Internationalizing Extension with Stakeholder Training Meetings:
Use of a Distance Diagnostic Information System and Interactive Video

Pete Vergot III, Ph.D.,
District Extension Director,
University of Florida IFAS Extension,
155 Research Road, Quincy, Florida, USA,
Telephone: (850) 875-7137, Fax: (850) 875-7189,
e-mail: pvergot@ufl.edu

Tim Momol, Ph.D.,
Plant Pathology Extension Specialist,
University of Florida IFAS Extension

Abstract
The International Plant Diagnostic Network (IPDN) was developed to assist in food safety and the protection of crops for citizens of the United States of America and international host countries. IPDN used the model of a system of diagnosing plant problems and information sharing. This model was developed among the Land Grant Universities in the United States as part of the “Homeland Security” response to develop strategies to crop biosecurity for the producers of the U.S.

Early activities of the IPDN plan included a stakeholder meeting and training session of increasing communications and plant pathogen diagnostic tools in Western Africa. To train the stakeholders on communications and digital diagnostics a hands-on four day training was offered in collaboration with the International Institute of Tropical Agriculture (IITA) located in Benin, of Western Africa. The agenda included seminars, discussion, workshops for practicing new techniques and laboratory training on scientific techniques for 47 participants from 32 NGOs, Research and Extension departments located in 13 countries of Benin, Burkina, Faso, Cameroon, Cote D’Ivoire, Ghana, Guinea, Mali, Niger, Nigeria, Senegal, Sierra Leone and Togo.

During the stakeholder meeting, participants gained knowledge and skills of using a Distance Diagnostic Information System (DDIS) and the use of web-based interactive video to communicate across countries. This paper will focus on the Distance Diagnostic Information System (DDIS) and the use of web-based interactive video to increase communications for the West African Plant Diagnostic Network (WAPDN), across Western Africa and Land Grant Universities in the United States.

Keywords: Extension, stakeholder, communications
**Introduction**

The International Plant Diagnostic Network (IPDN) was developed to assist in food safety and the protection of crops for citizens of the United States and other selected countries. The four year project is funded by a USAID grant. The three areas of the world that are included in the IPDN are the East African Plant Diagnostic Network (EAPDN), the West African Plant Diagnostic Network (WAPDN), and the Caribbean Central American Plant Diagnostic Network (CCAPDN). IPDN uses the model of a system of diagnosing plant problems and information sharing, National Plant Diagnostic Network (NPDN), developed among the Land Grant Universities in the United States as part of the “Homeland Security” response and to develop strategies which will increase crop yield and quality for the producers of the U.S. The USDA funding from CSREES NPDN was recently established, linking Land Grant University diagnostic laboratories to each other, state departments of agriculture and USDA Animal and Plant Health Inspection Service (APHIS) (Miller 2005).

IPDN expands on the NPDN model to include other areas of the world in an attempt to solve the problems of plant diseases at the source of the problem in the three selected areas of the world. This is accomplished by collaboration and assisting others with diagnostic training, information and tools to combat plant diseases by the transfer of knowledge of the U.S. Land Grant University system. Plant diseases are estimated to cause more than $80 billion in annual economic losses worldwide (Agrios 1997). Losses are particularly felt in developing regions, where agriculture is a major source of livelihood for a majority of the population and access to strategies for disease management are limited. Plant disease diagnosis is a critical first step in disease management and if symptoms are ill defined, it is not possible to associate them with the causal organism (Derrick & Timmer, 2000).

Early activities of the IPDN plan included a Stakeholder (Plant Pathologists, Extension and Research Faculty, staff and students) meeting and training session of communications and plant pathogen diagnostic tools for the Western Africa region. During the stakeholder meeting held in cooperation with faculty at the International Institute of Tropical Agriculture (IITA) in Cotonou, Benin, participants learned and gained experiences of world experts on symptom recognition and the diagnoses of pathogens, control options and dissemination of results. Stakeholders included personnel from NARS, NGOs, universities, private firms, agriculture ministries, USAID Missions, farmers, local government units, traders, seed producers, and others who are working to assist farmers on recommend appropriate IPM solutions to protect crops from diseases. The following will describe the first Stakeholder training section on the activities and successes that relate to the two issues of the University of Florida IFAS Extension Distance Diagnostic Information System DDIS and how Extension and Research Faculty use new web-based tools of interactive video. The specific interactive video are the software programs of “Skype” http://Skype.com and hardware and software from the manufacture of “Polycom” http://Polycom.com used to communicate within and across countries of Western Africa and the U.S.

