Plan of Work

Agricultural Research Programs
Purdue University

Federal Fiscal Years
2000 to 2004

Submission and Certification by:

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July 15, 1999

Plan of Work

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I. Preface

This Plan of Work is the projected Research Program for 2000-2004 submitted by Agricultural Research Programs (ARP) at Purdue University, West Lafayette, Indiana, as mandated by the Agricultural Research, Extension, and Education Reform Act (AREERA) of 1998.

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II. Program/Goal 1: An Agricultural Production System That Is Highly Competitive in the Global Economy.

The Indiana agricultural system including plant, animal and forest production systems must be competitive in an ever increasing global market system. Science, technology and information are important to success in this global market. There are several areas that support this program/goal.

A. Integrated and Sustainable Crop and Livestock Production Systems

Statement:
Develop efficient agricultural production systems which are consistent with environmental quality considerations and that provide capability and opportunities for our clientele to be competitive in a global market.

Issue:
Farmers in Indiana face a variety of challenges as they produce commodities and products for a global market. Consumer preferences and needs change over time and by locality both in the U.S. and internationally. The technology involved in agricultural production is evolving at an ever increasing pace with modified tillage systems, application of GIS and GPS technology, new genetic options, etc. Integrating the appropriate technologies to be competitive in the market place while operating in a sustainable framework in an evolving scenario presents numerous management challenges. Environmental impacts resulting from agricultural operations continues to be high on the agenda and agriculture faces increasing pressures for regulatory compliance.

Goal:
The thrust in this area is to identify and assess technologies that can be integrated into a diversity of animal and plant production systems.

Research in the area addresses CSREES Goals 1.1, 1.2, 1.4, 4.1, 4.2, 5.1, 5.2.

Target Audience:
We will focus on producers and the public where the potential is greatest for the development of a negative interface between agriculture and the environment.

Key Components:

- Develop appropriate technology and systems.

- Enhance profitability via access to appropriate technologies.
- Identify special or unique production and economic opportunities.
- Assess global market condition and opportunities.
- Develop strategies to minimize landscape degradation.

Performance Goal:
Enhance the information and options available to producers which will enable them to be competitive in a global market system.

Output Indicators:
- Methods for improved management of animal waste.
- Analysis of systems and system component impacts and economics.
- Technologies developed and assessed for optimizing production.
- Information in peer publications and public media.

Outcome Indicators:
- Producers will be successful in the marketplace.
- Appropriate use/adoption of production inputs.
- Reduced impact on surface and ground water quality.

Linkages:
Partnerships will be developed and enhanced with public agencies, associations, research institutions (inter and intra-state, regional and federal) and the private sector who develop and provide products and services for agricultural production systems.

Duration:
- Short term: assess impact of inputs on crop productivity and potential environmental degradation.
- Intermediate term: develop modified diets and waste management systems to reduce impact of animal manure.
- Long term: evaluate impact of production practices and systems on water quality.

B. Genetic Resource Development

Statement:
Identify genetic determinants of productivity and health of plants and animals, and conserve genetic resources.

Issue:
Indiana farmers seek to exploit new developments in genetics and biotechnology to improve productivity, add value, and increase profitability of their products. Technologies associated with molecular genetics and bioinformatics are evolving at a rapid pace, leading the way to further improvement in agriculture productivity. Major investments in

genetic technologies and resources in the private industrial sector have put increasing pressure on the public land-grant institutions to focus efforts on basic discoveries related to genetics and gene function. Furthermore, it is critical that public institutions play a major role in conserving genetic resources for future generations.

Goal:
The germplasm and genetic resources area seeks to identify and characterize the genetic determinants for animal and plant productivity.

Research in this area addresses CSREES Goals 1.1, 1.2, 4.1, 4.2.

Target Audience:
The focus will be on producers, agri-businesses, and government policy makers in the public sector where there is increasing concern over the use of genetically modified organisms.

Key Components:
- Develop and assess new genetic technologies.
- Enhance germplasm through breeding and biotechnology.
- Assess impact of genetic technologies on agricultural production systems and the environment.

Performance Goal:
Increase productivity and profitability of agriculture producers through genetic enhancement of plants and animals.

Output Indicators:
- New technologies for the identification of genetic determinants of productivity of plants and animals.
- Information on gene structure and function as related to growth, development and health of plants and animals.
- Information in peer reviewed publications and public media related to genetics, germplasm and biotechnology.

Outcome Indicators:
- Increased options for producers of agricultural commodities.
- Reduced use of pesticides through improved plant resistance.
- Increased productivity through genetic improvement of environmental stress tolerance.

Linkages:
Partnerships with governmental agencies, public universities, and private industry will be maintained and strengthened. We will collaborate with extension to develop educational materials related to genetics and biotechnology. Linkages with growers and consumers will be maintained in an effort to identify opportunities for research.

