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Regional status of pest surveillance in the context of ISPM No. 6: International Standard for Phytosanitary Measures – Guidelines for Pest Surveillance

Analysis of the responses to the Implementation Review and Support System (IRSS) questionnaire from APPPC countries

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FOOD AND AGRICULTURE ORGANIZATION OF THE UNITED NATIONS
REGIONAL OFFICE FOR ASIA AND THE PACIFIC
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Foreword

A fundamental activity of national plant protection organizations is to conduct pest surveillance. For the purpose of international trade, the results of pest surveillance provide the basis for pest listing, identification of pest status, pest categorization and the conduct of pest risk analyses. In 1997, the International Plant Protection Convention issued the International Standard for Phytosanitary Measures (ISPM) No. 6: Guidelines for surveillance to assist national organizations in the implementation of this critical activity.

In 2011, it was decided to review these guidelines and to identify challenges faced by the contracting parties for implementation, as well as identify resources for resolving those challenges. At the request of the Standards Committee of the IPPC, the Implementation Review and Support System (IRSS) will catalogue the challenges faced and make recommendations to the review panel of ISPM No. 6 on ways to improve the standard. It will also gather examples of best practice globally so that appropriate training material and manuals might be prepared under the capacity development programme of the IPPC.

For the purpose of this review, a questionnaire was developed and distributed among national plant protection organizations. I am pleased to report that a total of 17 countries from the Asia and the Pacific region responded to this call and completed the questionnaire, as well as listing their resources and best practices. The results from this survey were compiled and analyzed, and are presented in this publication, which reflects the current regional status of the surveillance. Best practices of the surveillance and main constraints, challenges as well as issues that exist in implementation of the surveillance were also discussed and updated at a workshop held in Chiang Rai, Thailand from 31 January to 3 February 2012.

It is hoped that the experiences with ISPM No. 6 in the Asia and the Pacific region will not only facilitate the work of the ISPM No. 6 review panel, but that it will also foster greater collaboration and exchanges among the countries of the region.

Hiroyuki Konuma
Assistant Director-General and
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Bangkok, February 2012

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List of acronyms

ACIAR	Australian Centre for International Agricultural Research
ALPP	Areas of low pest prevalence
APPPC	Asia Pacific Plant Protection Convention
ASEAN	Association of Southeast Asian Nations
AWM	Area wide management
CABI	Centre for Agriculture and Biosciences International
CPPQ	Crop Protection and Plant Quarantine Division (Malaysia)
DAFF	Department of Agriculture, Fisheries and Forestry
DNA	Designated National Authority
DOA	Department of Agriculture
EPPO	European and Mediterranean Plant Protection Organization
ETL	Economic threshold level
EU	European Union
FAO	Food and Agriculture Organization of the United Nations
FFS	Farmer Field School
GAP	Good agricultural practices
GIS	Geographic information system
HRSS	High risk site surveillance
IPM	Integrated pest management
IPPC	International Plant Protection Convention
IRSS	Implementation Review and Support System
ISPM	International Standard for Phytosanitary Measures
MOA	Ministry of Agriculture
NATESC	National Agro-Tech Extension Service Center
NAQS	National quarantine service
NGO	Non-governmental organization
NPPO	National plant protection organization
NSPM	National Standards for Phytosanitary Measures
NZMAF	Ministry of Agriculture and Forestry New Zealand (MAF NZ)
PaDIL	Pests and Diseases Image Library
PFA	Pest free area
PFPP	Pest-free place of production
PFPS	Pest-free production site
PPD	Plant Protection Department
PRA	Pest risk analysis
RDA	Rural Development Administration
RPPO	Regional plant protection organization
SOP	Standard operating procedures
USDA	United States Department of Agriculture
USD	United States dollar
WHO	World Health Organization
WTO	World Trade Organization

1. Introduction

Pest surveillance is an important activity of the National Plant Protection Organizations (NPPO) under the International Plant Protection Convention (IPPC). The main purpose of pest surveillance is to generate information about the presence or absence of regulated pests in a way that is internationally acceptable as reliable and sound. Information gathered through pest surveillance may be used to:

- conduct pest risk analyses to justify regulating a particular pest and to require precautionary phytosanitary measures from trade partners;
- establish and maintain pest-free areas to convince trade partners that the commodities from those areas are free of certain pests and should be except from quarantine measures;
- aid the early detection of new pests;
- compile host and commodity pest lists and distribution records;
- report to other organizations such as RPPO and FAO.

In 1997, the International Plant Protection Convention issued the International Standard for Phytosanitary Measures (ISPM) No. 6: "Guidelines for surveillance" to assist NPPOs in the implementation of this critical activity. These guidelines describe the requirements for general surveillance and specific surveys, including good surveillance practices, technical requirements for diagnostic services and record keeping.

General surveillance is a process whereby information on particular pests which are of concern for an area is gathered from many sources, wherever it is available and provided for use by the NPPO. Specific surveys are procedures by which NPPOs obtain information on pests of concern on specific sites in and area over a defined period of time.

In 2011, ISPM No. 6 was selected for review by the Implementation Review and Support System (IRSS). This system is an overarching programme of the IPPC aimed at identifying challenges of contracting parties for implementation of the IPPC and its standards as well as identifying resources for resolving those challenges.

At the request of the Standards Committee of the IPPC, and in support of the review of ISPM No. 6, the IRSS will be cataloguing the challenges faced by NPPOs for the implementation of the standard with a view to making recommendations to the review panel of ISPM No. 6 on ways to improve the standard. It will also be gathering examples of best practice globally so that appropriate training material and manuals might be prepared.

For this purpose, a questionnaire was developed and sent to the NPPO in order to determine the challenges faced with implementing this standard and to develop recommendations for the review panel.

The questionnaire consisted of three parts: (1) Questionnaire, (2) technical resources and (3) best practices. Not all countries submitted all three components. The following responses were received from 17 member counties in the Asia-Pacific Region:

ISPM No. 6 Survey responses from the Asia-Pacific Region

Country	Questionnaire	Technical Resources	Best Practices
Australia	x	x	4
Bangladesh	x	x	1
China	x	x	1
Fiji	x	x	1
India	x	x	1
Indonesia	x	x	1
Japan	x		
Korea, Republic of	x	x	1
Lao PDR	x	x	1
Malaysia	x	x	1
Myanmar	x	x	1
Nepal	x	x	1
New Zealand	x	x	1
Philippines	x	x	1
Sri Lanka	x		1
Thailand	x	x	1
Viet Nam	x	x	1
Total	17 countries	15 countries	19 best practices from 16 countries

The responses from this survey were summarized and compiled, and the findings were presented at a regional workshop held in Chiang Rai, Thailand, from 31 January to 3 February 2012. During this meeting, delegates from 17 countries reviewed the results from the questionnaire survey. Furthermore, they identified the challenges faced by NPPOs in the implementation of the standard, provided recommendations to the review panel on ways to improve the standard and gathered examples of best practises for the preparation of training materials and manuals. The outcomes from this meeting are included in this publication. The APPPC has established a working group on implementation of ISPMs in the 26th Session of APPPC for the purpose of identification of potential area to be assisted for improvement of implementation capacity of member countries based on analysis on the status and constraints for the specific ISPMs. Meanwhile the 27th Session of APPPC has decided to organize a symposium on the surveillance for promoting the implementation of ISPM No. 6. Therefore APPPC may contribute its expertise, lessons and experience in the surveillance to the global review and improvement of ISPM No. 6.

2. Questionnaire

A. Policy and legislative environment

ISPM standard

Per definition (ISPM No. 5), pest surveillance is an *official* process which collects and records data on pest occurrence or absence by survey, monitoring or other procedures [CEPM, 1996]. Official means that such surveillance has to be established, authorized or performed by a National Plant Protection Organization. [FAO, 1990]. To give the NPPO the authority and power to perform its functions requires official policies and a legislative framework for mandating other organizations to carry out official pest surveillance as required.

Summary of results

1. In about half the cases, surveillance programme were reportedly shaped by policy issues related to international trade (trade policy, market access, free trade agreements, IPPC, WTO), followed by pest management objectives (about 30 percent) and for the purpose of protecting the country through quarantine and biosecurity (about 20 percent);
2. The primary responsibility for conducting official pest surveillance rested with the NPPO in all countries except for Australia;
3. In all but two countries (Lao PDR, Nepal) there existed other organizations that were legally or otherwise **mandated** to perform pest surveillance;
4. In most of these countries (except Malaysia and Sri Lanka) did the NPPO coordinate surveillance activities with those mandated organizations;
5. Most countries regarded that the powers of the NPPO staff sufficient to carry out pest surveillance effectively. Only in three countries were they regarded as insufficient;
6. In two of these three countries mentioned before did the NPPO receive the results of the survey;
7. In emergencies, all NPPOs (except in India) could legally mandate these other organizations to undertake surveys;
8. Most countries had written agreements that defined the mandate, functions and responsibilities of those other mandated organizations. In only three instances there were there no written agreements;
9. All but two countries had a strategic and operational plan for pest surveillance;
10. Generally, NPPO's surveillance responsibility covered both regulated and non-regulated pests. Only in the Republic of Korea were these responsibilities limited to quarantine pests only.

