Future Programs in Areawide Pest Management

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ABSTRACT The United States Department of Agriculture (USDA) Agricultural Research Service's (ARS) Areawide Pest Management Program is a coordinated partnership between the federal and state systems with active grower participation. Two highly ranked proposals were selected for initiation in 1995 and 1996—one involving the codling moth (Cydia pomonella (L.)) and the other, corn rootworms (Diabrotica spp.). In 1996, the ARS expanded the program. Based on peer reviews of proposals, followed by full proposal evaluations, two new projects targeting the weed leafy spurge (Euphorbia esula L.) and insect pests in stored wheat (Triticum spp.) were implemented in 1997. The ARS plans to expand its integrated pest management (IPM) research activities in areawide pest management as funds become available, either from new congressional appropriations or from the completion of ongoing projects. New areawide pest management projects judged to be of highest priority and merit will be implemented for insect, mite, tick, plant pathogen, or weed pests. The vision of the USDA–ARS Areawide Program is to provide farmers, consultants, and local organizations with mature areawide pest management systems that are affordable, operational, and adoptable, and that contribute to the overall goals of the USDA IPM Initiative.

KEY WORDS areawide pest management, insects, mites, ticks, plant pathogens, weeds, biological control, cultural control, chemical control

In 1994, the United States Department of Agriculture (USDA) commenced its Integrated Pest Management (IPM) Initiative (USDA 1993, 1994). This initiative reflects the redirection and combination of old and new resources of the USDA and land-grant university programs into a single coordinated and cooperative effort with farmers, private consultants, and industry to achieve the national goal of IPM on 75% of the crop acres by the year 2000. The Agricultural Research Service's (ARS) major contribution to the initiative is through the agency's Areawide Pest Management Program, as well as through its ongoing base-funded IPM research projects. The Areawide IPM Program focuses on management of pests where existing environmentally sound
technologies are most effective when used over a multistate or multiregion area. The success of the program is dependent on full partnering and participation between the ARS; Cooperative States Research, Education and Extension Service (CSREES); Economic Research Service (ERS); Animal and Plant Health Inspection Service (APHIS); state agricultural experiment stations and extension facilities, farmers, and ranchers; and other private sector (e.g., consultants, industry) entities.

In 1993, ARS management decided, in concert with a USDA IPM Working Group, to develop a partnership framework for collaborative activities on an areawide pest management approach that would include the federal, state, and private sectors. On 27 September 1993, key pest management representatives from the USDA, university research and extension, and several state Departments of Agriculture participated in an organizational meeting in Beltsville, Maryland. At this meeting, participants identified key pests and cropping systems for which environmentally sound pest management technologies were available for implementation on an areawide basis. A high-priority list of 10 projects was developed, proposals were submitted, and these proposals were evaluated by a peer-review panel. Two of the highest ranked projects were selected for initiation. One of these two projects was implemented in 1995 and involved the codling moth \textit{(Cydia pomonella (L.))} and the apple \textit{(Malus spp.)} pest management system in the U.S. Pacific Northwest by using mating disruption (Howell et al. 1992, USDA 1995). The second project was implemented in 1996 and involved the management of adult corn rootworms \textit{(Diabrotica spp.)} and the corn \textit{(Zea mays L.)} pest management system in the Midwest by using an adult semiochemical insecticide-bait (Lance & Sutter 1992).

Although the ARS’s Areawide Pest Management Program is a part of the framework of the IPM Initiative’s strategic plan, its scope actually extends beyond pests of cropping systems. These programs may include both animal and plant pests and may address both preharvest and postharvest problems. The program may encompass insects, mites, ticks, plant pathogens, nematodes, and weeds where existing technologies are available and would be most effective when used over a multiregion or multistate area.

The ARS does have certain expectations for all of the areawide projects, both ongoing and new. They are expected to have a strong stakeholder partnership and collaboration; they are expected to demonstrate the positive impacts and advantages of such a program over a large area; and they are expected to provide farmers, consultants, local organizations, and others with a mature areawide pest management system that is affordable and operational, and that will meet the overall goals of the USDA IPM Initiative, through adoption of the demonstrated strategies.

