Agricultural Security and Nationally Coordinated Networks: The Need for Federal Support of Research, Education, and Extension

August 2012

Background

Plant and animal agriculture are an amazing American success story. In addition, they are vital elements of one of the seventeen recognized critical infrastructures (Food and Agriculture) of the United States and, by extension, the world. The protection of plants and animals from insect pests and diseases is essential to national and global food security, food safety, and public and environmental health. Increased agricultural production efficiencies mean little or nothing if plant and animal agriculture cannot be protected from catastrophic loss due to the introduction and spread of plant or animal pests or diseases of consequence. Any major agricultural disaster can lead to significant job and income loss, food scarcity, food contamination, panic buying, and lack of confidence in the food production system. The direct and collateral costs from such an event can affect the entire U.S. economy. For example, it is estimated that the direct, first-year costs of a foot and mouth disease (FMD) outbreak could be as much as $50 billion. The direct and collateral costs over two years could be over $200 billion. While FMD is considered to be a worst-case scenario for animal agriculture in the U.S., other plant and animal pest invasions and disease events could lead to similar substantial direct and collateral costs. A catastrophic loss in plant or animal agriculture has the potential to cause broad and significant negative affects to food security, the overall economy, environment, and even the social and political stability of the U.S.

The primary means to protect plant and animal agriculture from pests and diseases, and mitigate the consequences of any major event that does occur, are through preparedness (i.e., directed research, education, and extension/outreach/service efforts), comprehensive surveillance, early and accurate detection, rapid response, and effective recovery strategies. Surveillance, detection, response, and recovery programs are primarily the responsibility of federal and state regulatory agencies. However, there are a large number of support activities, including basic and translational disease and diagnostics research, the development of bioinformatics and information tracking systems, technology transfer, formal and informal education, and the development of effective internal and public communications that are essential to preparedness - i.e., the development and provision of the personnel, tools, integrated strategies, and tactics needed to implement and support the regulatory programs. In addition, the support activities that develop these people, tools, and tactics are on-going requirements of the state and federal regulatory agencies if they are to sustain and enhance the systems that prevent and control high consequence pests and diseases.

Introduction

In the U.S., there are three nationally coordinated networks that support agricultural and food security. These are the Extension Disaster Education Network (EDEN; www.eden.lsu.edu), the National Plant Diagnostic Network (NPDN; www.npdn.org), and the National Animal Health Laboratory Network (NAHLN; www.aphis.usda.gov/animal_health/nahln). Each of these

networks is a state/federal partnership that exists due to contributions from all partners. The state and local partners have provided the vast majority of inputs necessary for the formation of the networks including capital outlays for structures, funds for infrastructure enhancement, personnel development, other staffing costs, and annual operating budgets. However, federal support has been, and will continue to be essential in order to coordinate the agricultural security efforts of these networks at the national level and to help develop, support, and continue to make needed enhancements to the networks with respect to their activities that are of national importance.

The EDEN came into being in 1994 as the Cooperative Extension Service's (CES) response to flood disasters in the U.S., but has broadened its scope to become an extension education resource for all hazards and disasters. Because of federal funding, the EDEN agricultural security focus developed in 2002 in response to real, local needs for extension educational resources and other efforts in support of agricultural security. It is important to note that EDEN became a national, CES working network because of federal funding. The NPDN and NAHLN came into being in 2002 due to the advent of USDA Homeland Security funding and a common understanding that existing federal and state plant and animal disease diagnostic resources needed to be leveraged and coordinated nationally.

During the past ten years, each of these networks has made significant contributions to agricultural security and the economy that, in some cases, has been measured in the hundreds of millions of dollars. The EDEN has developed and implemented, among other things:

- Regional Agrosecurity Conferences in which producers, emergency management officials and response personnel, extension specialists, and state and federal regulatory officials have met, become aware of each others' roles and responsibilities, and established important working relationships where none may have existed before;
- Developed the nation’s largest network of agrosecurity planners with the use of agricultural security tools including a course entitled "Strengthening Community Agrosecurity Planning" (S-CAP) (In 20 states, through local workshops, hundreds of producers, emergency managers, and other related parties have been trained and helped to develop or enhance their county agricultural emergency plans. This is important because "all disasters are local", but few counties had agricultural emergency plans or exercises);
- On-line Agrosecurity and Emergency Management and Plant Biosecurity courses that are viewed thousands of times monthly (The Plant Biosecurity course was developed in cooperation with NPDN);
- Print and online publications to help agricultural suppliers and producers save valuable resources during disasters, while protecting the environment from potentially hazardous materials entering the environment during a disaster;
- Free on-line training, developed in partnership with FEMA, for farmers and producers, as business owners, to develop business continuity plans.