Duration:

- Short term: develop and conserve germplasm through gene discovery.
- Intermediate term: develop genetic technologies that improve breeding of crops and animals.
- Long term: increased productivity and profitability of Indiana farmers through improved genetics of crops and animals.

C. Plant Stress Management

Statement:
Develop solutions for biotic and abiotic plant stress to reduce the risk of plant production systems.

Issue:
Production agriculture in Indiana derives approximately 66% of its income from plant related sources. This plant productivity is challenged by biological and non-biological stress including insects, pathogens, weeds, nematodes, drought, salination, soil nutrient deficiencies, soil contaminants, etc. Biotic and abiotic stress presents a risk to food and fiber production. The farmer/producer is annually at economic risk for loss of production attributed to biological and non-biological stress that impact plant growth and productivity. A sustainable agriculture system needs to have the tools to counter the threat posed by biological and environmental stresses that place plant growth and productivity at risk. The objective is to maintain and further enhance the profitability and environmental compatibility of plant productivity as an economic sector in Indiana.

Goal:
The primary research thrust includes discovery of risk mitigating approaches for biotic and abiotic stress, evaluation of tactics, and incorporation into production practices and systems.

Research in this area addresses CSREES Goals 1.2, 1.4, 2.2, 4.1, 4.2, 4.3.

Target Audience:
We will focus on farmers/growers of market place plant species. This will involve a diversity of species including plants that produce fruits and vegetables, landscape and ornamental plants, and agronomic crops/commodities. Priority will be given to pests and abiotic stresses identified in the Indiana environment.

Key Components:

- Develop and incorporate of IPM tactics into a productive system.
- Discover new approaches to address plant stresses.
- Assess the risk and benefit inherent in different approaches.

Performance Goal:

Increase the options available to clientele for addressing potential loss due to biotic and abiotic factors that pose a risk to plant agricultural productivity.

Output Indicators:

- Tactics and systems available to use in pest management.
- Information and approaches to enhance productive, sustainable agricultural systems.
- Information in peer publications and public media.

Outcome Indicators:

- Reduced losses due to plant stress.
- Increased options for producers to use in managing plant stress.
- A more productive and profitable plant agriculture system.

Linkages:
Partnerships will be maintained and further developed with other public research organizations including the relevant intra and inter-state organizations, federal institutions, and extension systems. We will collaborate with growers, agricultural associations and industries in identifying and addressing opportunities and needs to solve problems encountered in agricultural production.

Duration:

- Short-term: evaluate and incorporate approaches/tactics in a production system to reduce the risk to plant productivity by biotic and abiotic stresses.
- Intermediate term: develop alternate approaches/tactics for pest management and crop protection.
- Long term: discover/identify new approaches for mitigating plant stress.

D. Animal Disease, Health and Well-Being

Statement:
Develop solutions to diseases and increase productivity through improved health and well being of farm animals.

Issue:
Indiana agriculture is represented by a large and diverse group of animal producers. Animal productivity is limited by both abiotic and biotic stresses, which reduces animal health and well-being. Indiana producers are under tremendous economic pressure to insure disease-free herds and flocks, relying heavily on information and technology developed through research. Growing concerns by consumers related to the public health

threat associated with pharmacological treatments of animals posses a serious threat to profitability and sustainability of animal agriculture in Indiana. In addition, increased sensitivity of our public to the treatment of farm animals has led to a tremendous need for new information and technologies for improved animal well-being.

Goal:
The primary thrust of this research includes discovery of disease causing organisms, development of risk integrating approaches to biotic and abiotic stresses, and evaluation of production strategies that reduce risk of disease and improve animal well-being.

Research in this area addresses CSREES Goals 1.2, 1.4, 2.2, 3.2, 5.1.

Target Audience:
This research program focuses on producers of food animal species, veterinarians, public health agencies and industry. Priority is given to those abiotic and biotic stresses identified as a threat to Indiana producers.

Key Components:

- Develop production systems that promote health and well-being of farm animals.
- Discover disease causing entities and develop technologies to reduce disease.
- Develop tools to assess animal behavior and well-being.

Performance Goal:
Increase options to clientele that reduce diseases, improve health and well-being of farm animals, all of which pose a threat to profitability.

Output Indicators:

- Tools for the detection of disease causing organisms.
- Tactics and systems to reduce biotic and abiotic stress.
- Information in peer reviewed publications and public media.

Outcome Indicators:

- Reduced losses of farm animals due to biotic and abiotic stress.
  - Increased options to producers to improve animal health and well-being.
- Reduced risk to public health from animal production practices.
- More profitable and productive animal systems.

Linkages:
Partnerships with other public research organizations, state agencies, commodity groups and the extension system will be maintained, and in some cases, strengthened. We will collaborate with producers, veterinarians, and agriculture organizations to identify critical issues encountered in Indiana animal agricultural production.

Duration:

- Short term: assess and improve diagnostics for detection of disease causing organisms.
- Intermediate term: develop technology and systems to reduce disease.
- Long term: identify and evaluate technology and systems to enhance animal well-being.