Survey responses

			Australia	Bangladesh	China	Fiji	India	Indonesia	Japan	Korea, Republic of	Lao PDR	Malaysia	Myanmar	Nepal	New Zealand	Philippines	Sri Lanka	Thailand	Viet Nam
1	**List the most important policy issues that shape your country's surveillance programme (e.g. trade policy, free trade agreements etc.)?**	**NR = 2**		–									–						
	• Trade Policy	**10**	**x**					**x**	**x**	**x**		**x**			**x**	**x**	**x**	**x**	**x**
	• Pest Management	**7**					**x**	**x**	**x**		**x**	**x**			**x**	**x**			
	• Market access/free trade/agreements	**4**												**x**		**x**	**x**	**x**	
	• Plant Quarantine	**3**						**x**			**x**	**x**							
	• IPPC	**2**			**x**	**x**													
	• WTO/SP	**2**			**x**	**x**													
	• Plant Protection statuts	**2**			**x**	**x**													
	• Environ. Protection	**1**								**x**									
	• Risk return	**1**	**x**																
	• Value: public good vs. private benefit	**1**	**x**																
	• Biosecurity	**1**													**x**				
	• Seed import	**1**															**x**		
	• Pesticide policy	**1**															**x**		
	• Locust control	**1**					**x**												
2	**Does the NPPO have primary responsibility for pest surveillance?**	**Yes = 16 No = 1**	**N**	**Y**	**Y**	**Y**	**Y**	**Y**	**Y**	**Y**	**Y**	**Y**	**Y**	**Y**	**Y**	**Y**	**Y**	**Y**	**Y**
3	**Are other public or private organizations, agencies or departments, whether they operate at the provincial/district/ regional etc. level, legally or otherwise mandated to perform pest surveillance?**	**Yes = 15 No = 2**	**Y**	**Y**	**Y**	**Y**	**Y**	**Y**	**Y**	**Y**	**N**	**Y**	**Y**	**N**	**Y**	**Y**	**Y**	**Y**	**Y**
4	**Does the NPPO conduct pest surveillance activities in a coordinated manner with those public or private organizations, agencies or departments?**	**Yes = 15 No = 2**	**Y**	**Y**	**Y**	**Y**	**Y**	**Y**	**Y**	**Y**	**Y**	**N**	**Y**	**Y**	**Y**	**Y**	**N**	**Y**	**Y**
5	**Are the powers/authority of the NPPO staff involved in pest surveillance sufficient to enable them to carry out the work effectively?** *Note:* * Suitable surveillance models and sufficient number of trained personnel are lacking	**Yes = 14 No = 3**	**Y**	**N**	**Y**	**Y**	**N**	**Y**	**Y**	**Y**	**Y**	**N**	**Y**	**Y**	**Y**	**Y**	**Y***	**Y**	**Y**
6	**If no are the results of surveys provided to the NPPO?**	**Yes = 1 No = 4**		**N**			**Y**					**N**		**N**					**N**
7	**When there are emergencies, can the NPPO legally mandate use of the services of those public or private organizations, agencies or departments to undertake surveys?**	**Yes = 15 No = 1 NR = 1**	**Y**	**Y**	**Y**	**Y**	**N**	**Y**	**Y**	**Y**		**Y**	**Y**	**Y**	**Y**	**Y**	**Y**	**Y**	**Y**

			Australia	Bangladesh	China	Fiji	India	Indonesia	Japan	Korea, Republic of	Lao PDR	Malaysia	Myanmar	Nepal	New Zealand	Philippines	Sri Lanka	Thailand	Viet Nam
8	**Are there written documents establishing the mandates, functions and responsibilities of those organizations or government departments for the conduct of pest surveillance?** *Note:* * There are some documents pertaining fruitflies and plant parasitic nematodes of vegetables	**Yes = 14** **No = 3**	**Y**	**Y**	**Y**	**Y**	**Y**	**Y**	**Y**	**Y**	**Y**	**Y**	**N**	**Y**	**Y**	**Y**	**N***	**Y**	**N**
9	**Does the pest surveillance programme or service have a strategic and operational plan?** *Note:* * But variable	**Yes = 15** **No = 2**	**Y***	**Y**	**Y**	**Y**	**N**	**Y**	**Y**	**Y**	**Y**	**Y**	**Y**	**Y**	**Y**	**Y**	**N**	**Y**	**Y**
10	**Is the surveillance responsibilities of the NPPO limited to quarantine pests, regulated non-quarantine pests, and/or regulated pests, or does it also include non-regulated pests of national concern?**																		
	• Non-regulated pests (pest of national concern)	**16**	**x**	**x**	**x**	**x**	**x**	**x**	**x**		**x**	**x**	**x**	**x**	**x**	**x**	**x**	**x**	**x**
	• Regulated non-quarantine pests	**15**	**x**	**x**	**x**	**x**	**x**	**x**	**x**		**x**	**x**	**x**	**x**	**x**	**x**	**x**		**x**
	• Quarantine pests	**17**	**x**	**x**	**x**	**x**	**x**	**x**	**x**	**x**	**x**	**x**	**x**	**x**	**x**	**x**	**x**	**x**	**x**
	• Regulated pests	**15**	**x**	**x**	**x**	**x**	**x**	**x**	**x**		**x**	**x**	**x**	**x**	**x**	**x**	**x**		**x**
	• All of the above		All	All	All	All	All	All	All		All	All	All	All	All	All	All		All

NR = No response

Observations/Contradictions

- If no other organizations are mandated to conduct pest surveillance (question 3), it would seem difficult for NPPOs to coordinate with them (question 4); thus if question 3 was answered with "No", one would expect a negative response in question 5.
- Questions 4, 7 and 8 referred to only those organizations that are officially mandated, but not explicitly questions 4/5 and 9. The follow-up question 5 makes more sense, however, if question 4 would be seen as referring to those mandated organizations. Otherwise, why would the results from surveys not be available to the NPPO when NPPO staff carried out the work? To understand the answers given, one would need to find out how the respondents understood these two questions. Particularly, it is not clear that two countries indicated that their staff had sufficient powers, but that they were not provided with the results of surveys.
- In the same context, question 9 makes more sense if it referred to pest surveillance programmes carried out jointly with other mandated organizations.
- One NPPO indicated that it can legally mandate other organizations to undertake surveys while it also indicated that such organizations did not exist.
- Since regulated pests may be both quarantine and non-quarantine pests, the option "regulated pests" seems redundant in question 10.

- Surprisingly, Thailand's NPPO was not responsible for non-quarantine regulated pests (i.e. pests on plants for planting).

Conclusions

- The responses indicated that most countries had a sufficient policy and legislative environment that defined the mandates (i.e. by law, official job descriptions or mission statements) for the NPPO and other organizations to carry out official pest surveillance activities;
- In emergencies, almost all NPPOs (16; except for India) can legally mandate the use of other organizations to undertake surveys;
- Most countries (14) have written documents defining the official functions and responsibilities of organizations undertaking pest surveillance;
- It should be confirmed whether the questionnaire responses referred only to official pest surveillance, or whether they also included other surveillance activities and pest monitoring;
- It should be clarified in what context the questions 4/5 and 9 were answered and whether the responses referred to the NPPO's collaboration with other mandated organizations.

B. Organizational structure, competences and culture

ISPM standard

Within countries there are generally many sources of pest information. To utilize data from these sources for official surveillance purposes, it is recommended that NPPOs develop a system whereby appropriate information on the particular pest(s) of concern is collected, verified and compiled.

Summary of results

1. Slightly more than half the countries had an organizational chart of the pest surveillance service.
2. The NPPO's pest surveillance functions are centralized under a national manager in 70 percent of the countries.
3. The number of organizations involved in pest surveillance ranged from a few (1-3) to probably well over 30. The NPPO was involved in 8 countries. Besides surveillances by other national and local agencies and plant protection services (12 countries), they were also undertaken by research institutes (6 countries) and local universities (3 countries), as well as industry (3 countries) and NGO and community groups (2 countries).
4. Indicators for the relevance and performance of the pest surveillance programmes were mainly the number of detections, followed by information on outbreaks and damage.
5. Almost all countries had established formal linkages between the NPPO and external, non-NPPO organizations, while only two countries had informal or no linkages.
6. Almost all NPPO (15) engaged relevant stakeholders to support and improve the quality of the pest surveillance service.
7. The main stakeholders engaged were: industry (5 cases), research institutions (5 cases) and associations (3 cases).
8. In case of emergencies, stakeholders were included in the emergency planning team in 70 percent of the countries.
9. All but 3 countries reported that they had a well developed data system to collect, store and report pest surveillance information. The exceptions were Bangladesh, Nepal and Sri Lanka.
10. Procedures to review the performance of the pest surveillance programme or service was in place in almost all countries (15).

