
- 3700 Clothing and textiles
- 6700 Plants

RPA 408. QUALITY MAINTENANCE IN STORING AND MARKETING FIELD CROPS

Maintenance of quality of field crop commodities against the inroads of insects, molds, moisture, chemical changes, and other quality deteriorating factors is important to minimize costs in storage and distribution. This RPA includes maintaining quality of farm products in storage and distribution channels, whether on or off the farm.

Areas of research include:

- (a) Effective ways to reduce physiological deterioration and losses due to insects, molds, rodents, and other pests.
- (b) Effects and means of controlling temperature, humidity, and atmosphere in storage and transportation.
- (c) Containerization needed to maintain optimum conditions.
- (d) Biochemical reactions that occur in products after harvest.
- (e) Determination of the relationship among variables of handling, storage and crop conditioning, and loss in quality.

Exclude: (1) Research on prevention, reduction, or elimination of harmful microorganisms, mycotoxins, and other naturally occurring toxins in field crops. (Use RPA 702).

Classification Guidelines:

Activities:

- 4500 Protection against insects, mites, snails, and slugs and their control agents
- 4600 Protection against diseases, parasites, and nematodes and their control agents
- 4860 Protection against rodents and other mammals
- 4870 Protection against molds, fungi, and other spoilage organisms
- 4890 Protection against radiation, noise, and other hazards
- 5410 Chemical and physical properties of food
- 5420 Biochemical and chemical reactions in food
- 5430 Sensory properties of food
- 5550 Food product handling, packaging, and storage
- 5600 Chemical and physical properties of non-food products
- 5800 Identification, measurement, and maintenance of quality
- 5900 Improving economic and physical efficiency in marketing, including analysis of market structure and functions
- 6310 Nutrient composition of food
- 6330 Food fortification, enrichment, and improvement
- 6390 Eating quality of food

Commodities, etc.:

- 1400 Corn (For Sweetcorn use 1280)
- 1500 Grain sorghum

RPA 408 (Cont'd)

Commodities, etc.:

- 1600 Rice
- 1700 Wheat
- 1800 Other small grains
- 1900 Pasture
- 2000 Forage crops
- 2100 Cotton (including cottonseed for planting purposes)
- 2200 Cottonseed (for meal, oil, etc.)
- 2300 Soybeans
- 2400 Peanuts
- 2500 Other oilseed and oil crops (excluding cottonseed)
- 2600 Tobacco
- 2700 Sugar crops
- 2800 Miscellaneous and new crops
- 3800 Food (not readily associated with specific field crops)
- 6200 Seed research
- 6700 Plants

RPA 409. PRODUCTION OF ANIMAL PRODUCTS WITH IMPROVED ACCEPTABILITY

Acceptability of animal products varies widely among species and products. We should know why. Concern over the role of fat in the diet has focused attention on the problem of excess fat in beef, pork, and lamb. Consumption trends for milk and eggs point toward acceptance problems for these products. More information is needed concerning what livestock product qualities are desired by consumers. Production should be tailored to these preferences.

Areas of research include:

- (a) Physiology and biochemistry of fats, proteins, and flavor components.
- (b) Influence of breeding, feeding, and management practices on quality of animal products.
- (c) Improving the acceptability of animal products through breeding, feeding, and management.
- (d) Factors responsible for development of flavor.
- (e) Reduction in amount of undesired fat in animal products.
- (f) Improving wool, hides, and other non-food animal products.

Exclude: (1) Research on bees and honey. (Use RPA 314).

Classification Guidelines:

Activities:

- 4900 Biology of plants and animals
- 5100 Increasing consumer acceptability of farm and forest products
- 5410 Chemical and physical properties of food
- 5420 Biochemical and chemical reactions in food
- 5430 Sensory properties of food
- 5510 Food physical processes (canning, freezing, dehydration, milling, separation, extraction)
- 5520 Food bioprocesses (enzyme and microbial applications)
- 5530 Food chemical processes (salt, sugar, acid)
- 5540 Food processing efficiencies (management of energy, water, wastes)
- 5550 Food product handling, packaging, and storage
- 5600 Chemical and physical properties of non-food products
- 5700 Developing new and improved non-food products and processes
- 5800 Identification, measurement, and maintenance of quality
- 7500 Development of research equipment and technology

Commodities, etc.:

- 0800 Fish, shellfish, game and fur-bearing animals, and other wildlife and their habitats
- 2900 Poultry
- 3000 Beef cattle
- 3100 Dairy cattle

RPA 409 (Cont'd)

Commodities, etc.:

- 3200 Swine
- 3300 Sheep and wool
- 3400 Other animals
- 3800 Food (not readily associated with specific animal products)
- 6800 Animals (Vertebrates)

RPA 410. NEW AND IMPROVED MEAT, MILK, EGGS, AND OTHER ANIMAL FOOD PRODUCTS

The development of new and improved meat, milk, eggs, and other animal food products and processing may reduce costs, increase variety, and expand markets for these foods. Some products can also be tailored to simplify home storage, reduce time required for preparation, and, in case of meats, develop more attractive products from low-value or low quality cuts. Other products can be developed for special uses and to minimize weight.

Areas of research include:

- (a) Improved techniques for stabilization through freezing, sterilization, dehydration, or combinations of these.
- (b) New or improved products through fortification and better formulation.
- (c) Development or improvement of engineering and processing methods to maintain or improve the stability and nutritional value of foods.
- (d) Methods of decreasing product weight and bulk to reduce storage, transportation, and distribution costs.
- (e) Chemistry of color, flavor, texture, and nutritive value.
- (f) Chemical and biochemical reactions which occur among the constituents and the factors which determine their rates.
- (g) Development of food concentrates from fish.

Exclude: (1) Research on bees and honey. (Use RPA 314).

(2) Research on product development for foreign markets. (Use RPA 604).

Classification Guidelines:

Activities:

- 5410 Chemical and physical properties of food
- 5420 Biochemical and chemical reactions in food
- 5430 Sensory properties of food
- 5510 Food physical processes (canning, freezing, dehydration, milling, separation, extraction)
- 5520 Food bioprocesses (enzyme and microbial applications)
- 5530 Food chemical processes (salt, sugar, acid)
- 5540 Food processing efficiencies (management of energy, water, wastes)
- 5550 Food product handling, packaging, and storage
- 5800 Identification, measurement, and maintenance of quality
- 6310 Nutrient composition of food
- 6330 Food fortification, enrichment, and improvement
- 6390 Eating quality of food
- 7500 Development of research equipment and technology

RPA 410 (Cont'd)

Commodities, etc.:

- 0800 Fish, shellfish, game and fur-bearing animals, and other wildlife and their habitats
- 2900 Poultry
- 3000 Beef cattle
- 3100 Dairy cattle
- 3200 Swine
- 3300 Sheep and wool
- 3400 Other animals
- 3800 Food (not readily associated with specific animal products)
- 6800 Animals (Vertebrates)
- 7000 Research equipment and technology (such as remote sensing)

RPA 411. NEW AND IMPROVED NON-FOOD ANIMAL PRODUCTS

Animal byproducts have traditionally contributed significantly to our livestock economy as raw materials for the textile, leather, soap, feed, pharmaceutical, and other industries. In more recent times, industrial research has developed from alternative raw materials, mostly petrochemical, new products having attractive properties for some of these end uses. These synthetic fibers, detergents, and shoe-making materials have become highly competitive with farm products. Agricultural raw materials have many useful properties frequently not possessed by the synthetics. New technology promises to add other desired properties such as permanent press in wool, and biodegradability in detergents from fats. Research has also developed useful new plasticizers and surface coatings from agricultural products.

Areas of research include:

- (a) Chemical and physical properties of hides, wool, skins, and animal fats.
- (b) Engineering in the processing of new and improved products.
- (c) Reduction of product wastage in processing.
- (d) Methods of processing or treating wool to increase its use and furnish properties desired by consumers.
- (e) Cross-bonding agents and improved tanning processes to develop new uses for leather, sheepskins, and shearling skins.
- (f) Development of polymers, detergents, lubricants, and chemical intermediates from animal fats.
- (g) Development of feed concentrates from fish.

Classification Guidelines:

Activities:

- 5600 Chemical and physical properties of non-food products
- 5700 Developing new and improved non-food products and processes
- 5800 Identification, measurement, and maintenance of quality

Commodities, etc.:

- 0800 Fish, shellfish, game and fur-bearing animals, and other wildlife and their habitats
- 2900 Poultry
- 3000 Beef cattle
- 3100 Dairy cattle
- 3200 Swine
- 3300 Sheep and wool
- 3400 Other animals
- 6800 Animals (Vertebrates)

RPA 412. QUALITY MAINTENANCE IN MARKETING ANIMAL PRODUCTS

Maintenance of quality in storage and transport of perishable livestock products and protection against the inroads of spoilage microorganisms, insects, moisture, and deleterious chemical, physical, and physiological changes is important.

Areas of research include:

- (a) Biochemical changes during storage.
- (b) Effects and means of controlling temperature, humidity, and atmosphere in storage and transportation.
- (c) Development of containerization to maintain optimum conditions.
- (d) Effective ways to control physiological changes in color, flavor, texture, and nutritive value and reduce losses due to microorganisms and insects.

Exclude: (1) Research on prevention, reduction, or elimination of harmful microorganisms, mycotoxins, and other naturally occurring toxins in animal products. (Use RPA 702).

Classification Guidelines:

Activities:

- 4500 Protection against insects, mites, snails, and slugs and their control agents
- 4600 Protection against diseases, parasites, and nematodes and their control agents
- 4860 Protection against rodents and other mammals
- 4870 Protection against molds, fungi, and other spoilage organisms
- 4890 Protection against radiation, noise, and other hazards
- 5410 Chemical and physical properties of food
- 5420 Biochemical and chemical reactions in food
- 5430 Sensory properties of food
- 5550 Food product handling, packaging, and storage
- 5600 Chemical and physical properties of non-food products
- 5800 Identification, measurement, and maintenance of quality
- 5900 Improving economic and physical efficiency in marketing, including analysis of market structure and functions
- 6310 Nutrient composition of food
- 6330 Food fortification, enrichment, and improvement
- 6390 Eating quality of food

Commodities, etc.:

- 0800 Fish, shellfish, game and fur-bearing animals, and other wildlife and their habitats
- 2900 Poultry
- 3000 Beef cattle
- 3100 Dairy cattle
- 3200 Swine
- 3300 Sheep and wool

RPA 412 (Cont'd)

Commodities, etc.:

3400 Other animals

3800 Food (not readily associated with specific animal products)

6800 Animals (Vertebrates)

GOAL V

IMPROVE EFFICIENCY IN THE MARKETING SYSTEM

The larger share of the consumer dollar is being spent for marketing rather than producing farm and forest products. The potential is great for reducing marketing costs. Greater efficiency of assembling, handling, processing, packaging, storing, transporting, wholesaling, and retailing farm and forest products would reduce prices paid by consumers, increase returns to farmers and marketers, and expand markets.

