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## **Invasive Pest Management A Case for Benchmarking the Emergency Response Process**

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Invasive Pest Management  
A Case for Benchmarking the Emergency Response Process

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## TABLE OF CONTENTS

Abstract.....	3
Introduction.....	4
Literature Review.....	12
Research Methods.....	17
Conclusion and Recommendation.....	27
Literature Cited.....	38

## ABSTRACT

The Plant Health Emergency Response is tasked to the United States Department of Agriculture's Plant Protection and Quarantine program in the event of a newly detected exotic plant pest. The four pronged approach of prevention, preparedness, response and recovery provide the umbrella of crop biosecurity and emergency response. Within the structure of PPQ, the State Plant Health Director (SPHD) has the authority of establishing and executing the operational objectives of managing the response efforts. Working collaboratively with other public and private entities, the SPHD ensures that program efforts are effectively performed to maintain the status of an adequate food supply. Should the response process fail, the economic and environmental impacts of an established pest population would be witnessed in increased pesticide applications, increased food prices and a loss of trade.

As a tool in the response efforts, New Pest Response Guidelines (NPRG) are developed by the Emergency and Domestic Programs Emergency Planning Team, for exotic pests that have yet become established in the United States. In the developing stages of an emergency response, the NPRG provides the information needed to adequately respond to a plant health emergency. This study examines the use and implementation of the NPRG by the SPHD as its function in the plant health emergency response and the methods to improve its impact in the response process. The research should demonstrate if the NPRG are being utilized as intended.

## INTRODUCTION

### **Research Question**

The New Pest Response Guides, specific to a pest, are developed in preparation for plant health emergencies, in essence tools for first responders to use at the onset of a response effort. Response actions, such as survey, control and regulatory activities are developed to assist the SPHD and regional management in developing an effective program. Though constraints may develop at the onset of a program (operational, budgetary and political ramifications may ensue), the suggested methods may be different than actual procedures.

However, there currently exists no method of evaluating the recommended activities of the NPRG with operational activities on a program. After Action Reviews have never been developed, and likewise it is uncertain if NPRGs have ever been used in a response.

Consequently, the research question to be answered is '*Are the New Pest Response Guides used by Western Region State Plant Health Directors in a plant health emergency response?*'. In further research, I will be looking at three sub questions to be answered, those being, 1) *Are other resources being used to develop operational methods on a new plant health emergency program?*; 2) *If the NPRGs are not being used, then what is needed to promote their usage?*; and 3) *Are there organizational factors that may be hindering the usage of NPRG?*

## **Background**

The economic consequences of invasive pest introductions are staggering. In 2004 alone, the costs associated with invasive species topped over \$120 billion in lost output. (Kiplinger). Each year, the federal agencies spend over one billion dollars in managing invasive species (Invasive). With an ever increasing amount of agricultural trade entering the U.S., so too are the risks of invasive plant pests. The response efforts of mitigating, controlling and eradicating the spread of invasive plant pests are unique to each pest of concern, dependent on the pest biology, the acceptable control methods and the political ramifications enveloping the program. As such, for those pests that reproduce and spread rapidly, a quick turnaround time on developing response efforts may be a few days. In contrast, for those pests that quite some time to proliferate and spread, such as weeds or mollusks, the response efforts may be sufficiently increased to several years (GAO, 2001). When pest survey efforts at the state, local or national level result in the finding of a plant pest of national concern, and the decision has been made to conduct a response, federal actions begin.

Organizational communication becomes critical in the response process. First, knowing the biology of the organism is vital in the response efforts. Survey methodologies, control strategies and regulatory efforts are all dependent on the biological aspects of the plant pest. Drawing heavily on scientific experts and academia, the operational aspects of response are developed. Second, trade issues and the political climate weigh heavily on the response process. Industry groups and stakeholders share a voice in determining the response efforts of a particular pest response. Lastly, the

political aspects of a response and the trade challenges also impact an effective response process.

The article “A Threat to Agriculture and the Food Supply” identifies the gaps and loopholes present, stating that “should preventative measures fail, and the United States experiences an outbreak, the country would face challenges in responding quickly and effectively” (GAO). Focusing on an overall approach to the federal response to emergency programs in agriculture, it was evident that preventative measures and a forward approach were critical to program response time and success.

Pimental identifies that 50,000 invasive species may be present in the United States alone (Pimental, 2000). But how do these invasive species enter the country? Predicting which of these invasive species will arrive to our shores is uncertain. The three likely avenues of entry are ballast water from ships, cargo, and packing material (Jenkins, 1996). The trade of agricultural commodities brings with it the potential of infested plant material. Packing materials, such as wooden pallets or soil, may harbor pests of concern. In order to gauge the impact of a specific pest, a risk assessment is performed. Seen worldwide, risk assessments are scoring methods with which international guidelines and national agencies use to provide an explanation for the severity of a potential pest introduction (Holt, et al, 1996). Invasive species populations span geographic and jurisdictional boundaries; thus efforts to manage invasive species must be coordinated across boundaries (Draft, 2007).

On a global level, and mirrored at USDA-PPQ are the plant health management strategic goals of:

1) Prevention-Collaborating with international plant protection organizations and trading partners in the development of early detection and control activities.

2) Preparedness-Working with public and private industries to prepare, build, and sustain detection, pest diagnostic activities, and control strategies against plant health threats.

3) Response-Collaboration with public and private industries to contain, control or eradicate plant pests. The Incident Command System, an organizational tool to effectively manage resources is used by PPQ in response to plant health emergencies.

4) Recovery-Coordinating with agencies at the close of an emergency to develop long-term systems of stability and protection from the pest, such as regulations, eradication, restoration plans and best management practices (Crop Biosecurity).

### **Planning and Preparedness**

PPQ's Emergency and Domestic Programs oversees the planning functions for the plant health emergency response efforts. The program Planning and Preparedness is one of five components of plant health emergency management (Fig. 1).

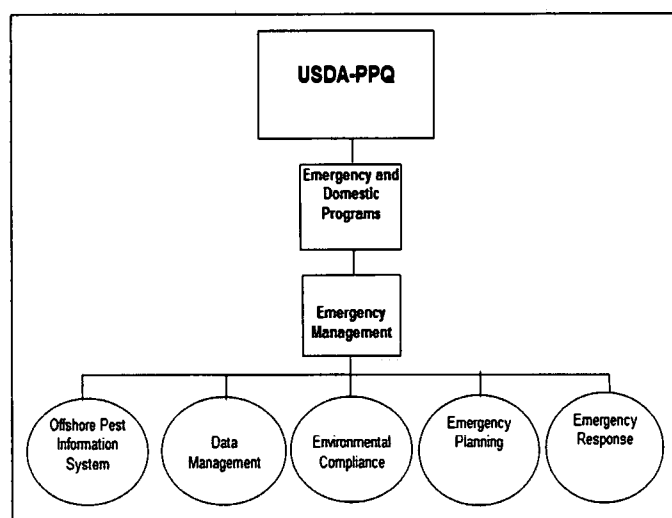


Figure 1. Organizational chart of PPQ's Emergency Management.