E. Farm Business, Management Economics and Marketing

Statement:
Develop innovative methods to evaluate and understand the forces that affect the competitiveness of Indiana Agriculture.

Issue:
Farmers in Indiana are faced with an increasingly competitive environment influenced by changing market arrangements between producers and buyers, and strong consumer preferences. New genetic and production technologies, coupled with a stream of new knowledge on how to compete in the production and marketing of commodities and value-added products, has tremendous potential to stimulate economic development in rural communities and the profitability of Indiana farmers. In addition, changing national and international policies and regulations will impact the competitiveness of Indiana Agriculture.

Goal:
The thrust in this area is to identify and address issues that affect the competitiveness of Indiana Agriculture in both national and global economics. Another focus is to understand marketing trends where new arrangements between producers and buyers, identity-preserved commodities, and niche markets can impact the profitability of Indiana producers.

Research in this area addresses CSREES Goals 1.2, 1.4, 4.1, 4.2, 4.3, 5.1, 5.2.

Target Audience:
This research will focus on producers, agribusiness, and public policy makers.

Key Components:

- Develop new theories, concepts and methods to assess and evaluate competitiveness in domestic and international markets.
- Assess impacts of public policy on agribusiness structure and performance.
- Determine benefits and costs of regulations.
- Assess the adoption of new technologies and the potential impact of emerging technologies on competitiveness of production agriculture and agribusiness.

Performance Goal:
Enhance the opportunities and competitiveness of Indiana producers and agribusiness in a global economy.

Output Indicators:

- New methods to evaluate and assess the factors that influence profitability of producers and agribusiness.
- Sound research-based information to affect the development of effective public policy.
- Information in peer publications and public media.

Outcome Indicators:

- Producers will be successful in adopting new technologies.
- Producers will recognize emerging opportunities in niche markets.
- Agribusiness will be successful in new markets and market structures.
- Public policy will be based on sound economic principles.

Linkages:
Partnerships with governmental agencies, public universities and private industry will be maintained and strengthened. Additional attention will be given to organizations involved in international/global marketing activities. Collaboration with extension systems will involve needs assessment and development of educational materials.

Duration:

- Short term: assess and evaluate impact of new production and marketing technologies on producer profitability, environment, and rural economies.
- Intermediate term: develop new methods, concepts and theories to advance the analysis of forces that impact production agriculture and agribusiness.
- Long term: evaluate impact of new market structures and technology on the sustainability of farming operations and agribusiness.

F. Value-Added Agricultural Products

Statement:
Enhance the value and use of agricultural and forest-based products to provide opportunities for clientele to compete in local, national and international markets.

Issue:

Indiana farmers and agribusinesses increasingly seek opportunities to obtain greater economic value from agricultural and forest commodities and products. Increased value results from conversion to higher-value products at all stages of product development and use. Opportunities exist for adding value by improving production, harvest, storage, transportation, product formulation, processing and manufacturing. An understanding of end-use characteristics and consumer demand drives the development of value-added products.

Goal:
Research in this program area seeks to enhance the value, expand and create new uses for agricultural and forest-based products, while making more efficient uses of natural resources and increasing the competitiveness of producers and agribusiness.

Research in this area addresses CSREES Goals 1.1, 1.2, 1.4, 5.1, 5.2.

Target Audience:
The focus will be on producers and processors of agricultural and forestry products.

Key Components:

- Develop innovative products and processes for improved utilization and increased efficiency in conversion of agricultural products and/or waste materials to value-added food and non-food products.
- Discover properties of raw agricultural products that are determinants of quality, value, and processing characteristics.
- Assess the potential of new technologies in genetics and engineering to impact the development of value-added agricultural products.

Performance Goal:
Increase the profitable options for clientele in the production and utilization of agricultural and forest-based products.

Output Indicators:

- Information and approaches to add value to agricultural and forest-based products.
- New food and non-food products from agricultural materials.
- Information in peer reviewed publications and public media.

Outcome Indicators:

- Increased profitability of producers, processors and agribusiness.
- Better utilization of agricultural and forest-based products, reducing waste and environmental impact.

Linkages:
Partnerships with other public research organizations, state agencies, commodity groups and the extension system will be maintained, and in

some cases, strengthened. We will collaborate with producers, processors, manufacturers and other groups that utilize products from the agricultural and forestry sectors.

Duration:

- Short-term: identify targets for adding value to agricultural and forest-based products based on consumer demand.
- Intermediate term: develop approaches to add value to products through the application of genetic, processing and manufacturing technologies.
- Long term: discover novel biological or physical properties that, when modified or enhanced, add value to agricultural products.

III. Program/Goal 2: Safe and Secure Food and Fiber System.

The safety of the food we eat is a high profile issue with clientele. Purdue Research Programs has significantly enhanced the research directed to improved contaminant detection and engineering for safety.

