

PDP Proposal

Professional Development Program

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Title: Plant Disease Diagnostic Training for Agricultural Professionals in Guam and the Northern Mariana Islands

Subject Matter Area: Education and Training

Funding Request: \$63,900.00 - Years - \$22,000.00 / \$35,400.00 / \$6,500.00

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(confirmed - 10/28/2013)

Associated Documents:

- **Letter of Support Subcontractor S. Cohen** - APP1606_190304.pdf
- **Budget Justification** - APP1606_190454.pdf
- **Signature Documents** - APP1606_190601.pdf
- **Vitae PI Robert Schlub** - APP1606_211345.pdf
- **Vitae Subcontractor Susan Cohen** - APP1606_211511.pdf
- **References** - APP1606_213106.pdf

Summary:

Guam and the Commonwealth of the Northern Mariana Islands (CNMI) are constantly under pressure from plant diseases due to the islands' tropical climate, yearly movement of nearly 2 million tourists and residents, and importation of fresh produce. The plant disease diagnostic services in Guam and CNMI, once provided by specialists in plant pathology are now being shifted to agricultural professionals with little formal training in plant pathology. There were four individuals with doctoral degrees actively engaged in plant pathology in Guam and CNMI in 1995, currently only Dr. Schlub in Guam remains and he is approaching retirement. The goal of Dr. Schlub's grant is to increase the viability of small commercial and subsistence farming operations in the region by reducing the impact of plant diseases. Project objectives: 1) Improve the ability of agricultural professionals to conduct education programs on diagnostics and to respond to inquiries about 'sick' plants from commercial farmers, gardeners, and the public; and 2) Bring awareness to agricultural professionals of the importance of surveying and monitoring for diseases as parts of an integrated plant disease control program. Project activities: 1) Centralize plant disease information and publish a list of plant diseases for Guam and the CNMI, 2) Develop and publish a diagnostics manual for Guam and CNMI, 3) Conduct a four-day diagnostic workshop, and 4) Evaluate project success and identify opportunities for future plant pathology related activities.

Introduction:

Justification for this project is predicated on the belief that early and accurate diagnoses and pathogen surveillance on local, regional, and global scales are necessary to predict outbreaks and allow time for development and application of mitigation strategies necessary to sustain agriculture production. Unfortunately, diagnostic capabilities in the region are in jeopardy. There were four full-time doctoral positions in plant pathology in the region in 1995: Northern Mariana Islands College (NMC) research and extension, Dr. Diana Greenough; Guam APHIS and PPQ, Dr. Mitchell Nelson; University of Guam (UOG) Agriculture Research Station, Dr. George Wall; and UOG Cooperative Extension, Dr. Robert Schlub. The UOG extension plant pathologist position is the only position currently filled. To address this shortfall in specialists, agricultural professionals are being asked to take an active role in field diagnostics. However, most have not received any formal training in plant pathology.

The purpose of this project is to build agriculture professionals' skills and knowledge of plant diagnostics. They will also become aware of the importance of surveying and monitoring for diseases as a precursor to the application of chemical control practices. Through training, these professionals will be able to identify and scout for the majority of the common plant diseases in Guam and CNMI and triage to the specialists those diseases that pose the greatest risk to island agriculture. Attendees will be provided with the necessary training and materials to conduct their own training for farmers and other constituents.

There are few factors that would likely influence the implementation and success of the project. The project is not dependent on the outcome of experimentation or surveys, but instead is derived from plant diseases related material that already exists in Guam and CNMI (Russo et.al.1985; Schlub and Yudin eds. 2002; Wall 1987, 1988, & 1991; Yudin and Schlub eds., 1998). Market forces will not likely impact the workshop because it will be held at the University of Guam. Political influence will not likely impact the project because the topic is not political in nature nor is the course required to meet any regulatory agency criteria. To reduce professional bias, instruction will be shared between the PI and subcontractor.

This project supports WSARE program goals while remaining unique among funded projects. As a result of a search of the various databases (National SARE, National Agricultural Library and USDA-NIFA-CRIS) it was concluded that no other project had such a broad scope with respect to diagnostics and plant diseases in Guam and the Northern Mariana Islands, with the exception of the Dr. Schlub's 1999 WSARE grant: Strengthening Through Education the Sustainability of Solanaceous Crop Production in the Western Pacific Region (Schlub, 1999).

Objectives and Timetable:

The purpose of this project is to provide plant diagnostic training and support for those engaged in providing advice to producers of agronomic and horticultural crops. The corner stone to this training project is a four-day diagnostic workshop where agricultural professionals will learn about plant diseases and diagnostics. For the participants to gain fully from the workshop experience and to ensure success of the training project there are various activities that need to be completed and objectives met.