The primary components of emergency planning are to develop NPRGs for invasive pests of concern; establishment of Memorandums of Understanding (MOU) for states and tribal nations; and the oversight of the Emergency Response Manual. Of the three components, NPRG development is considered the most important constituent in regards to impact of a program. Moffit and Osteen point out the difficulties in planning for an invasive pest introduction, stating “Program officials make important preparedness decisions concerning many organisms, such as whether or not to collect more information about specific organisms and their potential effects; implement surveillance programs; develop management practices or strategies; ban or restrict imports; require import inspections or treatments; implement offshore management programs; develop plans for eradication, containment, or control strategies in response to pest detections; or implement information or extension programs to help growers identify and respond to a pest” (Moffitt & Osteen, 2006).

The inception of NPRG development began in the early 1980s with their precursor, then known as Action Plans. From 1982 to 1989, sixteen action plans were

completed for a variety of pests. In 1990, NPRGs began to replace the action, with the focus shifting from specific actions to a more general guideline. Since then, fourteen NPRG have been completed with sixteen still in draft form.

With a project timeframe of four to twelve months for the completion of a single NPRG, many resources and references are researched to develop a quality manual. Scientific and technical experts are tapped based on their expertise and knowledge of the specific pest, such as entomologists, plant pathologists, nematologists, university scientists, industry and government managers, and scientists at the international stage. As such, the collected information leads to the development of survey methods; biological and background information of the pest; potential control strategies; regulatory procedures; and diagnostic tools. These components are critical to the response efforts, providing project management the basic tools to begin a quarantine program.

### **Management of plant health emergencies**

Response activities are well known, especially for common types of emergencies, such as fires, earthquakes, floods or disease outbreaks. These services typically have the resources, funding and infrastructure available for rapid response. The two primary concerns that such emergencies are concerned with are 1) the protection of life and 2) the protection of property. However, in regards to invasive pest emergencies, there is the inherent lack of awareness of the costs involved and likewise a lack of adequate response system (Anderson, 2005). Two crucial differences in the response effort not present in emergency services but play a large part in plant health responses are trade and politics, both of which must be accounted for when pest is detected. Ultimately, stakeholder

concerns play a large part in the development of response efforts at the federal, state, and local level. Still, “eradication programs often cross jurisdictional lines and different stakeholders may view the costs and benefits of a management action differently” (Simberloff et al, 2005).

When a pest of national concern is detected, and the decision is made to control the pest, the Deputy Administrator of PPQ distributes a Declaration of Authority, a document authorizing the State Plant Health Director of the state of concern oversight of program management to reach agency objectives. At the organizational level, PPQ is divided into two regions, with the Western Region headquarters located in Fort Collins, Colorado, and the Eastern Region Headquarters located in Raleigh, North Carolina. The Western Region is composed of twenty-three states, with twenty-two state plant health directors overseeing management of PPQ’s activities in each state (Nevada and Utah are under management of one SPHD). Figure 2 highlights the separation of the two regions.

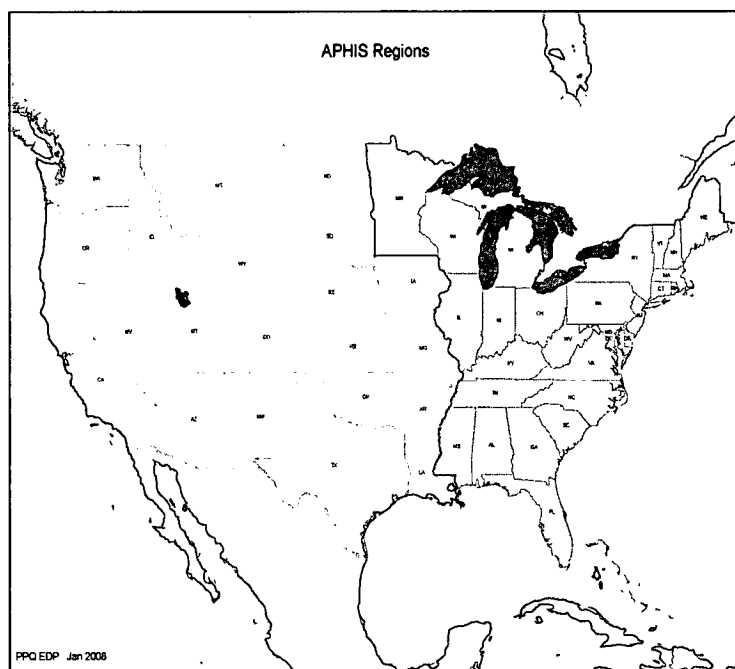


Figure 2. USDA-PPQ Western and Eastern Regions.

The SPHD will then initiate the initial emergency response efforts in collaboration with state and/or local agricultural authorities, usually with the Incident Command System as an organizational tool. Figure 3 describes the organizational chart of an emergency response. The SPHD, many times as the Incident Commander, will begin the process of defining objectives, allocating personnel and resources to accomplish objectives, and initiate a program headquarters or Incident Command Post.

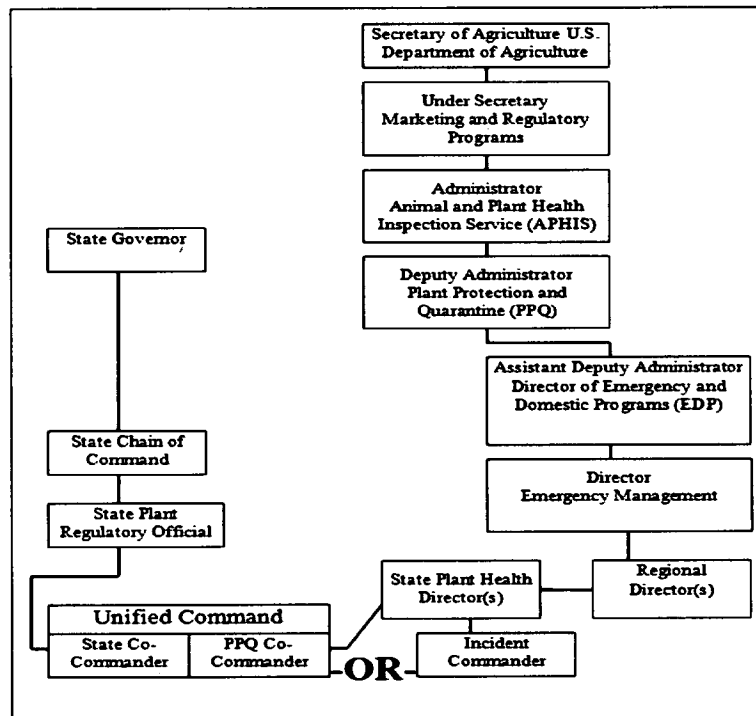


Figure 3. Organizational Structure of Emergency Response. From Draft PPQ Emergency Response Manual, 2008.