A. Food and Fiber Processing, Safety, and Quality.

Statement:
Develop strategies to control, eliminate, or prevent disease-causing microorganisms or naturally occurring contaminants in meats, poultry, fresh fruits and vegetables.

Issue:
The safety of the food supply in the United States is a growing concern for consumers. The issue of food safety covers a broad spectrum from "farm to fork". The introduction and/or presence of food born contaminants occurs on the farm, during postharvest handling and processing, distribution, food preparation and consumption. Recent outbreaks of disease-causing microorganisms and naturally occurring contaminants have increased the visibility of food safety in the eyes of the public and government policy makers. Current methods for detection and intervention of food born contaminants take excessive time and resources. In addition, increased understanding of the ecology of food born pathogens, their products and naturally occurring contaminants is necessary to develop improved detection and control mechanisms.

Goal:
The primary thrust in this program area is to conduct basic studies leading to improved understanding of the biology and ecology of food born pathogens, toxins and naturally occurring contaminants. In addition, we seek to develop improved methods for the detection and control of food born pathogens, toxins and contaminants.

Research in this area addresses CSREES Goals 1.1, 1.2, 2.1, 2.2, 3.1, 3.2.

Target Audience:
Food safety affects all aspects of the food chain, thus the food safety research efforts will involve producers, processors, food handlers, food distributors, and consumers.

Key Components:

- Identify innovative technologies for the detection of food born pathogens and contaminants.
- Develop innovative processing technologies that eliminate food born pathogens and contaminants.
- Determine the ecology and biology of food born pathogens and naturally occurring contaminants.

Performance Goal:
Enhance the safety of food through increased understanding of food borne contaminants and improved methods of detection and prevention.

Output Indicators:

- Methods for rapid and sensitive detection of food born pathogens and naturally occurring contaminants of food.
- Methods for processing food that prevent the introduction of food born pathogens and contaminants, and eliminate the presence of such contaminants.
- Information in peer publications, trade publications and public media.

Outcome Indicators:

- Producers will successfully limit the introduction and spread of food born pathogens and contaminants.
- Adoption of innovative food processing and handling methods by industry that eliminate the presence of food born pathogens, toxins and naturally occurring contaminants.
- A safe and healthy food supply in the United States.

Linkages:
Partnership with USDA-ARS through the Purdue University Food Safety Engineering Center will be maintained and expanded. Additional partnerships with public research institutions, public regulatory agencies, professional associations and consumer groups will be maintained and strengthened.

Duration:

- Short term: assess current technologies for the detection of food born pathogens and contaminants.
- Intermediate term: develop and evaluate innovative technologies for the rapid and sensitive detection of food born pathogens and

contaminants, and study the ecology and biology of food born pathogens.

- Long term: evaluate the impact of new technologies in detection of contaminants.

IV. Program/Goal 3: A Healthy, Well Nourished Population

The quality of the constituents in foods is a key element in the health of the population and an important program emphasis for Agricultural Research Programs.

A. Human Nutrition and Human Health

Statement:
Identify and develop quality foods and assess food constituents that contribute to a healthy and well-nourished population.

Issue:
There is a great diversity of foods available in the United States marketplace. As we learn more about individual health there is an increasing body of evidence linking diet to health. Diet in early life stages may condition well being in later years. Research is needed to identify the functionality of food constituents and the inherent individual variability. Nutritional value of foods needs to be explored against the background of information on food preference and dietary habits. There is a need for additional information on foods in order for individuals to choose a healthy diet that can contribute directly to an improved quality of life.

Goal:
The thrust in this area is to identify and assess the influence of food constituents on the health and well-being of people.

Research in this area addresses CSREES Goals 3.1, 3.2.

Target Audience:
The public needs information on the nutritional qualities and potential benefits or harm that might result from consumption of certain foods. There will be some specifically targeted groups that will be identified through collaboration with agencies having direct interface with the public such as extension.

Key Components:

- Identify appropriate components and levels of constituents for a healthy diet.
- Identify foods or supplements that will ameliorate individual needs, physiological or diet deficiencies.

- Evaluate and enhance raw materials to create a more nutritious and consumer desired product.

Performance Goal:
Increased information and options available to the consumer for making dietary choices.

Output Indicators:
- Enhanced information on effect of food constituents on human health.
- Enhanced information on nutritive value of various foods.
- Development of modified raw materials and/or food products for enhanced nutritional quality and consumer acceptance.
- Information in peer publications and public media.

Outcome Indicators:
- Improved public health.
- Enhanced dietary options based on nutritional and healthy food choices.
- A more health conscious and informed consumer.

Linkages:
Partnerships will be further enhanced with associations, public agencies and institutions that have a diet and health program component (for example, Indiana Dietetics Association, Indiana Family and Social Services). Partnering with the Extension Service programs that deliver nutrition programs will be important in identifying information needs to provide science based information. Dialogue with food processing companies is presently a part of our stakeholder activity and will be enhanced.