Survey responses

			Australia	Bangladesh	China	Fiji	India	Indonesia	Japan	Korea, Republic of	Lao PDR	Malaysia	Myanmar	Nepal	New Zealand	Philippines	Sri Lanka	Thailand	Viet Nam
1	**Is there an organizational chart of the pest surveillance service?** *Note:* * Informal surveillance system for rice pests	**Yes = 10 No = 7**	**N**	**Y**	**Y**	**N**	**Y**	**N**	**Y**	**Y**	**Y**	**Y**	**Y**	**N**	**Y**	**Y**	**N***	**N**	**N**
2	**Are the NPPO's pest surveillance functions centralized under a national manager?** *Note:* * SRG	**Yes = 12 No = 5**	**Y***	**Y**	**N**	**Y**	**Y**	**N**	**Y**	**Y**	**Y**	**Y**	**Y**	**N**	**Y**	**Y**	**N**	**N**	**Y**
3	**List the organizations that are involved in carrying out pest surveillance in the country?**																		
	• NPPO	**8**		**x**	**x**	**x**	**x**	**x**	**x**	**x**									**x**
	• Local/Provincial/State Agencies	**6**			**x**		**x**	**x**	**x**	**x**					**x**				
	• Plant Protection	**6**		**x**		**x**					**x**					**x**	**x**		**x**
	• Commodity Research Institutes	**6**	**x**				**x**					**x**	**x**				**x**		**x**
	• Dept. of Agriculture/Extension	**4**										**x**		**x**		**x**		**x**	
	• Industry	**3**	**x**									**x**			**x**				
	• Universities	**3**					**x**						**x**						**x**
	• Agr./Rural Dev. Authorities	**2**								**x**		**x**							
	• Commodity Boards	**1**										**x**							
	• Ministry of Agriculture	**1**													**x**				
	• Fed. Land Dev. Authority	**1**										**x**							
	• Commercial crop monitors	**1**	**x**																
	• NGO, Farmer groups	**2**				**x**										**x**			
	• Nat. Fed. Agr. Coop.Ass.	**1**							**x**										
	• Forest Service (KFS)	**1**								**x**									
	Estimated total number:		3	>30	2	3	>30	>2	>3	>4	1	10	3	>30	>3	>6	12	2	>4
4	**List the indicators you use to measure the relevance and performance of the pest surveillance programme?**	**NR = 1**																	
	• Detections/incidence/ pest list	**9**	**x**						**x**		**x**	**x**		**x**	**x**		**x**	**x**	**x**
	• Infested area/severity/ density/ outbreak	**4**			**x**							**x**					**x**		**x**
	• Damage/Loss	**2**			**x**														**x**
	• Early warning/forecast	**3**		**x**													**x**	**x**	
	• Risk assessment	**2**	**x**	**x**															
	• Incursions	**1**	**x**																
	• Pest management	**1**							**x**										
	• Market access/trade requirements	**1**														**x**			
	• Cost of surveillance	**1**	**x**																
	• Time, timeliness	**2**				**x**								**x**					
	• Reference of surveillance	**1**	**x**																
	• Quality standards	**1**													**x**				
	• Monitoring, reporting, review	**1**					**x**												
	• Work plan implementation	**1**				**x**													
	• Comparing data	**1**					**x**												

			Australia	Bangladesh	China	Fiji	India	Indonesia	Japan	Korea, Republic of	Lao PDR	Malaysia	Myanmar	Nepal	New Zealand	Philippines	Sri Lanka	Thailand	Viet Nam
5	**Does the NPPO have formal linkages with external sources (non-NPPO) of information on pest surveillance?**	**Yes = 15 No = 2**	**Y**	**Y**	**Y**	**Y**	**Y**	**N**	**Y**	**Y**	**Y**	**Y**	**Y**	**N**	**Y**	**Y**	**Y**	**Y**	**Y**
6	**Does the NPPO engage relevant stakeholders to support and improve the quality of the pest surveillance service?**	**Yes = 15 No = 2**	**Y**	**Y**	**Y**	**Y**	**Y**	**Y**	**Y**	**Y**	**N**	**Y**	**Y**	**N**	**Y**	**Y**	**Y**	**N**	**Y**
7	**If so, with which stakeholders and how?**	**NR = 4**																	
	• Research institutions	**5**			**x**	**x**		**x**									**x**		**x**
	• Industry/companies	**4**	**x**		**x**								**x**		**x**				
	• Associations grower/exporter/ plant protection	**3**		**x**					**x**							**x**			
	• Growers, farmer groups	**3**										**x**	**x**			**x**			
	• Local authorities	**3**	**x**				**x**								**x**				
	• Universities	**2**					**x**	**x**											
	• Comm. crop monitors/general public	**1**	**x**																
	• Extension Dept.	**1**				**x**													
	• NGO	**2**				**x**													**x**
	• Surveillance	**2**			**x**		**x**												
	• Sharing information	**1**	**x**																**x**
	• Encourage reporting/seeking assistance, collaboration	**1**	**x**			**x**											**x**		
	• Specific training	**1**	**x**																
	• Inspections	**1**		**x**															
	• Regular consultation/meetings	**1**										**x**							
8	**When there is an emergency, are stakeholders included in the emergency planning team?** *Notes:* * Should be included (?) + Farmer # They are consulted as appropriate	**Yes = 12 No = 3 NR = 2**	**Y**	**Y**	**Y**	**Y**	**Y**	(-) *	**Y**	**N**	**–**	**Y**	**Y**	(Y) +	**N #**	**Y**	**Y**	**N**	**Y**
9	**Does the NPPO's pest surveillance programmes have well developed and compatible data systems to collect, store and report pest surveillance information?** *Note:* * Partially	**Yes = 14 No = 3**	**Y**	**N**	**Y**	**Y**	**Y**	**Y**	**Y**	**Y**	**Y**	**Y ***	**Y**	**N**	**Y**	**Y**	**N**	**Y**	**Y**
10	**Does the pest surveillance programme or service have procedures to review its performance?** *Notes:* * Variable but does happen ^ Advise was taken from Coconut Research Institute for Kerala wilt	**Yes = 15 No = 2**	**Y***	**Y**	**Y**	**Y**	**Y**	**Y**	**Y**	**Y**	**Y**	**Y**	**Y**	**N**	**Y**	**Y**	**N^**	**Y**	**Y**

NR = No response

Observations/Issues

- Most (75 percent) of the countries that had a national surveillance manager also had an organizational chart. Countries without a national manager generally also did not have an organization chart (1 exception).
- It was assumed but not obvious that organizational structures described were for the purpose of official pest surveillances mandated under IPPC (i.e. pest risk assessments, pest reporting, establishment of pest-free areas).
- There was little information regarding the way stakeholders were engaged and how they supported and improved the quality of pest surveillance service.
- Two of the countries without data systems also did not have procedures for reviewing the pest surveillance performance.

Conclusions

- In most countries, official pest surveillance involved multiple organizations. However, the NPPO was involved in carrying out pest surveillance in only 8 countries. In most cases, pest surveillance was performed by other national and local agencies and plant protection services, as well as research institutions.
- Eighty percent of the countries indicated that they had well developed and compatible data systems to collect, store and report pest surveillance information.
- The indicators of relevance and performance gave little clues about the purposes of the surveillances, whether they were carried out to fulfill obligations under the IPPC or for other reasons. Surveillances for non-IPPC purposes would seem not relevant for this survey. Surprisingly, pest risk analysis was only mentioned twice.
- There is little information about the procedures for reviewing the performance of the pest surveillance programme.
- The survey results gave limited insights into the organizational structure, competence and culture of pest surveillance other than that formal linkages existed between the NPPO and non-NPPO organizations in most countries. More information may be of interest concerning the ways how stakeholders supported and improved the quality of the pest surveillance service.

C. Documented procedures

ISPM standard

The NPPO should on request, distribute reports of pest presence, distribution, or absence derived from general surveillance and specific surveys. Reports should be adequately referenced in relation to pest occurrence.

Summary of results

1. Many NPPOs (65 percent) had a computerized retrieval system for surveillance information, but 6 countries in the region did not.
2. Half the NPPO kept all required 8 items of a pest record, while India and Sri Lanka did not keep any. The information most often not recorded in the remainder of the countries was the *means of collection* and *date and name of verifier*. Other information lacking in some countries were also *scientific name of host*, *plant parts affected*, *date and name of collector* and *geographical location*.
3. GPS coordinates are used by 70 percent of the countries to specify the locations of pest detection.
4. All but 3 countries (i.e. 80 percent) had an operational manual for pest surveillance.

