National Research Support Project Summary

Project Number:
NRSP_TEMP261
Title:
ipmPIPE National Research Support Project
Duration:
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Administrative Advisor(s):
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NIFA Reps:

Statement of Issues and Justification

Prerequisite Criteria

How is the NRSP consistent with the mission?
This proposal seeks to establish a new National Research Support Project (NRSP) to enable advances in our understanding of invasive pest and disease biology and impacts by providing access to national pest monitoring and outbreak data and modeling tools. It will provide a unique resource for research into epidemic processes, the design of novel management systems and the susceptibility of US agriculture to pest invasions. It will also create the opportunity for the analysis of status and trends in changes in pest invasion and survival that may be associated with climate and land use changes. Uncertainties associated with the economic, ecological and health risks of new and potential invaders impairs our ability to anticipate severe risks, manage them before they enter US agriculture or design our agricultural system so it is less sensitive to damage. New tools and approaches will require the insights of mathematicians, systems biologists, engineers and policy specialists and they need to have access to high quality data and modeling tools to carry their work forward.

This NRSP will support research applications of wide-area pest monitoring and systems analysis research such as are represented by the Integrated Pest Management-Pest Information Platform for Extension and Education (ipmPIPE) (http://www.ipmpipe.org/) and similar systems. These systems will be henceforth referred to as ipmPIPE systems or components. The ipmPIPE framework is dependent upon an information technology core that provides researchers with the data and tools needed for process level evaluations and enhanced model development, validation, and commercialization. Overall, the function of this NRSP is to create and maintain a data repository and the capability to submit data and retrieve data for research purposes. Providing this core function allows new ipmPIPE components to be added when they are developed. Through this function, these stored data can provide the foundation upon which new research can be based. Examples would include linkages of outbreak events with degree day accumulation through overlaying observational data with weather data stored in other repositories, reinterpreting data into new distribution/risk maps, developing pest phenology analyses, tracking pesticide use trends and impacts, improving models, relating existing models to new pest threats,

and improving understanding of pest biology. A key component will be migrating high value data sets into a central repository.

The ipmPIPE data is a valuable resource, however the ipmPIPE was not designed to make data and models widely accessible. The initial focus of ipmPIPE has been on forecasting rather than data sharing. The objective of this NRSP is to make sure that the data being captured by the ipmPIPE can be readily accessed by providing a central repository of data and models. The ipmPIPE data collection and management system has proven to be a highly effective mechanism to provide risk management information that helps protect vulnerable agricultural industries from economically limiting plant pathogens, insect pests, and other threats presented by new biological invasions. First established for Asian Soybean Rust, ipmPIPE has become an essential tool for farmers and producers, guiding the use of fungicides as needed. The first year in place, it is estimated that the soybean industry saved almost $3 million in unnecessary fungicide applications based on the valuable information delivered to growers (Roberts et al. 2006). In addition to the practical applications of the ipmPIPE systems by extension specialists and their producer constituency, has been the additional benefit of having a unified research platform, heavily used by research scientists, aerobiologists, epidemiologists, and crop physiologists. A wealth of new tools and practical applications have resulted from research using the ipmPIPE-generated data on crop growth stage, climate variables, disease and insect pressure, agronomic practices, and economic thresholds. These data and the Information Technology (IT) platform continue to represent unparalleled intrinsic value for the research community. One such example of the research application of these data was a meta-analysis of soybean rust observations from the 2005 and 2006 growing seasons (Christiano and Scherm, 2007). Recent interest has emerged to develop international cooperation for responding to global crises. The Feed the Future Initiative from the US Department of State is one such opportunity. Similarly, discussions are underway with foreign governments for collaborative projects that build on the value of existing data to influence global crop production challenges. Already, Mexico has built a pest tracking and management system based on the ipmPIPE. This proposal to establish an ipmPIPE NRSP is consistent with the NRSP mission because it will provide a stable foundation for the existing legacy data and IT platform tools for use by the research community; these data will allow development of a new understanding about crop production constraints and analysis of these new applications in service to the sector.

The existing ipmPIPE is a dynamic nationally coordinated research and extension platform supported by information technology that provides centralized and useful research-based tools with reliable pest management information for use by IPM practitioners. Currently, there are seven ipmPIPE projects in operation: soybean rust (http://sbr.ipmpipe.org); insects and diseases of legume and pulse crops (http://legume.ipmpipe.org); cucurbit downy mildew (http://cdm.ipmpipe.org); pecan scab and nut casebearer (http://pecan.ipmpipe.org); onion diseases (http://onion.ipmpipe.org); southern corn rust (http://scr.ipmpipe.org); and, most recently, Western Specialty Crop PIPE that focuses on Light Brown Apple Moth and Spotted Wing Drosophila of small fruits. There are also information platforms being developed for wheat rust and other PIPE systems through proposals to the USDA Risk Management Agency (RMA), the USDA National Institute for Food and Agriculture's (NIFA) Specialty Crops Research Initiative (SCRI) and Agricultural Food Research Initiative (AFRI). Crops currently targeted by ipmPIPE are directly tied to the US Gross National Product (GNP), exports and global food