Duration:
- Short term: assess dietary constituents for potential health effects.
- Intermediate term: develop technologies that enhance nutritional quality of food.
- Long term: identify new approaches to enhance health through nutrition.

V. Program/Goal 4: Greater Harmony Between Agriculture and the Environment.

Production agriculture is totally reliant on environmental resources, soil, water and air. Focus of this research program will be to identify and develop the science and technology that will lead to further conservation of our natural resources and contribute to biodiversity in the environment.

A. Soil, water and air quality conservation and management.

Statement:
Foster stewardship and enhancement of our fundamental resources, soil, water, and air through appropriate agricultural practices.

Issue:
Agriculture is the world's greatest producer/factory that is totally reliant on our natural resources, i.e. soil, air, and water. Thus, using technologies, practices and systems in production agriculture that are inherently conserving of these resources is in the best interests of the producer. In fact, farmers in many sectors have been the greatest stewards of these natural resources.

There is an increasing awareness and concern by the public relative to the quality of the natural resources. With public interest comes pressure to enact laws and regulations intended to conserve the natural resource. Environmental quality is a priority on virtually everyone's agenda. Ensuring enhancement of the environment will require the collaboration of a diverse set of interest groups.

Goal:
Develop technologies, practices and systems that sustain and enhance our primary natural resources of soil, water, and air while also addressing the productive capacity or our land and people.

Research in this area addresses CSREES Goals 1.2, 1.4, 4.l, 4.2, 4.3.

Target Audience:
The focus in production agriculture will be on those areas and practices that have the greatest potential to have a negative impact on the natural resources. The primary focus will be on those individuals who utilize

natural resources in production agriculture and those entities with potential natural resource regulatory responsibilities.

Key Components:

- Develop analytical tools to identify impact on natural resources.
- Develop models to examine agriculture/natural resource relationships.
- Develop production systems and biorational approaches that are more environmentally benign.
- Evaluate impact of agricultural production practices and systems on environmental quality.

Performance Goal:

Increase the options available to producers that minimize impact on the environment. Enhance the information for regulators in the environmental area.

Output Indicators:

- Technology and tactics for use by producers.
- Models and decision support systems for use by agencies and people with environmental stewardship responsibility.
- Information in peer publications and public media.

Outcome Indicators:

- Producers will adopt more environmentally benign production practices.
- Citizens will be better informed about the relationship between production agriculture and natural resources.
- Regulations will be developed that are based on science, needs and public consideration.

Linkages:

Partnerships will be developed and enhanced with public agencies, associations, research institutions (inter and intra-state, regional and federal) and the private sector who develop and provide products and services for agricultural production systems. Special attention will be given to further the collaboration with state government agencies that have specific responsibilities for natural resources, for example, Indiana Department of Natural Resources. Also, there will be increased interaction with citizen based environmental interest groups.

Duration:

- Short term: evaluate impact of agricultural production practices on natural resources, i.e. water, soil and air.
- Intermediate term: develop alternative tactics and practices that reduce impact on natural resources.
- Long term: discover/develop agricultural production systems that ensure quality of the natural resources.

VI. Program/Goal 5: Enhanced Economic Opportunity and Quality of Life for Americans.

Agricultural Research Programs will seek to develop technology and information to enhance entrepreneurship at a local level and participate in identifying opportunities and information relevant to developing new enterprises.

A. Improved Quality of Life

Statement:
Develop an information base that will increase the opportunity for individuals and communities to have an improved quality of life.

Issue:
Quality of life has a different meaning based on peoples values, interests, economic status and background. Availability of resources, services, opportunities, and information plays a key role in the potential for people to attain a desired quality of life. Personal initiative and individual circumstances are significant in creating, realizing or taking advantage of things and situations that could enhance quality of life. Enhancing human capacity at the local level through education, leadership and information resource development is key to quality of life.

There is a great diversity among communities and neighborhoods in the availability of amenities, goods, services and activities that would potentially contribute to an enhanced quality of life. Identifying, assessing, and building unique options in a community to foster quality of life is an important process.

Goal:
Develop technical, economic and societal information that will contribute to enhancing the opportunity for quality of life.

Research in this area addresses CSREES Goals 5.1, 5.2

Target Audience:
The Indiana Extension Service is a key contact for Agricultural Research Programs in addressing quality of life issues. Agricultural research will

be guided by Extensions' extensive, local-based network to identify critical audiences and the need for research based information.

Key Components:

- Assess scientific and technical issues associated with developing characteristics for enhancing quality of life.
- Identify constraints that limit quality of life.
- Assist in identifying developments that would enhance quality of life.

Performance Goal:

Enhance the factors/characteristics that contribute to quality of life for citizens.

Output Indicators:

- Resource information.
- Analysis and models of communities and enterprises that contribute to quality of life.
- Information in peer publications and public media.

Outcome Indicators:

- Increased activity opportunities in communities.
- Enhanced quality of physical environment.
- Effective partnerships developed and community working together to improve their quality of life.