Survey responses

			Australia	Bangladesh	China	Fiji	India	Indonesia	Japan	Korea, Republic of	Lao PDR	Malaysia	Myanmar	Nepal	New Zealand	Philippines	Sri Lanka	Thailand	Viet Nam
1	**Is there a computerized retrieval system for surveillance information in use by the NPPO?**	**Yes = 11 No = 6**	**Y**	**N**	**Y**	**Y**	**N**	**Y**	**Y**	**Y**	**Y**	**Y**	**Y**	**N**	**Y**	**N**	**N**	**N**	**Y**
2	**Indicate if the following information is kept by the NPPO:** *Note:* * Lack of documented procedures for surveillance	**NR = 1**															**–***		
	• Scientific name of pest	**Yes = 15 No = 1 NR = 1**	**Y**	**Y**	**Y**	**Y**	**N**	**Y**	**Y**	**Y**	**Y**	**Y**	**Y**	**Y**	**Y**	**Y**		**Y**	**Y**
	• Scientific name of host	**Yes = 13 No = 3 NR = 1**	**Y**	**Y**	**Y**	**Y**	**N**	**Y**	**Y**	**N**	**Y**	**Y**	**Y**	**N**	**Y**	**Y**		**Y**	**Y**
	• Plant part affected	**Yes = 14 No = 1 NR = 2**	**Y**	**Y**	**Y**	**Y**	**N**	**Y**	**Y**	**Y**	**Y**	**Y**	**Y**	**–**	**Y**	**Y**	**–**	**Y**	**Y**
	• Means of collection	**Yes = 12 No = 2 NR = 3**	**Y**	**Y**	**–**	**–**	**N**	**Y**	**Y**	**N**	**Y**	**Y**	**Y**	**Y**	**Y**	**Y**		**Y**	**Y**
	• Date and name of collector	**Yes = 15 No = 1 NR = 1**	**Y**	**Y**	**Y**	**Y**	**N**	**Y**	**Y**	**Y**	**Y**	**Y**	**Y**	**Y**	**Y**	**Y**	**–**	**Y**	**Y**
	• Date and name of identifier	**Yes = 14 No = 2 NR = 1**	**Y**	**Y**	**Y**	**Y**	**N**	**Y**	**Y**	**N**	**Y**	**Y**	**Y**	**Y**	**Y**	**Y**		**Y**	**Y**

			Australia	Bangladesh	China	Fiji	India	Indonesia	Japan	Korea, Republic of	Lao PDR	Malaysia	Myanmar	Nepal	New Zealand	Philippines	Sri Lanka	Thailand	Viet Nam
	• Date and name of verifier *Note:* * Some	**Yes = 10 No = 4 NR = 3**	**Y**	**Y**	**–**	**–**	**N**	**Y***	**Y**	**N**	**Y**	**Y**	**Y**	**N**	**Y**	**Y**		**N**	**Y**
	• Geographical location	**Yes = 14 No = 2 NR = 1**	**Y**	**N**	**Y**	**Y**	**N**	**Y**	**Y**	**Y**	**Y**	**Y**	**Y**	**Y**	**Y**	**Y**		**Y**	**Y**
3	**Are GIS coordinates used to specify the location of pests detected during pest surveys?** *Note:* * But not all	**Yes = 12 No = 5**	**Y**	**N**	**Y**	**N**	**N**	**Y**	**Y**	**Y**	**Y**	**Y**	**Y**	**N**	**Y**	**Y**	**N**	**Y**	**Y***
4	**Is there an NPPO's operational manual for general pest surveillance?** *Note:* * Variable	**Yes = 14 No = 3**	**Y***	**Y**	**Y**	**Y**	**Y**	**Y**	**Y**	**Y**	**Y**	**Y**	**Y**	**Y**	**N**	**N**	**N**	**Y**	**Y**

NR = No response

Observations/Issues

- Not all pest records are of equal importance under the IPPC. There is no information about the kind of pest records kept and what kinds of documents were prepared.
- In addition to the quality of individual pest records it is also important to record information about the method, extent and intensity of the surveillance which would determine the accuracy and relevance of the findings.

Conclusions

- Half the countries need to improve their pest record keeping to meet international standards.
- It would be of interest to know the number and types of documents produced from the surveillance results such as pest risk analyses (ISPM No. 2), determination of pest status in an area (ISPM No. 8), and pest reports about pests of immediate or potential danger (ISPM No. 17).

D. General surveillance

ISPM standard

General surveillance is a process whereby information on particular pests which are of concern for an area is gathered from many sources, wherever it is available and provided for use by the NPPO. To utilize data from these sources, it is recommended that NPPOs develop a system whereby appropriate information on the particular pest(s) of concern is collected, verified and compiled. Information gathered through such general surveillance will most often be used (1) to support NPPO declarations of pest freedom, (2) to aid early detection of new pests, (3) for reporting to other organization such as RPPOs and FAO, and (4) in the compilation of host and commodity pest lists and distribution records.

Summary of results

1. Three quarter of the countries had a national database of plant pest records.
2. With the exception of Thailand, this database is easily accessible by the NPPO.
3. In half the countries, more than 50 percent of the samples could be verified from insect or culture collection; the level was above 75 percent in 30 percent (4) of the countries. However, the level of verification was below 25 percent in about 40 percent of the countries.
4. In most countries, plant pest records were compiled from multiple sources. The number of sources ranged from 1 to 13, with an average number of 4.8. Most sources were utilized in Australia and New Zealand (13 each), the least in Lao PDR (1). The most frequent information source was NPPO itself (13) followed by research institutions, universities (11 each), local government agencies (7) and journals (7).
5. Only two countries considered the resources required for general surveillance as sufficient. About half the countries rated their resources as intermediate, while 35 percent regarded them as marginal or lacking.
6. Pest identification services to the public were available in 75 percent of the countries.

Survey responses

			Australia	Bangladesh	China	Fiji	India	Indonesia	Japan	Korea, Republic of	Lao PDR	Malaysia	Myanmar	Nepal	New Zealand	Philippines	Sri Lanka	Thailand	Viet Nam
1	**Is there a national database of plant pest records?** *Note:* * For major crops ^ In relevant institutes	**Yes = 13 No = 3 NR = 1**	**Y**	**–**	**Y**	**Y**	**N**	**Y**	**Y**	**Y**	**Y**	**Y**	**Y**	**N**	**Y**	**Y**	**N^**	**Y**	**Y***
2	**Are databases of plant pest records easily accessible by the NPPO?** *Note:* * Can be accessed from relevant institutes	**Yes = 13 No = 3 NR = 1**	**Y**	**Y**	**Y**	**Y**	**N**	**Y**	**Y**	**Y**	**Y**	**Y**	**Y**	**N**	**Y**	**Y**	**–***	**N**	**Y**
3	**What proportion of the records can be verified from insect or culture collections?**	**NR = 2**							–							–			
	• 0	**0**																	
	• 1-25 percent	**5**		**x**				**x**			**x**		**x**	**x**					
	• 26-50 percent	**1**								**x**							**x**	**x**	
	• 51-75 percent	**3**	**x**				**x**												**x**
	• >75 percent	**4**			**x**	**x**						**x**			**x**				

			Australia	Bangladesh	China	Fiji	India	Indonesia	Japan	Korea, Republic of	Lao PDR	Malaysia	Myanmar	Nepal	New Zealand	Philippines	Sri Lanka	Thailand	Viet Nam
4	**List the information sources from which plant pest records have been compiled** (e.g. NPPOs, other national and local government agencies, research institutions, universities, scientific societies (including amateur specialists), producers, consultants, museums, the general public, scientific and trade journals, unpublished data and contemporary observations). *Note:* * All; some are more common than others	**NR = 2**	*										–				–		
	• NPPO	**13**	x	x	x	x	x		x	x	x	x			x	x		x	x
	• Universities	**11**	x	x	x		x	x	x			x		x	x			x	x
	• Research institution	**11**	x	x	x	x	x	x	x			x			x			x	x
	• Other national government agencies	**6**	x						x	x					x	x			x
	• Other local government agencies	**7**	x				x	x	x						x	x			x
	• Scientific and trade journals	**7**	x		x	x		x				x			x				x
	• Unpublished data	**3**	x									x			x				
	• Contemporary observations	**3**	x									x			x				
	• Scientific societies	**2**	x												x				
	• Producers	**2**	x												x				
	• Consultants	**2**	x												x				
	• Museums	**2**	x												x				
	• General public	**2**	x												x				
	• Farmer groups and growers	**1**														x			
	• KRS,USP, NZ (??)					x													
5	**Rate the sufficiency of resources required for general pest surveillance:**																		
	• Not at all	**1**												x					
	• Marginally	**5**					x	x					x				x	x	
	• Intermediate	**9**	x	x	x	x				x	x	x			x	x			
	• Sufficient	**2**							x										x
	• More than Sufficient	**0**																	
6	**Is there a service for the public to have pests identified?**	**Yes = 13 No = 3 NR = 1**	**Y**	**Y**	**Y**	**Y**	**Y**	**Y**	**Y**	**Y**	**N**	**Y**	**–**	**N**	**Y**	**Y**	**Y**	**Y**	**N**

NR = No response

Observations/Issues

- According to the definition, general surveillance is the gathering of information about specific pests of concern in an area. There is no information about the number of pests of concern about which evidence was gathered by the NPPO from available sources.
- Distinction may have to be made between general, scientific surveys that record any kind of insect or pathogen found in an area, and general surveillance of specific pests which are of concern for an area because of their immediate or potential danger.

Conclusions

- Almost all countries (15) reported to have plant pest records which most had been gathered in a national database (13) that is generally assessable to the NPPO.
- The relevance and performance of general surveillance in the respective counties may be equally assessed by the number and types of documents generated as a result from the investigation, as by the number of different information sources that were utilized.