security, human nutrition and dietary diversity for the United States. The ipmPIPE NRSP will support centralization of data at a single website and a relational database that serves as a metadata catalog for all ipmPIPE projects. The core modules will include a website, data management system, metadata catalog and model hosting service; the project will support an individual responsible for managing the data collection, aggregation and access. The data and models collected and archived under this NRSP will provide a valuable resource for research that will lead to additional predictive modeling and mapping utilizing analytics, graphics and charting made possible from this database and the associated tools housed with it (those types of activities that add value to the datasets will remain a role of the specific research projects funded from other sources).

There is substantial benefit to having a national network for data acquisition and management to support research by maintaining infrastructure and products from the existing ipmPIPE infrastructure. The ipmPIPE NRSP is proposed to ensure that the system management, as well as the biological and associated climatological data core is protected and available for research and for the development of any additional tools focused on the management of economically important pathogens, insects, and other pests of nation-wide or regional importance to plant production systems.

How does this NRSP pertain as a national issue?
New pest introductions are increasing with global movement of people and goods, travel and trade. This NRSP is needed to optimize national capabilities to address problems as they arise. Every cropping system has economically limiting pests that impact production, as well as many potential pests that may be introduced and become established or may otherwise arise in the future. Natural systems also have pests that are costly and difficult to manage, limiting the utility and availability of the resource (carbon sequestration, air and water quality, recreation, wood products, etc.).

This NRSP will provide a framework for participating scientists from State Agricultural Experiment Stations (SAES); universities; federal, state, local, and tribal government agencies; national forests and laboratories; environmental institutes; private companies; and other research organizations to cooperate in research leading to the management of pests that limit food and fiber production nation-wide. The NRSP will provide coordination and collateral support services for research leading to informed decisions on issues related to agriculture and natural systems vulnerable to attack by high consequence pests unconstrained by geographic boundaries. Knowledge of where pests are and how they are likely to move affects detection and rapid response.

The NRSP will provide a centralized data management system for invasive pest incidence and a platform that will enable access to models of pest risks and management. It will help to establish a community of researchers who can exploit these data and also a mechanism for new data to be submitted. Over the five years of the NRSP, research publications derived from these data will be archived and reported to establish the role and value of the system. The expanding capacity of the system to support novel, fundamental lines of research that would not have been possible without this initiative will also be tracked.

The potential for early impact and success of this NRSP is greatly enhanced by the availability of nationally distributed data for pest and disease incidence in a diverse array of specialty and agronomic crops within USDA-sponsored programs. These programs include the NIFA/RMA PIPE, AFRI and SCRI. The NRSP would provide funding for a scientist project manager to build the system, populate it with data from these sources and facilitate access and use by the United States and international research community.

The ipmPIPE components developed since 2004 were in response to a number of critical regional and national pest incursions that threaten crops across the country. This NRSP will support and coordinate research in order to respond to new pests of national significance. The ipmPIPE components have amassed great talent across private and public entities to create a network and databases that apply directly to risk management and problem solving through interdisciplinary research. The ipmPIPE concept has been so successful that it is increasingly being sought out by researchers for application to new emerging pest problems. Looking to the future, it is important for critical components to be centralized and to store the biological and climatological data, plus models and ancillary products developed within those projects for further epidemiological research. In many cases, these data will become more valuable when additional datasets are aggregated and analyzed retrospectively. The NRSP will allow the research community to optimize and coordinate resources that can be applied to stability, quality and access of the databases for research and application purposes. Years of data on pest and disease development will be a valuable resource for assessment of the effects of time, introduction of new IPM tools, and climate change on occurrence of pest outbreak and other physiological crop responses.

Integrated pest management using the ipmPIPE has been responsible for reducing the economic and environmental risks in the crops addressed (See Attachment "Investments to Date"). To date, the ipmPIPE has been supported by a variety of sources. It grew out of the 2004 USDA initiative to track Asian Soybean Rust, a fungal plant disease that threatens soybean production across the U.S. Several USDA agencies (APHIS, ARS, NIFA, RMA), land-grant universities, grower organizations, crop advisers, and private industry work together to manage the Soybean Rust PIPE (http://sbr.ipmpipe.org), which included a (trans-) national network of soybean rust sentinel plots (including Mexico and Canada). The system was built on substantial research that resulted in disease prediction models that could be overlaid on meteorological information. This collaboration is highly effective in protecting the soybean industry from this economically limiting disease by providing farmers access to real-time scientific information on which to base fungicide application decisions. In the broader sense, this soybean disease system provides an excellent example of research on pathogen biology, aerobiology and epidemiology being validated and then widely implemented on a large scale with multi-state and multi-institutional communication and collaboration. A 2006 Economic Research Service report (Roberts et al.) concluded that the Soybean Rust PIPE saved farmers as much as $299 million dollars in 2005 alone. This equates to thousands of pounds of fungicides that were not applied, thereby reducing human and environmental exposure as well as reducing production costs for farmers. Estimates from Cucurbit Downy Mildew PIPE participants suggest that during 2009, a modest epidemic year for downy mildew, cucurbit producers used PIPE data to time fungicide applications and protect crop yields, saving a minimum of $24 million dollars in fungicides not applied in addition to relieving potential environmental impact of fungicide applications and fungicide