RPA's 501-503, 506-513, inclusive.

RPA 501. IMPROVEMENT OF GRADES AND STANDARDS--CROP AND ANIMAL PRODUCTS

Grades and standards are designed to describe characteristics of a product which affect its value to users. They are necessary either because the buyer or seller cannot appraise these characteristics by inspection or because buyers and sellers wish to execute sales on the basis of product description without inspection. Thus, effective grades and standards assist buyers in obtaining product characteristics they desire and sellers in obtaining appropriate compensation for what they sell. Costs of buying and selling are greatly reduced when, because of grades and standards, a buyer does not need to personally inspect each lot which he purchases.

The usefulness of market information, important in the conduct of trade and establishment of a fair price, is dependent upon adequately descriptive grades and standards. Many current grades and standards are not as useful as they could be because they do not adequately cover the characteristics desired by users. Others could be improved by the substitution of objective measurement of characteristics for the subjective techniques now in use.

Areas of research include:

- (a) Quality characteristics desired by buyers, including processors and handlers, as well as consumers.
- (b) Finding easily measurable characteristics that can be used to distinguish levels of quality found in products.
- (c) Developing objective measures of quality to replace subjective ones.
- (d) Developing procedures to update grades and standards to realistically reflect production practices.
- (e) Determining the need for and developing grades and standards for products not now covered.
- (f) Evaluating the effectiveness of particular grades and standards in meeting the requirements of buyers and sellers.

Exclude: (1) All research relating to grades and standards for ornamentals and turf. (Use RPA 906).
(2) All research relating to grades and standards for bees and other pollinating insects and their products. (Use RPA 314).

Classification Guidelines:

Activities:

5800 Identification, measurement, and maintenance of quality

Commodities, etc.:

0800-1200, 1400-3400, 3600, 3800, 6200, 6700, 6800 (See Commodity Classification)

RPA 502. DEVELOPMENT OF MARKETS AND EFFICIENT MARKETING OF TIMBER AND RELATED PRODUCTS

Development of markets and efficient marketing of timber and related products may help to maintain the incomes and employment associated with the timber industry. Non-wood products have penetrated many traditional markets for wood materials in construction, manufacturing, shipping, and other uses. Research to evaluate opportunities for market expansion through more efficient processing and marketing of timber products is essential to maintain and improve the competitive position of wood, and wood and timber related products.

Areas of research include:

- (a) Analysis of performance requirements for various wood products in construction and other markets.
- (b) Determining consumer attitudes and preference for various wood materials and relationships to performance requirements.
- (c) Changes in processing and distribution practices that would lead to increased marketing efficiency and lower costs.
- (d) Appraisals of the economic feasibility of developing markets for underused or low-quality timber.
- (e) Cost reductions through improved organization and management of marketing and processing firms.
- (f) Relationships involved in the size of marketing firms, number and composition of products handled, and marketing and processing costs.
- (g) Effects on marketing and processing costs and user demand of such characteristics of raw material supply as quality, dependability, and availability within an economic distance.
- (h) Market development and marketing efficiency for forest products other than timber including naval stores, maple syrup, chemicals derived from trees, Christmas trees, etc.

Classification Guidelines:

Activities:

- 5800 Identification, measurement, and maintenance of quality
- 5900 Improving economic and physical efficiency in marketing, including analysis of market structure and functions
- 6000 Analysis of supply, demand, and price, including interregional competition
- 6100 Developing domestic markets, including consumer preference and behavior

Commodities, etc.:

- 0600 Trees, forests, and forest products

RPA 503. EFFICIENCY IN MARKETING AGRICULTURAL PRODUCTS AND PRODUCTION INPUTS

The farm supply, processing, and marketing sectors account for a large percentage of the retail value of food and fiber. Thus, there are large potential returns from research to improve the efficiency of these sectors of the agricultural industry. Use of out-dated, inefficient marketing facilities, equipment, and methods contributes to the cost of supplying production inputs and moving food and fiber products from the farm to consumers. Research can identify and develop ways to reduce these costs. As consumers continue to demand more marketing services, the importance of efficiency in marketing will become even greater.

Areas of research include:

- (a) Determining the effects of marketing facility layout, equipment, and methods on handling costs, and developing the types of facilities and combinations of facilities that will move production inputs to the farm and farm products from farms to consumers most efficiently.
- (b) Evaluating and designing transportation equipment and handling methods to reduce losses and handling costs.
- (c) Effects of characteristics of raw products such as quality, stability, and physical characteristics on marketing and processing costs.
- (d) Routing products from producers to consumers in such a way as to minimize transportation and processing costs.
- (e) Optimum size and location of facilities for specified levels of output.
- (f) Improved techniques for managerial decision making and communications within the firm.

Classification Guidelines:

Activities:

5900 Improving economic and physical efficiency in marketing, including analysis of market structure and functions

Commodities, etc.:

0100 Soil and land

0800-1200, 1400-3400, 3600-3900, 4400, 4600-4800 (See Commodity Classification)

6200 Seed research

6700 Plants

6800 Animals (Vertebrates)

RPA 506. SUPPLY, DEMAND, AND PRICE ANALYSIS--CROP AND ANIMAL PRODUCTS

Reliable forecasts of supply, demand, and prices of farm products are essential to efficient and orderly marketing. Individual producers, processing and marketing firms, and end users base daily decisions upon information about and forecasts of future supply, demand, and price conditions. Sound public policy decisions on acreage control, surplus diversion, and food assistance to developing countries are dependent upon such information. The farm supply industries need similar data on goods and services purchased by producers so that they may make orderly adjustments to prospective changes in supply, demand, and price of production inputs.

Some large firms employ staffs to carry out sophisticated analyses of the many interrelated factors that must be considered in forecasting supply, demand, and price. Small firms, most farmers, and consumers do not have the resources for such analyses. Their bargaining power would be greatly reduced if information from public sources were not available to them.

Areas of research include:

- (a) Effects of changes in supply of individual commodities on farm product prices, marketing spreads, and consumer prices.
- (b) Effects of changes in supply of one commodity on prices and spreads for substitute and complementary products.
- (c) Effects of income, level of education, type of residence, and other consumer characteristics on demand.
- (d) Effects of such characteristics of supply as variability of production on user demand.
- (e) Seasonal patterns of consumer demand and effects of special events such as religious and national holidays and unusual supply and demand patterns as a result of weather extremes.
- (f) Effects of new production and processing technology and of technological developments in production of synthetics on demand for farm products.
- (g) Development of improved techniques for collecting consumption data for use in long-range projections of demands.

Classification Guidelines:

Activities:

6000 Analysis of supply, demand, and price, including interregional competition

7300 Evaluation of public programs, policies, and services

7400 Improvement of agricultural statistics

Commodities, etc.:

0800-1200, 1400-3400, 3600-3800 (See Commodity Classification)

4400 Agricultural economy of United States and sectors thereof, including interrelationships with the total economy

RPA 506 (Cont'd)

Commodities, etc.:

- 6200 Seed research
- 6700 Plants
- 6800 Animals (Vertebrates)

RPA 507. COMPETITIVE INTERRELATIONSHIPS IN AGRICULTURE

Competitive interrelationships in agriculture change with the development of new technology, shifts in consumer tastes, and organizational changes in the farm supply, production, and marketing sectors. An understanding of the changing competitive position of regions and industry groups is necessary for sound management decisions, particularly long-term investment decisions by farm operators and managers of agriculture related firms. The development of sound public agricultural policy requires estimates of its probable impact on the competitive position of farmers in different regions.

Areas of research include:

- (a) The competitive position of different regions and industry groups in the production and marketing of agricultural products.
- (b) The potential impact of changes in transportation costs, wage rates, technology, rates of population growth, and other factors on the competitive position of the various regions producing or handling crop and livestock products.
- (c) The potential for a product to compete with other farm products for the use of the land, labor, and other production resources in a geographic area.

Classification Guidelines:

Activities:

- 6000 Analysis of supply, demand, and price, including interregional competition
- 7300 Evaluation of public programs, policies, and services

Commodities, etc.:

- 0800-1200, 1400-3400, 3600-3800 (See Commodity Classification)
- 6700 Plants
- 6800 Animals (Vertebrates)

RPA 508. DEVELOPMENT OF DOMESTIC MARKETS FOR FARM PRODUCTS

Farm products compete with other goods and services for the consumer's dollar. A few are widely advertised by processors. Many suffer from relatively inadequate presentation of their value to consumers. Some products are not readily available to all consumers or are not available in the forms which consumers desire. When new products are developed, commercialization depends upon evaluation of market potential so as to attract venture capital into their production.

Substantial investments are being made by farmer-supported organizations in an effort to improve farm product merchandising. These groups look to research to evaluate these activities and to guide them to more effective alternatives.

Areas of research include:

- (a) Market potential of new products.
- (b) Availability of products to users and consumers in the existing marketing system and factors affecting their availability.
- (c) Consumer response to alternative advertising, educational and promotional techniques, and activities.
- (d) Consumer preference studies except as noted below.

- Exclude:
- (1) Research on development of markets and more efficient marketing of timber products. (Use RPA 502).
 - (2) Research on production of farm products with improved consumer acceptability. (Use RPA 402, 405, or 409).
 - (3) Research on development of new and improved products. (Use RPA 401, 403, 406, 407, 410, or 411).
 - (4) Research on specific consumer preference studies on:
 - wood products (Use RPA 502)
 - bees and honey (Use RPA 314)
 - recreation (Use RPA 902)
 - fur-bearing animals, fish, etc. (Use appropriate RPA)
 - trees to enhance environment (Use RPA 905)
 - ornamentals and turf (Use RPA 906)

Classification Guidelines:

Activities:

- 5900 Improving economic and physical efficiency in marketing, including analysis of market structure and functions
- 6000 Analysis of supply, demand, and price, including interregional competition
- 6100 Developing domestic markets, including consumer preference and behavior

RPA 508 (Cont'd)

Commodities, etc.:

0800-1200, 1400-3400, 3600-3800, 4700 (See Commodity Classification)

6700 Plants

6800 Animals (Vertebrates)

RPA 509. PERFORMANCE OF MARKETING SYSTEMS

Performance is a measure of the consequences or benefits that flow from alternative methods of performing the marketing functions. One such measure has been farm-to-retail price spreads over time for the market in the aggregate, as well as for individual commodities. Changing price spreads provide timely signals of market adjustments. But, an interpretation of the nature of such developments in relation to performance requires exacting analyses of organization characteristics and practices of marketing firms and subsectors. Industry concentration, the occurrence of mergers, various dimensions of integration and diversification and other structural elements are essential ingredients of studies seeking an explanation of market performance.