E. Specific surveys

ISPM standard

Specific surveys are procedures by which NPPOs obtain information on pests of concern on ***specific sites*** in an area over a defined period of time. Specific surveys may be detection, delimiting or monitoring surveys. These are official surveys and should follow a plan which is approved by the NPPO. Surveys for specific pests will provide information to be used mainly (1) to support NPPO declarations of pest freedom, but also (2) to aid early detection of new pests and (3) for reporting to other organization such as RPPOs and FAO,

Summary of results

1. Most counties (= 13) have a specific manager with overall responsibility for surveillance activities.
2. In all but two cases is the surveillance manager trained in management.
3. The number of plants/plant products that are officially surveyed for pests on a regular basis ranged from 1 to over 250.
4. The number of plant species listed ranged from 1 to 90 species, mostly between 5 and 9 species. The crops mentioned most often were rice (11), followed by maize (6), potato (6), coconut (5) and banana (5).
5. Most countries listed multiple organizations or bodies that decide which plant species or plant product are officially surveyed for pests. The institutions most often mentioned were NPPO, quarantine and plant protection services (8), ministry level (7), other national and local government agencies (6).
6. The main reasons for initiating a specific survey were to gather information about the importance and damage of a pest(11), maintaining trade opportunities (8), pest management (6) and new pest detections (5).
7. In 4 countries there were agreements between the NPPO and industry to cover expenditures for surveys.
8. In 8 countries there were agreements between the NPPO and public institutions to cover expenditures for surveys.
9. In most cases, these agreements were for specific surveys, surveys related to outbreaks and surveys related to pest-free areas, areas of low pest prevalence, etc.
10. In about 80 percent of the countries, the specific pest survey procedures were described in an operational manual or plan.
11. Most countries (75 percent) indicated that the performance, efficiency, efficacy and relevance of those manuals or plans were periodically evaluated. There was only one case where such evaluations did not take place.

Survey responses

			Australia	Bangladesh	China	Fiji	India	Indonesia	Japan	Korea, Republic of	Lao PDR	Malaysia	Myanmar	Nepal	New Zealand	Philippines	Sri Lanka	Thailand	Viet Nam
1	**Is there a specific manager with overall responsibility for surveillance activities?**	**Yes = 13 No = 4**	**Y**	**N**	**Y**	**Y**	**Y**	**Y**	**Y**	**Y**	**N**	**Y**	**Y**	**N**	**Y**	**Y**	**N**	**Y**	**Y**
2	**Is the pest surveillance manager trained in management?**	**Yes = 12 No = 5**	**Y**	**Y**	**Y**	**Y**	**Y**	**Y**	**Y**	**N**	**N**	**Y**	**Y**	**N**	**Y**	**Y**	**N**	**N**	**Y**
3	**How many plant species or plant products grown in the country are officially surveyed for pests on a regular basis?** *Notes:* ++ Many * Not regular and have no record		200 +	4-7	>20	>10	>20	++	>50	250 spp.	9	9	6	*	>10	7+	1	1	>10
4	**List the plant species using scientific names (genus and species).** *Notes:* [1] See attached list [2] All kinds of grain crop and cash crop [3] Horticulture crops, Estate crops, Food crops [4] Risk assessment, impact, economic loss, pest control	NR = 1	[1]		[2]		[2]	[3]		–							[4]		
	• *Oryza sativa* (Rice)	**11**	**x**	**x**			**x**		**x**		**x**	**x**	**x**			**x**	**x**	**x**	**x**
	• *Zea mays* (Maize)	**6**	**x**								**x**		**x**	**x**		**x**			**x**
	• *Solanum tuberosum* (Potato)	**6**	**x**	**x**			**x**		**x**						**x**				**x**
	• *Cocos nucifera* (Coconut)	**5**	**x**				**x**				**x**	**x**				**x**			
	• *Musa* spp. (Banana)	**5**	**x**				**x**				**x**	**x**							**x**
	• *Mangifera indica* (Mango)	**4**									**x**	**x**				**x**			**x**
	• *Citrus* spp.	**4**	**x**				**x**				**x**					**x**			
	• Triticum aestivum (Wheat)	**4**	**x**	**x**			**x**		**x**										
	• *Nephelium lappaceum* (Rambutan)	**3**	**x**									**x**							**x**
	• *Carica papaya* (Papaya)	**3**	**x**			**x**						**x**							
	• *Gossypium hirsutum* (Cotton)	**3**	**x**				**x**						**x**						
	• *Saccharum* sp. (Sugarcane)	**3**	**x**				**x**				**x**								
	• *Brassica* spp. (cabbage)	**3**	**x**				**x**				**x**								
	• *Capsicum frutescens* (chilli)	**3**	**x**			**x**	**x**												
	• *Hylocereus undatus* (Pitaya)	**2**										**x**							**x**
	• *Artocarpus heterophyllus* (Jackfruit)	**2**				**x**						**x**							
	• *Cajanus cajan* (Pigeon Pea)	**2**					**x**						**x**						
	• *Abelmoschus esculentum,* (Okra)	**2**					**x**									**x**			
	• *Coffea canephora* and *C. arabica* (Coffee)	**2**	**x**																**x**
	• *Pinus radiate* (Montery Pine)	**2**	**x**												**x**				
	• *Prunus* sp. (Cherries)	**2**	**x**												**x**				
	• *Persea americana* (avocado)	**2**	**x**			**x**													
	• *Psidium guajava* (guava)	**2**	**x**			**x**													
	• *Solanum melongena* (egg plant)	**2**	**x**			**x**													
	• *Nicotiana* spp. (tobacco)	**2**	**x**				**x**												
	• *Allium* (onion, garlic)	**2**	**x**				**x**												

			Australia	Bangladesh	China	Fiji	India	Indonesia	Japan	Korea, Republic of	Lao PDR	Malaysia	Myanmar	Nepal	New Zealand	Philippines	Sri Lanka	Thailand	Viet Nam
	• *Averrhoa carambola* (Star fruit)	**1**										**x**							
	• *Vigna radiata* (Mung Bean)	**1**											**x**						
	• *Vigna mungo* (Black gram)	**1**											**x**						
	• *Cicer aeriatinum* (Chick pea)	**1**					**x**												
	• *Euphoria longan* (Longan)	**1**																	**x**
	• *Litchi chinensis* (Lichi)	**1**																	**x**
	• *Durio zibethinus* (Durian)	**1**																	**x**
	• *Agathis australis* (Kauri)	**1**													**x**				
	• *Colocasia esculenta* (coco yam)	**1**				**x**													
	• *Manhiot esculaenta* (cassava)	**1**				**x**													
	• *Arachis* spp. (groundnut)	**1**					**x**												
	• Vegetables	**1**														**x**			
5	**Identify the organization, government department or other body who decides which plant species or plant products grown in the country are officially surveyed for pests:**	**NR = 1**																	
	• NPPO/Quarantine/Plant Protection	**8**		**x**		**x**	**x**		**x**	**x**			**x**			**x**			**x**
	• MOA/DAFF/	**6**	**x**		**x**			**x**					**x**		**x**				**x**
	• DOA	**3**									**x**	**x**						**x**	
	• Local Government	**3**	**x**						**x**	**x**									
	• Forest Service/Admin.	**3**			**x**	**x**				**x**									
	• Rural Dev. Admin	**1**								**x**									
	• MAP?, MPI?	**2**				**x**					**x**								
	• (Maize?)	**1**												**x**					
6	**List three main reasons for initiating a specific survey?**																		
	• Economic importance of pests/loss/ define pest status/establish-update pest list/pest risk	**11**			**x**	**x**		**x**	**x**	**x**	**x**	**x**		**x**			**x**	**x**	**x**
	• International trade obstacle pests/ maintain trade/market access/disputes	**8**	**x**				**x**			**x**		**x**	**x**		**x**	**x**			**x**
	• New Pest detection	**5**			**x**	**x**		**x**		**x**					**x**				
	• Pest management/control/outbreak	**6**					**x**		**x**			**x**	**x**	**x**			**x**		
	• Early warning/detection	**3**	**x**	**x**				**x**											
	• Conducting PRA	**2**															**x**	**x**	
	• Generally proof of absence/ Delimiting survey	**2**	**x**													**x**			
	• Policy support/ new regulations	**3**			**x**	**x**													**x**
	• Forecasting	**1**		**x**															
	• Operationing	**1**		**x**															
	• Pest/nat. enemy populations	**1**											**x**						
	• Industry request	**1**													**x**				
	• When quarantine pest is intercepted	**1**																**x**	
	• Establishment of quarantine weeds																		
	• Establishment of biocontrol agents	**1**															**x**		
	• Domestic importance of crop	**1**					**x**												

			Australia	Bangladesh	China	Fiji	India	Indonesia	Japan	Korea, Republic of	Lao PDR	Malaysia	Myanmar	Nepal	New Zealand	Philippines	Sri Lanka	Thailand	Viet Nam
7	**Are there agreements between the NPPO and industry (or private institutions) to cover expenditures for surveys?**	**Yes = 4 No = 13**	**Y**	**N**	**N**	**N**	**N**	**N**	**N**	**N**	**N**	**N**	**N**	**N**	**Y**	**Y**	**N**	**N**	**Y**
8	**Are there agreements between the NPPO and public institutions or agencies to cover expenditures for surveys?**	**Yes = 7 No = 10**	**Y**	**N**	**Y**	**Y**	**N**	**N**	**Y**	**N**	**N**	**N**	**N**	**N**	**Y**	**Y**	**N**	**N**	**Y**
9	**Are these agreements for:**																		
	• Specific surveys,	**Yes = 7 No = 10**	**Y**	**N**	**Y**	**Y**	**N**	**N**	**Y**	**N**	**N**	**N**	**N**	**N**	**Y**	**Y**	**N**	**N**	**Y**
	• Surveys related to outbreaks,	**Yes = 8 No = 9**	**Y**	**N**	**Y**	**Y**	**N**	**Y**	**Y**	**N**	**N**	**N**	**N**	**N**	**Y**	**Y**	**N**	**N**	**Y**
	• Surveys related to PFA, ALPPs etc.	**Yes = 6 No = 11**	**N**	**N**	**Y**	**Y**	**N**	**Y**	**Y**	**N**	**N**	**N**	**N**	**N**	**Y**	**Y**	**N**	**N**	**N**
10	**Are the specific pest surveys procedures described in an operational manual or plan?** *Note:* * Only rice	**Yes = 14 No = 3**	**Y**	**Y***	**Y**	**Y**	**Y**	**Y**	**Y**	**Y**	**Y**	**Y**	**N**	**N**	**Y**	**Y**	**N**	**Y**	**Y**
11	**Are the performance, efficiency, efficacy and relevance of those manuals or plans periodically evaluated?** *Note:* * Might be a long time between reviews though	**Yes = 13 No = 4**	**Y***	**Y**	**Y**	**Y**	**Y**	**Y**	**Y**	**Y**	**N**	**Y**	**N**	**N**	**Y**	**Y**	**N**	**Y**	**Y**