Pre-workshop, September 2014-March 2016: Activity (1) Centralize plant disease information and publish a list of plant diseases for Guam and the CNMI: "Plant Diseases in Guam and Northern Mariana Islands." Activity (2) Develop a working draft diagnostics manual for Guam and CNMI: "Diagnostic Manual for Plant Diseases in Guam and the Northern Mariana Islands." Trainees will be encouraged to provide literature and editorial comments during this stage.

Activity (3) Conduct a four-day plant disease diagnostic workshop, March 2016: Objective (1) Improve the ability of agricultural professionals to conduct educational programs on diagnostics and to respond to inquiries about 'sick' plants from commercial farmers, gardeners, and the public. Objective (2) Bring awareness to agricultural professionals of the importance of surveying and monitoring crops

as a component of an integrated plant disease control program. The workshop will emphasize diagnoses based on field symptoms and those revealed through the use of a hand lens. The PI and subcontractor will provide the bulk of the instruction with individual trainees providing examples from their own experiences. The first three days will be a mix of field trips, lectures, and hands-on examination of samples. Trainees with access to their own laboratories will receive instruction on laboratory diagnostic techniques, whereas others will receive additional training in basic field diagnostics. To assist trainees in passing on their newly gained knowledge, a plant clinic will be set up in conjunction with the Guam Nursery's Association's monthly plant sale. Commercial agriculture and horticulture producers and others involved in growing plants will be encouraged to bring plant specimens and ask questions.

Post-workshop, March 2016-March 2017: Activity (4) Evaluate project outcomes. Activity (5) Publish and make available to the public the project's disease list and diagnostic manual. As the result of various surveys given to the participants over the course of the project, a comprehensive evaluation will be produced. Trainees will be asked to comment on the project's disease list and diagnostic manual. Their suggestions for future workshops will be solicited. After the incorporation of participant comments, the documents will be placed on the UOG website. One hundred photo quality copies of the final diagnostic manual will be produced and distributed to participants and others.

Relevance to Western SARE Goals/Sustainable Ag:

Our proposal addresses Western SARE goals 1, 2, and 3. (1) It promotes good stewardship of natural resources by providing plant disease resources and training that strengthen agricultural competitiveness. (2) It ensures the viability of rural communities by reducing the impact of plant diseases on productivity and profitability of those engaged in agronomic and horticultural crops production. (3) It protects the health and safety of those involved in food and farm systems by raising awareness of the importance of surveying and monitoring for plant diseases before toxic chemicals are applied.

The buy-in by agricultural professionals for training in plant diagnostic and surveying and monitoring of diseases was established from strategic planning sessions in 2012-2013. Three strategic planning sessions were conducted and funded by the EIPM-Coordination Development Grant Coordinator program (Schlub, 2013). The 127 stakeholders formulated a list of IPM related activities from which UOG should seek funding. This list laid the foundation for the funding of an EIPM coordination grant for Guam for FY 2013-2015 (Schlub, 2013). In the grant \$9,262.50 was budgeted to support diagnoses of pests and diseases and their reporting to the Western Region. Funding from EIPM and other sources will enable the disease list "Plant Diseases of Guam and Northern Mariana Islands" and diagnostic manual "Diagnostic Manual for Plant Diseases in Guam and Northern Mariana Islands" to be updated in the years to come.

Methods:

The training team of PI, Dr. Robert Schlub, and principal participant, Dr. Sue Cohen, believe that providing proper supporting materials and conducting an effective plant diagnostic workshop will increase the viability of small commercial and subsistence farming operations in the Mariana Islands for agricultural professionals in Guam and the Commonwealth of the Northern Mariana Islands (CNMI). This belief is predicated on a number of assumptions that the training team have addressed: (1) Trainers are experts in plant pathology, have familiarity with plant diseases of the region, and have experience in writing extension type literature; (2) The trainers have a track record of conducting successful workshops; (3) The workshop will follow the "Train the Trainer" model of the United Nations Economic and Social Commission for Asia and the Pacific (2001); (4) The trainees are actively engaged in advisement of producers of agronomic and horticultural crops; (5) The workshop will keep trainees engaged by providing both classroom and field instructions; and (6) Trainees will be given opportunities to enrich the course by providing diagnostic examples based on their own experiences.