## LITERATURE REVIEW

In order to identify a specific problem within the plant health emergency response process, I had to delve into not only the issues surrounding the nature of invasive species (what is happening), but also what are the methods available to fix the problem (recommendations). In my efforts to investigate the invasive species problems, I found a sufficient number of journal articles that could provide the background of the research. I also researched several articles identifying benchmarking methods, tools for improving processes.

The 2001 GAO report “Obstacles Hinder Federal Rapid Response to Growing Threat” performs the duties wonderfully in describing the staggering effects of invasive species and the potential economic and environmental damages inherent with pest introduction. The article ties in beautifully with the research question by tying into the discussion the rapid response process. Though it is dated to 2001 and the major pests of PPQ concern at that time (Citrus Canker in Florida), a similar high profile pest of concern is under scrutiny today (Light Brown Apple Moth in California). The report identifies the challenges with the response process, and recommendation to overcome those challenges, including coordinated planning efforts, technical assistance, and program guidance.

Lars Olson article “The Economics of Terrestrial Invasive Species: A Review of the Literature” provides further information identifying the economic consequences of invasive species and how widespread of a problem it has become on a global scale (Olson, 2006). Olson touches on the raw numbers when describing control costs (over

\$120 billion in control costs in the United States). He also describes the various economic models available that researchers utilize to determine the impacts of invasive pests on the economy. Though I do not focus on any of the several statistical methods for research, the article provides a good building block for quantifying the problem.

Many articles are general in nature, describing invasive pests as a whole. The book "Invasive Arthropods in Agriculture" delves closer into the aspects of trade and the impacts of invasive species in agriculture. An entire chapter is devoted to regulatory plant health in the United States, which provided me with a solid foundation of the response process. What was interesting about this chapter was a discussion on evaluations and reports that had been performed, and the accompanying results. One key point that stood out was a study performed in 1985 which identified communication gaps between the federal response agencies and stakeholders, which appear to be a common problem over twenty years later, and becomes a recommendation I propose in the policy recommendation section (Hallman et al, 2002).

The history and background of the development of NPRGs was condensed in an eight page draft titled "New Pest Response Guidelines-History, Prioritization, and Workflow", of which I used to establish the foundation of my research. Joel Floyd, former Team Leader of Emergency Planning, is the author of the text and produced a valuable source of information to build a foundation of study. I also discussed with Mr. Floyd further points related to the document to fill in information gaps as needed.

In 1999, USDA-PPQ requested stakeholder input on the effectiveness of the safeguarding procedures being performed, published in the guide "Safeguarding American Plant Resources, A Stakeholder Review of the APHIS-PPQ Safeguarding

System”. The National Plant Board assembled reviewers from government and non-governmental agencies as well as academia and industry to research methods of improving PPQs core safeguarding activities. The major findings of the review are directly linked to my research and provide an excellent jumping off point for discussion. For instance, one of the recommendations mentioned was “Prepare emergency response guidelines for plant pests which pose an eminent threat to American plant resources” (Safeguarding, 1999). This was based on the finding that “The APHIS-PPQ does not have a well coordinated invasive plant pest response plan to involve State and Federal plant regulatory agencies and industry stakeholders”. Clearly, the point that is made is the lack of planning for plant health emergencies was evident, and that development of guidelines was required. Evidently, guidelines and action plan development started to occur with a more coordinated effort, which answers the recommendation. However, this leads us to our research, in which we look further and see if the guidelines are actually be used.

Improving organizational improvement and performance is a much studied area. One component of this is organizational communication. An article that added to my understanding of communication and its effects on organizational performance is “Penetrating the Performance Predicament: Communication as a Mediator or Moderator of Organizational Culture’s Impact on Public Organizational Performance”. Pointing out that little research is done in regards to the public sector and communication, a key point brought to attention links our study to a problem identified, that being the promotion of a product (NPRG) to improve the response process. “ It is those aspects of the priorities, criteria, and rituals that are actually communicated — that is, what receivers actually observe and interpret rather than what the senders intend — that has the most impact on organizational culture”(Garnett et al., 2008).

But how do we improve the effectiveness of programs or policies in the public forum? In the era of organizational improvement, "The Reinventor's Fieldbook" by Osborne and Plastrik provided a solid foundation on the aspects of creating change. In the avenue of improving government performance, the authors bring to light methods of change and steps to take to help foster an arena of public sector improvement. It is here that I gained a foothold on the concept of benchmarking performance, by definition "comparing the performance of different organizations", and the authors generalize a function by stating "...to undermine old mental models" (Osborne, 2000). Consequently this book opened the door for me to pursue different methods of benchmarking, and to further my knowledge of benchmarking as an improvement tool.

Evaluation of a program should be the cornerstone of improvement. In a brief sense: 1) Goals should be established and objectives communicated through a plan; 2) Execution of the plan; and 3) Evaluation of the process to establish what has worked and what needs to be improved. Unfortunately, there are no cases of evaluations having been performed for plant health programs and the impact of NPRGs. As such, I needed to visit various models of evaluation and using benchmarking and goal setting as a public policy tool.

Because the plant health emergency response is collaboration between federal, state and sometimes local agencies, evaluation, and its overarching theme of accountability is central to the improvement process. Is each agency performing its function? Is each agency contributing to the goal? Is each agency being held accountable to its stakeholders? Stephen Pages' article "Measuring Accountability for Results in

Interagency Collaboratives” is an excellent model of improving the processes. Page points out “An accountable collaborative, therefore, needs a measurement system to document its results and how those results change over time” (Page, 2004). The four aspects of his theory, 1) External authorization; 2) Internal inclusion; 3) Results measurement; and 4) Managing for results succinctly put together an effective method to transform the collaborative culture. Of the four aspects, the first three are well defined in PPQs safeguarding mission in the realm of trade, biology, and politics. However, ‘Managing for results’ stood out as the one key area that tied in to my knowledge of the subject-“the capacity to use data about results strategically to assess progress and to improve policies and operations in the future” (Page, 2004).