Linkages:

Partnerships will be developed with other agencies, services and institutions that have a potential role in developing information that can impact quality of life. Linkage with the extension service is particularly important given their contact and outreach across the state in order to identify needs and deliver information that has potential to impact quality of life.

Duration:

- Short term: identify elements that contribute to quality of life.
- Intermediate term: study factors contributing to and constraining quality of life development.
- Long term: model communities where there has been success in enhancing quality of life.

B. Individual, Family and Community Economic Development

Statement:
Develop a knowledge, an information base that will contribute to economic decision making by a diversity of groups and people.

Issue:
The economic viability of community, family and individual represents a complex, interwoven and interdependent situation. It is a dynamic scene with demographic shifts, changing agricultural production systems, moving and shifting enterprises. Production agriculture and its related enterprises which were the base for rural communities have experienced dramatic changes, for example, through consolidation, mergers, and demise.

Entrepreneurship on the part of individuals and communities is a key factor in economic viability. Entrepreneurs with a unique idea could benefit from science based information in evaluating options for economic development. Locally based enterprises are important to the economic development of a community.

Goal:
The emphasis in this area is to develop basic technical and economic base information used in making an assessment of potential for economic opportunity and development.

Research in this area addresses CSREES Goals 5.1, 5.2.

Target Audience:
The Indiana Extension Service is the key contact in working with community development programs. Agricultural research will be guided by their extensive, local based network to identify critical audiences and the need for research based information.

Key Components:
- Assess scientific and technical issues associated with enterprise development.
- Identify economic impact of potential actions/developments, rules, regulations, and initiatives.

Performance Goal:
Increase the information and basis for improved decision making that contributes to community and individual economic viability.

Output Indicators:

- Analysis of technical and scientific feasibility for enterprise development.
- Economic analysis of input and output components and systems in enterprise development.
- Information in peer publications and public media.

Outcome Indicators:

- Utilization of research based information in individual and community based decision processes.
- Entrepreneurial developments.
- Enhanced viability of local communities.

Linkages:

Partnerships will be further developed with other public agencies and institutions that have economic development as a primary thrust. Agencies such as NASS will be key collaborators in data and information development. The Extension Service is particularly important in this program to identify needs that might be addressed by research and in the information development process.

Duration:

- Short term: identify economic constraints and advantages in an economic development opportunity.
- Intermediate term: develop systems, protocols, and resources that contribute to entrepreneurial initiative and development.
- Long term: assess strategic opportunities for various sectors.

VII. Peer Review

All Hatch Projects are subject to a peer review prior to submitting the projects to USDA-CSREES. The Office of Agricultural Research Programs (ARP) is responsible for the oversight and conducts the peer review. ARP administration selects the reviewers after consultation with Department Heads.

A minimum of three scientists are involved in the review. Written comments are requested on the following points: objectives; approach and methods; feasibility; importance/relevance; relation to previous research; scientific and technical quality. These written comments are shared with the PI. A face to face meeting is scheduled with reviewers, PI, Department Head and ARP Administrator(s). Projects are often revised in response to this review process. In addition, the face to face meeting often results in the development of research collaborations that enhance the project.

VIII. Multi's

The multi-institution, state and discipline requirement is met primarily via the Multi-state Research Program, formerly identified as the Regional Research Program. Each of the geographic regions have a Multi-state Research Program which is described in their respective web sites:

North Central Region: http://www.wisc.edu/ncra/,
Northeastern: http://www.agnr.umd.edu/users/nera/,
Southern: http://www.msstate.edu/org/saaesd/,
Western: http://www.colostate.edu/Orgs/WAAESD/

Agricultural Research Programs adopts those programs by reference. Attached (Appendix A) to this Plan of Work is a list of multi-state projects in which Purdue is a participating partner.

Agricultural Research Programs staff are involved in numerous additional multi-institution, multi-state and multi-disciplinary programs. Following is a partial listing of those programs:

1. Animal Waste Consortium with six states: Indiana, Iowa, North Carolina, Missouri, Oklahoma, and Michigan collaborate in developing tactics and strategies for managing animal waste.

2. United States Department of Interior: Indiana is the lead state partnering with Illinois in a Sea Grant Program. This involves collaboration with several other Universities in the two states plus agencies of state governments in the respective states.

3. Purdue/ Rutgers/Illinois: a long-term collaboration in apple germplasm improvement.

4. USDA – ARS: program involvement includes Soil Erosion Laboratory at Purdue University; Animal Well-Being Center at Purdue University including adjunct faculty in Michigan; Food Safety Engineering Center.

5. Five-State Beef Program: Illinois, Indiana, Kentucky, Michigan, and Ohio collaborate on calf feeding trials.

6. United States Forest Service: collaborative program with Hardwood Tree Improvement and Regeneration Center and Forest Productivity.

7. Indiana Department of Environmental Management: collaborative program in studies on tourism and water quality assessment.

