Plan of Work

The Ohio State University

College of Food, Agricultural, and Environmental Sciences

Ohio Agricultural Research and Development Center

And

Ohio State University Extension

Addendum for

Federal Fiscal Years

FY05-FY06

Introduction:

When the original Plan of Work for the period FY00 through FY04 was written, it described in some detail the scope of research being conducted by the Ohio Agricultural Research and Development Center (OARDC) and the programs and outreach being conducted by Ohio State University Extension (OSUE). For OARDC, most of the topics had been the subject of investigation in the past and continue to be addressed. These include basic and applied research of plants, particularly the agronomically important crops of soybeans and corn, as well as food animals. Food safety and human health issues as well as protection of the environment, all of which were described in the original Plan of Work, continue to receive attention from both OARDC and OSUE.

For Extension, the major changes highlighted below are changes in contact information. OSUE continues to address the goals described in the FY 99 – 04 Plan of Work and does not foresee major changes for FY 05 – 06 at this time. For OARDC, some areas have changed since the original Plan of Work due to increased opportunities, such as advances in biotechnology, or changed circumstances, such as a greater need for attention to food safety and homeland security. It is these new opportunities that will be described here.

Goal 1 An Agricultural System that is Highly Competitive in the Global Economy

Continued:

Extension Program 1A. Summary of Extension Programs

Agricultural Focus Teams will continue to be fostered in 2005 – 2006 for interdisciplinary focus and to network with respective stakeholder and commodity organizations.

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Added:

Research Program 1H. Plant and Animal Biotechnology

Statement of Issue:

It is apparent that those societies which successfully improve agricultural productivity and efficiency as well as those who develop specialized products for specific niche markets will be the economic winners in the global economy. The developments in molecular biology and biotechnology in the past few years hold great promise for both of these aspirations.

In the original plan of work, seven specific programs under this goal were identified. These included: A) value added products; B) innovative farming techniques, C) increased animal production efficiency, D) increased plant production efficiency, E) enhancement of animal health, F) enhancement of plant health, and G) economic competitiveness. Biotechnology could be used to a more or less extent to further each of these programmatic goals but all of the potential of the application of new tools of molecular biology is captured by none of them. For that reason, we conclude that Biotechnology deserves a category of its own.

Numerous examples already exist for the application of biotechnology combined with traditional plant breeding programs for improved plant production efficiency, protection from plant diseases and the production of specialized products for niche markets. These include development of varieties which have resistance to plant diseases (phytophthora root rot) and pests (soybean cyst nematodes) as well as high-protein soybean varieties developed for the Asian tofu market.

Among the new developments on the biotechnology horizon include such basic research projects as continuing the exploration of the genetic basis of cold-tolerance in plants which can hopefully lead to plants less susceptible to being killed by an early frost. Another project with high potential is the determination of the genetic manipulation necessary to produce low-phytate soybeans. The presence of phytate (inositol hexaphosphate) as a bound, organic form of phosphorus in soybeans used for animal feed leads to excess phosphate in animal waste. In addition, food grade soybeans that are low in phytate would be ideal for the infant formula market. At present, phytate is removed by expensive processing from soybean protein used in infant formula because it binds trace minerals and prevents the absorption of these required nutrients by the child.

Molecular biology being applied to animal production and disease prevention includes the development of vaccines for viruses which cause respiratory and gastrointestinal diseases in food animals. Biotechnology has also been used to detect infectious bursal disease virus (IBDV) in poultry. IBDV either kills chickens or it makes them susceptible to other diseases because the virus weakens their immune system. This weakening of the immune system allows the bacteria Campylobacter jejuni to occur in chickens at a much higher level than normal. The organism does not harm the chicken but it is the most common cause of food borne illnesses in humans. Biotechnology is being used to create a vaccine for IBDV.

Performance Goals:

- ♦ increase our depth of knowledge of the genetic basis of susceptibility to plant diseases and pests
- ♦ increase the basic knowledge of disease and pest resistance of plants
- ♦ continue to expand knowledge of plant genomes
- ♦ increase the knowledge of the immune systems of animals for the development of more effective vaccines for animal viral diseases.

Output Indicators:

- ♦ develop a better understanding of how the genetic environment allows some diseases / pests to affect some plant species and varieties and not others
- ♦ develop a more comprehensive knowledge of the genomic makeup of plants important as food sources
- ♦ more fully understand how animal diseases may be prevented.