resistance development. The ipmPIPE NRSP is proposed to ensure that the systems management and biological and climatological information core remain available for research and development of additional tools to deploy in controlling economically important pathogens, insects, and other pests of wide national or regional importance.

The focus of this system through NRSP support, will be to provide access to ipmPIPE biological and climatological data that enable and leverage fundamental research in pest epidemiology and climate change as it relates to economically viable agricultural systems. For example, each ipmPIPE component collects crop growth/phenology, pest incidence and severity data on temporal and spatial scales that build a database which can be used for additional research in epidemiology, pest biology, and development of management tools and decision support models based on validated information obtained directly from real-time field data. Preserving and sharing these data will allow future scientists the ability to explore whether there are measurable changes to epidemic spread and distribution of pests as well as crop growth phenology in relation to climate and cropping systems changes. Further, this NRSP will provide the platform for scientists to pursue additional funding for maintaining the network.

The possible relationship with other NRSPs has been considered. NRSP-003 is a similar distributed data collection system for atmospheric pollutants, and synergies between NRSP-003 and the ipmPIPE have been explored. The National Atmospheric Deposition Project (NADP) (http://nadp.sws.uiuc.edu/) is a network of traps to analyze rainwater for atmospheric pollutants. Efforts with the NADP from 2005-07 explored the use of water traps to detect Asian Soybean Rust spores. The water traps did capture spores, but detection did not correlate to disease occurrence. It is now understood that agricultural disease forecasting data are somewhat more complex as there is a three-way dynamic between host, pest, and environment. Nevertheless, the NRSP-003 is a model of networked data collection that has parallels to this NRSP. Bearchell et al. (2005) demonstrate the value of long-term datasets such as we are proposing to achieve. The ipmPIPE NRSP will allow for excellent tracking and prediction of pest movement and the data housed there can also provide a foundation for research that will help develop improved management recommendations. In some instances, control recommendations are generated through the NRSP-004 board (pesticide registration for specialty crops and minor uses [aka IR-4]). The NRSP-004 and the proposed ipmPIPE NRSP are therefore complementary in focus because they both address generation of data for reducing risk, both economic and environmental (http://ir4.rutgers.edu/).

Rationale

Priority Established by ESCOP/ESS
The NRSP committee will assure that researchers and growers will continue to have the ability to respond rapidly to new insect pest and disease threats to crop production systems. This is truly a national resource that can be important in any region of the country. Therefore a centralized coordination and support for the ipmPIPE by the system which it serves is justified and reasonable.

The ipmPIPE NRSP will support research to respond to one or more dimensions of four of the Grand Challenges (# 1, 2, 4 and 6) described in the recently completed "A Science Roadmap for

Food and Agriculture" (Association of Public and Land-grant Universities, Experiment Station Committee on Organization and Policy - Science and Technology Committee Nov. 2010).

Grand Challenge 1: We must enhance the sustainability, competitiveness, and profitability of U.S. food and agricultural systems.

Grand Challenge 2: We must adapt to and mitigate the impacts of climate change on food, feed, fiber, and fuel systems in the United States.

Grand Challenge 4: We must play a global leadership role to ensure a safe, secure, and abundant food supply for the United States and the world.

Grand Challenge 6: We must heighten environmental stewardship through the development of sustainable management practices.

Related to Grand Challenge 1, the availability of the ipmPIPE data can assist in improving the productivity of organic and sustainable agriculture. This is an application that fosters sustainable strategies for pest management which is at the heart of organic production.

Under Grand Challenge 2, data available through this NRSP will facilitate development of economic assessments to provide more accurate estimates of climate change impacts and the potential costs and benefits of adaptation, and to validate and calibrate models. Such was the case with the most complete example we have in hand, the soybean rust PIPE.

This NRSP can also help address Grand Challenge 4 through provision of data for improving predictive models; such models can optimize effective crop, weed, insect, and pathogen management strategies while decreasing dependence on chemicals that may have harmful effects on people and the environment. Many ipmPIPE and ipmPIPE-like systems have addressed these same concerns by helping producers make good decisions. This NRSP has the potential to facilitate the science community to improve models and further serve the public.

It also has the potential to heighten environmental stewardship under Grand Challenge 6 through enhancing ecosystem services that support production outcomes so that chemical inputs can be reduced. All pest systems included should be expected to reduce chemical inputs and the associated producer costs.