8. Indiana University: Pest Management in Schools; Diabetes Center; Alcohol, Cancer Center.

9. Midwest Turf Foundation: turf development and management program.

10. USDA – APHIS: Pest Survey; Special Projects – for example, Pine Shoot Beetle.

11. Indiana Department of Natural Resources: research involving wildlife and forestry.

12. Indiana Beef Producers Association: collaboration on beef performance evaluation.

13. Indiana Beekeepers Association: program to study pest problems associated with honey bees.

14. Indiana Wine Grape Council: Indiana, Michigan and Ohio collaboration on a program to study wine-grape production in the midwest and wine making with local grapes; Heartland Wine-Grape Coalition.

15. USAID: Agricultural Research Programs has been a long-term participant in the following CRSPs: Intsormil, Pest Management, Bean and Cowpea.

Integrated Research and Extension Activities:

There are several ways to assess commitment to and investment in joint research and extension activities. Virtually all Purdue Agricultural faculty have a dual appointment involving two of the three functional areas i.e. teaching, extension and research.

Faculty in ARP holding joint research/extension appointments have a complimentary, integrated research and extension program. Each of those faculty with a joint appointment have a portion of their time allocated to research and extension. Of the total number of ARP faculty having either a research and/or an extension appointment, 33 percent of the individuals have a joint research/extension appointment. Assessing this on the basis of a full time

equivalent (FTE) allocation, 29 percent of the FTE is devoted to a joint/integrated research and extension activity. Based on the above two assessments ARP exceeds the 25 percent integrated research and extension activity.

IX. Stakeholder

General:
The interaction with stakeholders is a complex and continuous process. Interaction takes many forms; occurs in multiple settings; in scheduled meetings and spontaneously; in fields, laboratories and coffeehouses; involves field and campus based staff. While meetings scheduled for the purpose of soliciting stakeholder input is important, it is also most important to be opportunistic in the interaction with stakeholders. It is critical that ARP staff be present at times and places to hear what people have to say. Attendance at meetings, conferences and events not sponsored by the institution provides a unique and broad-based opportunity to learn about needs and concerns.

Purdue agriculture obtains stakeholder input through involvement with organizations and associations. In that context staff attend a broad spectrum of meetings to learn what's on the agenda of a diverse group of people. Numerous organizations in the state have requested a liaison representative from Purdue agriculture with the intent to both inform and be informed.

Staff appointments in agriculture at Purdue University are multi-functional and this facilitates interaction with stakeholders. The most common appointment is a dual appointment (i.e., research-extension, research-teaching, extension-teaching) with a few three-way (i.e., research-extension-teaching) appointments. This multi-functional appointment scenario serves a dual role — input to research based on extension program activities and use of research generated information in an extension education mode. Purdue agriculture is unique in that the regulatory functions related to agriculture are legislatively assigned to the Office of the State Chemist, Purdue Agriculture. The regulatory staff are all on campus and report to the Dean of Agriculture — thus, there is a unique flow of information to research and extension programs.

There is a broad range of stakeholder activities involving departments, specific programs and the Dean's Advisory Committee for the School of Agriculture. Following is a brief description of several programs/activities:

Departments:
Within the last five years, departments have convened sessions for advisory groups. These have included focus groups to explore topics and to provide general council to a multi-disciplinary department. While most participants have been identified by the departments being served, frequently an opportunity has also been presented for invited participants to bring others to the discussion.

Programs:
Within the last five years, programs in agriculture have convened sessions for advisory groups. These sessions have been focused to specific programs, for example, grain quality. Participants are identified by program participants and invited by the administration in the School of Agriculture. Primary focus is to engage those organizations/individuals who may have some stake in using the product developed by the program.

Purdue Agricultural Centers (PAC):
Purdue agriculture has eight field research centers strategically located throughout the state. There are five advisory teams that meet annually and in some years there have been two meetings. An Advisory Team is identified based on recommendations by local educators and PAC staff. The Advisory Team is encouraged to bring additional people to the meetings. At an annual meeting, a person has been engaged to facilitate a nominal group technique approach in needs identification and prioritization. Sessions are a mix of topic focus and "open-ended".

Council for Agricultural Research, Extension, Teaching (CARET):
CARET is a multi-level organization: county, region/area, and state. At the county level, the committee members are identified by current CARET members, county staff and the County Extension Board. County committees elect representatives to the area committee and the area committee elects state leadership. One of the annual state meetings involves an open dialogue on issues, concerns and needs identification. CARET members bring other interested individuals to these meetings.

Extension Planning:
Extension at Purdue has engaged clientele in a major needs identification and planning activity as described in the Extension Plan of Work. That activity has identified knowledge gaps. Information developed in that activity is a valuable resource in identifying research needs.