**Purpose**

The impact of plant disease on the agriculture of West Africa, the most poverty stricken region of the world, is immense. The lack of technical ability to diagnose the causal agents of disease and disseminate this information through a network of stakeholders prevents the adoption of appropriate IPM solutions (Waller et al 2002). Two of the objectives of the IPDN workshop held in Benin, West Africa were to: (1) increase communications of the stakeholders of the area and...
(2) to introduce and to develop new diagnostic techniques allowing for the increase in Integrated Pest Management (IPM) practices for farmers of West Africa.

IPM strategies will increase crop yield and quality, which can directly impact women who are charged with the responsibility of producing and selling produce from subsistence agriculture and feeding their children. In detail, agricultural technical change through diagnoses of diseases will have positive impacts on women and children in three ways:

1. Reduced crop losses and higher yields due to disease identification and control will increase the food supply and lower the burden of food provision by women who are responsible for food security in many African farm-households. The increased incomes from higher food supply out of pests and diseases control will raise effective food demand or the quantity of food and services purchasable by higher incomes. Women and children from food insecure households may benefit from adoption of pathogen management technologies by being able to afford more food;

2. Higher food quality through pathogen control will attract higher price premium and hence higher incomes to buy food for women and children. Improved food quality will decrease under-nourishment for vulnerable segments of the population who are poor and pregnant women and children. Higher food quality through pest management will also decrease the health expenses and increase the supply of cash available for food, goods and services for poor households which are usually managed by women; and

3. The diagnosis and IPM of pathogens will reduce the use of chemical pesticides and the health risks to vulnerable populations who are poor and pregnant women and children under 5 years. The consequent saved health costs could be used to purchase more food, goods and services for the households (Miller 2005).

Methods

To train the stakeholders on communications and digital diagnostics a hands-on four day training was offered in collaboration with the West African Plant Diagnostic Network (WAPDN) at the center of International Institute of Tropical Agriculture (IITA) located in Benin, in Western Africa. The agenda included seminars, discussion, workshops for practicing new techniques and laboratory training on scientific techniques for 47 participants from 32 NGOs, Research and Extension departments located in 13 countries of Benin, Burkina, Faso, Cameroon, Cote D’Ivoire, Ghana, Guinea, Mali, Niger, Nigeria, Senegal, Sierra Leone and Togo.

The training was conducted by extension and research specialists from Ohio State University, University of Florida, University of California – Davis, International Institute for Tropical Agriculture, specialists from NGOs in the U.K. and administrators of USAID and FAO. Time was allowed during the conference for participants to share what they currently utilize and what their needs are for both gathering information on plant pathogens and how they then share results with their clientele. To accomplish the goals of the project two web-based technologies were introduced to the stakeholders, one being the use of web-based interactive video and the other a web-based digital diagnostic tool of the University of Florida IFAS Extension, web-based software of the Distance Diagnostic and Identification System (DDIS), a tool for assisting in the timely diagnosis of plant pathogens.

The agenda of the stakeholder training included and overview of the use of DDIS and how Extension and Research Faculty use new web-based tools of interactive video specifically with the software of “Skype” and hardware and software from the manufacture of “Polycom”.

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The next phase of the workshop included multiple hands-on training to give an overview and time for real-life training of the web-based DDIS software and the equipment of special adapters of digital cameras connected to microscopes that are needed to successfully use the software. The system allows users to submit digital samples obtained in the field for rapid diagnosis and identification of pests, plants, diseases, insects, and animals.

Currently scientists and Extension workers request identification assistance by attaching a file to an email or by posting pictures to the web then asking another scientist or Extension worker to identify the problem. The main issue with this current practice is that many small email systems and computer hard drives cannot transmit or process the large size of the digital picture files and if they do the email process is a one-time use that does not develop a database of the pest problems with a way to record the diagnosis. This system has to be repeated each time a new problem was in need of diagnosis.