Relevance to stakeholders

The primary stakeholders for this project will be scientists whose research methods and results will be supported and leveraged by the ipmPIPE NRSP to directly address pest and disease management problems of wide regional and national importance. This will benefit the research community by providing infrastructure through which research outcomes and impacts can be accelerated, multiplied, and quantitatively documented. This NRSP will provide an enabling technology that increases the ability of the research community to easily find, access, and utilize datasets that are generated by the ipmPIPE and its components for research.

The primary purpose of this NRSP is to host and promote national pest and disease databases and relevant metadatasets and ancillary support products and related systems to the research community. Descriptions of the datasets (metadata) and information about how to access the databases will be provided. Policies and framework for data sharing with researchers will allow broad access to data. These datasets are unique because of the scope and scale, broader than the borders of any one state. Inclusion of data under the NRSP will make available data more strategic and will provide added benefits for climate change research.

Further, the NRSP will delineate the criteria for inclusion of new ipmPIPE components to standardize inputs and will eliminate duplication of effort by housing completed products such as validated models and related ipmPIPE training modules. This project will serve research scientists and benefit a broader stakeholder community, with representatives from industry and crop association user groups who need models to address specific needs. The ipmPIPE supports research that can then be applied by plant protection specialists and others to formulate best management practices. Access to these data by the user communities can allow rapid and timely response to new and chronic insect and pest disease threats to the U.S. crop production systems.

Implementation

Objectives

1. National coordination of ipmPIPE research and development tools will support the collection, distribution, storage and preservation of scientific data and validated models for prediction and control of pests and diseases of wide regional and national importance and indentify minimum data standards, including data fields of importance that are common across pest systems. This data platform will facilitate the development of enabling technologies for integrated pest management through research using these data and model assembly strategies.
2. Access to the rapidly expanding pest/environment databases being assembled under federal funding to date: All of the ipmPIPE-like systems that are now in place are accumulating large and useful databases that relate environment to biological phenomena and human decision making. This NRSP will provide a means to organize the various databases so that information can be available to researchers who develop epidemiological, ecological and economic models. Data will be made available in a ready-to-process format. An important value proposition is that this effort will allow members of the research community to leverage existing data for robust discovery of information, knowledge and innovation. A fundamental goal of this effort is to give end users the ability to extract and cross-aggregate data from any available dataset to accomplish their desired research objectives.
3. Model building tools: Many plant protection scientists, students and technical service providers recognize the value of models and the need for adaptation and deployment of more models. The ipmPIPE NRSP will house model building tools that can be applied to new pests with minimal modification. These tools will include definitions of environmental and biological variables needed for deployment.
4. Climate change scenario building: Since a priority of government funding addresses climate change, the ipmPIPE NRSP will support assembling the data needed to evaluate

the effect of climate change on pest populations. This central location for large historical databases and the response of plants and animals to environmental variables will provide the ability to pose 'what if' scenarios using modeling tools.

Projected Outcomes

1. Objective 1: a. Metric: Databases are designed and established to accept existing datasets. b. Milestones: i. Ten datasets incorporated and in use by end of year 5. ii. Number of new datasets incorporated per year (2 per year).
2. Objective 2: a. Metric: Data is available and accessible from the NRSP databases. b. Milestones: i. Data Query and filtering tools are in place. ii. Scientists are accessing datasets for research.
3. Objective 3: a. Metric: Consolidated models and tools are being used. b. Milestone: i. Scientists will regularly develop models that add value to data for end users. ii. New models developed by end of year five.
4. Objective 4: a. Metric: Data will be readily accessible for research efforts that will inform climate change policy decisions. b. Milestones: i. The ipmPIPE NRSP data will be used for projects accessing data for measuring the effects of climate change such as through revising ranges of pest adaptation.

Management, Budget, and Business Plan

The NRSP initial membership was constituted by the organizing committee (see section "Outreach, Communications and Assessment"), four administrative advisors, and three representatives from NIFA. This group will work to ensure that in moving forward, the membership is comprised of both regional and disciplinary researcher representation.By submission time of the final ipmPIPE NRSP proposal, ten states had approved members and additional are anticipated. The NRSP Committee will work with the ipmPIPE Steering Committee; the latter being comprised of representatives from multiple government agencies, universities, and projects, with additional representatives from impacted customer stakeholder groups. Since 2004, the ipmPIPE has been developed and maintained by a Steering Committee (http://www.ipmpipe.org/SC/index.cfm#steering) under leadership of the National Institute of Food and Agriculture (NIFA) and its land-grant partners. NIFA has provided $60,000 to $115,000 per year in partial support of infrastructure through Food and Agriculture Defense Initiative (FADI) funds. However, this funding line is subject to annual Congressional appropriation and is not sufficient to support the research proposed. As long as funding exists for the Food and Agriculture Defense Initiative (FADI), NIFA holds the ipmPIPE as a high priority for on-going support. The new NRSP funding will be used for five years to develop the core data management system, to archive the data collected to date, to help ensure that additional competitively funded projects have access to ipmPIPE resources during the development phase, and that new datasets are incorporated into the database as they are developed. Project oversight and fund management will be done by the NRSP Committee. Any additional NIFA or RMA funding will be handled via the authorities and disbursement mechanisms specific to those agencies. The coordination of the various funding streams occurs at the level of the ipmPIPE Steering Committee which represents the stakeholders.