While structural analyses provide many helpful clues about market performance, they are a step away from the achievement of a total overview that can be gained by regarding the market as a dynamic operating system characterized by interlocking activities and interactions. Economic linkages and interdependencies among market participants need to be identified and the products and outcomes of such configurations translated into various equity interpretations to arrive at conclusions about market performance in the broadest sense. Ideally, performance should be equated with the interests of farmers, marketing firms, capital suppliers, labor, and consumers. In this context, market structure analysis is not an end in itself but rather a major component of a systems approach to market analysis.

Areas of research include:

- (a) Simulation and behavioral models of industry systems and subsystems for use in evaluating performance in terms of efficiency and participant equity.
- (b) Economic intelligence on the changing structure of marketing systems, including size and number of firms, patterns of ownership, development of integrated and contractual relationships, and competitive practices of marketing firms.
- (c) Estimates of the aggregate effects of adjustments of individual firms in an industry on costs, prices, and marketing margins.
- (d) The effect on market performance of public utility and transportation industry adjustments to public programs, policies, and regulations (e.g., the Interstate Highway System).
- (e) Expected effects on the firm of public programs and legal restraints such as licensing, tax regulations, grades and standards, and sanitation requirements.
- (f) Effects of market coordination and integration on price determination and on the efficiency of price as an allocative mechanism.

Classification Guidelines:

Activities:

- 5900 Improving economic and physical efficiency in marketing, including analysis of market structure and functions
- 7300 Evaluation of public programs, policies, and services

RPA 509 (Cont'd)

Commodities, etc.:

0800-1200, 1400-3400, 3600-3900, 4600-4800 (See Commodity Classification)

6700 Plants

6800 Animals (Vertebrates)

RPA 510. GROUP ACTION AND MARKET POWER

Research on group action and market power is essential to help producers and agricultural marketing, purchasing, and service organizations adjust to a changing agricultural production pattern, a changing market structure, increasing urbanization, and increasing rural, non-farmer residency. Cooperatives, marketing orders and agreements, and other types of group effort offer potential for strengthening or improving the economic and social position of farmers and other rural residents.

Areas of research include:

- (a) Effectiveness of alternative forms of group action under different supply, demand, and price relationships.
- (b) Design and development of appropriate institutional devices for bargaining.
- (c) Role of the individual in group action related to marketing and purchasing.
- (d) Effectiveness of organizational structures in serving rural people in relation to ownership control, financial requirements, management capabilities, and market responsibility.
- (e) Determination of additional, modified, or new services and techniques that can be used by agricultural and other types of rural associations.

Classification Guidelines:

Activities:

- 5900 Improving economic and physical efficiency in marketing, including analysis of market structure and functions
- 7300 Evaluation of public programs, policies, and services

Commodities, etc.:

- 4600 Farmer cooperatives
- 4700 Marketing, processing, and supply firms other than cooperatives
- 4800 Marketing systems and sectors thereof

RPA 511. IMPROVEMENT IN AGRICULTURAL STATISTICS

Accurate information concerning production, marketing, and pricing of farm products is essential for research and is needed by farmers, private industry, and government for wise decision making. Dynamic changes in the whole fabric of agricultural production, processing, and marketing have greatly expanded the amount, precision, and detail of information needed, and introduced new problems of collecting this information. One of the dynamic changes has been the integration of supply, production, and marketing functions. With the increase in integration, the points at which meaningful data have traditionally been collected are losing their relevance.

A new structuring of the statistics is essential to bring statistical measures into agreement with the actual production and marketing system. The field of statistics relating to agriculture including farm income and population and market prices of farm products is in need of improvement. Traditional methods of collection and estimation of economic statistics for agriculture cannot produce the data needed to analyze, define, and quantify the dynamic changes in agriculture. The reconstruction of the statistical program in terms of content and parameters to be estimated will require much research effort in addition to research in the techniques of effective and efficient data collection.

Areas of research include:

- (a) Definitions and concepts needed for statistical purposes, together with establishment of criteria for classifying agricultural enterprises.
- (b) Questionnaire and survey design and definitions to reduce non-sampling errors in collection of crop, livestock, yield, production, price, farm labor, and other agricultural data.
- (c) Sampling frames - both simple and multiple - to obtain data on yield, production, price, and labor.
- (d) Methods of forecasting and estimating yield.
- (e) Application of new technology in transmission and data processing.
- (f) Use of administrative records associated with various public programs as sampling frames and as sources of data.

Exclude: (1) Research on the application of remote sensing techniques to crop and livestock estimates. (Use RPA 113).

Classification Guidelines:

Activities:

- 7400 Improvement of agricultural statistics
- 7500 Development of research equipment and technology

Commodities, etc.:

- 6400 Experimental design and statistical methods
- 7000 Research equipment and technology (such as remote sensing)

RPA 512. IMPROVEMENT OF GRADES AND STANDARDS--FOREST PRODUCTS

Grades and standards describe the characteristics of a product so that producers and processors, and buyers and sellers can gauge product utility. Tree grades provide a means of more effectively valuing growing stock, thus assisting the producer to set specific goals for silvicultural practice and to obtain true value for stumpage. Log grades reduce the uncertainty in product transactions and permit sorting logs for their highest use, to the benefit of both buyer and seller. Standards for processed forest products likewise assist buyers in obtaining product characteristics they desire and sellers in obtaining appropriate compensation for what they sell. Because wood is heterogenous material, the efficiency of wood markets depends to a large degree on a system of accurate and understandable grades and standards.

Areas of research include:

- (a) Analysis of the bases for selection of quality criteria used in process and product specifications.
- (b) Determining the relationships between product specification, physical characteristics of trees and logs, and process capability.
- (c) Developing techniques for evaluating product quality level.
- (d) Describing product quality characteristics and variations for which grades and standards should be developed.
- (e) Evaluating the effectiveness of particular grades and standards in meeting the requirements of buyers and sellers.

Classification Guidelines:

Activities:

5800 Identification, measurement, and maintenance of quality

Commodities, etc.:

0600 Trees, forests, and forest products

RPA 513. SUPPLY, DEMAND, AND PRICE ANALYSIS--FOREST PRODUCTS

Improved forecasts of supply, demand, and prices of forest products are essential to more efficient and orderly planning for production and marketing. Individual producers, processing and marketing firms, and end users base decisions upon information about the forecasts of future supply, demand, and price conditions. Public policy on forest use is likewise dependent on such information. The forest supply industries need similar data on goods and services purchased by producers so that they may make orderly adjustments to prospective changes in supply, demand, and price of production inputs.

Areas of research include:

- (a) Development of improved techniques for collection of data.
- (b) Effects of changes in supply of individual commodities upon stumpage prices, marketing spread, and consumer prices.
- (c) Effects of changes in supply of one commodity upon prices and spreads for a substitute product.
- (d) Effects of income, level of education, type of residence, and other consumer characteristics on demand.
- (e) Effects of such characteristics of supply as variability of production upon user demands.
- (f) Seasonal patterns of consumer demands.
- (g) Effects of new production and processing technology and technological developments in production of synthetics on demand for forest products.
- (h) Impact of current and proposed government programs on supply, demand, and price.
- (i) Evaluation of methods of collecting data and disseminating market information.

Classification Guidelines:

Activities:

- 6000 Analysis of supply, demand, and price, including interregional competition
- 7400 Improvement of agricultural statistics

Commodities, etc.:

- 0600 Trees, forests, and forest products
- 3600 General purpose supplies (including machinery, equipment, fertilizers, feedstuffs, and pesticides)
- 3900 Structures and facilities

GOAL VI

EXPAND EXPORT MARKETS AND ASSIST DEVELOPING NATIONS

Our agricultural products contribute prominently to our balance of payments position. The potential is far greater. We need more and better sales promotion efforts. We need to direct more effort toward producing and marketing to meet specific market preferences and to developing preferences for desirable attributes our products already have. We need much more knowledge of how to establish foreign markets, how to organize production and marketing to meet export demand, and what potential our products have in foreign markets.

Our sense of moral responsibility impels us to help people in need. At the same time our abundant food, fiber, and agricultural technology represent our most effective instrument of foreign policy. Agricultural and forestry technical assistance will help developing nations produce more of their own food needs, contribute to their economic growth, and lead to expanded export markets for us. Our productive capacity can serve a useful and humanitarian purpose in helping to feed hungry people wherever the need exists. Much ingenuity will be required in order to accomplish this humanitarian objective without upsetting world markets and internal economics of the countries involved.

RPA's 601-604, inclusive.

RPA 601. FOREIGN MARKET DEVELOPMENT

The U.S. lost its preeminent position in agricultural trade during the 1980's. The U.S. share of world agricultural trade was 21% in 1980 but declined to 15 percent in 1988. The U.S. is now faced with new competitors in the global marketplace. Since agricultural production exceeds domestic needs, the economic viability of the U.S. food and agricultural system in the years ahead depends on the expansion of export sales. For example, in 1989 the U.S. exported over two-fifths of its harvested acreage and a half-million farm jobs were dependent on the production of exported agricultural products. These exports also create about 6 million off-farm jobs in financing, storage, packaging, processing, merchandising, and shipping.

An increasing concern is the competitive position of the U.S. in the international marketing of value-added food products. The potential benefits from the increased export of value-added products is enormous. In 1986, it was estimated the U.S. would have an additional \$9 billion in value-added exports and an additional 350,000 Americans employed in processing, marketing, and handling if growth in value-added exports had been comparable with growth in bulk commodity exports.

Areas of research include:

- (a) Prediction of trade levels by analysis of current and prospective changes in population, incomes, price levels; domestic agricultural production, and economic development of importing countries; and the development of economic models to predict trade levels.
- (b) Effects of regionalization, changing trade policies, and market organizations in importing countries on U.S. agricultural exports.
- (c) Effectiveness of promotional programs for expanding foreign markets.
- (d) Trade agreements and other government programs as methods of expanding exports of farm products.
- (e) Analysis of current and prospective trends in production, trade, and consumption in competitor countries.
- (f) Determination of the countries or regions which have a comparative advantage in the production of specific agricultural commodities.
- (g) Determination of needs for new and improved products and processing and packaging methods that appeal to the preference of consumers in other countries and better maintain the quality of the product.

Exclude: (1) Research on the development of new and improved products and processes and packaging. (Use RPA 604).