In addition, EDEN and CES-affiliated activities such as the Animal Health Network (AHN - Texas AgriLife) and the Agriculture/Livestock Incident Response Team (ALIRT - New Mexico and Arizona) have been adopted as models for similar efforts in multiple states.

The NPDN has responded to multiple plant pest and disease outbreaks, which has resulted in the early detection and reduction in impact of these problems. In one case, the early detection of asian soybean rust was estimated to have saved the industry $240 million in chemicals "not applied", not to mention the costs of lost crops, lost jobs, environmental insults,

and other direct disease impacts. Similarly, the NAHLN has implemented national surveillance efforts for highly pathogenic avian influenza, classical swine fever, bovine spongiform encephalopathy, and other important animal diseases. These surveillance programs have been used, among other things, to demonstrate freedom from disease in support of international trade, resulting in increased trade income.

However, recent budget cuts of up to 50% at both the state and federal level have diminished the operational capabilities of each network, and curtailed the research, education, and extension activities that are important to the continued improvement of these networks and agricultural security in the U.S. A summary of the effects of recent budget cuts to each network is presented in Appendix A. In general, the consequences of these funding reductions have been, among other things, 1) a reduction in the overall ability of each network to coordinate nationally, 2) a significant reduction in the ability of individual diagnostic laboratories and CES educators to contribute to the national agricultural security effort, 3) loss of trained personnel and a reduction in training of personnel, 4) a reduction in the effort to develop and enhance standardized diagnostic capabilities and capacities across networks, 5) a reduction in the effort to enhance efficient diagnostic data communications between state and federal laboratories, 6) a reduction in the ability of the CES to respond to agricultural emergencies in rural America, and 7) a reduction in the development and delivery of formal and informal agricultural security educational programs.

In response to these challenges, a meeting entitled "The Future of the Food and Agriculture Defense Initiative (FADI) - A Meeting of Networks" was held on June 12-13, 2012 at the USDA National Institute of Food and Agriculture (NIFA). FADI is an integrated activities line item in the budget of NIFA that is used to provide partial support for infrastructure enhancement, research, education, and extension activities of the EDEN, NPDN, and NAHLN. Meeting attendees included state and federal partners of each network, producer and professional group representatives, and other interested parties. A list of organizations represented at the meeting is included in Appendix B. The purposes of the meeting were to 1) identify the operational gaps and future needs of each network in order to allow each to become a more comprehensive contributor to agricultural security, 2) to identify the research, education, and extension activities to help close the current gaps and support the future network needs, and 3) to identify potential inter-network commonalities and needs that could lead to dual or triple purpose activities in support of each network. The following is a synopsis of the output of that meeting.

Current Gaps and Future Needs

EDEN

The EDEN is, above all else, a disaster information resource for CES educators. In turn, CES educators are a primary conduit of important agricultural information to producers and the affected public. EDEN specialists provide Internet and other access to information and communications on a wide variety of disaster preparedness and recovery issues, such as floods, tornadoes, droughts, hurricanes, wildfires, and major snow events. Over the past several years, the EDEN Agriculture Security component has expanded its scope through developing and implementing workshops and training courses in disaster planning, preparedness, and response at the county and state levels (e.g., Regional Agrosecurity Conferences, Regional Food Safety

Conferences, S-CAP). For example, prior to the inception of S-CAP, few counties in the U.S. had agricultural emergency plans. Those that did often lacked information on the preparation and response to a plant or animal agriculture disaster. Because disasters occur and are dealt with initially at the local level, it is extremely important that individual producers, their support businesses and professionals, and responders at the county and state level have a disaster plan prepared and exercised. In the three years of this program, 24 workshops have been held in 20 states serving multiple agricultural counties and over 16 million citizens.

Although EDEN has made major contributions to agricultural security with relatively minor funding, there remain a number of significant gaps and needs that could be filled by this organization. Among these are:

- develop and deliver a systematic approach and materials for agricultural security planning across the country, including educational materials that address disaster preparation and recovery from a social and cultural perspective;
- assess NPDN and NAHLN public communications needs, produce appropriate education materials, and deliver information through CES specialists;
- train state and local CES staff in nationally standardized processes such as Incident Command System (ICS) and Emergency Support Function (ESF) procedures and issues;
- promote the integration of trained CES staff into state and county emergency operations management and participation in exercises;
- develop a national inventory of agricultural security training and practice resources for CES;
- develop a broader presence in social media for the EDEN and agricultural security;
- convert current EDEN training tools and develop additional agriculture security tools into DHS/FEMA-approved courses in order to expand potential for funding of related workshops and other training efforts;
- develop standardized training and nationwide implementation ALIRT and AHN at the state level;
- develop and deliver nationally standardized agricultural security education and training materials for 4-H, Ag In the Classroom, and other youth-oriented agriculture programs;
- develop and use effective evaluation tools to provide quantitative measurements of EDEN accomplishments.