And as a follow up to Pages research was another journal article that shed light on collaboration in the public government titled “Can Agencies Work Together? Collaboration in Public and Nonprofit Organizations” by Joseph Grubbs. Reaffirming the roles of collaborative programs (as noted above), Grubbs likewise states “Categorical restrictions on budget resources, restraint of personnel, refusals to share information, these are some of the most prevalent ways in which prospective partners limit the engagement, and in time the effectiveness of a collaborative venture”. Obviously such concerns are well known. It makes sense that to improve the response process on a plant health emergency, these difficulties must be addressed, and the building of relationships in this capacity, a concept mentioned in Grubbs article as “resource enlarging”. Again, the literature helped me gain insight to the problems in the public arena, and a closer look identified similar problems within a collaborative program. Identifying the background of the NPRGs (their beginnings and history), the issues that have been addressed in the past with plant health emergencies (what were the findings and recommendations), and tools to improve agency performance as it relates to public policy (collaborative efforts) provided a solid foothold for conducting research into how the NPRGs are being put to use as they were intended.

## RESEARCH METHODS

Data garnered from the study helped in understanding the ideal aspects and purposes of developing a tool to improve the plant health response process and the actual methods employed when a response occurred. I performed the study with the assumption that the New Pest Response Guides are not used in the beginning stages of a plant health emergency response. A second assumption was that the population interviewed was not familiar with the NPRG.

### **Qualitative study**

Over a period of five weeks between March 24 and April 28, 2008, I interviewed eight State Plant Health Directors managing states in USDA-PPQs Western Region, and two Directors in the Eastern Region of PPQ. The interviews were conducted by phone, each lasting between ten to twenty minutes. Six questions were asked of each (Fig. 4). I recorded and described these conversations and comments in a notebook.

The Western Region of PPQ was chosen for this study as I had several years of experience with Western Region programs (California, Idaho, Texas and Colorado). As such I have built acquaintances with employees of Western Region and was familiar with the background of plant health emergency programs. Also, the interviewees would more than likely be experienced as operational personnel, as a team leader, or as a designated Incident Commander or manager of a program. One of the Western Region State Plant Health Directors had recently been promoted to the regional headquarters in Fort Collins, Colorado. Three Western Region State Plant Health Directors are current members on the two of four PPQ National Incident Management Teams, with two as designated Incident

Commanders. The two State Plant Health Directors located in the Eastern Region are Incident Commanders on two of the four PPQ National Incident Management Teams, representing the two teams for Eastern Region.

The aspect that those State Plant Health Directors currently on the Incident Management Teams or those with emergency program experience could be seen as biased and may be seen in the data collected. However, the thought was the interviewed population would have the highest likelihood of using the NPRG in their experiences of managing or participating in plant health emergency programs. Yet, this would classify a sample representation for the study.

## Survey and data collected

Question 1) Have you used a New Pest Response Guide to assist in the emergency response effort?

As shown in the pie chart in Figure 4:

- 8 out of 10 responses were negative to the question.
- 1 response indicated that NPRGs had been used, and are currently in use, in programs in the state. However, it must be pointed out that the guidelines in use were developed for pests after their introduction into the United States, not prior to their introduction as intended.
- 1 response indicated a portion of a guideline had been used. However, it must be pointed out the SPHD had used the survey section of a guideline for a domestic program, not an emergency program
- 1 response indicated that a NPRG had been used (Golden Nematode), but for a different program (Potato Cyst Nematode). The information was marked as no as they were different species.

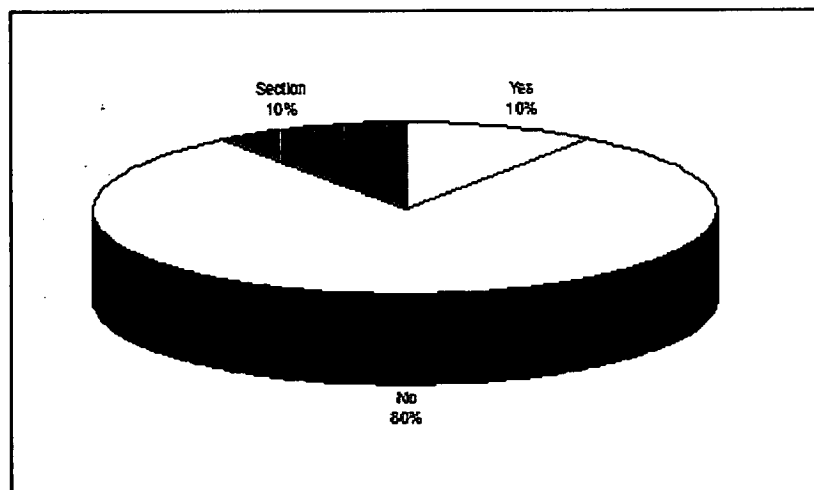


Figure 4. Percentage of SPHDs that use the NPRG in a plant health emergency response.

Question 2) What resource do you use to develop survey, control and regulatory protocols for initial response efforts?

As shown in Figure 5:

- 2 responses indicated the Centers for Plant Health Science and Technology (CPHST) would be the primary point of contact for information on a new plant health response.
- 1 response indicated that the Western Region (WR) Headquarters would be the primary point of contact for information on a new plant health response.
- 1 response indicated that the state department of agriculture would be the primary point of contact for information on a new plant health response.
- 1 response indicated that a local contact, such as University Extension would be the primary point of contact for information on a new plant health response.
- 4 responses indicated that a Technical Working Group (TWG), comprised of scientists and regulatory officials would be the primary point of contact for information on a new plant health response.
- 1 response indicated that the NPRG would be the primary point of contact for information on a new plant health response.

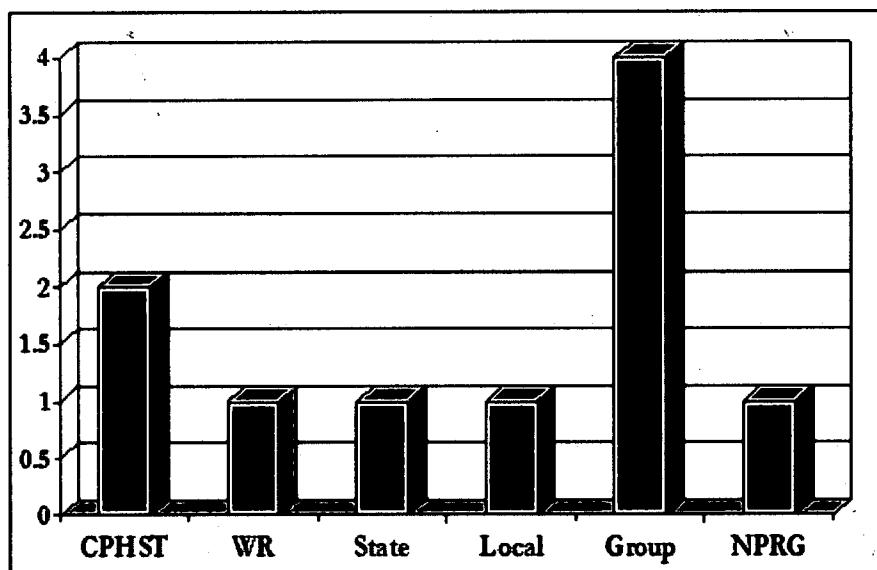


Figure 5. Resources tasked to establishing protocols for a plant health emergency.