Classification Guidelines:

Activities:

- 6200 Foreign trade, market development, and competition
- 7300 Evaluation of public programs, policies, and services

RPA 601 (Cont'd)

Commodities, etc.:

0600, 0800-1200, 1400-3400, 3600-3800, 4400, 4500, 6700, 6800 (See Commodity Classification)

RPA 602. EVALUATION OF FOREIGN FOOD AID PROGRAMS

Our country is subsidizing large scale exports of food annually to countries that do not have enough foreign exchange to buy this food for their undernourished people. Research is needed to analyze the effects of food aid on economic development, agricultural productivity, and trade of the recipient countries. There is little prospect that domestic production of many developing countries plus commercial imports will be adequate to fill their food and fiber needs for some years to come. Effective food aid from countries with exportable surpluses can permit continued economic development in countries where shortages in food production occur. The local currencies derived from food aid also provide a valuable resource that, under appropriate guidelines, can be used to promote economic development.

Areas of research include:

- (a) How food aid can best contribute to the economic development of the recipient country with the least disruption of commercial markets, including those for domestic products.
- (b) The probable volume and duration of food aid needed.
- (c) The impact on U.S. farm income and relative program cost as a consequence of relaxing our production controls and expanding concessional exports.
- (d) Ways of increasing the efficiency of handling food aid in the recipient country, including labor, transportation, and storage.
- (e) Use of food aid or local currency receipts from sale of food aid as wage goods in the development of roads, schools, and other public facilities necessary for the development of a modern economy in the recipient country.
- (f) Measurement of the extent to which diets in developing countries fall short of minimum nutritional requirements as published in WORLD FOOD BUDGET.

Classification Guidelines:

Activities:

- 6500 Description, inventory, and trends
- 7300 Evaluation of public programs, policies, and services

Commodities, etc.:

- 4500 Agricultural economy of foreign countries and sectors thereof, including interrelationships with the total economy

RPA 603. TECHNICAL ASSISTANCE TO DEVELOPING COUNTRIES

In recognition of our vital stake in a peaceful and prosperous world, the U.S. has undertaken programs of technical assistance to developing countries. Economic development in most of them, at least in the early stages, is largely a matter of improving the productivity of their agriculture. A developing agriculture supplies a means of capital accumulation, provides an expanding market for the products of other industries, and eventually releases workers to other sectors of the economy.

Areas of research include:

- (a) Development of new technology for increasing yields and output of farm products and enhancing marketing and distribution activities through (1) adaptation to local conditions of methods proved effective elsewhere, and (2) developing new methods specifically for use in the developing country or local area.
- (b) Determination of conditions that promote or retard improvements in agricultural productivity, such as educational levels, cost-price relationships, availability of improved production technology, and cultural, legal, and institutional factors.
- (c) Determination of optimum allocation of resources for agricultural vs. nonagricultural development, and for production of farm products for domestic use vs. production of farm products for export.
- (d) Ways of choosing, developing, and training native research personnel to staff the developing country's agricultural research and teaching programs.
- (e) Evaluation of the effects of educational programs on production practices, nutrition, health, sanitation, housing, and techniques of leadership development.
- (f) Contribution to economic development by organizational groups such as cooperatives, service agencies, and youth groups.

Classification Guidelines:

Activities:

4100-7500 (See Activity Classification)

Commodities, etc.:

0100-7000 (See Commodity Classification)

RPA 604. PRODUCT DEVELOPMENT AND MARKETING FOR FOREIGN MARKETS

Sales of farm products abroad are an important source of income for American farmers and they contribute substantially to the U.S. balance of payments. Product development and processing is an essential phase of meeting the particular requirements of different foreign groups. In addition, processing may serve to reduce transportation costs by putting products in more concentrated forms and eliminating waste portions prior to shipment.

Another vital factor in the competition for foreign markets is efficiency in the performance of the various functions that make up the total process of marketing. The functions include packaging, handling, transportation, and quality maintenance. The marketing abroad of products of agricultural origin poses many problems such as distance, climate, food habits, and food safety laws. Success in dealing with these problems requires continuing research.

Areas of research include:

- (a) Developing new and improved products that appeal to consumers in foreign countries, and efficient processing methods to derive these products.
- (b) Developing supplemental protein foods and various types of fortified foods for use in countries with specific dietary deficiencies.
- (c) Developing processed foods from plentiful raw materials that will appeal to foreign tastes and induce new food habits.
- (d) Modifying existing non-food products obtained from agricultural materials and developing new ones for specific foreign markets.
- (e) Developing containers and packages suited to overseas transportation requirements and foreign consumer preferences.
- (f) Determining food safety and quality requirements in foreign countries and developing market practices to meet these requirements.

Classification Guidelines:

Activities:

- 5410 Chemical and physical properties of food
- 5420 Biochemical and chemical reactions in food
- 5430 Sensory properties of food
- 5510 Food physical processes (canning, freezing, dehydration, milling, separation, extraction)
- 5520 Food bioprocesses (enzyme and microbial applications)
- 5530 Food chemical processes (salt, sugar, acid)
- 5540 Food processing efficiencies (management of energy, water, wastes)
- 5550 Food product handling, packaging, and storage
- 5700 Developing new and improved non-food products and processes
- 5800 Identification, measurement, and maintenance of quality
- 5900 Improving economic and physical efficiency in marketing, including analysis of market structure and functions

RPA 604 (Cont'd)

Activities:

6200 Foreign trade, market development, and competition

Commodities, etc.:

0600, 0800-1200, 1400-3400, 3600-3800, 6200 (See Commodity Classification)

GOAL VII

PROTECT CONSUMER HEALTH AND IMPROVE NUTRITION AND WELL-BEING OF THE AMERICAN PEOPLE

The public expects agriculture to produce and market foods that it can buy with confidence. This means food that is wholesome and free from harmful pesticide residues, disease agents, or toxic substances. While this nation has a food supply that cannot be surpassed for wholesomeness anywhere in the world, there is ample room for improvement, particularly with respect to microbiological safety and chemical residues. Also, we are concerned with helping people in the selection, construction, and care of clothing and textiles, and in controlling insect pests of man and his belongings.

In spite of our abundant food supply, a large percentage of our families have poor diets. We have better knowledge of optimum diets for some of our livestock than for our people. We need to know how to blend our plentiful food supply into better diets for buoyant health and longevity.

RPA's 701-709, inclusive.

RPA 701. INSURE FOOD PRODUCTS FREE OF TOXIC CONTAMINANTS, INCLUDING RESIDUES FROM AGRICULTURAL AND OTHER SOURCES

Research on toxic residues of agricultural origin is needed to determine the levels and circumstances under which chemicals may be safely used in crop or livestock production. 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. Farmers have a vital stake in the detection and elimination of these hazards because of their possible effects on human health, the resulting hesitancy on the part of consumers to buy certain farm products, and the income loss that may occur if products are not acceptable.

Areas of research include:

- (a) Safe levels of residues on or in farm products for human consumption.
- (b) The behavior and fate of pesticides and other applied chemicals in and on plants, animals, and their products.
- (c) The nature and permanence of toxic metabolites produced by plants or animals which have absorbed or consumed pesticides or other chemicals and methods of removing them or reducing their concentration.
- (d) Quick and accurate methods for monitoring pesticide residue levels in or on crop and livestock products.
- (e) Development of equipment and facilities to reduce or eliminate toxic residues from agricultural sources.

Exclude: (1) Research on identification and control of pollutants and safe disposal of pesticide materials. (Use RPA 901).
(2) Research to reduce ingestion of harmful pesticides and other chemicals in or on animal feeds. (Use RPA 213).

Classification Guidelines:

Activities:

- 4500 Protection against insects, mites, snails, and slugs and their control agents
- 4600 Protection against diseases, parasites, and nematodes and their control agents
- 4700 Protection against weeds and their control agents
- 4830 Protection against pollutants
- 4880 Protection against allergens, toxins, and poisonous plants
- 4890 Protection against radiation, noise, and other hazards

Commodities, etc.:

0800-1200, 1400-2000, 2200-2500, 2700-3400, 3600, 3800, 6100, 6300, 6700, 6800 (See Commodity Classification)

RPA 702. PROTECT FOOD AND FEED SUPPLIES FROM HARMFUL MICROORGANISMS AND NATURALLY OCCURRING TOXINS

Agriculture has a responsibility for ensuring the production of foods and feeds which are safe to eat. The United States enjoys a reputation for food supplies that are microbiologically among the safest in the world. Nevertheless, salmonellae, staphylococci, botulini, trichinellae, and other harmful microorganisms are a constant threat in inadequately processed or preserved foods and feeds. Mycotoxins, such as those affecting peanuts, and naturally occurring toxins, such as gossypol, also affect food and feed supplies. The Public Health Service has determined that salmonellosis in humans is a significant problem. Agriculture must reduce the risk to man from these and other harmful microorganisms and toxins.

Areas of research include:

- (a) Methods for freeing breeding and production herds and flocks of Salmonella and other harmful microorganisms.
- (b) Ways to provide livestock and poultry with feeds that are free of harmful microorganisms.
- (c) Prevention of transmission of harmful microorganisms from human carriers to livestock and feed or food supplies.
- (d) Production of microbiologically safe foods.
- (e) Maintenance of microbiological safety in handling, processing, packaging, and distributing food products.
- (f) Improved methods of food handling, storage, and preparation at home or in institutions for greater microbiological safety.
- (g) Methods for preventing or eliminating mycotoxins in peanuts and other field crops.
- (h) Methods of preventing, removing, or controlling naturally occurring toxins and allergens in agricultural products.

Exclude: (1) Production of field crops with improved acceptability where the objective is to reduce naturally occurring toxins. (Use RPA 405).
(2) Protection of livestock and poultry from poisonous plants. (Use RPA 213).

Classification Guidelines:

Activities:

- 4600 Protection against diseases, parasites, and nematodes and their control agents
- 4830 Protection against pollutants
- 4870 Protection against molds, fungi, and other spoilage organisms
- 4880 Protection against allergens, toxins, and poisonous plants
- 4890 Protection against radiation, noise, and other hazards

Commodities, etc.:

- 0800-1200, 1400-2000, 2200-2500, 2700-3400, 3600, 3800, 4000, 4100 (See Commodity Classification)
- 6200 Seed research

RPA 702 (Cont'd)

Commodities, etc.:

- 6500 Invertebrates
- 6600 Microorganisms, viruses, etc.
- 6700 Plants
- 6800 Animals (Vertebrates)

RPA 703. FOOD CHOICES, HABITS, AND CONSUMPTION

Knowledge of what people actually eat and why is limited. The problems in this area are complex and difficult to investigate. Many factors are involved when people make their food choices. Patterns of food consumption have important implications for well-being throughout the life span.

The profile of food choices of people in our country are reflected in food consumption patterns. Knowledge about food consumption patterns is needed to provide the basis for evaluating nutritional adequacy of segments of the population.

Knowledge of food choices and habits of people, ways to motivate people to change where needed, together with food consumption patterns, form the basis for the establishment of educational programs and other action programs to improve nutrition in different groups.