There is an urgent need to establish a repository/clearing house for data and models generated for ipmPIPE and similar systems with a stable source of support for the biological database core. The current ipmPIPE framework is a portal with linkages to all of the ipmPIPE components. It is important to protect the investment to date (See Attachment "Investments to Date") and to ensure that the data collected remains available by archiving both legacy and current data. When ipmPIPE projects end, it will be important to continue the coordination of the research and development efforts particularly relative to those data and to make those products available on an ongoing basis. It is important to make sure that research model products can continue to be available and used by researchers and other stakeholder communities. Management of these datasets and management of access to these datasets is a primary purpose for this NRSP. The NRSP ipmPIPE is aimed at increasing access to data and improving search and discovery as well as provisioning of data in more usable formats, adding value to the previously collected wide area pest and disease data. The ipmPIPE NRSP will be located at a land-grant institution that will be determined by the potential synergy in its management with other pest-related databases. Leveraging existing information technology infrastructures, such as those which exist at the University of Georgia, North Carolina State University, Oregon State University or Purdue University in support of related projects, will reduce the cost of maintaining the system. Most of these institutions have indicated interest in using their IT infrastructure to facilitate the project. Once it is known that the NRSP will be established, the NRSP organizing committee will put out a request for applications and an independent panel will be used to select the host organization. Criteria would be that the institution has an existing IT unit that is independent in function from other academic units. The unit must be certified in information security and have all fail-safes already in place to manage critical databases. The unit must have on staff, a Chief Technical Officer and personnel capable of writing computer code that is specific to the development of the NRSP user interface. A more detailed list of criteria for selection can be found in attachment "Data center and IT requirements." Annual support of $150,000 is requested for fiscal years (FY) 13 through FY17. The ipmPIPE NRSP scientific director will be identified by the organization selected to host the ipmPIPE NRSP system; it is anticipated that this will be a partial appointment which is compatible with the director's other responsibilities. A RFA and peer-paneled review process will be conducted per NIFA competitive program standards.

The work will consist of maintaining one or more data marts and performing periodic data/application updates to those data marts. Extraction, transformation and load tools will be used to maintain the data marts. The system may consist of one or more layers to include a staging data layer 0 (data management layer), consolidation data layer 1 (business logic layer), and reporting data layer 2 (presentation layer). The exact number and type of data layers will be determined when the database design is vetted with the NRSP steering committee. Source-to-target client mapping, including rules, will be a key deliverable. For historical purposes we anticipate migrating all data into a central repository without any cleansing for reference purposes. Since data cleansing is an expensive effort, the amount of effort devoted to data quality will be vetted through the NRSP steering committee. The IT unit will be responsible for analyzing and configuring (as necessary) all integration points between source systems and the various data layers. As appropriate, validation tests will be developed and systems testing conducted to determine that data has loaded. Statistics on web site usage, data usage and number of distinct users will be kept. As this effort is in the partially defined stage, the unit will be expected to develop detailed system design of data that is to be housed in the system. The first

six months of the project will be devoted to developing the design for storage of all of the ipmPIPE data. Development and implementation will follow the design phase with some level of overlap. The applying organizations will have to meet specific requirements in terms of physical infrastructure for database management. The proposals will describe specifically how the budget will be allocated. Certain criteria, such as mandatory attendance of ipmPIPE NRSP annual meetings would be required. The total budget for this project is $150,000/year and is weighted in the earlier years toward establishment of the databases to house the data, but is reliant on people to maintain the data and facilitate movement of data for researchers. The preliminary budget breakdown is as follows:

Salaries and Fringe: includes ipmPIPE Director and programming staff

Yr 1: $100,000 (increase 3%/yr); Yr 2: $103,000, Yr 3: $106, 090; Yr 4: $109,273; Yr 5: $112,551.

Position Descriptions: The ipmPIPE director will be employed by the host organization providing the IT data unit. The director will coordinate the project in support of the ipmPIPE NRSP Committee and provide oversight for the programmers who develop the data management interface, provide access to the data and interface with the research user group, monitor and assure acceptable progress on the development of the data repository resource. The ipmPIPE director will be an active participant in the NRSP oversight committee and the ipmPIPE Steering Committee. The ipmPIPE NRSP director will be knowledgeable about Intellectual Property rights and oversee development of commercial or fund raising opportunities.

Throughout the tenure of the program, the ipmPIPE NRSP director will be developing social capital and seeking synergistic funding sources and/or commercialization options. The director is expected to have technical ability to design the IT system, adding value to existing databases. Additional technical expertise is expected to develop the IT resource.