The DDIS system provides an environment for the Extension workers, plant pathologists or their staff to share information on plant diseases and insects that are carriers of disease. The DDIS software is designed to assist the Extension workers, plant pathologists and their staff to:
1. reduced response time for diagnosis of some diseases, current success rates of identification using the system in Florida are 60% for plant diseases and 80% on insect identification,
2. improved communication between users and clinics,
3. increased knowledge of diagnostics, digital imaging and information technologies throughout the West Africa, and
4. create databases of images of signs and symptoms of diseases and insects that transmit diseases.

Through interactions on the Internet between Plant Pathologists, Extension workers and other specialists, problems can be quickly communicated and assessed. The Plant Pathologists, Extension workers and their staff can perform diagnosis and identification and provide best management practice recommendations to the crop producers. The advantages of the University of Florida IFAS Extension DDIS system allows users create a digital image library with associated site, crop, and pest or disorder data that could be used in educational programs, assisted diagnosis, and data mining. The University of Florida IFAS Information Technology department programmers are modifying the current DDIS system to allow for a multi-country regional approach in DDIS operations and management.

For the second communications component the instructor demonstrated in a computer laboratory during multiple hands-on workshops how other Land Grant University Faculty utilize both the Polycom and Skype web-based interactive video software programs across the world. These web-based software programs allow for interactive video and audio for communication from a single location to single location, in addition the Polycom Software and appropriate hardware allows multiple users to communicate simultaneously. Currently the University of Florida IFAS Extension can offer up to 60 users via a video bridge located in Gainesville, Florida. In addition to software, discussions and demonstrations on the appropriate video cameras and their use were examined along with appropriate use.

Both of these interactive video technologies are similar in that they provide for two-way audio and video discussion via the World Wide Web though an Internet Protocol (IP) address at each site. During the training, the participants had the opportunity to discuss how they would utilize the software at their respective institutions in the future for identifying plant pathogens...
and communicating with each other via the new web-based interactive video software. Continued training will be needed to implement the diagnosis software and the web-based interactive video applications.

Results

The USAID funding backing the project allowed the West African Plant Diagnostic Network (WAPDN) consortium to utilize specialty software of communications and web-based interactive video, to ease the distance and costs of communications and diagnosis and to develop new diagnostic techniques.

The first objective of developing new diagnostic techniques was accomplished by introducing the University of Florida IFAS Distance Diagnostic and Identification System (DDIS), a tool for assisting in the timely diagnosis of plant pathogens. Workshop participants discussed how the DDIS system allows users to submit digital samples obtained in the field for rapid diagnosis and identification of pests, plants, diseases, insects, and animals. The participants of the training observed how DDIS provides for an environment for agricultural extension workers and scientists to share information on plant diseases and how problems can be quickly communicated and assessed, which helps clientele with their pest problems.

The second objective of increasing communications among plant pathologists, extension workers and staff of the West African region was accomplished by introducing and training the participants to use web-based interactive video software tools from “Polycom” and “Skype”. Both of these web-based software tools allow individuals and groups to communicate with both voice and video without the costs of long distance travel or cost. Participants discussed the benefits of increased communications, how they could utilize these new techniques and how they would use the software in their day-to-day activities while assisting clientele.

Some of the roadblocks to implementation and success were discussed during the reflection section of the workshop. Many of the Scientist, Extension workers and staff of the Extension and Research units have access to the World Wide Web and other communication services, however the amount and speed of current bandwidth at their laboratories and offices will be a deterrent to success by many participants. This bandwidth is needed to utilize the video component of the web-based interactive video. Other obstacles include the availability of increased computer processor speed and hard drive capacity, availability of low cost digital video cameras that are adaptable to microscope use. In some cases basic issues of dependable electrical and telephone connections are an issue. Discussions were held on how to overcome these issues and allow for successful sharing of ideas and assistance to clientele of Western Africa.

Importance

The successes of this stakeholder meeting and training session allowed for an increased knowledge of all participants. An evaluation tool was distributed to the participants and is currently being analyzed to determine what areas need to be enhanced for future training workshops. Further results and outcomes from other regional workshops are posted on the web at http://www.intpdn.org/.

The use of stakeholder meetings continues to be an important tool for Extension. Extension Faculty worldwide can effectively utilize many tools used during this project. By providing information and training of web-based communications and by sharing plant pathogen diagnostic tools and methods the farmers of Western Africa and the United States will have an opportunity to work together with the world-wide struggle of keeping the food supply safe for
human consumption. Lessons learned from this workshop will be used in enhancing the next workshop in Eastern Africa while in Kenya in March of 2007.

References