Areas of research include:

- (a) The economic, psychological, sociological, and physiological factors associated with age, ethnic, and income groups that function as determinants and motivating forces in making food choices.
- (b) Food habits, understanding, and misconceptions about nutrition.
- (c) Methods of informing people about the relationship of food to health.
- (d) Methods of stimulating people to improve their food habits, including analysis of the process of attitude and behavior change.
- (e) Food consumption patterns of the nation and of various population groups.
- (f) Evaluation of the effects of programs to improve nutritional status on food choices.
- (g) Computer approaches to diet and menu planning.

Classification Guidelines:

Activities:

- 6310 Nutrient composition of food
- 6320 Human nutrient requirements
- 6330 Food fortification, enrichment, and improvement
- 6340 Food consumption patterns and use
- 6360 Metabolism and function of nutrients in food
- 6370 Human nutrition and behavior
- 6380 Human nutritional monitoring and surveillance
- 6390 Eating quality of food
- 7000 Design of experiments and methods of statistical analysis
- 7300 Evaluation of public programs, policies, and services

Commodities, etc.:

0800-1200, 1400-2000, 2200-2500, 2700-3400, 3800, 4000, 4100, 6700 (See Commodity Classification)

RPA 704. HOME AND COMMERCIAL FOOD SERVICE

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

Commercially prepared foods are moving to the public through newly developed channels of distribution. Trends are apparent in automatic vending of more foods; in central preparation of food for large groups; and in more centralization of food preparation for restaurant and home use. Each new development in food preparation requires the determination of factors related to palatability, wholesomeness, safety, and nutritional value and an assurance of consumer acceptance.

Areas of research include:

- (a) Factors that achieve the highest quality of food prepared at home or commercially.
- (b) Effects of different methods of preparing, holding, and serving food on wholesomeness, nutrient content, quality, and consumer satisfaction.
- (c) Knowledge regarding the effects and interrelationships of factors such as time and temperature in the preparation of food at home or commercially.
- (d) Adaptation of computer approaches to food preparation and services.
- (e) Development of methods to provide effective, efficient management in institutional and commercial food services.
- (f) Development of guidelines for product labeling to improve consumer information about product quality, preparation and storage, nutritional values, and unit cost of foods for home and commercial use.

Classification Guidelines:

Activities:

- 4500 Protection against insects, mites, snails, and slugs and their control agents
- 4600 Protection against diseases, parasites, and nematodes and their control agents
- 5800 Identification, measurement, and maintenance of quality
- 5900 Improving economic and physical efficiency in marketing, including analysis of market structure and functions
- 6310 Nutrient composition of food
- 6320 Human nutrient requirements
- 6330 Food fortification, enrichment, and improvement
- 6340 Food consumption patterns and use
- 6360 Metabolism and function of nutrients in food
- 6370 Human nutrition and behavior
- 6380 Human nutritional monitoring and surveillance
- 6390 Eating quality of food

RPA 704 (Cont'd)

Commodities, etc.:

0800-1200, 1400-2000, 2200-2500, 2700-3400, 3800, 4600, 4700 (See Commodity Classification)

RPA 705. SELECTION AND CARE OF CLOTHING AND HOUSEHOLD TEXTILES

Research on the purchase, use, and care of clothing and household textiles is needed to assist consumers in obtaining greater service from products derived from agricultural raw materials. Research is needed to provide knowledge about the products of agriculture used in clothing and household textiles and on the choices that consumers make of these products.

Areas of research include:

- (a) Determination of the properties of agricultural fibers which affect consumer satisfaction when such fibers are used in textiles, clothing, and for other household purposes.
- (b) Methods of predicting fabric performance in service.
- (c) Combinations of fibers and fabrics that will best meet consumer preferences and needs.
- (d) Safe, economical, and efficient methods of care and maintenance of clothing and household textiles, with emphasis on new developments in fibers and finishes.
- (e) Factors influencing consumption patterns for clothing and household textiles of families according to income and stage in the family cycle as a basis for developing budgets of expenditures for these items by families.
- (f) The effect of drycleaning and laundering on survival of harmful microorganisms and viruses.

Exclude: (1) Research on control of insect pests affecting clothing, carpeting, and other textiles. (Use RPA 706).

Classification Guidelines:

Activities:

- 4830 Protection against pollutants
- 4870 Protection against molds, fungi, and other spoilage organisms
- 5100 Increasing consumer acceptability of farm and forest products
- 5600 Chemical and physical properties of non-food products
- 5700 Developing new and improved non-food products and processes
- 6410 Quality of family living
- 6420 Quality of housing
- 6450 Quality of management and use of personal, domestic, and other resources

Commodities, etc.:

- 3700 Clothing and textiles

RPA 706. CONTROL OF INSECT PESTS OF MAN AND HIS BELONGINGS

Insects, ticks, and mites are known to be vectors of such diseases as encephalitis, malaria, typhus, bubonic plague, and Rocky Mountain Spotted Fever. Mosquitoes, flies, and other insects are also a great annoyance to man. Insects cause serious damage to the belongings of man. Included are such pests as clothes moths, roaches, and carpet beetles. We need to learn more about the biology of the insects affecting man, and about safe, effective, and economical means of controlling them.

Areas of research include:

- (a) Studies on the biology and ecology of the insects, ticks, and mites of concern.
- (b) Developing attractants and repellents.
- (c) Developing biological methods of control.
- (d) Developing safer and more effective methods of chemical control.
- (e) Developing methods to control insects that damage clothing, rugs, and upholstery; and mosquitoes, roaches, gnats, house flies, and sand flies.

- Exclude: (1) Studies on the role of insects, ticks, and mites in disease transmission. (Use RPA 707).
- (2) Research on control of insects affecting stored food products. (Use RPA 404, 408 or 412).
 - (3) Research on control of insects affecting pets. (Use RPA 210).
 - (4) Research on control of insects affecting wood products. (Use RPA 401).

Classification Guidelines:

Activities:

- 4500 Protection against insects, mites, snails, and slugs and their control agents
- 4900 Biology of plants and animals

Commodities, etc.:

- 3700 Clothing and textiles
- 3900 Structures and facilities
- 4000 People as individual workers, consumers, and members of society
- 6500 Invertebrates

RPA 707. PREVENT TRANSMISSION OF ANIMAL DISEASES AND PARASITES TO MAN

Residents of the United States are fortunate that animal diseases transmissible to man have become a relatively low risk. Although much progress has been made in eradicating brucellosis and tuberculosis in cattle, there are many other animal diseases and parasites that represent a potential threat to human health. Among these are anthrax, encephalitis, leptospirosis, rabies, erysipelas, and trichinosis. The latter is probably the most serious, because this parasite is difficult to detect in pork and its presence in this country is a barrier to export sales.

Areas of research include:

- (a) Understanding the mechanisms involved in transmission of animal diseases to man, including the role of insects, ticks, and mites.
- (b) Developing control programs to prevent transmission of animal diseases to man.
- (c) Developing means of preventing the transmission of trichinosis to man.
- (d) Developing improved procedures, equipment, and facilities for use in red meat and poultry inspection programs.

Exclude: (1) Research on animal disease where the concern is the protection of the animal itself. (Use RPA 211).

Classification Guidelines:

Activities:

- 4600 Protection against diseases, parasites, and nematodes and their control agents
- 4900 Biology of plants and animals

Commodities, etc.:

- 4000 People as individual workers, consumers, and members of society
- 4100 The family and its members

RPA 708. HUMAN NUTRITION

Human nutrition research provides fundamental knowledge about the relationship of food eaten by people to their physical and mental status and development and the levels of well-being maintained during the life span. Some research has been conducted on human requirements for nutrients. So many gaps exist, however, that far more research is needed to provide answers to what the human nutrient requirements are and how best to meet those requirements from the food available. Research to support the programs in consumer education and food use is vital to the development of the country.

Areas of research include:

- (a) Guidelines for selection of food combinations to meet nutritional requirements.
- (b) Methods of evaluating nutritional status.
- (c) Determination of the nutrient content of foods.
- (d) Methods to quantify the relationship of nutrient intake to well-being.
- (e) The relationship of nutrient intake to health, intellectual development, vigor, and longevity.
- (f) Requirements for energy, carbohydrate, fat, protein, amino acids, fatty acids, minerals, and vitamins as related to age, sex, activity, and physiological and environmental conditions.
- (g) The interrelationships among nutrients as they affect absorption, metabolism, growth, and maintenance requirements.
- (h) Evaluation of the effectiveness of nutritional phases of programs to improve nutritional status.

Classification Guidelines:

Activities:

- 5510 Food physical processes (canning, freezing, dehydration, milling, separation, extraction)
- 5520 Food bioprocesses (enzyme and microbial applications)
- 5530 Food chemical processes (salt, sugar, acid)
- 5540 Food processing efficiencies (management of energy, water, wastes)
- 5550 Food product handling, packaging, and storage
- 6310 Nutrient composition of food
- 6320 Human nutrient requirements
- 6330 Food fortification, enrichment, and improvement
- 6340 Food consumption patterns and use
- 6360 Metabolism and function of nutrients in food
- 6370 Human nutrition and behavior
- 6380 Human nutritional monitoring and surveillance
- 6390 Eating quality of food
- 7000 Design of experiments and methods of statistical analysis
- 7300 Evaluation of public programs, policies, and services

RPA 708 (Cont'd)

Commodities, etc.:

0800-1200, 1400-2000, 2200-2500, 2700-3400, 3800, 4000, 4100 (See Commodity
Classification)

6700 Plants

6800 Animals (Vertebrates)

RPA 709. REDUCTION OF HAZARDS TO HEALTH AND SAFETY

Public Health Service findings indicate that "cigarette smoking has a deleterious effect on health." Tobacco growers, manufacturers, distributors, suppliers, exporters, and the consuming public all have a substantial stake in the development of improved cigarettes by reducing or modifying the substances in cigarette smoke which create hazards to good health.

Handling of some agricultural products can cause allergies or other toxic reactions. Some farm supplies may be toxic if inhaled, if accidentally brought in contact with the skin, ingested, or otherwise improperly used. Certain concentrations of dusts or fumes from agricultural products or supplies are explosive. Farm and processing equipment must be used correctly and effectively shielded to prevent accidents. Safety is an essential ingredient of sound agriculture.

Areas of research include:

- (a) Improvement of analytical methods for determining the constituents of tobacco and tobacco smoke.
- (b) Isolation and identification of the components of tobacco and tobacco smoke that may be injurious to human health.
- (c) Developing methods to eliminate or deactivate injurious components of tobacco smoke.
- (d) Developing methods to detect and to avoid the harmful effects of toxic residues and harmful mycotoxins in tobacco.
- (e) Developing methods for the safe handling of farm products, supplies, and livestock.
- (f) Determining the need for protective devices and procedures for safe usage of farm machinery and equipment.
- (g) Determining the nature, frequency, and causes of farm accidents.
- (h) Developing methods to reduce fire risks and to improve fire control measures for cotton gins, barns, and other farm structures.
- (i) Determining risks and developing needed safety measures for product handling in processing plants and marketing channels.