NR = No response

Observations/Issues

The huge difference would warrant a closer look how the numbers were generated:

- According to the main definition, specific surveys are about specific sites in an area, e.g. PFA or ALPPs. The survey questions, however, were largely about specific plant species or plant products.
- Later in ISPM No. 6, additional categories of specific surveys are mentioned which seem to exceed the definition in ISPM No. 5 and at the beginning of ISPM No. 6. The following types of specific surveys are listed: (1) pest surveys, (2) Commodity or host surveys, and (3) targeted and random sampling.
- The connection between a specific manager with overall surveillance responsibility and specific surveys is not clear.

Conclusions

- There seems to be confusion about the specific meaning of "specific surveys" in the context of ISPM No. 6. Without a clear common understanding of the scope and purpose of "specific survey", it is difficult to interpret the responses.

(Pest diagnostics)

Note: This section was not part of the questionnaire sent to the APPPC countries. However, it was answered by 7 of the 17 countries who found it on-line.

ISPM standard

The NPPO should provide appropriate diagnostic services to support general surveillance and specific survey activities or ensure access to such services. Verification of diagnoses by other recognized authorities will provide increased confidence in the survey results.

Summary of results

1. In almost all countries there are pest diagnostic services besides the NPPO.
2. In all countries is the pest diagnostic laboratory optimally situated.
3. In some countries, the laboratories are run independently, but mostly they are managed centrally.
4. In most countries there are formal arrangements between the NPPO and other laboratories.
5. Slightly more than half the countries have formal arrangements with laboratories outside the country.
6. Almost all countries transmit pictures to a central diagnostic laboratory to assist in pest diagnosis.
7. Almost all NPPO verify their results with other laboratories, except India.
8. Only India and New Zealand have NPPO diagnostic laboratories accredited to formal ISO standards.
9. Only Australia and India have other laboratories accredited to formal IPO standards.
10. All countries considered their staff sufficiently qualified and trained to perform pest diagnostics and use relevant laboratory equipment.
11. Three NPPO reported to lack a weed science professional. In addition, one country also lacked a nematologist, and another one a virologist; otherwise, all other professionals are available in the NPPO diagnostic services.
12. All contries have documented procedures for sampling, sample delivery, intermediate storage and disposal.
13. All countries have documented procedures for diagnostics, tracability and reporting.
14. In all countries are the samples submitted managed in accordance with those procedures.
15. With the exception of Australia, collection kids are provided by the laboratory to the pest surveillance staff.
16. In all countries do the phytosanitary surveillance plans take into account the required laboratory support.
17. In all countries does the laboratory staff participate in the preparation of the NPPO's pest surveillance plans.
18. Normally, the government paid fully or mostly for the pest diagnostic services. In Australia, there are multiple sources of funds.
19. In more than half the countries are the pest diagnostic services costed separately.
20. In all countries does the laboratory staff provide training on taking samples and field recognition of fests and their symptoms.
21. In the majority of the countries (4 out of 7), training in pest diagnostics is scheduled at least once a year; in the other countries, there was no programmed training.

Survey responses

			Australia	India	Japan	Lao PDR	Malaysia	New Zealand	Thailand
1	**Is the NPPO the sole provider of pest diagnostic services in the country?**	**Yes = 1 No = 5 NR = 1**	**N**	**–**	**N**	**Y**	**N**	**N**	**N**
2	**Is the pest diagnostic laboratory (ies) optimally situated in the country so that it takes into account the geographic demand for laboratory services?**	**Yes = 6 No = .5 +/- = .5**	**Y**	**Y**	**Y**	**Y**	**Y**	**Y**	**N,+/-**
3	**If more than one NPPO laboratory exists in the country, are they managed centrally at the national level?**	**Yes = 4 No = 2 NR = 1**	**N**	**Y**	**Y**	**–**	**Y**	**Y**	**N**
4	**Does the NPPO's laboratory cooperate through formal arrangements with other non-NPPO laboratories or institutions inside the country for pest diagnostics?**	**Yes = 5 No = 2**	**Y**	**Y**	**Y**	**N**	**Y**	**Y**	**N**
5	**Does the NPPO's have formal arrangements with other laboratories or institutions outside the country for pest diagnostics?**	**Yes = 4 No = 3**	**N**	**N**	**N**	**Y**	**Y**	**Y**	**Y**
6	**Does the NPPO use virtual diagnostics, i.e. transmission of images of pests to a central diagnostic service inside or outside the country?**	**Yes = 6 N = 1**	**Y**	**N**	**Y**	**Y**	**Y**	**Y**	**Y**
7	**Does the laboratory verify its performance/results with other pest diagnostic laboratories inside or outside the country?**	**Yes = 6 N = 1**	**Y**	**N**	**Y**	**Y**	**Y**	**Y**	**Y**
8	**Is the NPPO pest diagnostic laboratory accredited to formal ISO standards e.g. ISO 17025?**	**Yes = 2 No = 5**	**N**	**Y**	**N**	**N**	**N**	**Y**	**N**
9	**Are other pest diagnostic laboratories in the country accredited to formal ISO standards e.g. ISO 17025?**	**Yes = 2 No = 5**	**Y**	**Y**	**N**	**N**	**N**	**N**	**N**
10	**Are staff sufficiently qualified and trained to perform pest diagnostics and use relevant laboratory equipment, analytical methods, etc. necessary to support the pest surveillance activities?**	**Yes = 5 +/- = 2**	**Y**	**+/-**	**Y**	**Y**	**+/-**	**Y**	**Y**
11	**If any, which of the following professions are *missing* in the NPPO's pest diagnostics service?**								
	• Entomology	**0**							
	• Plant Pathology (Bacteriology)	**0**							
	• Plant Pathology (Mycology)	**0**							
	• Plant Pathology (Virology)	**1**				**x**			
	• Nematology	**1**					**x**		
	• Weed Science	**3**			**x**	**x**	**x**		
12	**Are there documented procedures for: sampling, sample delivery, intermediate storage and disposal?**	**Yes = 7**	**Y**	**Y**	**Y**	**Y**	**Y**	**Y**	**Y**
13	**Are there documented procedures for: diagnostics, traceability, reporting etc.?**	**Yes = 5 +/- = 2**	**Y**	**Y**	**Y**	**+/-**	**+/-**	**Y**	**Y**
14	**Are all samples submitted managed in accordance with those procedures?**	**Yes = 6 +/- = 1**	**Y**	**Y**	**Y**	**Y**	**+/-**	**Y**	**Y**
15	**Does the laboratory provide to the pest surveillance staff collection kits for different types of specimens and samples?**	**Yes = 6 No = 1**	**N**	**Y**	**Y**	**Y**	**Y**	**Y**	**Y**
16	**Do the NPPO's phytosanitary surveillance plans take into account the required laboratory support?**	**Yes = 5 +/- = 2**	**Y**	**Y**	**Y**	**+/-**	**+/-**	**Y**	**Y**

			Australia	India	Japan	Lao PDR	Malaysia	New Zealand	Thailand
17	**Does the laboratory staff participate in the preparation of the NPPO's pest surveillance plans?** *Note:* * But may be by s/t	**Yes = 6 +/- = 1**	**Y***	**+/-**	**Y**	**Y**	**Y**	**Y**	**Y**
18	**Who pays for pest diagnostics services?**	**0**							
	• Government	**5**		**x**	**x**	**x**	**x**		**x**
	• Variable – Mostly Government	**1**						**x**	
	• Variable – Mostly Private Sector	**0**							
	• Private Sector	**0**							
	• Other: Whole range: Federal government, state/territory governments, private	**1**	**x**						
19	**When planning for pest surveillance, are pest diagnostics services that might be needed costed separately?**	**Yes = 4 No = 3**	**Y**	**N**	**N**	**Y**	**N**	**Y**	**Y**
20	**Does the laboratory staff provide training on taking samples and field recognition of pests and their symptoms to staff involved in pest surveillance?**	**Yes = 7**	**Y**	**Y**	**Y**	**Y**	**Y**	**Y**	**Y**
21	**How frequent are training programs for staff involved in pest diagnostics?**								
	• [x] No programmed training	**3**	**x**			**x**			**x**
	• [x] At least once per year	**4**		**x**	**x**		**x**	**x**	

NR = No response; +/- = To a certain extent

Observations/Issues

- It is not clear whether question 2 refers to the NPPO or other laboratories. There was no question whether NPPO has more than one laboratory. If there is only one, then it would automatically be centrally managed (question 3) and it would not need to transmit pictures to itself (question 6).
- An explanation may be required why India's staff in only qualified "to a certain extent" qualified and trained to perform pest diagnosis even though its NPPO and other laboratories in the country are accredited to formal ISO standards.
- An explanation may be required why in Lao PDR and Thailand laboratory staff provides training to staff involved in pest surveillance, but still less than 25 percent of the surveillance staff was reported to be trained to do so (section F-question 11).
- It is not clear whether all laboratories were assumed to be able to identify all pest categories, i.e. insects, bacteria, fungi, viruses, nematodes and weeds? It may be possible that some answers would depend on the type of laboratory.