Question 3) What are the reasons for not utilizing a New Pest Response Guide for program implementation?

As shown in Figure 6:

- 1 response indicated that a NPRG was used for program implementation
- 1 response indicated that the NPRGs are outdated as a reason for not utilizing them for program implementation.
- 7 responses indicated awareness of the NPRG as a reason for not utilizing them for program implementation.
- 1 response indicated that ineffectiveness of the NPRG as a reason for not utilizing them for program implementation.
- 8 responses indicated that inability to locate the NPRG as a reason for not utilizing them for program implementation.
- 1 response indicated that an alternate guide would be used as a reason for not utilizing them for program implementation.
- 8 responses indicated that a NPRG was not available for the pest as a reason for not utilizing them for program implementation.

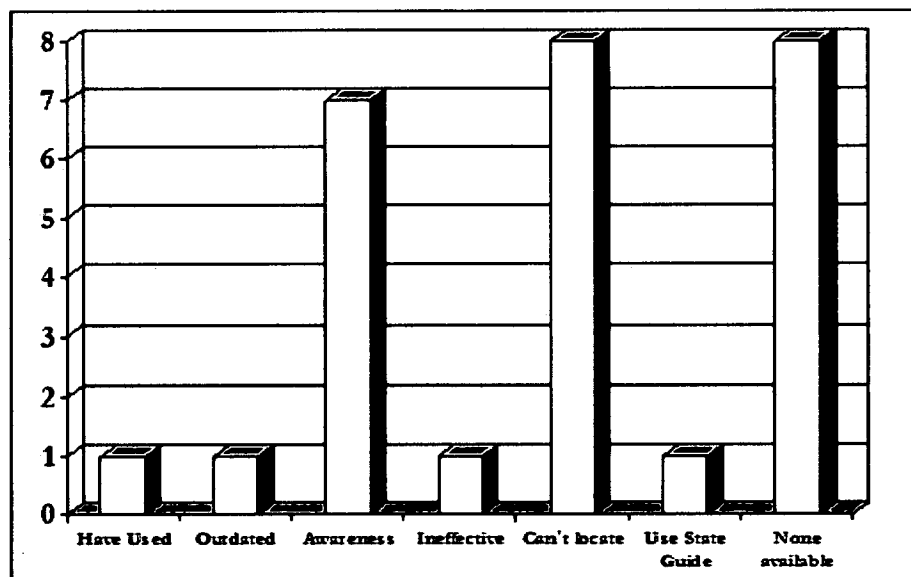


Figure 6. Reasons for not utilizing a NPRG.

Question 4) In your collaborative efforts with the state department of agriculture, have they developed guidelines similar to the federal NPRGs?

As shown in Figure 7:

- 1 response indicated that the state department of agriculture has developed guidelines similar to the federal NPRGs.
- 9 responses indicated that the state department of agriculture has not developed guidelines similar to the federal NPRGs.

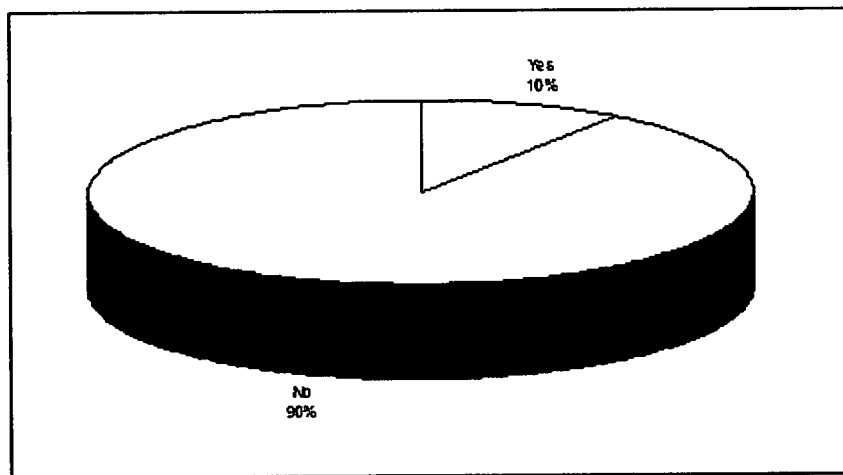


Figure 7. Percentage of states that have known plant health emergency plans in place.

Question 5) If you were to utilize a NPRG, what modules would be most beneficial in accomplishing the objectives of a particular plant health response?

As shown in Figure 8:

- 6 Responses indicated that the survey module would be most beneficial in accomplishing the objectives of a particular plant health response.
- 3 Responses indicated that the regulatory module would be most beneficial in accomplishing the objectives of a particular plant health response.

- 2 Responses indicated that the biology module would be most beneficial in accomplishing the objectives of a particular plant health response.
- 2 Responses indicated that the control module would be most beneficial in accomplishing the objectives of a particular plant health response.

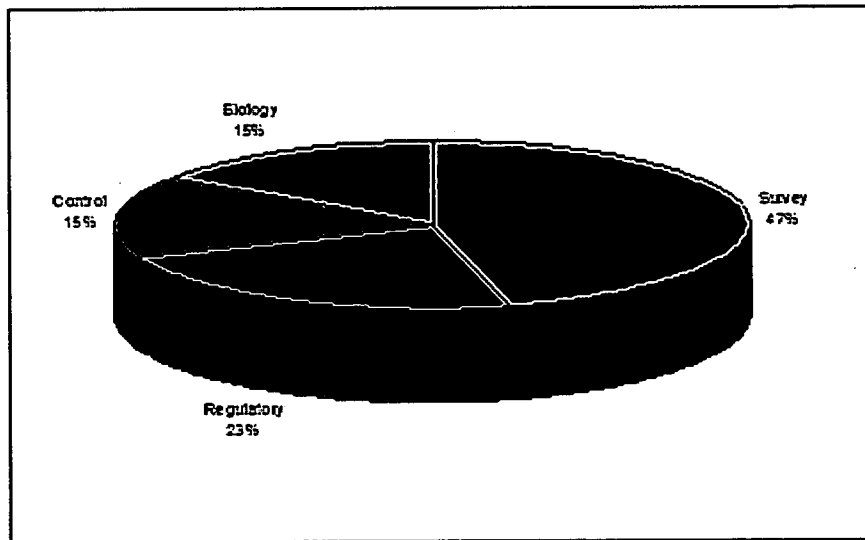


Figure 8. NPRG modules most likely requested during a plant health emergency.

Question 6) What recommendations do you have to improve the usage of the NPRG as a tool in the plant health emergency response?

As shown in Figure 9:

- 1 Response indicated that it depends on the program as to what the needs will be in the plant health emergency response.
- 4 Responses indicated distribution of the NPRGs will improve the usage of the NPRG as a tool in the plant health emergency response.
- 1 Response indicated that creating a list of available NPRGs will improve the usage of the NPRG as a tool in the plant health emergency response.