- Exclude:
- (1) Research on toxic residues on food products. (Use RPA 701).
 - (2) Research on harmful microorganisms and naturally occurring toxins in food. (Use RPA 702).
 - (3) Research on disease transmission. (Use RPA 707).

Classification Guidelines:

Activities:

- 4810 Protection against fire
- 4830 Protection against pollutants
- 4840 Protection against climatic extremes (frost, hail, wind, drought, etc.)
- 4880 Protection against allergens, toxins, and poisonous plants
- 4890 Protection against radiation, noise, and other hazards

RPA 709 (Cont'd)

Commodities, etc.:

- 1400 Corn (For Sweetcorn use 1280)
- 1700 Wheat
- 2100 Cotton (including cottonseed for planting purposes)
- 2300 Soybeans
- 2600 Tobacco
- 2800 Miscellaneous and new crops
- 3300 Sheep and wool
- 3600 General purpose supplies (including machinery, equipment, fertilizers, feedstuffs, and pesticides)
- 3700 Clothing and textiles
- 3900 Structures and facilities
- 4000 People as individual workers, consumers, and members of society
- 4100 The family and its members

GOAL VIII

ASSIST RURAL AMERICANS TO IMPROVE THEIR LEVEL OF LIVING

Median farm family income, as well as rural nonfarm family income, lags far behind that of urban families. Ways must be found to assist rural people in adjusting to structural changes in agriculture and to balance farm output and market demand. This income disparity also can be reduced by improving the economic potential of rural youth and adults. Also needed is information on how to use money and other resources to achieve desired goals without losing the uniquely desirable aspects of rural life.

RPA's 801-808, inclusive.

RPA 801. HOUSING

Housing, as individual units and collectively, has a significant impact on the quality of living. Tremendous opportunities exist for research to reveal effective, economical procedures and materials for renovating and modernizing existing houses as well as in design and development of new housing.

Areas of research include:

- (a) Determining family housing requirements on the basis of selected characteristics such as age, income, size; stage in the family cycle; health, occupation, and ethnic background.
- (b) Determining the community, regional, and national needs for housing on the basis of the needs of various kinds of families and the current status of housing. Special consideration should be directed to migrants, the aged, low income groups, and the physically handicapped.
- (c) Effect of housing environment on the development of people.
- (d) Determining costs and benefits of construction systems and materials giving special attention to consumer needs and overcoming market obstacles.
- (e) Credit availability and financing arrangements and improved credit systems which provide adequate financing for the renovation of houses and construction of new homes.
- (f) Improved designs, materials, and construction methods for both renovation and new construction. Includes possibilities for inputs by the homeowner and employees with limited skills and/or training.
- (g) Reviewing and developing building codes and other legal requirements which provide appropriate safeguards to the individual and the community without imposing unnecessary obstacles to efficient, economical construction.
- (h) Determining maintenance needs and developing convenient, economical ways to meet these needs. This should include consideration of the possibilities of inputs by the homeowner.
- (i) Factors contributing to deterioration of housing structures.

Exclude: (1) Development and consideration of the impact of alternative public policies to create incentives for rural living. (Use RPA 907 or 908).
(2) Research on housing for animals. (Use RPA 317).

Classification Guidelines:

Activities:

- 4500 Protection against insects, mites, snails, and slugs and their control agents
- 4810 Protection against fire
- 4820 Protection against flood
- 4830 Protection against pollutants
- 4840 Protection against climatic extremes (frost, hail, wind, drought, etc.)
- 4850 Protection against birds
- 4860 Protection against rodents and other mammals
- 4870 Protection against molds, fungi, and other spoilage organisms
- 4890 Protection against radiation, noise, and other hazards

RPA 801 (Cont'd)

Activities:

- 6100 Developing domestic markets, including consumer preference and behavior
- 6410 Quality of family living
- 6420 Quality of housing
- 6430 Improvement of domestic and community water and waste systems
- 6450 Quality of management and use of personal, domestic, and other resources
- 6500 Description, inventory, and trends
- 6710 Improvement of social well-being
- 6720 Improvement of social services and facilities
- 6730 Community, family, and individual adjustment to social change
- 6740 Community, family, and individual adjustment to economic change

Commodities, etc.:

- 0600 Trees, forests, and forest products
- 3900 Structures and facilities
- 4000 People as individual workers, consumers, and members of society
- 4100 The family and its members

RPA 802. INDIVIDUAL AND FAMILY DECISION MAKING AND RESOURCE USE AND FAMILY FUNCTIONING

Families and individuals are concerned with social and economic decision making. Social decisions encompass some of the major turning points in family development, including the life plans of children and the fulfillment of aspirations. Social decisions involve making the most of human resources such as intelligence, special talents and skills, and special motivations.

Economic decisions are concerned with financial, material, and community resources. These may be wages and salaries, goods in kind, public services, or earnings from farm or other businesses. Allocations must be made to provide for current living, investment, or capital accumulation.

Quality of family life is highly dependent upon both economic and social decisions; upon task performance and family role behavior, including consumer, parental, and wage-earning roles; and upon the interaction of family members both within the family and with others. Knowledge gained from research will provide a basis for assisting families to improve the quality of living.

Areas of research include:

- (a) Factors involved in the decision making process and decisions as affected by availability of resources, stage in the life cycle, living patterns, values, goals, interests, and attitudes.
- (b) Consumer behavior and effect of consumer decision making on the quality of life of individuals and families.
- (c) Allocation of resources by individuals and families and resulting consumption patterns and level of living.
- (d) Guidelines for "minimum decency" levels of living, including "market basket" cost of goods and services for various residence situations.
- (e) Family task requirements and ways to improve performance.
- (f) Identification of structural, functional, and environmental factors contributing to family life patterns and performance.
- (g) Family roles as influenced by subcultural, economic, social, and attitudinal factors, and effect on family cohesiveness and human organization.
- (h) Factors influencing interaction of family members and communication between family members and others.

Classification Guidelines:

Activities:

- 6410 Quality of family living
- 6420 Quality of housing
- 6430 Improvement of domestic and community water and waste systems
- 6450 Quality of management and use of personal, domestic, and other resources
- 6710 Improvement of social well-being
- 6720 Improvement of social services and facilities
- 6730 Community, family, and individual adjustment to social change

RPA 802 (Cont'd)

Activities:

6740 Community, family, and individual adjustment to economic change

Commodities, etc.:

4000 People as individual workers, consumers, and members of society

4100 The family and its members

RPA 803. CAUSES OF POVERTY AMONG RURAL PEOPLE

Research is needed to discover the underlying social, educational, psychological, nutritional, physical, and economic factors that explain why a significant proportion of people in rural areas are in poverty. Nearly half the people with poverty-level incomes in the United States are in rural areas. Little is known of how the poverty cycle can be broken or how those isolated in poverty can be aided in their own development and in finding and taking advantage of social and economic opportunities.

Areas of research include:

- (a) The characteristics of the rural poor: their physical, educational, economic, and personal resources; their attitudes and interests through which they can be stimulated to improve their situation; their resources, income, and levels of living; and their ability and willingness to migrate to areas with greater economic potential.
- (b) Conditions that give rise to and perpetuate poverty, such as poor health and malnutrition, occupational displacement, mental and physical handicaps, limiting family and community circumstances, inadequate educational preparation, and personal and family catastrophe.
- (c) The factors related to, and the processes by which, some individuals and families have overcome their poverty backgrounds and achieved socio-economic well-being.

Exclude: (1) Research on improvement of economic potential of rural people. (Use RPA 804).
(2) Research on improving income opportunities in rural communities. (Use RPA 907).

Classification Guidelines:

Activities:

- 6500 Description, inventory, and trends
- 6600 Economic development and adjustment
- 6710 Improvement of social well-being
- 6720 Improvement of social services and facilities
- 6730 Community, family, and individual adjustment to social change
- 6740 Community, family, and individual adjustment to economic change
- 7300 Evaluation of public programs, policies, and services

Commodities, etc.:

- 4000 People as individual workers, consumers, and members of society
- 4100 The family and its members
- 4300 Communities, areas, and regions, including counties and states, and their institutions and organizations

RPA 804. IMPROVEMENT OF ECONOMIC POTENTIAL OF RURAL PEOPLE

Research is needed to provide knowledge which will help people improve their economic potential, enable them to identify and develop their employable skills, and find satisfying employment in the occupation that uses those skills most effectively. In the next few years most rural youth seeking first employment will need to find jobs in nonfarm occupations.

Areas of research include:

- (a) Developing information on the requirements for success in various occupational alternatives, including education, experience, and financial resources.
- (b) Developing programs to provide education, training, and retraining needed by rural youth and adults to take advantage of farm and nonfarm employment opportunities.
- (c) Determining ways to raise the level of aspirations of rural youth and to motivate them to acquire necessary training and education.
- (d) Determining opportunities for operators of low-income farms to improve their situation through adjustments to improve farm income, combining farming with part-time nonfarm work, or working full-time at a nonfarm job or business.

Exclude: (1) Research to improve income opportunities in rural communities. (Use RPA 907).

Classification Guidelines:

Activities:

- 6500 Description, inventory, and trends
- 6600 Economic development and adjustment
- 6710 Improvement of social well-being
- 6720 Improvement of social services and facilities
- 6730 Community, family, and individual adjustment to social change
- 6740 Community, family, and individual adjustment to economic change

Commodities, etc.:

- 4000 People as individual workers, consumers, and members of society
- 4100 The family and its members
- 4300 Communities, areas, and regions, including counties and states, and their institutions and organizations

RPA 805. COMMUNICATION AND EDUCATION PROCESSES

Effective communication is vital to the educational process, the dissemination of knowledge, development of sound public policy, successful conduct of public programs, and development of understanding among groups in our society.

Research on communication will assist in obtaining agreement on the most important problems; gaining public support for research on the problems; and reducing the time lag between discovery and development and the adoption of improved practices and products.

Research on education processes is needed to determine effective ways to achieve educational goals.

Areas of research include:

- (a) Determining the various forms and combinations of mass media, group, and person-to-person contacts most effective for various types of persons and groups of persons and for different kinds of information to be communicated.
- (b) Developing techniques, procedures, and educational processes for effectively communicating information to people with varying backgrounds and skills.
- (c) Developing effective ways of reaching individuals and families and motivating them to utilize available information, resources, and technology that may affect their economic, social, and physical well-being.