The cost of each of these initiatives would vary depending on the scope of the projects, but most could be accomplished with between $50,000 and $250,000 per project. Some programs, such as the ALIRT, AHN, and evaluation efforts, require sustained funding to expand and function at the national level. Funding for these efforts could be coordinated and shared at the federal and state levels through the NIFA (FADI and Smith-Lever appropriations), Department of Homeland Security (Office of Health Affairs), state CES, state departments of agriculture, and other interested groups.

NPDN and NAHLN

While the organization and operating strategies of the NPDN and NAHLN are different, many of the research, education, and extension gaps and future needs for plant and animal pests and diseases are shared at the general level. Among these are:

Research -

- determine functional genomics of plant and animal disease resistance characteristics, and pest and pathogen vulnerabilities;
- better characterize evolutionary biology of pest and pathogen commonalities;
- study pest and pathogen virulence and pathogenesis to better identify the best time and place to interrupt the pest or disease cycle;
- study pathogen variation to provide better direction for the development of diagnostic tools;
- determine environmental preferences of pests and disease pathogens;
- determine origins and potential distributions of pests and disease pathogens;
- develop and transfer of diagnostic assays for surveillance, control, eradication, or disease freedom;
- validate diagnostic assays for nation-wide use;
- conduct risk assessments for better prioritization of efforts;
- use predictive models to better understand the spread of pests and pathogens in static and changing environments;
- analyze economic impacts, including direct and collateral costs;
- establish reference collections and preservation efforts;
- develop bioinformatics for large data analyses;
- analyze sample processes to identify and solve the weak links in surge capacity;
- develop syndromic analyses and the study of anomalies to better identify emerging pests and pathogens;
- develop cost-efficient, bi-directional, nationally integrated laboratory information management systems (LIMS);
- develop processes that promote interoperability with and between networks;
- develop additional data mining tools;

Education -

- expand agricultural security curricula in plant science, animal science, and veterinary medicine departments and colleges;
- focus education of pathologists, other diagnosticians, epidemiologists, and risk management specialists on agricultural security issues;
- train trainers to expand educational deployment;
- train technicians for additional laboratory support;
- train first detectors to have more eyes and ears "on the ground";
- develop new and enhanced course and workshop training materials;

Extension/Outreach/Service -

- train first detectors;
- increase biosecurity education of producers;
- increase preparedness, response, and recovery education of producers and general public;
- develop consistent and accurate public communications to the public;
- develop preparedness, response, and recovery communications for K-12;
- increase internal and external "newsletters" to better inform interested parties of network activities;

Infrastructure Enhancement -

- standardize LIMS;
- enhance biocontainment facilities;
- standardize sample accession processes - e.g., barcoding, etc.;
- increase IT training;
- develop better database architectures;
- work towards better database integration;
- expand event exercises;
- enhance quality management systems;
- certify and accredit laboratories to national standards.

Inter-network Opportunities

There are a number of opportunities for collaboration between the EDEN, NPDN, and NAHLN. Among these are:

- coordinate ALIRT training with NAHLN laboratories at the state and regional level;
- develop NPDN and NAHLN communication documents by EDEN to help CES educators understand the diagnostic resources;
- include NPDN and NAHLN laboratory staff in S-CAP training efforts;
- provide NAHLN assistance to NPDN to enhance laboratory quality management systems and develop national certification and accreditation programs;
- establish linkages between each network website;
- coordinate first detector training;
- move towards interoperability of equipment and explore potential for shared diagnostic resources between NPDN and NAHLN;
- develop exercises that include all three networks;
- explore commonalities of data repositories and potential interoperability of data transmission systems.

The cost of these efforts would be dependent on their respective magnitude. For example, event exercises could cost as little as $10,000 while the research necessary to support the national validation and deployment of a single diagnostic assay could cost $500,000 or more. Educational costs would vary from several thousand dollars for a training course to several million for comprehensive training of pathologists, microbiologists, and diagnostic technicians. The amount allocated for support to these efforts will most often be dependent on the political will of the supporting agencies and legislatures. Because these efforts would benefit states, regions, and the nation, the costs should be borne by all involved. However, federal support and commitment is essential to unite, coordinate, and standardize these efforts nationally. At the federal level, this will require improved coordination between and increased appropriations to, among others, the regulatory and research agencies of the USDA (APHIS, ARS, and NIFA).