- 1 Response indicated that acquiring feedback from field staff on the effectiveness of NPRGs will improve the usage of the NPRG as a tool in the plant health emergency response.
- 1 Response indicated that updating the NPRGs will improve the usage of the NPRG as a tool in the plant health emergency response.
- 1 Response indicated that creating a summary of modules available within the NPRGs will improve the usage of the NPRG as a tool in the plant health emergency response.
- 2 Responses indicated that creating a list of available NPRGs will improve the usage of the NPRG as a tool in the plant health emergency response.

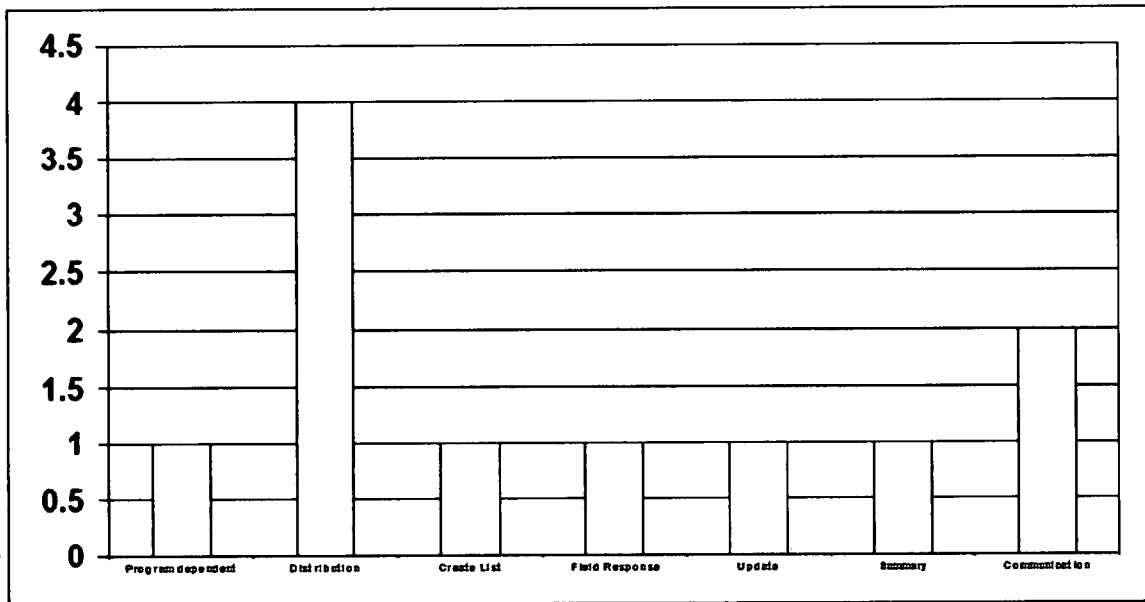


Figure 9. SPHD recommendations for improving NPRG usage in the agency.

## **Interpretation of the data**

The NPRGs are not being utilized as they are originally intended. Figure 4 points out that eight out of ten SPHD's have never used a NPRG for a plant health emergency response. This obviously confirms the question of the research project, and our assumption. One SPHD had used the guides before, and to good use. But as mentioned in the data, the pests were detected in a previous state, not a first detection or program for the United States. Also, the guidelines for those pests (Citrus Greening and Panicle Rice Mite) were developed after the detections occurred, indicating that research and resources used to construct the guideline were rerouted from other projects and thus affecting the early response process.

Likewise, Figure 5 indicates other avenues are used to assist in the response process outside of the NPRG in the early stages of a plant health response. The most cited method was the use of a working group consisting of managers, scientists and program experts. This would make sense, as there are numerous stakeholders and players that become involved in the process. Trade issues, political issues, resource allocation, budgetary parameters and administrative guidelines all become linked in the web of a response program. This complexity is echoed in the 2001 GAO report, stating "rapid response often involves coordination among multiple government agencies. The complex interplay among federal, state, and local agencies adds to the potential for inefficiencies in these efforts. In the past, issues concerning leadership, funding, and other organizational responsibilities have hampered such efforts" (GAO, 2001). The results also answer our first sub question concerning resources, *1) Are other resources being used to develop operational methods on a new plant health emergency program?*

In Figure 6, three data points are clear pointing to the reasons why the NPRGs are not used. Awareness (NPRGs are not referenced in discussions), location (who oversees the guides or where to go to find them) and availability (either a guide was not created for a pest or it was unknown) are the three responses most likely cited. Comments indicating that the guides were not distributed, or that the guides have never been seen were common. SPHDs indicated that familiarity is absent outside of the SPHD as well, as regional and national management is unaware of their presence. Thus, communication and outreach, promotion of their use at the national level, and developing accurate methods of resource allocation for manual development should be considered to promote the usage of NPRGs. This answers our third sub question 3) *Are there organizational factors that may be hindering the usage of NPRG?*

Figure 7 indicates that the corresponding state departments of agriculture do not utilize guides in their efforts of plant health response. Though this speaks for itself, it indicates that states are less prepared for pest emergencies. This would indicate that the burden of the response process falls on the shoulders of the federal government (when a pest of importance is both a state and federal concern), pointing to the idea that the federal response needs to be even more vigilant.

Figure 8 indicates that the most important module of a NPRG is the survey portion. This makes sense, as when a pest is first detected, the natural questions that follow are 1) How many more of the pests are in the environment? and 2) Where are they located? Detection trapping is crucial to maintaining trade as quarantines are established and trading partners are contacted. Thus, it is crucial that the technical aspects of a program are correct when a program begins.

Lastly, Figure 9 points out that SPHDs have various ideas on what to do to improve the usage of NPRGs. Communication and Distribution are the two areas recommended by SPHDs. This answers our second sub question, 2) *If the NPRGs are not being used, then what is needed to promote their usage?*

## CONCLUSION and RECOMMENDATION

### **Research Question Confirmed**

The concept of preplanning for an invasive pest introduction is an essential component of risk assessment. Economic and environmental costs are the primary factors playing into developing a plan of action, which is echoed by Parker “Calculating the economic cost in terms of damages or eradication/control is one useful approach to measuring the impact on an invader and enjoys the simplicity of a common currency” (Parker, 1999). Yet what we have seen from the study is the divide between an ideal state of public needs versus a realistic state of program concepts. A clear eighty percent of those surveyed had never used the NPRGs as a tool in developing an emergency response program.