Classification Guidelines:

Activities:

- 6310 Nutrient composition of food
- 6320 Human nutrient requirements
- 6330 Food fortification, enrichment, and improvement
- 6340 Food consumption patterns and use
- 6360 Metabolism and function of nutrients in food
- 6370 Human nutrition and behavior
- 6380 Human nutritional monitoring and surveillance
- 6390 Eating quality of food
- 6710 Improvement of social well-being
- 6720 Improvement of social services and facilities
- 6730 Community, family, and individual adjustment to social change
- 6740 Community, family, and individual adjustment to economic change
- 7200 Information documentation and retrieval
- 7300 Evaluation of public programs, policies, and services

RPA 805 (Cont'd)

Commodities, etc.:

- 4000 People as individual workers, consumers, and members of society
- 4100 The family and its members
- 4300 Communities, areas, and regions, including counties and states, and their institutions and organizations

RPA 806. INDIVIDUAL AND FAMILY ADJUSTMENT TO CHANGE

The quickening pace of technological, economic, and social change increases the difficulties of many families in making successful adjustments. What was predominantly a rural economy has been transformed to a transitional society having many urban characteristics. These changes and those involved in farm-nonfarm or rural-urban migration often require major social, psychological, and economic adjustments by individuals and families, some of which are very stressful and disorganizing. People who fail to make successful adjustments, often those who are poorly educated and with limited employable skills, present critical problems.

Areas of research include:

- (a) Basic occupational skills and personal competencies needed by rural people to continue to be productive and lead satisfying lives in a changing environment.
- (b) Ways in which individuals and families can be motivated and helped to meet changes in economic and social conditions, especially those involved in a transition from a farm to a nonfarm or rural to urban environment.
- (c) Useful alternatives in dealing with problems of occupational displacement and economic, educational, psychological, mental, and physical handicaps.
- (d) Understanding the role of the family and developing ways to help families cope with the demands of modern society.
- (e) Composition and trends in farm and rural population.
- (f) Migration patterns of the farm and rural population.
- (g) Identifying factors within the family and the general environment that influence the development of individuals including social, mental, physical, and emotional growth and well-being.

Exclude: (1) Research on the causes and alleviation of poverty. (Use RPA 803, 804 or 907).

Classification Guidelines:

Activities:

- 6500 Description, inventory, and trends
- 6600 Economic development and adjustment
- 6710 Improvement of social well-being
- 6720 Improvement of social services and facilities
- 6730 Community, family, and individual adjustment to social change
- 6740 Community, family, and individual adjustment to economic change

Commodities, etc.:

- 4000 People as individual workers, consumers, and members of society
- 4100 The family and its members
- 4300 Communities, areas, and regions, including counties and states, and their institutions and organizations

RPA 807. STRUCTURAL CHANGES IN AGRICULTURE

Research provides an understanding of the significance of changes taking place in the organization and structure of the agricultural industry. Among these changes are the trend toward fewer and larger farms; the greater specialization of production; the use of vertical coordination arrangements, and accompanying shifts of functions from farm to nonfarm firms; the status of the farm labor force; and changes in the managerial status of the farm operator.

The study of structural changes in agriculture provides information that is essential for accurate projections of: (1) supply responses to changes in price-cost conditions; (2) demand for production inputs; and (3) farmer participation in various types of organization. In addition, an understanding of changes in the structure of agriculture is basic to sound agricultural program development, both in appraising the probable degree of participation in the program, and its impact on output and farm incomes.

Areas of research include:

- (a) Assembling and analyzing data on current and prospective trends in numbers of farms, by size, type, tenure and managerial status, and region. Estimating, for homogeneous groups of farms, averages such as the following: total investment, labor force, inputs, costs, production, gross income, and net income.
- (b) The extent and forms of vertical coordination and other arrangements between farm and nonfarm firms and the associated transfer of functions from farm to supply, processing, or marketing firms.
- (c) Interrelationships between changes in the structure of agriculture and the status and composition of its labor force, including the effects of increasing wage levels and wage and hour legislation on capital-labor substitution in agriculture.
- (d) Changes in the financial structure of agriculture; management and ownership of and equity in farm resources.
- (e) Developing alternative proposals and procedures which will encourage desirable structural changes in agriculture.

Classification Guidelines:

Activities:

- 5300 Management of labor, capital, and other inputs
- 6000 Analysis of supply, demand, and price, including interregional competition
- 6500 Description, inventory, and trends
- 6600 Economic development and adjustment
- 7200 Information documentation and retrieval
- 7300 Evaluation of public programs, policies, and services

Commodities, etc.:

- 0800-1200, 1400-3400 (See Commodity Classification)
- 4200, 4300, 4400 (See Commodity Classification)
- 4600 Farmer cooperatives

RPA 807 (Cont'd)

Commodities, etc.:

- 4700 Marketing, processing, and supply firms other than cooperatives
- 4800 Marketing systems and sectors thereof

RPA 808. GOVERNMENT PROGRAMS TO BALANCE FARM OUTPUT AND MARKET DEMAND

The demand for most farm products is highly inelastic. Hence, in a free market, small percentage changes in supply may cause much greater percentage changes in price. Because of the nature of crop and livestock production these fluctuations in supply cannot readily be avoided. The resulting price fluctuations in turn, introduce additional instability into the market. Among the premises of price-support and production-control programs are these: (1) in a free market, it is difficult to balance farm output with market demand at stable prices, and (2) that the interests of both producers and consumers are better served by orderly markets than by unstable ones.

Areas of research include:

- (a) Developing effective ways to stabilize farm prices and incomes through government purchases of farm products, and storage of surplus stocks against periods of short supply.
- (b) Developing effective and acceptable supply restraints and production incentives for use as needed.
- (c) Developing an economic model to predict the response of farmers to various economic influences, including U.S. Department of Agriculture programs for balancing supply and supporting prices, cropland adjustments, and incentive payments. This type of analysis assists policy makers in selecting program alternatives with greater certainty of attaining farm program goals at minimum costs.
- (d) Determining the effectiveness of alternative arrangements for administering government programs.

Classification Guidelines:

Activities:

- 5900 Improving economic and physical efficiency in marketing, including analysis of market structure and functions
- 6600 Economic development and adjustment
- 7300 Evaluation of public programs, policies, and services

Commodities, etc.:

- 0600-1200, 1400-3400 (See Commodity Classification)
- 4200 The farm as a business enterprise
- 4400 Agricultural economy of United States and sectors thereof, including interrelationships with the total economy
- 4800 Marketing systems and sectors thereof
- 6700 Plants
- 6800 Animals (Vertebrates)

GOAL IX

PROMOTE COMMUNITY IMPROVEMENT INCLUDING DEVELOPMENT OF BEAUTY, RECREATION, ENVIRONMENT, ECONOMIC OPPORTUNITY, AND PUBLIC SERVICES

Achievement of many aspirations depends upon group action at local, State, and Federal levels to make desired services available. To a considerable measure, availability to individuals of utilities, health services, opportunities for education, employment, and recreation depend upon community action. Community groups, private and public, need facts as a basis for programs that lead to group satisfaction from joint use of economic and natural resources.

RPA's 901-908, inclusive.

RPA 901. ALLEVIATION OF SOIL, WATER, AND AIR POLLUTION AND DISPOSAL OF WASTES

Soil, water, and air are being polluted with a variety of substances, both inorganic and organic. Some of the contaminants in addition to those of industrial origin are organic pesticides, radionuclides in fertilizers, growth regulating chemicals, animal and crop wastes, mulching materials, pathogenic microorganisms, heavy metals, salts used on roads for de-icing, lead from fuel combustion, allergens, and radioactive fallout. Agricultural research must be primarily concerned with alleviating pollution initiated by agricultural and forestry practices.

Areas of research include:

- (a) The character, intensity, and causes of pollution from agricultural and forest practices and the frequency of their occurrence.
- (b) The behavior and fate of pesticides and a wide variety of other pollutants in air, soil, and water.
- (c) Methodology and instrumentation for detection of pollutants and methods of analysis.
- (d) Public policy that would reduce pollution.
- (e) Alternative methods of reducing and controlling pollution to levels that are not harmful to man, plants, or animals; or methods that will prevent emission of the pollutant.
- (f) The role and use of living organisms in removing pollutants from the environment.
- (g) Minimum environmental quality standards for human, animal, and plant health.
- (h) Methods of collecting, storing, moving, and disposing of animal, plant, and radioactive wastes including those from processing plants.
- (i) Alleviating odors, dust, and noise.
- (j) Developing useful products from wastes to help offset the costs of disposal.
- (k) Safe methods of disposing of pesticides and other agricultural chemicals and containers of such materials.
- (l) Aquatic weeds as a pollutant.

Exclude: (1) Research on the protection of plants, animals, and man from harmful effects of pollution. (Use RPA 214).

Classification Guidelines:

Activities:

- 4300 Resource development, conservation, and management
- 4400 Evaluation of alternative uses and methods of use
- 4830 Protection against pollutants
- 4880 Protection against allergens, toxins, and poisonous plants
- 4890 Protection against radiation, noise, and other hazards
- 5900 Improving economic and physical efficiency in marketing, including analysis of market structure and functions
- 7300 Evaluation of public programs, policies, and services

RPA 901 (Cont'd)

Commodities, etc.:

- 0100 Soil and land
- 0200 Water
- 0300 Watersheds and river basins
- 0400 Air and climate
- 0600 Trees, forests, and forest products
- 0800-3400, 3600, 3800, 3900 (See Commodity Classification)
- 6100 Weeds
- 6600 Microorganisms, viruses, etc.
- 6700 Plants
- 6800 Animals (Vertebrates)

The general intent of this RPA is to alleviate soil, water, and air pollution. The resource being protected is thus 0100-0400 (see above), one or more of which should be listed as the Commodity or Resource on Form AD-417. For those projects concerned primarily with developing a way to dispose of a particular kind of waste, the appropriate crop or animal Commodity (0600, 0800-3400, 3600, 3800, 3900, 6100, 6600, 6700, or 6800--See Commodity Classification) should also be listed on Form AD-417.

RPA 902. OUTDOOR RECREATION

Outdoor recreational research provides information to guide the management of rural lands for recreation, and to help coordinate this use with other land resource uses. The research involves problems in management of the resource and socio-economic relationships of users to the resource. Demands for recreation continue to increase, and are becoming more varied and more complex, at a time when pressure on all land resources is increasing.

Areas of research include:

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

Classification Guidelines:

Activities:

- 4100 Resource description and inventory
- 4300 Resource development, conservation, and management
- 4500 Protection against insects, mites, snails, and slugs and their control agents
- 4700 Protection against weeds and their control agents
- 6500 Description, inventory, and trends
- 6710 Improvement of social well-being
- 6720 Improvement of social services and facilities
- 6730 Community, family, and individual adjustment to social change
- 6740 Community, family, and individual adjustment to economic change
- 7300 Evaluation of public programs, policies, and services

Commodities, etc.:

- 0500 Recreational resources
- 0600 Trees, forests, and forest products
- 4300 Communities, areas, and regions, including counties and states, and their institutions and organizations

RPA 903. MULTIPLE USE POTENTIAL OF FOREST LAND AND EVALUATION OF FORESTRY PROGRAMS

Most forest areas and related resources can be devoted to widely varying uses depending on the owner's objective and the allocation of investments for resource development. On more than 300 million acres of National Forests and other public lands, for example, guidelines are needed to determine the best combination of uses or systems of managing forest land for timber, water, forage, recreation, wildlife, or other purposes.