Conclusions

- All responding countries had diagnostic services, and in most cases there were laboratories in addition to the NPPO's laboratory/ies.
- All NPPO laboratories had formal agreements with other laboratories for pest diagnosis.
- All laboratories had fully or partially documented procedures for sampling, delivery, storage, disposal, diagnostics, traceability, reporting, etc. and all samples were generally submitted and managed in accordance with those procedures.
- There is no information regarding the capacity of the laboratories, and how the number of pest diagnostics corresponded to the number of samples collected during the pest surveillance programme. It would seem of interest whether the NPPO laboratory manages 100 samples per year or 10 000.

F. Resources

ISPM standard

Personnel involved in general surveillance and surveys should be adequately trained. Appropriate equipment and supplies should be used and maintained adequately.

Summary of results

1. The annual NPPO investments for pest surveillances ranged from US$600 in Lao PDR to more than US$10 million in Australia.
2. The non-NPPO budget contributions for pest surveillance ranged from zero to US$10-50 million in New Zealand.
3. The percentage of the NPPO budget that is allocated for salaries ranged from 0 percent to 40 percent.
4. Industry (private sector) contributed to pest surveillance in 2 countries. In Myanmar, these contributions were less than 5 percent of NPPO's budget, and about 10 percent in New Zealand.
5. The other resources required to operate the pest surveillance programme were considered as adequate in only four countries. Most countries rated them as marginally or intermediate sufficient. In Bangladesh they were as not at all sufficient.
6. The number of NPPO surveillance personnel ranged from 3 to 697; overall, 5 percent had a doctoral degree, 18 percent a masters degree, 37 percent a bachelor and 40 percent had less than a bachelor. The largest staffs with almost 700 persons were reported from Indonesia and Malaysia.
7. The NPPO's human resources capacity in terms of numbers was rated as *good* in three countries (India, Japan and Viet Nam). It was rated "*weak*" in 40 percent of the countries, and *average* in the rest (also 40 percent).
8. In terms of qualification and skills, it was also rated as *good* in three cases (Australia, India and Viet Nam) and *weak* in only one case (Lao PDR).
9. The human resources were considered *sufficient* in Australia and New Zealand, and *almost sufficient* in Japan and Viet Nam. The remainder of the countries carried out their activities *with difficulties* (40 percent) or *insufficiently* (35 percent).
10. Specific surveys were almost always entirely paid by the government. Australia and Viet Nam also had some additional sources.
11. In 40 percent of the counties, 75-100 percent of the surveillance staff was trained to do so. In 60 percent of the countries the proportion was only about 25 percent.
12. In about half the countries (8), training programmes for surveillance staff were carried out at least once a year. It was less frequent in 3 other countries, and there was no programmed training in 30 percent of the countries.

Survey responses

			Australia	Bangladesh	China	Fiji	India	Indonesia	Japan	Korea, Republic of	Lao PDR	Malaysia	Myanmar	Nepal	New Zealand	Philippines	Sri Lanka	Thailand	Viet Nam
1	**What is the total annual investment being currently made by the NPPO to conduct Pest Surveillance (USD)? Please make the best guess possible?** *Notes:* [1] Inadequate [2] Not calculated as it is cumulative cost [3] General Surveillance	**NR = 5**	10 + M	[1]	2 M	15 000	4.9 M	4.5 M	–	0.4 M	600	0.6 M	–	[2]	2-5 M	0.75 M[3]	–	40 000	0.3-0.5 M
2	**Estimate the total annual investment being made by other public or private organizations, agencies or departments (non-NPPO) to conduct pest surveillance in the country?** *Notes:* [1] Inadequate [2] No data/unknown [3] No such activities [4] USDA Detection & LMS for (2006-2010)	**NR = 7**	12 + M	[1]	2 M	20 000	–	[2]	–	23 M	0	3.5 M	–	0[3]	10-50 M	1 M	–	0	[2]
3	**What percentage (percent) of the NPPO budget is allocated to cover salaries of those involved in the pest surveillance programme?** *Notes:* [1] No specific allocation of fund [2] Cumulative task [3] Unknown	**NR = 3**	0.25 percent	[1]	0	0.8	31 percent	4.5 percent	–	0	0	40 percent	20 percent	[2]	< 5 percent	30-40 percent	–	0	[3]
4	**What is the contribution of industry (private sector) to surveillance as a percentage of the total NPPO pest surveillance budget (best guess)?**	**NR = 3**							–		–						–		
	• Nil	**10**	**x**		**x**	**x**	**x**	**x**		**x**		**x**		**x**				**x**	**x**
	• Negligible	**1**		**x**															
	• Not available	**1**														**x**			
	• < 5 percent	**1**											**x**						
	• 10 percent	**1**													**x**				
5	**Rate the sufficiency of other resources (vehicles, traps, lures, samplers, GPS, etc.) required to operate the pest surveillance programme:**																		
	• Not at all	**1**		**x**															
	• Marginally	**6**									**x**		**x**	**x**		**x**	**x**	**x**	
	• Intermediate	**6**	**x**		**x**	**x**		**x**		**x**		**x**							
	• Sufficient	**4**					**x**		**x**						**x**				**x**
	• More than sufficient	**0**																	

			Australia	Bangladesh	China	Fiji	India	Indonesia	Japan	Korea, Republic of	Lao PDR	Malaysia	Myanmar	Nepal	New Zealand	Philippines	Sri Lanka	Thailand	Viet Nam
6	**Of the staff of the NPPO officers undertaking general or specific surveys, how many are in the following categories of qualification?**	**NR = 3**																	
	• Doctoral or equivalent: *Note:* * For general	95	5	–	7	3	30	4	–	10		5	5	1	1	1*		3	20
	• Master or equivalent:	342	1		26	26	40	35		25		45	8	1		3		12	120
	• Bachelor or equivalent:	697	11		5	5	30	350		5	x	197	12	4	2	16		–	60
	• Lower than bachelor level:	762	0		0	0	–	300		–		455	2	5				–	
	Total staff	1 882	17		38	34	100	685		40		697	22	11	3	20		15	200
7	**Rate the current NPPO's pest surveillance programme current human resources capacity in terms of numbers:**																–		
	• Very weak	**0**																	
	• Weak	**7**		**x**						**x**	**x**		**x**	**x**			**x**	**x**	
	• Average	**7**	**x**		**x**	**x**		**x**				**x**			**x**	**x**			
	• Good	**3**					**x**		**x**										**x**
	• Very Strong	**0**																	
8	**Rate the current NPPO's pest surveillance programme current human resources capacity in terms of qualifications and skills:**																		
	• Very weak	**0**																	
	• Weak	**1**									**x**								
	• Average	**11**		**x**	**x**	**x**		**x**		**x**		**x**	**x**	**x**		**x**	**x**	**x**	
	• Good *Note:* * For NPPO (NAQS)	**3**	**x***				**x**												**x**
	• Very Strong	**2**							**x**						**x**				
9	**Are those human resources sufficient to carry out the activities according to the NPPO's requirements for pest surveillance?**																		
	• Not at all	**0**																	
	• Insufficient	**6**		**x**						**x**	**x**			**x**			**x**	**x**	
	• With Difficulty	**7**			**x**	**x**	**x**	**x**				**x**	**x**			**x**			
	• Almost	**2**							**x**										**x**
	• Completely *Note:* * (NPPO)	**2**	**x***												**x**				
10	**Who pays for the specific surveys to be conducted?**	**NR = 1**																	
	• Government *Note:* * For delimiting survey	**14**		**x**	**x**	**x**	**x**	**x**	**x**	**x**	**x**	**x**	**x**	**x**		**x***	**x**	**x**	
	• Variable – Mostly Government	**2**	**x**																**x**
	• Variable – Mostly Private Sector	**0**																	
	• Private Sector	**0**																	
	• Other (please describe) USDA/ACIAR	**1**														**x**			