### **Conduct similar research on Eastern Region SPHDs**

Making a credible case that NPRGs are not utilized as originally intended would indicate a need to reevaluate the objectives of the Emergency Planning and Response team. As identified earlier, two PPQ Eastern State Plant Health Directors were interviewed, both holding positions as an Incident Commander on one of four Incident Management Teams. One IC (Minnesota) identified that survey standards were actively used for programs in their state, though not necessarily on an emergency program. Could this indicate that Eastern Region SPHD's are more familiar with the NPRGs? Maybe. The *Ralstonia Solanacearum* NPRG was utilized in 2003 and 2004 for a new response in ER. However, the NPRG was not completed until 2007, and operational activities were

based on guidelines developed out of Ralstonia programs of the late 1990's. Performing a similar study among SPHD of the ER would provide a clear picture of the situation, indicating whether or not non-use of NPRG is a regional or national issue of concern. Not to mention that such SPHDs of high profile states in the ER with ongoing or emerging emergency programs (New York, Michigan, Illinois and Florida) could be considered as excellent candidates of survey data. Florida, as its WR counterpart California, is considered a high profile state constantly under threat of invasive pest introduction. Florida witnesses twelve new plant pest introductions each year, with a high of thirty nine in 1996-1997 (Florida). New York (with Asian Longhorned Beetle and Syrex Wood Wasp), Michigan (Emerald Ash Borer) and Illinois (Asian Longhorned Beetle) all have established (2+ years) programs.

### **Communicate to stakeholders the history of New Pest Response Guides**

The stakeholders of NPRGs are quite numerous. Federal agencies, state and local governments, industry, growers, international trading partners, and the American public are all players affected by the outcomes of pest introductions into the United States, with accountability as a necessary requirement. As pointed out in O'Connell's article "Program Accountability as an Emergent Property", this 'accountability environment' is "a constellation of forces—legal, political, sociocultural, and economic— that place pressure on organizations and the people who work in them to engage in certain activities and refrain from engaging in others" (O'Connell, 2005). Thus, the various players need to be engaged in the process to drive the accountability environment. The obvious question becomes, if the agencies intended proponent of NPRG is clearly unfamiliar with the

documents, then how can we ask and accept such necessary accountability from stakeholders outside the agency? By identifying agency goals and objectives and doubly showing how NPRG fit into the PPQ emergency model of planning and preparedness, the issue of accountability is highlighted. The development of NPRGs is a lengthy process, and the stakeholder response of having such resources available would be a first step towards a progress in communication. This relationship building is reinforced in Gibbs article, stating "we have come to recognize that an agency's capacity to achieve public outcomes depends upon its ability to establish meaningful, effective relationships with other institutions of governance (Gibbs, 2000)

#### **Needs assessment before or after detection**

The decision making process of a plant health quarantine response lends itself to pinpointing the objectives and goals of a program. Of course this goes to the core of the planning guidelines themselves. Should resources be spent prior to the detection of a pest population (the current view of the planning process), or instead utilize those resources when an actual detection occurs to develop guidelines as the program develops? Proponents would say that having response information available before detection occurs would be a two fold advantage. First, something is better than nothing, and having rudimentary techniques in survey, regulatory and control would be acceptable. Second, guidelines are a clear tool to disseminate information on a pest, and would be essential in establishing a foundation for the variety of federal, state and local managers tasked with program oversight. Detractors would indicate that the organization is a response agency, and as such, spending time and resources before a program is established is rather inefficient. As pointed out by Hulme, "...an effective response system requires: (i) a

sound scientific basis upon which to plan actions, (ii) the tools and protocols with which to respond and (iii) the capacity as well as resources to achieve its goals” (Hulme, 2006). Clearly, the scientific aspect of a plant pest response is a natural aspect of developing NPRGs. Also, resources can be mustered and goals can be defined, usually bent towards either eradication, containment or control. And one can argue that the NPRGs are simply the tools with which to respond. However, their use as protocols can be questioned, as pointed out in the research. NPRGs are neither communicated as protocols, or tools for that matter, nor are they looked towards as a resource when a program is developing. With resources spent on developing such guidelines and action plans over the past fifteen years, there should be successful cases of the guidelines being put to use. Since their development, only one has been put into use, the Karnal Bunt NPRG, and it was subsequently redeveloped at the onset of the program.

A more effective approach to the development and dissemination of NPRGs would focus less on the scientific wing of management and instead focus on the management and policy side of a potential program which would encompass the economic, environmental and trade aspects of a detection. Again Hulme illustrates this aspect by stating “The final aspect of management, which is arguably the most important but most often overlooked, is the role of public perception and stakeholder interest” (Hulme, 2006). Altering such an approach from a detailed method of program response to a larger picture of program impacts can indeed turn into a needs assessment. What would be the response of trading partners should such a detection and subsequent program begin? In 2006, a new detection of Potato Cyst Nematode in Idaho triggered trade restrictions from Japan, Korea, Mexico and Canada, each requiring certain regulatory measures met before

reinstating market conditions (PCN, 2007). What impacts would other pest detections have upon trading partners? Exploring this avenue can change the function of NPRGs from the current stance on how to respond to a new plant pest to one of why should the agency respond. Stakeholder input at an international level will indeed clarify goals and objectives for a program and what will be expected in the control efforts. State and local management will be tied into such goals, and consequently the various industry groups that would be impacted. Also, public perceptions can be addressed prior to program development. Margolis' discussion on trade and invasive species makes a valid point as well, stating "...public policies to control these invasive species are not immune from political pressure from private interest groups" (Margolis, 2005). Interestingly, the implications of trade and economics of invasive pest introductions is dealt with protectionism and tariffs on exporting countries based on risk assessments, however little is known on actual response efforts of international trade.

### **Disseminate to stakeholders availability of New Pest Response Guides**

To fully engage the various players in developing applicable guidelines, problem solving and dissemination of information should be crucial to its success. Economic and environmental issues and the expected impacts of an exotic pest introduction are crucial pressures that should be addressed. Hence, collaboration among federal, state, and local governments is essential for the development of optimal plans for disaster response (Lester, 2007). Likewise the player that is most important, yet seldom overlooked is the public. If the various groups that are affected by policy guidelines are informed of the

consequences of pest introductions, most likely the problems that may inherent in the response process can be overcome.

Public outreach is vital to gaining support for pest eradication efforts. The economic aspects of a new pest introduction are well understood, using risk management tools to establish pest rankings based on the dollar value of crop estimates. Guidelines are disseminated to the National Plant Board for review among the state regulatory agencies, however they are not actively distributed to the public. The twofold approach of exclusion and control are similar, yet exclusionary activities by the fact they are already implemented are what the public is aware of. Trade restrictions, border inspections and foreign eradication programs are well established and documented. Control measures, such as quarantine and regulatory restrictions on movement, seizure of commodities and destruction of infested or potentially infested commodities are only applicable when a pest program has been detected (Kim et al, 2006). Such effects could be addressed as part of the outreach efforts of the program. Contained in the NPRGs are the survey, control and regulatory aspects, and providing such information to state and local agencies, as well as industry groups could establish an increase in communication and cooperative efforts.