Programming staff will be employed as needed to develop IT deliverables and accomplish the goals of the project. The primary tasks for the NRSP director:

Phase 1) Communicate with stakeholders during the development of the ipmPIPE portal user interface. The ipmPIPE director will be the liaison between the user community and the program developers. The ipmPIPE director will be very familiar with the success of the ipmPIPE functions for linking efforts and coordinating data collection and be able to bring that model to the development of the access tools. Focus group work and on-going coordination of IT resources will be required.

Phase 2) The NRSP director will work with the PIPE component directors to determine the most efficient way to incorporate data and ancillary tools into the database system and user interface as new PIPE components are developed. As each new ipmPIPE component becomes available, the director will organize communication with the target user groups.

Operational Costs:

Travel: $10,000/yr

Staff travel may be needed relative to project functions and focus group meetings will be needed in the early phase of the project. An annual meeting will bring all parties face-to-face to share progress, identify needs, and discuss efficiencies and opportunities to develop programs and tools across pest systems.

Supplies: Yr 1: $25,000; Yr 2: 22,000; Yr 3: 18,910; Yr 4: 15,727; Yr 5: 12,449

There will be costs associated with regular conference calls and webinars with university, Federal, and industry stakeholders during the development stage. Calls will assure the continued cohesiveness of the project as a whole by identifying issues and future research agendas.

Maintenance equipment/capital: $15,000/yr

Data and model hosting by the IT service provider will cost about $15,000 per annum. Backup of data at a redundant repository will be required. Server systems and location security require on-going upkeep and periodic replacement.

Cost sharing:

This request does not account for full operating costs, but provides for base operations and safekeeping of the data. This NRSP augments the role that the regional IPM Centers have in supporting new ipmPIPE component development and data collection. The regional IPM Center directors have been active participants in the ipmPIPE Steering Committee and are anticipated to provide an important role in ensuring the transfer of existing data to the NRSP. Additionally, it is expected that university and industry partners will continue to supply expertise, resources and participation in ipmPIPE projects funded by other resources.

In the long-term, a cost recovery system needs to be developed. Researchers accessing the NRSP data set will be expected to share in the cost of maintaining the system. Sources of support could include competitive grants, local commodity support and university personnel time. Establishment of the NRSP will enhance competitiveness for USDA integrated program and Risk Management Agency funding for development projects consistent with the specific mission of the ipmPIPE. Support for the services of the NRSP PIPE will be expected to be included in proposals for funding future ipmPIPE components.

Based on annual availability, other sources of funds may include a NIFA contribution from the Food and Agriculture Defense Initiative and RMA ARPA funds. Over the next five years, over $4.8 million has been committed to four ipmPIPE components. Details are provided in the attachment "Investments to Date." Competitive grants programs such as the Agriculture and Food Research Initiative (AFRI) are also seen as a source of continued funding. Individually supported research projects should include data repository support in their proposals. This plan does not intend to implement user fees for accessing data for research.

Participation of university researchers in the NRSP is supported primarily through state funds. Details of cost-share will be documented within the second year budget to be submitted in January 2013.

Integration

This NRSP data management system, will build upon what has been achieved to date through funding from the various agencies, beginning with incorporating the data and validated models from the existing ipmPIPE components, serving as a tool for building research around these dynamic and living data sets. However, added value for producers may be provided at sites hosted by university partners.

The ipmPIPE concept of wide area pest monitoring and correlation with weather events has revolutionized pest risk management in numerous crops across the country. University scientists have built systems to collect pest and disease data, create visualization tools and provide risk assessment and management tools as a service to stakeholder communities. Originally built around soybean rust in 2004, (http://sbr.ipmpipe.org), the ipmPIPE has been expanded to cover soybean aphid (2006-2009), insects and diseases of legume and pulse crops (http://legume.ipmpipe.org) (2007), cucurbit downy mildew for cucurbit crops (http://cdm.ipmpipe.org) (2008), the pecan nut casebearer throughout the pecan belt (http://pecan.ipmpipe.org) (2008), southern corn rust (http://scr.ipmpipe.org) and onion diseases (http://onion.ipmpipe.org) (2010). The Western Specialty PIPE is presently in development. Funding in support of the development of these components came from the USDA Risk Management Agency via the Agriculture Risk Protection Act, various USDA NIFA competitive grant programs and industry support. Risk forecasting through estimating wide area movement has been well received by stakeholders and a suite of these tools were recently presented at the Entomological Society of America Annual Meeting (Calixto et al. 2011; Hershman et al. 2011; Langham et al. 2011; and Ojiambo et al. 2011). Additional potential component PIPEs already funded through competitive grants are in the research pipeline. A primary concern addressed through the NRSP is that there is no stable funding to support a clearinghouse of the research models and data that are being generated by these PIPEs for long term access and continued development. Often initial development of systems has been funded, but beyond initial validation (Isard, et al, Kanetis, et al, and Ring, et al), continued enhancement of the models is challenging. The ipmPIPE NRSP will facilitate this function as well as coordinate development of relevant research objectives and priorities.