**Components of the USDA–ARS Pest Management Projects**

The USDA–ARS Areawide Pest Management Program typically is comprised of four key components within the framework of a temporal–spatial scale and phased implementation: operations, assessment, research, and education. The operational component forms the core of an areawide project and is necessary for the implementation of the other components, with the exception of certain research aspects. It includes a stepwise implementation of the program and the
delineation of baseline information requirements, site selection requirements and candidates, and implementation protocols. The assessment component addresses economic, sociological, and environmental impacts. A research component is included as needed to aid in the improvement of program efficacy or to help circumvent existing barriers to implementation on a regional scale. Finally, an education component is needed to ensure continued and broad adoption (technology transfer) of areawide strategies beyond the local study sites, and to enable technical training, communication, and support targeted to specific categories of potential adopters. The training structure is generally composed of four major parts: (1) direct training programs, such as field days, short courses, and seminars; (2) training materials; (3) communication by using newsletters; electronic decision support tools; and bulletin boards, trade journals, etc.; and (4) educational assessment by using social science tools to measure the benefits of the project, rate of the adoption, and opportunities for improvement. The key to enabling the education component is the regional areawide management extension specialists who will provide educational system management and coordination.

Phases of Implementation

Similar to the USDA IPM Initiative, in which the areawide program plays a substantial role, the Areawide Pest Management Program involves three phases of implementation over the 5-yr lifetime of most of its projects. Phase I includes six parts: (1) establishment of research–implementation partnership teams; (2) development of a conceptual plan and other planning activities, and definition of the scope of the projects implementation; (3) definition of the target pest(s) and secondary pest problems to be solved; (4) selection of sites and definition of the bounds of the implementation area; (5) execution of baseline data collection, feasibility studies, and limited implementation; and (6) definition of the range of research, extension, and education activities; economic, sociological, and environmental impact assessments; and technology transfer activities needed to solve end-user problems. In phase II site proposals developed by the teams in phase I are reviewed, modified as necessary, and funded for mission-linked, adaptive, and developmental research and education; technology transfer; and economic, social, environmental, and public health impact assessment. Also, in phase II the implementation and assessment of the project is begun, and the progress of the project is reviewed on an annual basis. Three expectations for phase II are as follows: (1) the areawide pest management system is fully supported by the private sector, and the public sector remains active in providing mission-linked research, extension, education, and training; (2) the project has demonstrated positive impacts and advantages over a large area through enhanced grower profits, reduced worker risks and enhanced environment, and a proven superiority of an areawide pest management strategy; and (3) the project has provided farmers, consultants, and local organizations with a mature areawide pest management system that is affordable, operational, and adoptable; and that will contribute to the overall goals of the USDA IPM Initiative. Successful projects should be able to demonstrate full implementation and adoption by the public sector in phase III of the program.
Areawide pest management projects must meet certain criteria, eight of which follow: (1) bio-intensive or environmentally sound technology must be available and the use of an areawide pest management approach must be justified; (2) the project should increase opportunities for implementation of current or future IPM strategies; (3) management technology should be available after the program, and such technology should be economical; (4) the project should provide positive environmental benefits, food and worker safety, help address the impact of the Food Quality Protection Act of 1996, contribute to rural development, increase potential for exports, and have a high benefit-cost ratio; (5) involvement of federal, state, and private groups should be significant; (6) probability for acceptance and implementation by growers at the end of the project should be high; (7) area (sites) for the project should be appropriate in size, should be typical production settings with representative pest problems, with consistent populations of the key pests, and the state or region where the site is located should have an active extension IPM program; and (8) the overall likelihood of success should be high.

**Future Programs in Areawide Pest Management**

In fiscal year 1997, Congress increased its support of the ARS areawide pest management initiative. These funds allowed the agency to implement fully (phase II) the corn rootworm project, and proceed with the implementation of additional projects. In October 1996, a request for areawide pest management project preproposals was distributed to ARS scientists and to the state IPM coordinators through the coordinator of the USDA IPM Subcommittee. Scientists submitting preproposals were strongly encouraged to develop them as federal-state-customer partnerships. The ARS received 16 preproposals in response to this request.