A broad array of resources will go into making this proposal successful. Other than direct financing from WSARE, indirect contributions will come from salary support for PI and agricultural professionals from their respective agencies. Human resources include those paid directly through the grant (Extension Associate/Graduate Student, project participant Dr. Sue D. Cohen) and indirectly (agricultural professional trainees and staff of Guam Cooperative Extension Service). Farmer volunteers will host workshop field trips and ornamental producers will host a half-day plant clinic. Partnerships include agencies on Guam and CNMI: USDA Natural Resources and Conservation Service, Northern and Southern Soil and Water Conservation Districts, University of Guam-Cooperative Extension Service (UOG-CES), Guam Department of Agriculture (DOA), Northern Mariana College Research and Extension Services, and CNMI state forestry. Reference resources for the project's disease list and diagnostic manual include annual reports, fact sheets, posters, and journal articles from Guam and the CNMI. Equipment and supplies include those provided by UOG-CES (Xerox ColorQube 9202 color printer, dissecting and compound microscopes, vehicles) and those provided through project funding, i.e. hand lens, wide angle/macro lens for the apple/android phone (Photojojo), USB digital microscope camera attachment for desktop/laptop computers (Rushing, Hurst, and Sheehan, 2006). Supporting affiliations through training team's ties include American Phytopathological Society, Western Integrated Pest Management Center, Western National Plant Diagnostic Network, and extension.

The "Train the Trainer" methodology will be used in this project (Train the Trainer, 2001). Year one activities: Subcontractor will search the following scientific literature databases: Agricola, CAB, Abstracts, BIOS, and Pubmed Entrez for relevant citations that describe plant diseases in Guam and CNMI and add findings to the disease list compiled by the Research Associate. The taxonomic nomenclature of the plant pathogens listed will be verified if possible through various web resources (American Type Culture Collection, Index Fungorum, NCBI

Nucleotide Database, bacterio.net, ICTVdatabase) and experts.

Year two activities: Prepare a working draft workshop diagnostic manual. Manual will include new photos taken as seen through a hand lens, wide angle/macro lens for apple/android phones (Photojojo) and a USB digital microscope laptop camera and existing photos from UOG crop production guides (Schlub and Yudin, 2002; Yudin and Schlub, 1998). On Guam, 15 trainees will attend the workshop on plant disease diagnostics. The workshop will include three days of field trips, lectures and laboratory examination of plant samples. On request, some trainees will be given additional specialized instruction in laboratory diagnostics techniques. The fourth day will be devoted to a plant clinic, where trainees will answer questions from the public on plant problems. Before and after questionnaires will be used to assess and measure the trainees' gain in knowledge. Formative and summative evaluation of the training workshop and overall project will be conducted.

Year three activities: The outreach survey will be created in the third year and sent electronically to participants by email. The survey will be created on a web site called SurveyMonkey and distributed by email to participants of the training course as described by Gugino and Abawi (2010). The survey generates outcome indicators such as how often participants use their newly acquired knowledge of plant diseases, how often they use the project documents and training materials, the number of people they have trained in the follow-up year, and the number of cases where their advisement reduced the impact of diseases on crop selection, profits, or yields. After input from trainees, a final diagnostic manual will be written and hosted on UOG-CES website.

Products:

This project will benefit Guam and Northern Mariana Islands agricultural communities by producing six products continued within five product categories.

Educational category: (1) A disease checklist of plant diseases, hosts and pathogens: "Plant Diseases in Guam and Northern Mariana Islands." Checklist will index diseases by host, then by host part and then by pathogen groups. This approach will assist current trainees to finding information quickly and will be user friendly for others in the future. (2) Disease diagnostic manual: "Diagnostic Manual for Plant Diseases in Guam and the Northern Mariana Islands." Citations will be downloaded into the bibliography library software, Endnote. Papers, if available, will be downloaded and linked to the library. A subject bibliography report based on plant pathogen groups will be created to determine if additional literature searches will be needed. The project will take the current patchwork of annual reports, production guides, and fact sheets that cover some 200 plant pathogens and extract from them islands' plant diseases and associated pathogens (Russo et.al.1985, Schlub and Yudin eds. 2002, Wall 1987, 1988, & 1991, Yudin and Schlub eds., 1998). The diagnostic manual will be of similar quality and thoroughness as exhibited in other manuals of Dr. Robert Schlub (Schlub and Yudin, 2002; Yudin and Schlub, 1998; Schlub, 2011; Schlub, et al., 2013). Links to the websites for these publications are located in the "References" section. Results of the literature searches may be shared as an Endnote library export or may be exported as a Microsoft Word document or Adobe PDF document.

Conference category: (3) A four-day plant disease diagnostic train the trainer workshop. In addition to agricultural professionals gaining diagnostic skills and knowledge, they will also become aware of the importance of surveying and monitoring crops as a component of an integrated plant disease control program. Attendees will be provided with the necessary training and materials to conduct their own training program for farmers and other constituents.