The system will use a modular architecture with application programming interfaces (API) to facilitate shared services for the research community and enable the development of third party visualization tools. The architecture, APIs, and services will be based on open source architecture. Data will be disaggregated from existing ipmPIPE datasets to enable direct and ongoing access to the underlying data.

Outreach, Communications and Assessment

The ipmPIPE NRSP will support communications across projects in the ipmPIPE system, maintain ipmPIPE system standards, and link participants to pertinent scientific information and

risk management tools as a growing number of multi-state and multi-disciplinary projects join the ipmPIPE.

The intended participants will be other scientists whose research methods and results will be supported and leveraged by the ipmPIPE NRSP to directly address pest and disease management problems of wide regional and national importance. This will benefit the research community by providing infrastructure through which research outcomes and impacts can be accelerated, multiplied, and quantitatively documented. At the same time, Land-Grant Universities and Extension will play an active role in identifying and bringing issues from users of the ipmPIPE systems directly to researchers. The NRSP Committee will utilize the existing ipmPIPE Steering committee (http://www.ipmpipe.org/SC/index.cfm) to ensure that the research will address highest priority needs. Products from the ipmPIPE concept are the result of collaborative efforts involving many organizations and individuals that use the ipmPIPE including producers, commodity and specialty crop groups, Land-Grant university researchers and Extension specialists, Extension field staff, local, state and federal governmental agencies, crop consultants, private industry, consumers, and the general public (http://www.ipmpipe.org/partners.cfm). The ipmPIPE NRSP will ensure engagement of the user audience by helping the research community to define and conduct research relevant to the ipmPIPE. NRSP endorsement will assure that products of research are reintegrated into new ipmPIPE components.

Research is the primary function of this NRSP, but working with extension communicators to share the research outcomes is also important in the long term. Extension involvement in ipmPIPE components fosters development of educational programs and communication pieces for the intended research and user audiences, and State Agricultural Experiment Stations and Agricultural Research Directors (SAES/ARD) organizations, funding agencies, and policy initiatives to document impact of the ipmPIPE NRSP and maintain a proactive approach to addressing pest and disease management issues that are national and transnational in scope. The NRSP will explore and encourage novel and innovative ways to link to eXtension and possibly other more diverse partnerships to deliver outcomes from the research. One approach would be to link to crop specific communities of practice in eXtension as communication portals. Other approaches for consideration might include webinars through eXtension, the Plant Management Network, or other newly established outlets.

However, it is only through concerted research that extension programs are able to provide producers with the best information to guide their decision process. What has been done so far with pest monitoring and risk modeling/forecasting is essentially a proof of concept that is leveraged by the past history of pest observations as a rich resource that is too valuable to risk losing. In fact the progression of activities is similar to the progression of activities that led to disjointed state by state pest survey that were eventually brought together in the Cooperative Agricultural Pest Survey (CAPS). The ipmPIPE was a further evolution of that philosophy and now we have the potential to take that philosophy to the next step.

Outreach and Communications activities will be formally evaluated to measure accomplishments and impacts of the ipmPIPE NRSP (for example, through user surveys, focus group meetings, conferences, and economic analyses). Results of the ipmPIPE NRSP will be shared at annual

stakeholder meetings, scientific society symposia, and via communications pieces and reports to administrative advisers and committees.

Organizing committee:

Eileen Cullen, University of Wisconsin, Madison

Frank Zalom, University of California, Davis

Jim Van Kirk, North Carolina State

Paul Jepson, Oregon State University

Harold Coble, ARS

Gail Wisler, ARS

Martin Draper, NIFA

Kitty Cardwell, NIFA

Michel Desbois, NIFA

Projected Participation

Include a completed Appendix E

Budget Requests Summary

Include a completed Appendix F

Literature Cited

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Links to partner websites:

CDM (Cucurbit Downy Mildew) PIPE (http://cdm.ipmpipe.org/)

EDDMaps- Center for Invasive Species and Ecosystem Health (http://www.eddmaps.org/)

Legume PIPE (http://legume.ipmpipe.org/cgi-bin/sbr/public.cgi)

North Central ipmPIPE (http://apps.csi.iastate.edu/pipe/)

Onion PIPE (http://apps.planalytics.com/aginsights/pipehome.jsp)

Pecan PIPE (http://pecan.ipmpipe.org/)

Pest Watch (http://www.pestwatch.psu.edu/)

SBA (Soybean Aphid) PIPE (http://sba.ipmpipe.org/cgi-bin/sbr/public.cgi?host=All%20Legumes/Kudzu&pest=soybean_aphid&language_sel=1)

SBR (Soybean Rust) PIPE (http://sbr.ipmpipe.org/cgi-bin/sbr/public.cgi)