Twelve reviewers provided evaluation and recommendations regarding the qualifying criteria, including the quality and scope of the science and the relevance of the preproposals to the areawide pest management concept. An ad hoc USDA Areawide Pest Management Oversight Committee also provided comments on the recommendations of the review panel. Eight preproposals were identified as candidates for development into full proposals.

A panel of five scientists from the federal and state sectors, and a number of ad hoc reviewers provided peer evaluation and recommendations regarding the quality of science and the appropriateness of each of the full proposals submitted. The peer panelists and ad hoc reviewers highly recommended three out of the eight proposals for funding. Only two, however, could be funded within the available resources in fiscal year 1997. It must be emphasized that the ARS is not a granting agency and that the funding for this program is not awarded as a grant. Instead, ARS is authorized to support such programs through specific cooperative agreements with its partners. The ARS, however, does use a peer-review panel process similar to that of other granting organizations to ensure that the most meritorious and relevant science is undertaken. Two other areawide IPM projects were initiated by the ARS in fiscal year 1997. One pro-
ject is directed at insects of stored grain in Kansas and Oklahoma and the other project is directed at the weed leafy spurge (*Euphorbia esula* L.) in Montana, North and South Dakota, and Wyoming.

The ARS scientists and scientists from Kansas and Oklahoma State Universities are the key participants in the stored-grain insects project, with farmers and operators of grain elevators as team members. It was determined that this project met the criteria of an areawide concept because grains are moved from the farm to country elevators or network and satellite elevators, to terminal elevators, to mills, and to overseas export terminals. This is analogous to the movement of insects between fields, except stored grain and the pests associated with them are transported by truck and railcar. Currently, phosphine gas is generally used for pest control in stored grains. The technology to be used for this stored-grain project will include early aeration to cool grain and decrease insect and mold population growth (Cuperus et al. 1986), as well as other technologies such as monitoring models for forecasting, safe grain-storage periods, sanitation, and other tactics as needed. This project will run through fiscal year 2001.

The leafy spurge areawide IPM project is being initiated as a partnership between the ARS in Sidney, Montana; the USDA–APHIS; North and South Dakota State Universities; and Montana State University; in cooperation with ranchers, Forest Service, Cooperative States Research, Education and Extension Service (CSREES), the Bureau of Land Management, National Park Service, and the state Departments of Agriculture. This project uses biological control with emphasis on a beetle herbivore (*Aphthona* sp.) of leafy spurge (Rees 1994), and other technologies such as grazing systems, revegetation, decision aids, geographical information systems (GIS), and judicious use of herbicides, if needed. This project will likewise run through fiscal year 2001.

Several other ongoing areawide projects sponsored by the ARS are worthy of mention. In Mississippi, an areawide project underway since 1990 uses early-season spraying of an insect virus to suppress populations of the bollworm (*Helicoverpa zea* (Boddie)) and tobacco budworm (*Heliothis virescens* (F.),) thus decreasing the need for chemical insecticide treatments for these cotton (*Gossypium* spp.) pests. A community-based field trial study for control of the blacklegged tick (*Ixodes scapularis* Say) and lyme disease in the northeastern United States was implemented in 1997. An areawide management project on Colorado potato beetle (*Leptinotarsa decemlineata* (Say)) and aphids (Aphididae) that uses biological control systems and cultural practices to lessen the reliance on chemical insecticides that will be regulated as a result of the Food Quality Protection Act is underway in the northeastern United States.

Candidate projects, based on meritorious proposals that were submitted to the ARS in 1997, but for which there was not enough funding, could be Russian wheat aphid (*Diuraphis noxia* (Mordvilko)); silverleaf whitefly (*Bemesia argentifolii* (Perring & Bellows)); pests in potatoes (Solanaceae) with emphasis on Colorado potato beetle and select potato pathogens; boll weevil (*Anthonomus grandis grandis* Boheman) in southern Texas; fruit flies (Tephritidae) in Hawaiian fruits and vegetables; and an expansion of the heliothine moth areawide project by using early-season applications of baculovirus. As resources become available, either as ongoing projects come to completion or as
new congressional appropriations are received, other areawide projects will be initiated. Potential projects could be those that have been submitted as full proposals, after panel reevaluation, or others that might be submitted and peer evaluated. The earliest that new areawide projects might begin is fiscal year 2000.

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