#### **Assess operational accuracy of program needs**

State governments are just as concerned about the introduction of exotic pests as is the federal government. Exotic pests that are of concern at both the state and federal level usually have similar methods of control, survey and regulatory. Strategies for dealing with pest introductions at the state level are likewise developed by scientific experts and

regulatory officials. As such, important preparedness decisions must be made to address such a wide aspect of pest response. Moffitt clearly explains "Prioritizing invasive species threats and responses is an important resource allocation issue for government decision makers" (Moffitt, 2006).

What needs to be clarified is to what extent individual states have spent on developing guidelines for introduction activities. Of course, economic questions come to light, as decision makers must consider the costs of prevention, management, economic thresholds of pest damage, pesticide applications, and public outreach. Do national efforts align with specific state efforts, if any? Indeed, such information and response efforts may be quite similar; however they may also be quite different. Many different factors may be involved between states, and the impact on an industry would likewise be quite different. For example, a state with a single crop for a pest may develop a different response program than a state with multiple hosts available. When building such programs, greater collaboration between the federal and state programs would be highly beneficial, as similar objectives could be developed. What must be taken into account is the resource availability of states, which for the most part is limited. However identifying such resources can be helpful should a program begin, as a determination of needs can be accomplished.

### **Benchmarking for effective response**

The final recommendation to improve the response process is to perform benchmarking procedures, most likely another response agencies procedures. As described in literature, benchmarking is a concept that "an organization that wants to improve its performance may do so by adapting and implementing key practices that make

other organizations outstanding” (Alberta). Several methods have been developed that aid in the benchmarking process, nearly all performed in the private sector. Though the number of steps may be different between the various methods, the concepts are the same. First, identification of what needs to be benchmarked is key. What is it that needs improvement? Second, identify the processes or players are involved in the organization that are to be benchmarked. Third, identify the agency or organization that typifies the process that should be duplicated. Fourth, collect information and data related to the study. Fifth, analyze the data and how the process works. Sixth, implement the process into the organization. Seventh, monitor the results. Though it may seem simplistic, the process can be quite time consuming and costly. Berk reiterates the concept of benchmarking in the business sector, “Using benchmarking as a tool for continuous improvement is one way to determine if your business is doing everything it can to meet the challenges inherent in our global, intensely competitive business environment” (Berk, 2008).

A proposed model for use in the Planning and Preparedness is indicated in Figure 10. The example describes a simple tool for benchmarking the process of selecting pests for development of NPRGs. In it, the benchmarking occurs with USDA-Vet Services, the sister agency of USDA-PPQ. The emergency programs in VS have a long standing and well designed process for combating pest outbreaks of animal concern. VS also implements a planning department for emergency response, so it may be beneficial to benchmark their processes as well.

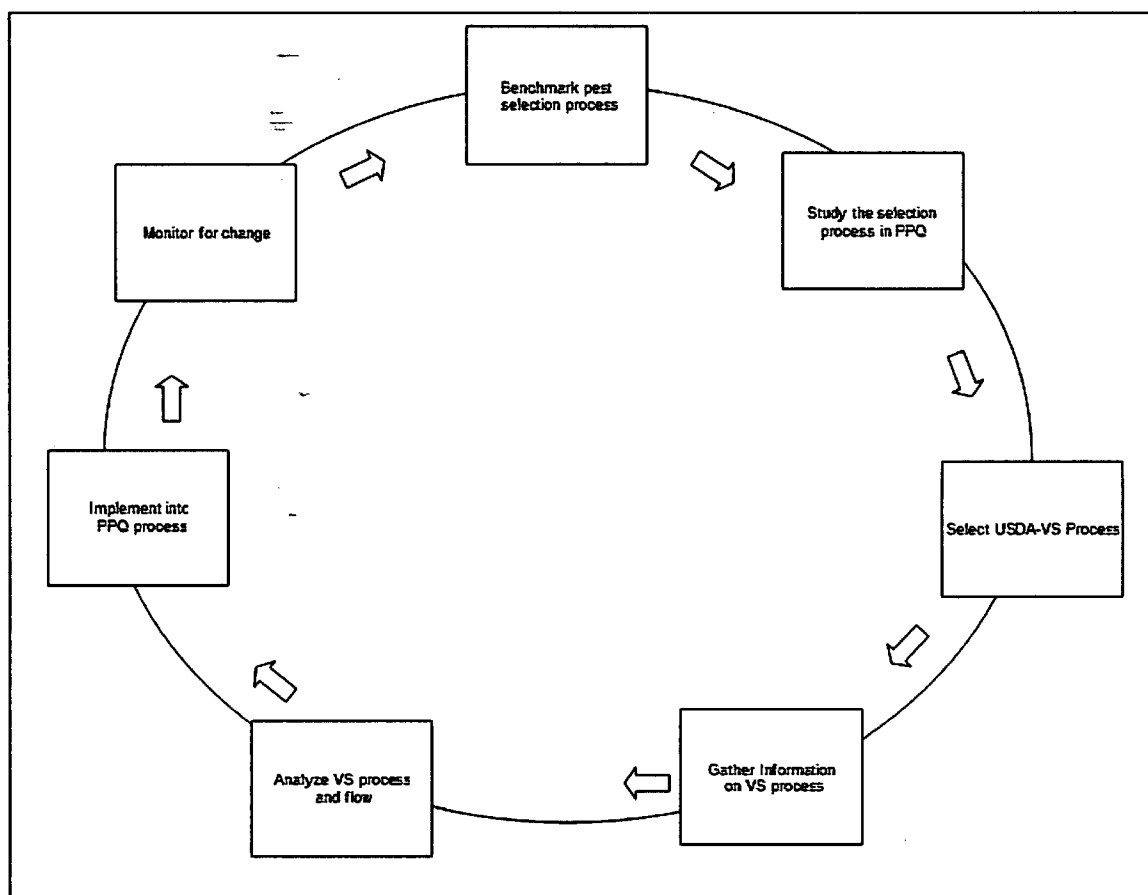


Figure 10. Example of benchmarking flow chart in PPQ's Planning and Preparedness.

We should not lose sight that evaluation of the response process is a crucial component of improving effectiveness in the plant health emergency process. Evaluating how a program accomplished its goals and objectives compared to the model of recommendations outlined in the NPRG can also be a critical component to benchmark. How do other organizations, even those outside of USDA, know that they are an effective organization? Performance can be improved by modeling emergency medical services (Fire departments, law enforcement, community organizations such as American Red Cross) and discovering what works. Gooden makes an excellent point in regards to organizational performance, stating that “However, regardless of the sector in which

these [strategies] are employed, the end sought in all instances is greater organizational effectiveness” (Gooden, S. 2001). Indeed, for the plant health response, effectiveness can certainly be improved.

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