Outcome Indicators:

- ♦ Increased productivity and efficiency of production of plants

- Increased production of plant foods / feeds for niche markets
- Greater production efficiency of animals less susceptible to diseases
- Less contamination of food animals with organisms harmful to humans

Key program components:

- Greater investments in specialized equipment
- Greater investments in faculty with expertise in various methods of molecular biology / biotechnology

Internal and External Linkages:
- Department of Animal Sciences
- Department of Horticulture and Crop Sciences
- Department of Plant Pathology
- Food Animal Health Research Program
- School of Natural Resources
- OSU Plant Molecular Biology Program
- College of Veterinary Medicine
- College of Biological Sciences
- Plant and Animal commodity groups and industry leaders

Target Audiences:

Biological science community, farmers, producers, agricultural processors, general public**.**

Program Duration:

Two years

Allocated Resources:

FY 2005 FTE = 3.45 Total Hatch + Matching allocated = $368,594

FY 2006 FTE = 3.45 Total Hatch + Matching allocated = $383,337

Goal 2. A Safe and Secure Food and Fiber System

Added to Research Program 2Ar. Pre Harvest Food Safety - Statement of Issue

One of the most perplexing diseases that has emerged as a threat to the animal industry in the past several years is bovine spongiform encephalopathy (BSE), also known as “mad cow disease.” While the disease in cattle is apparently non-contagious, it causes fear because of the evidence that consumption of contaminated meat can result in a devastating human brain disorder, new variant Creutzfeldt-Jakob Disease. It is the fear of the disease, not the disease itself, which is a major threat to the cattle industry in the United States. Research is underway at

OARDC to develop methods to detect prions, the putative causative agent of BSE.

Added to Research Program 2Br. Post Harvest Food Safety - Statement of Issue:

Since the original Plan of Work was written, efforts in the area of post-harvest food safety have taken on an increased sense of urgency. The reasons are the potential threat of terrorism to our food supply and, it seems, an ever increasing incidence of food safety issues ranging from bacterial contamination of food to mad-cow disease. In this connection, work on developing alternative methods of food preservation continues but more effort is now being expended on the detection of food contaminants using the tools of molecular biology. Specifically, real time PCR (polymerase chain reaction) to detect extremely small contamination of pathogens in food is being developed and promises to revolutionize food safety.

No change in other descriptive parameters for Goal 2 for Extension or Research.

Goal 3. A Healthy, Well Nourished Population

No Change from FY00 - FY04 Plan for Goal 3 for Extension or Research.

Goal 4. An Agricultural System which Protects Natural Resources and the Environment

Added to Research Program 4Ar. Agricultural Wastes and By-Products - Statement of Issue

It has long been the goal of agricultural scientists to turn waste products into valuable by-products. Composting has been used to convert waste into relatively inexpensive products used as soil additives. With the increase in energy fuel costs and the technological advances associated with efficient anaerobic fermentation facilities, a much greater economic return from by-products appears to be achievable. The technology is now being developed to turn a variety of wastes, ranging from animal manure, food processing wastes and agricultural by-products into methane. These same materials can be used as a source of raw materials for microbiological based fuel cells. Agricultural wastes include renewable materials such as corn stalks or the waste from soybean processing plants after oil and isolated soybean proteins are extracted. This type of conversion of waste is very important to Ohio which is characterized as a major agricultural state in spite of having relatively large urban population centers.

No change in other descriptive parameters for Goal 4 for Extension or Research.

Goal 5. Enhanced Economic Opportunity and Quality of Life

Added to Research Program 5A. Economic Development - Statement of Issue

The description of the need for economic development outlined in the original plan of work has taken on new meaning with the economic difficulties and manufacturing job losses being experienced by the State of Ohio. The leadership of the State, both at the executive and legislative level, are demanding that state funding to the Ohio Agricultural Research and Development Center demonstrably provide a return on the investment. To meet this mandate, OARDC contracted with Battelle Memorial Institute to conduct a study to determine the contribution of OARDC research to the State's economy and to make recommendations for areas for future investment of research dollars. Meeting the State directive may mean reexamining the entire research portfolio but it almost certainly means added emphasis on this Goal and the Program of Economic Development.

No change in other descriptive parameters for Goal 5 for Extension or Research.

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