Demonstration category: (4) How to use a hand lens and take close-up photographs through a wide angle/macro lens adapter for apple/android phones, and a digital microscope designed for use with laptop computers. (5) Basic diagnostic laboratory techniques. Topics covered will be simple techniques for preparing slides of infected plant tissue and fungal structures, isolation of fungi and bacteria on culture media, and nematode extraction.

Partnership category: (6) Through the workshop experience, agriculture professionals from Guam and the CNMI will strengthen their ties. Within their respective islands, trainees will build new partnerships with farmers, farmer co-ops, nursery associations, local agencies, and the public.

Outcomes:

The long-term outcome/impact of this project is to increase the viability of small commercial and subsistence farming operations in Guam and CNMI (Commonwealth of the Northern Mariana Islands) by reducing the influence of plant diseases. This will occur as the result of improving the diagnostic skills of those that interact with farmers on a daily basis, the agricultural professionals. As a result of training, agricultural professionals diagnostic practices will improve, their recommendations will be more in-depth, and their response to new disease outbreaks will be more effective and quicker. A measureable outcome of the project will be a reduction in the percentage of farmers that consider plant diseases as a restraint to crop selection, profits, and yields.

The outputs from this project that are driving the long-term outcome are the project's four-day workshop and training materials, and the 15 participants. The training materials will incorporate information developed on Guam for the Western NPDN (National Plant Diagnostic Network) and Western SARE (Sustainable Agriculture Research and Education) program. The instructional material will be placed on the

UOG extension website for use by other trainees in the future. Eleven agricultural professionals from Guam, three from Northern Marianas College and a CNMI State Forester will gain in their plant diagnostic skills and in turn pass these skills to others.

As a result of the workshop, agricultural professional attendees will be able to separate plant symptoms and signs caused by plant pathogens from those caused by poor cultural practices, insect pests, and weeds. They will learn how to subdivide plant disease symptoms into those caused by fungi, bacteria, virus, others. In addition, trainees will gain awareness of the importance of disease surveillance and monitoring as a precursor to the use of chemical control measures. Over the course of months, trainees will incorporate their new knowledge and skills into workshops of their own.

Evaluation:

A survey evaluation plan will be used to assess project activities, objectives, and outcomes. The majority of the surveys will take the form of paper-and-pencil questionnaire, while others will be interview in nature. The evaluation plan will be conducted by the University of Guam's Western Pacific Tropical Research Center. The results of the evaluation plan will be analyzed qualitatively using the pre-defined rating categories used in the questions or defined content variables for text in some questions. Microsoft EXCEL will be used to determine frequencies of categories and content variables and to display information in tables and figures. The plan is free to produce and distribute with minimal costs for labor.

The evaluation plan uses two evaluation approaches: formative and summative. The formative evaluation process allows the PI and subcontractor to gain feedback on activities (plant disease list, the diagnostic manual, and daily workshop sessions), while the summative evaluation processes provides information on project objectives and impacts (improving diagnostic skills, bring awareness of the important of disease monitoring, and reducing impact of diseases on island agriculture). Questions for the formative evaluation of project's activities will consist of two questions: was the activity informative and how can the activity be improved? Questions for the summative evaluation of projects objectives will consist of questions given on the final day of the workshop and 6 months later as part of an outreach survey.

The outreach survey will be created in the third year and sent electronically to participants by email. The survey will be created on a web site called SurveyMonkey and distributed by email to participants of the training course as described by Gugino and Abawi (2010). The survey generates outcome indicators such as how often participants use their newly acquired knowledge of plant diseases, how often do they use the project documents and training materials, the number of people they have trained in the follow-up year, and number of cases where their advisement reduced the impact of diseases on crop selection, profits, or yields.

EW14-006: Project Budget: \$63,900.00

	Year 1	Year 2	Year 3	Total
Projected Salary Expenses				
Senior Personnel	0	0	0	0
Senior Associates	0	0	0	0
Research Associates	7692	7692	2308	17692
Other Professionals	0	0	0	0
Graduate Students	0	0	0	0
Hourly Labor	0	0	0	0
Clerical	0	0	0	0
Technical/Shop/Other	0	0	0	0
Fringe Benefits	2308	2308	692	5308
Other Projected Expenses				
Non-expendable Equipment	0	0	0	0
Materials and Supplies	500	2500	0	3000
Travel (domestic)	0	8900	3500	12400
Publication Costs	0	0	0	0
Computer Costs	0	0	0	0
All Other Direct Costs	11500	14000	0	25500
Indirect Costs	0	0	0	0
Totals	22000	35400	6500	\$63,900.00