School of Agriculture:
The Dean of Agriculture's Advisory Committee is a broadly based group including representatives from, for example — primary and secondary educators, farm input industry (genetics, chemical, seed, and service), farmer/product (agronomic, horticulture, and forestry crops), banking, consultants, agriculture and commodity associations, retailer, legislator, and environmental organizations. The Committee meets several times a year. At the

most recent meeting the Committee identified and reviewed research needs/issues, did a synthesis and prioritized.

Purdue Staff:
There was a research initiative workshop for staff in Agriculture, August 1998. There was an open invitation for a workshop with the program structure based on the USDA-CSREES Goals. Strengths, needs and issues were identified and prioritized within each of the Goals. The workshop involved the development of teams in priority areas, which in turn also identified potential for collaboration with other universities and agencies.

Future:
ARP anticipates conducting additional stakeholder listening sessions in 2000 and 2001. This would involve a statewide activity to identify information and research needs. This activity could be based on the CARET area structure. Notices/invitations announcing the meetings could be made through the public media that is appropriate to the area where the meeting is being convened and with specific attention paid to media that serves a diverse clientele. Subsequent documents would report the information gained from these meetings.

X. Under Served

Numerous groups or populations may be considered as "under served." Those considered as "under served" are likely to range from inner city to minority to production agriculture. Also, at any one time there are likely to be under served entities on the part of the clientele that are traditionally served by the agriculture system. Further, there are groups or populations who may not realize that the agricultural system might be relevant to their needs. Following are some examples of addressing the "under served."

Listening sessions were created via CARET. CARET organized the meeting in each of the ten areas and invited people. In this set of meetings examples of addressing the "under served" were meetings in Indianapolis and Gary, Indiana convened in a facility that services the minority community.

A research and extension staff member was relocated to Calumet. This person specializes in horticulture and is serving an urban racial minority in that area.

A Purdue Agricultural Center (PAC) was established in northeast Indiana to serve a section of the state that has unique soil and agriculture. Research and extension specialists were located in southwest Indiana to serve an area of melon, fruit and vegetable production, an area having different environmental conditions and traditionally under served by agricultural research and extension.

Agriculture offers summer fellowships to minority high school, potential college students. This summer fellowship involves working in research labs on campus and participating in educational sessions.

Agricultural staff are involved in outreach programs to high schools that have a predominate minority population. The high schools involved are located in Chicago, Ft. Wayne, and Indianapolis. On-campus activities are also conducted for students from high schools with a predominate minority student body.

People in several areas of agriculture have expressed a need for more service. Dairy farmers were seeking additional assistance and a staff person was hired and located in Northeast Indiana. Poultry producers were seeking assistance and a faculty specialist was hired and located on campus. The beekeepers in the state were experiencing several problems and sought assistance, but Agricultural Research Programs did not have expertise on staff. In collaboration with the beekeepers, state funds were obtained and a specialist was hired to address the problems in apiculture. Fruit growers expressed a need for information on

production and sought assistance from Purdue Agriculture. A pomologist was hired and the Wine Grape Council was formed.

XI. Program Expenditure and Projection

15. 1999 Budget

Hatch	$3,932,030
Multi-State (Regional)	$840,759
Total Federal	$4,772,789

16. Current multi-state investment as interpreted from Form 419.

Multi-State: $840,000 =	21.6% of Hatch
	17.6% of Total Federal

17. Additional dollars required to meet 25%:

$142,249 based on Hatch
$352,438 based on Total Federal

18. Resources identified with other multi's listed in Section VIII: 1-15. For example:

19. Six-State Animal Waste Consortium	$100,000
20. Indiana/Illinois Sea Grant	$75,000
21. Animal Well Being	$100,000
22. Purdue/Rutgers/Illinois Apple Improvement	$50,000
23. Five-State Beef Program	$50,000

The above exceeds the required 25% while there are additional programs in which financial resources have been invested.

24. Fund Proportion:

The state to federal match for Indiana is 6:1. The ARP Director has discretion with the state dollars although a high percent of the dollars are committed to salaries.

25. Report Basis:
The financial and resource information is extracted from several sources and while it portrays research commitment, this presentation does not constitute an auditable document.

Projection of dollar and scientific years (SY)*

Percent of 1:1 State/Federal Match to be Invested in Programs

		1	2	3	4	5
2000	$	74.9	2.2	3.9	12.6	6.4
	SY	76.5	3.8	1.9	12.4	5.6
2001	$	74.9	2.9	3.9	13.1	6.7
	SY	76.5	4.5	1.9	13.0	5.8
2002	$	73.8	3.6	3.9	13.5	7.0
	SY	75.5	5.2	1.9	13.5	6.0
2003	$	72.7	4.0	3.9	13.5	7.0
	SY	74.4	5.5	1.9	13.5	6.0
2004	$	71.6	4.0	3.9	13.5	7.0
	SY	73.3	5.5	1.9	13.5	6.0

* The projection is based on a percentage given the uncertainty of future funding. These projections are made based on the expectation that the change in federal budget will not exceed $\pm$ 10%.