Acknowledgements

This meeting was co-sponsored by the National Institute of Food and Agriculture (NIFA) and the Kansas State University Department of Plant Pathology (KSU). NIFA and KSU provided administrative support, and NIFA provided the meeting venue.

The meeting organizers were:

Dr. Gary Anderson	KSU
Dr. Richard Bostock	UC Davis
Mr. Steve Cain	Purdue
Dr. Kitty Cardwell	USDA-NIFA
Dr. Martin Draper	USDA-NIFA
Dr. Cyril Gay	USDA-ARS
Dr. William Hoffman	USDA-NIFA
Ms. Andrea Husband Higdon	U Kentucky
Ms. Elizabeth Ley	USDA-NIFA
Dr. Mark Robinson*	USDA-NIFA
Dr. Gary Sherman	USDA-NIFA
Dr. James Stack	KSU
Ms. Davida Tengey	USDA-NIFA

We thank all the participants who made this a productive and successful meeting.

*Please direct any questions or comments to:

Mark M. Robinson, PhD, DVM
National Program Leader, Animal Agrosecurity
Division of Animal Systems
Institute of Food Production and Security
National Institute of Food and Agriculture
U.S. Department of Agriculture
800 9th St. SW, Room 3442
Washington, DC 20024
E-mail: mrobinson@nifa.usda.gov
Office: 202-401-6301

Appendix A

Some Effects of Recent Budget Reductions
From FY 2010-2012

EDEN

- reduced support to deploy S-CAP training
- reduced development of new educational and training materials related to agricultural security
- reduced capability to respond to major agricultural disasters with teams to support the needed education

NPDN

- laboratories reduced from one per state to one per several states
- coordinating hub laboratories and regional direction reduced from 5 to 3 or 2
- trained professionals in each state lab reduced by 35-50%
- training of diagnosticians in advanced techniques in plant disease and insect diagnoses at “expert labs” ceased
- equipment kept longer with reduced or canceled maintenance agreements and no provision for orderly replacement
- laboratory national accreditation program abandoned
- IT support from regional hub staff to member labs ceased
- Reduction in laboratories' ability to leverage state and other funding sources
- Outreach activities eliminated

NAHLN

- reduced laboratories' ability to leverage state and other funding sources
- personnel who are proficiency-tested in NAHLN assays reduced between 20% to 80% per laboratory
- training activities reduced significantly
- FTEs devoted to NAHLN activities reduced between 0.5 and 3.0 per laboratory
- overall staff losses range between 10% and 40% per laboratory
- equipment kept longer, and with reduced or no maintenance agreements
- support to QA reduced significantly
- support to IT reduced significantly, especially LIMS enhancement
- surveillance activities reduced or eliminated
- outreach activities reduced or eliminated

Appendix B

Organizations Represented at Meeting

CES/EDEN

- University of Kentucky
- University of Maryland
- Purdue University
- University of Tennessee
- New Mexico State University

NPDN

- Cornell University
- Kansas State University
- Michigan State University
- Purdue University
- University of California, Davis
- University of Florida

NAHLN

- Cornell University
- Kansas State University
- University of Wisconsin
- Texas A&M University
- Washington State University

Producer and Commodity Groups

- American Farm Bureau Federation
- National Pork Board
- National Pork Producers Council

Professional Organizations

- American Association of Veterinary Laboratory Diagnosticians
- American Phytopathological Society
- American Veterinary Medical Association
- National Association of Federal Veterinarians

State Organizations

- New Jersey Department of Agriculture
- New Mexico Department of Agriculture

US Government Departments and Agencies

- Department of Defense
- Department of Homeland Security
  - Office of Health Affairs
  - Science and Technology Directorate
- Department of Justice
- Office of Management and Budget
- USDA Agricultural Research Service
  - Animal Production and Protection
  - Crop Production and Protection
- USDA Animal and Plant Health Inspection Service
  - Centers for Epidemiology and Animal Health
  - National Veterinary Services Laboratories
  - Plant Protection and Quarantine
- USDA Economic Research Service
- USDA National Institute of Food and Agriculture
  - Division of Animal Systems
  - Division of Family and Consumer Sciences
  - Division of Plant Protection