Forestry programs to increase production of timber and related forest resources need to be evaluated to determine their relative costs and effectiveness. These programs cover a wide range of activities including protection against fire, insects and disease, reforestation, timber stand improvement, and improved timber harvesting.

Areas of research include:

- (a) Determining the relative efficiency of various combinations of measures and programs to meet projected demands for timber and other forest-based products and services.
- (b) Adapting basic data on output potentials and operational guidelines provided by timber, range, recreational, and wildlife research for use in analyzing multiple use management plans and programs.
- (c) Evaluating the response of forest owners and operators to various types of public and private forestry assistance programs.
- (d) Developing procedures and criteria for evaluating the relative costs and benefits of alternative forest land uses and combinations.

Exclude: (1) Research on the economics of timber production per se. (Use RPA 303).

Classification Guidelines:

Activities:

4300 Resource development, conservation, and management

4400 Evaluation of alternative uses and methods of use

7300 Evaluation of public programs, policies, and services

Commodities, etc.:

0300 Watersheds and river basins

0500 Recreational resources

0600 Trees, forests, and forest products

0700 Range

0800 Fish, shellfish, game and fur-bearing animals, and other wildlife and their habitats

RPA 904. FISH AND OTHER AQUATIC LIFE, FUR-BEARING ANIMALS, AND OTHER WILDLIFE

Research on wildlife, fur-bearing animals, fish, and other aquatic life is needed to meet the ever growing demands of sportsmen, trappers, and fishermen; to assure continuing supplies of aquatic life for food and other purposes; and to meet increasing demands for aesthetic values such as non-game wildlife.

To maintain and increase the supply of wildlife, fish, and other aquatic life it is essential to know how to maintain and enhance their habitat, and to determine the biological requirements and relationships of each species, including cover and food for normal growth.

Areas of research include:

- (a) The life histories and population dynamics of fish, fur-bearing animals, and wildlife, including non-game and vanishing species and aquatic organisms and of plants that provide food and shelter.
- (b) The ecological and physiological requirements of fish, fur-bearing animals, wildlife, and other aquatic life.
- (c) Adaptation of plants to sites and selection and genetic improvement of both native and exotic food and cover plants.
- (d) Improving wildlife habitat through such measures as seeding, planting, prescribed burning, spraying, fertilizing, and manipulation of native vegetation.
- (e) Improving fish habitat and food supplies through management of streamside vegetation, channel stabilization, and creation of spawning beds.
- (f) Breeding, selection, feeding, and management of wildlife and fur-bearing animals.
- (g) Breeding, selection, and management of fish and other aquatic animals.
- (h) The biology and environmental requirements of aquatic life and possibilities of environmental control.
- (i) Protection against insects, diseases, and other hazards, except pollutants.
- (j) Marketing studies related to any of the above commodities.

- Exclude:
- (1) Research on protection of aquatic organisms, fish, and wildlife against pollutants. (Use RPA 214).
 - (2) Research on new and improved animal products. (Use RPA 410 or 411).
 - (3) Research on quality maintenance in marketing animal products. (Use RPA 412).
 - (4) Grades and standards. (Use RPA 501).
 - (5) Supply, demand, and price analysis. (Use RPA 506).
 - (6) Research on farmed-raised fish, shellfish, game and fur-bearing animals, and other wildlife. (Use appropriate RPA).

Classification Guidelines:

Activities:

4100, 4300-5600, 5800-6390, 7300 (See Activity Classification)

RPA 904 (Cont'd)

Commodities, etc.:

- 0600 Trees, forests, and forest products
- 0700 Range
- 0800 Fish, shellfish, game and fur-bearing animals, and other wildlife and their habitats
- 3600 General purpose supplies (including machinery, equipment, fertilizers, feedstuffs, and pesticides)
- 3900 Structures and facilities
- 6500 Invertebrates

RPA 905. TREES TO ENHANCE RURAL AND URBAN ENVIRONMENT

This research provides some of the scientific knowledge required to maintain or improve the quality of the rural and urban environment, and to enhance natural beauty through special-purpose tree planting. Technological change is multiplying the need for special tree planting to screen junkyards and highways, suppress noise, slow the movement of dust and debris, and provide trees for shade, beauty, and shelterbelts to protect crops, animals, and farmsteads. Research is needed to find species and techniques so that trees can survive smoke and air pollution, compacted soils, deficient or excessive moisture, and other adverse conditions. The end product of concern in this research is a standing tree to enhance the environment.

Areas of research include:

- (a) Selection and breeding of trees for urban environments, shelterbelts, shade, and other special purposes.
- (b) Protection from insects, diseases, and other hazards through cultural, biological, or chemical means.
- (c) Methods of site preparation and planting appropriate for special-purpose tree planting.
- (d) Culture and maintenance of urban trees and stands.
- (e) Culture and improvement of shelterbelts.
- (f) Marketing of nursery stock of trees used to enhance the environment.
- (g) Soil and site requirements of species needed to improve the environment.

Exclude: (1) Research on trees for production of timber and other commercial products. (Use RPA 111, 201, 202, 301, 302, or 303).

Classification Guidelines:

Activities:

4300, 4500-5300, 5800-6200 (See Activity Classification)

Commodities, etc.:

0600 Trees, forests, and forest products

0700 Range

RPA 906. CULTURE AND PROTECTION OF ORNAMENTALS AND TURF

More efficient production and new varieties of flowers, ornamental plants, and turf are needed today for city and suburban gardeners, and for the national beautification effort. Ornamental plants resistant to insects, drought, flood, diseases, traffic, and the competition of weeds are needed for highway and railway rights-of-way and other areas where intensive care is not possible.

The floricultural and nursery industries, and owners and managers of parks and golf courses have many unsolved problems. Costs of protecting ornamentals against insects, diseases, and weeds are high, and losses due to decreased production are substantial. Problems of maintaining quality during transporting, storing, and marketing ornamentals are important. Christmas trees (0611), and ornamental, shade, and landscape trees (0615, 0624, and 0625) may be classified to this RPA.

Areas of research include:

- (a) Breeding and selection to enhance aesthetic and special use characteristics.
- (b) Breeding and selection for hardiness and resistance to drought, insects, diseases, and other hazards.
- (c) Methods for protection from insects, diseases, weeds, and other hazards.
- (d) Improved methods of propagation, culture, and care.
- (e) Improved marketing and handling, transportation, and packaging.
- (f) Optimum methods and materials for fertilizing and watering ornamentals and turf.

Classification Guidelines:

Activities:

4300, 4500-5300, 5600-6200, 6410, 6420, 6450, 7500 (See Activity Classification)

Commodities, etc.:

0600 Trees, forests, and forest products
1000 Deciduous and small fruits and edible tree nuts
1300 Ornamentals and turf

RPA 907. IMPROVED INCOME OPPORTUNITIES IN RURAL COMMUNITIES

Research on income improvement in rural communities will identify ways by which depressed areas can attain full economic potential. Only by providing adequate income opportunities can these communities retain more of their young people and finance the kind of public and private facilities and services that make them attractive places to live. Accelerated economic development of depressed rural areas is of vital concern to many large urban centers, which are not equipped to assimilate the flood of rural migrants they receive.

Areas of research include:

- (a) Criteria for delineating functional socio-economic areas for planning in order to achieve effective economic development in an area.
- (b) Developing a set of economic indicators for rural areas.
- (c) The process of economic growth and the influences that shape it, including the resource base of the area and its locational advantages and disadvantages.
- (d) Analysis of the comparative economic advantage for agriculture and industry and the prospects of increasing local employment opportunities and providing a more adequate tax base for the support of community services.
- (e) Potential for further development of agricultural and forest resources in rural areas, including the associated supply, processing, and marketing facilities.
- (f) Farm and community income possibilities from the development of new and expanded enterprises including raising pets, horses, and laboratory animals, and development of fee hunting and fishing and other recreation areas.
- (g) Potential contribution of improved transportation facilities in bringing desirable employment opportunities within commuting reach of residents of rural communities.
- (h) The kinds of public programs needed to stimulate rural community development and the effectiveness of existing programs in accomplishing this objective.
- (i) Factors associated with the occurrence of depressed areas, and policy measures that might have prevented such areas from falling behind the rest of the economy.

Classification Guidelines:

Activities:

- 6500 Description, inventory, and trends
- 6600 Economic development and adjustment
- 6710 Improvement of social well-being
- 6720 Improvement of social services and facilities
- 6730 Community, family, and individual adjustment to social change
- 6740 Community, family, and individual adjustment to economic change
- 7000 Design of experiments and methods of statistical analysis
- 7200 Information documentation and retrieval
- 7300 Evaluation of public programs, policies, and services

RPA 907 (Cont'd)

Commodities, etc.:

- 4000 People as individual workers, consumers, and members of society
- 4100 The family and its members
- 4300 Communities, areas, and regions, including counties and states, and their institutions and organizations

RPA 908. IMPROVEMENT OF RURAL COMMUNITY INSTITUTIONS AND SERVICES

Rural communities need information to help develop the organization, agencies, services, and leadership which will make them attractive places to live, work, and establish businesses.

Some rural communities are experiencing sharp increases or decreases in population. Modern transportation and communication have contributed to the development of trading and social centers serving large geographic areas, and have caused the decline or elimination of a great many small centers. Uncoordinated development and other changes in land use often make it impossible to provide public services economically.

Areas of research include:

- (a) Criteria for delineating functional socio-economic areas in order to provide effective and efficient community institutions and services.
- (b) Measuring the adequacy, quality, and cost of education, health, sanitation, and water systems, and other public and private services.
- (c) The organizational and operational efficiency of local government units in meeting the needs of modern rural society.
- (d) Effective protection of the community's interest in changes in land use through zoning and other means, including suburban development and industrial and agricultural uses.
- (e) Effective development, coordination, and adaptation of the various services, agencies, and organizations to best meet the community's needs.

Classification Guidelines:

Activities:

- 6430 Improvement of domestic and community water and waste systems
- 6500 Description, inventory, and trends
- 6600 Economic development and adjustment
- 6710 Improvement of social well-being
- 6720 Improvement of social services and facilities
- 6730 Community, family, and individual adjustment to social change
- 6740 Community, family, and individual adjustment to economic change
- 7300 Evaluation of public programs, policies, and services

Commodities, etc.:

- 4300 Communities, areas, and regions, including counties and states, and their institutions and organizations