SCR (Southern Corn Rust) PIPE (http://sba.ipmpipe.org/cgi-bin/sbr/public.cgi?host=Corn&pest=southern_corn_rust)

Wheat Scab forecasting system (http://www.wheatscab.psu.edu/)

WSC (Western Specialty Crops)-PIPE (no public site yet - plans call for tracking of regional pests such as the Spotted wing Drosophila and Light brown apple moth - http://www.reeis.usda.gov/web/crisprojectpages/223836.html)

Attachments

[Appendix_E.docx] [Copy of 13456_AppendixF_MRF-Funding.xlsx] [Data center and IT requirements.pdf] [Investments_to_Date_.pdf]

Land Grant Participating States/Institutions

AL, CA-D, CO, GA, IL, IN, Kentucky Cooperative Extension, MI, NC, North Carolina Cooperative Extension, SD

Non Land Grant Participating States/Institutions

USA Dry Pea and Lentil Council

Appendix E: Format for Reporting Projected Participation

Part 1: Participant List

Station/Institution and Department	Participant	Objective No.	Research						Extension	
			KA	SOI	FOS	SY	PY	TY	FTE	Program
Alabama - Auburn	Edward J Sikora	2	216	2410	1060	0.10	0.10	0.10	0.00	

University										
California -Davis : University of California, Davis	Frank Zalom	1,2,3,4	211 216	2410 2410	1130 1130	0.10	0.00	0.00	0.10	
Colorado - Colorado State University	Howard Schwartz	2	216	1499	1160	0.10	0.10	0.10	0.10	
Georgia - University of Georgia	Joseph H LaForest	1,2	0	0	0	0.00	0.00	0.00	0.10	
Illinois - University of Illinois	Susan Ratcliffe	1,2,3,4	216	2410	1130	0.00	0.00	0.00	1.00	
Indiana - Purdue University	Eileen M Luke	1,2	216	2410	1060	0.00	0.00	0.00	0.10	• not specified
Kentucky Cooperative Extension	Paul Vincelli	2,4	216	2410	1060	0.00	0.00	0.00	0.00	
Michigan - Michigan State University	Ray Hammerschmidt	unknown	212	2410	1102	0.00	5.00	0.00	0.00	
North Carolina - North Carolina State University	Hannah J Burrack	1,2,3	216	2410	1130	0.00	0.00	0.00	0.75	
North Carolina Cooperative Extension	James R VanKirk	1,2	0	0	0	0.00	0.00	2012.00	0.09	
PRODUCER-USA Dry Pea and Lentil Council	Todd Scholz	1,2,3,4	902 601	1415 1415	3100 3100	0.00	0.10	0.00	0.10	• not specified
South Dakota State University	Marie A Langham	1,2	212 212 212 21	1412 1413 1414 141	1101 1101 1101 110	0.20	0.00	0.00	0.00	• not specified

			2	9	1					
			212	1410	1101					
			212	1411	1101					

Part 2: Research Summary

Combination of KA, SOI, and FOS	Total SY	Total PY	Total TY
0-0-0	0.000	0.000	2012.000
211-2410-1130	0.050	0.000	0.000
212-1410-1101	0.033	0.000	0.000
212-1411-1101	0.033	0.000	0.000
212-1412-1101	0.033	0.000	0.000
212-1413-1101	0.033	0.000	0.000
212-1414-1101	0.033	0.000	0.000
212-1419-1101	0.033	0.000	0.000
212-2410-1102	0.000	5.000	0.000
216-1499-1160	0.100	0.100	0.100
216-2410-1060	0.100	0.100	0.100
216-2410-1130	0.050	0.000	0.000
601-1415-3100	0.000	0.050	0.000
902-1415-3100	0.000	0.050	0.000
Grand Total:	0.500	5.300	2012.200

Part 3: Extension Summary

Program	Total FTE
Grand FTE Total:	2.34

Appendix F: NRSP Budget Requests Summary

I. MRF Funding

Description	FY (2012)		Proposed FY (2013)		Proposed FY (2014)		Proposed FY (2015)		Proposed FY (2016)	
	Dollars	FTE	Dollars	FTE	Dollars	FTE	Dollars	FTE	Dollars	FTE
Salaries			103,000	1.00	106,090	1.00	109,273	1.00	112,551	1.00

Fring Benefits			0	0.00	0	0.00	0	0.00	0	0.00
Wages			0	0.00	0	0.00	0	0.00	0	0.00
Travel			10,000	0.00	10,000	0.00	10,000	0.00	10,000	0.00
Supplies			22,000	0.00	18,910	0.00	15,727	0.00	12,449	0.00
Maintenance			15,000	0.00	15,000	0.00	15,000	0.00	15,000	0.00
Equipment/ Capital Improvement			0	0.00	0	0.00	0	0.00	0	0.00
Total			150,000	1.00	150,000	1.00	150,000	1.00	150,000	1.00
Comments										

II. Other Sources of Funding