			Australia	Bangladesh	China	Fiji	India	Indonesia	Japan	Korea, Republic of	Lao PDR	Malaysia	Myanmar	Nepal	New Zealand	Philippines	Sri Lanka	Thailand	Viet Nam
11	**What proportion of the staff assigned to carry out pest surveillance have been specifically trained to do so?**																		
	• None	**0**																	
	• 25 percent *Note:* * Few	**10**		x	x	x				x	x		x	(x)*		x	x	x	
	• 50 percent	**0**																	
	• 75 percent	**3**	x				x	x											
	• All	**4**							x			x			x				x
12	**How frequent are training programmes for staff involved in pest surveillance?**																		
	• No programmed training	**6**	x								x		x	x			x	x	
	• Once every 5 years	**0**																	
	• Once every 3 years	**2**								x						x			
	• Once every two years	**1**																	x
	• At least once per year	**8**		x	x	x	x	x	x			x			x				

NR = No response; +/- = To a certain extent

Observations/Issues

- While question 2 asked for the amounts of public and private contributions, it must be realized that in almost all cases (with the exception of New Zealand), the numbers given are contributions from public organizations since these countries reported no private sector contributions in question 4.
- Question 3 gives little insight into the personnel resources involved in the pest surveillance since many NPPO rely on the services of other organizations. The answers may reflect the degree of decentralization of pest surveillance in the respective countries, or the priority ranking of pest surveillance among the NPPO obligations.
- It is not clear why question 6 is restricted to NPPO staff since in many countries pest surveillance is carried out by non-NPPO staff. The responses to this question give no indication as to the qualifications of the surveillance personnel, only about the qualifications of the staff of the national office.
- It is not clear why question 10 was restricted to specific surveys unless one expects differences between the two types of pest surveillance; in this case, however, the corresponding question concerning who pays for general surveillance activities is missing in the questionnaire.
- The frequency of training for surveillance staff may largely depend on their qualifications and turnover. Frequent training may indicate a large turnover where many new and inexperienced staff needed to be trained constantly, while other countries carried out their programmes with a qualified, professional core staff that did not require re-training.

Conclusions

- There are huge differences between the countries of the APPPC region in terms of resources; in 5 countries, the total annual investments for pest surveillance exceeded US$1 million, while it was less than US$50 000 in 4 countries.
- Difference in resources inevitably must result in differences of performance. This section attempted to quantify the inputs resources, but without information on the outputs produces, this seems incomplete.
- The questionnaire gives little information with regard to the respective sources of funding and allocation of resources for general surveillance and specific surveys if these two types of pest surveillances are indeed financed differently.
- There is clearly a training deficit in 10 of the responding countries where less than 25 percent of the staff involved in pest surveillance have been trained to do so.

G. Open ended feedback

Question 1

List five things that affect your country's ability to conduct effective pest surveillance.

Summary of results

- Most mentioned were personnel-related factors, lack of skilled personnel, lack of training and lack of staff (17).
- The single most often mentioned factor that affected surveillance activities was funding, which was reported from 2/3 (12) of the countries, mostly as the first priority.
- Other factors that were repeatedly mentioned were:
  - lack of skilled personnel, training of survey personnel (12)
  - lack of infrastructure and pest identification (11)
  - lack of stakeholder cooperation and public participation (8)

Survey responses

List five things that affect your country's ability to conduct effective pest surveillance		Australia	Bangladesh	China	Fiji	India	Indonesia	Japan	Korea, Republic of	Lao PDR	Malaysia	Myanmar	Nepal	New Zealand	Philippines	Sri Lanka	Thailand	Viet Nam
Funding	**12**	1	2	1	1		2		4	2	1	1			1			1
Lack of skilled personnel	**7**		3	3	3					3	2		1					2
training of survey personnel	**4**								3		3				2			4
Lack of logistics/infrastructure, laboratories	**4**		5							4	4				3			
Policy	**3**			2	2		1											
Pest identification/reference materials	**3**						5					2						3
Public participation	**2**			4	4													
Central/federal responsibilities	**3**	4				1			1									
Lack of staff	**3**		4			4					5							
Basic research	**2**			5	5													
Stakeholder cooperation	**2**									1			2					
Staffing	**1**	2																
Number of pests	**1**	3																
Diverse range of climate, regions, crops	**2**	5				3												
Administrative/planning	**1**		1															
Training on pest collection/preservation	**1**						x											
Expert access	**1**						4											
Practical emergency action plan	**1**								2									
Cooperation public/private	**1**								5									
National database	**2**					2				5								
Inadequate thust in the past (?)	**1**												3					
Lack of motivation and job descriptions	**1**												4					
Lack of support from surveillance tools	**1**												5					
Peace and order	**1**														4			
Legal power to utilize public/private organ.	**1**					5												

Note: number indicates ranking between 1-5

Question 2

List three things you would like to see improved in ISPM No. 6.

Summary of responses

- Most of the responses were related to improving the country's performance and implementation of ISPM No. 6 rather than improving the ISPM No. 6 guidelines themselves.
- Suggestions for improving ISPM No. 6 were
  - more detailed descriptions of surveillance and reporting procedures
  - case studies and examples
  - examples of report format and standard phrases for pest reporting

Survey responses

List three things you would like to see improved in ISPM No. 6	NR = 6	Australia	Bangladesh	China	Fiji	India	Indonesia	Japan	Korea, Republic of	Lao PDR	Malaysia	Myanmar	Nepal	New Zealand	Philippines	Sri Lanka	Thailand	Viet Nam
Training	**3**			**x**	**x**		**x**											
More detailed surveillance procedures	**3**					**x**					**x**							**x**
Technical/demonst. details for some pests	**2**			**x**	**x**													
Data analysis and report sharing	**2**			**x**	**x**													
Example of SOP for good practice	**1**						**x**											
Case study for quarantine pest surveillance	**1**									**x**								
Training materials for managers of emergency actions	**1**								**x**									
Field visit/diagnostic report format for presence of pest	**1**										**x**							
Standard phrases for pest reporting	**1**								**x**									
Software for record keeping	**1**						**x**											
Centralized survey & identification system	**1**								**x**									
Sustainable source for diagnosis	**1**											**x**						
Translation into local language	**1**									**x**								
Technical cooperation	**1**											**x**						
Acquisition with idea, knowledge and empowerment (?)	**1**												**x**					
Knowledge delivery	**1**												**x**					
Ability to conduct surveillance and teach staff	**1**												**x**					
Centralized record keeping	**1**														**x**			
Confirmation of surveillance records done by non-NPPO organizations	**1**																	**x**
Delegation of pest surveillance to non-NPPO organizations	**1**																	**x**

shaded: related to improving ISPM No. 6

3. Technical resources

Summary of resources

Following is a summary of the resources mentioned in the country responses. Some categories are not clearly distinguishable from others, resulting in some overlap of the items mentioned.

Tools

Sample collection

- Pests traps (plant diseases, insects and mites)
- camera
- nets
- Specimen bottles
- Inspection kits (scalpel, forceps, probes, magnifying glass)
- Latex gloves
- Fruit fly lures
- Monitoring of white grubs using light traps

Electronic devices

- data logger Hand Held Device for e-pest surveillance
- Global positioning system (GPS)
- Mobile handsets for transferring data through SMS
- e-locust device with Ramses system

Software

- Software for e-pest surveillance
- HRSS Mobile (field capture software)
- SAFRINET
- Lucid Keys
- Seed-born fungi identification (intranet only)
- Coleoptera Identification (intranet only)

General identification guides

- Crop Protection Compendium
- Diagnostic Insect pest book
- Pest illustrated handbook
- Identification fact sheets
- PaDIL (New Zealand Biosecurity image library)
- Pest Lists: http://www.biosecurity.govt.nz/pests/registers
- Lepidoptera: Identification guide
- Coleoptera: Identification guide
- Diagnostic protocol for plant bacteria
- Diagnostic protocol for plant viruses
- Diagnostic protocol for plant parasitic nematodes
- Diagnostic protocol for quarantine weeds

Taxonomic identification keys

- Crop Based Taxonomic Keys: Part 1 (202 pages)
- Crop Based Taxonomic Keys: Part 1 (420 pages)
- Organism Order Descriptions: Part 1 (172 pages)
- Organism Order Descriptions: Part 2 (362 pages)
- Identification of weevils in Genus Sternochetus

Other

- Electron microscope for pest diagnosis
- Remote microscopy session

Training materials

Training curricula

- Facilitator's Guide: Pest Identification Workshop 1
- Trainee's Workbook: Pest Identification Workshop 1 (56 pages)
- Facilitator's Guide: Pest Identification Workshop 2
- Trainee's Workbook: Pest Identification Workshop 2 (80 pages)
- Facilitator's Guide: Pest Identification Workshop 3
- Trainee's Workbook: Pest Identification Workshop 3
- Facilitator's Guide: Pest Identification Workshop 4
- Trainee's Workbook: Pest Identification Workshop 4

Identification aids

- Compendium of Exotic Plant and Weeds
- Identification of chrysomelid larvae based on morphological characters (Coleoptera: Chrysomelidae)
- Identification of Plant Quarantine Fungi for Beginners
- Identification for mealybug species of quarantine significance (Hemiptera: Pseudococcidae)
- A key to species of armored scales (Diaspidiae) intercepted on imported seedlings and fruits
- Quarantine pest illustrated handbook
- 100 genus of fungi
- Introduction nematode and diagnostic protocols for regulated pest pictorial glossary of morphological terms in Nematology

Teaching aids

- LCD Projectors
- pictures, photographs, specimen, leaflets, fact sheets, herbarium
- Guidelines for plant pest surveillance
- Surveillance team work plan
- Pest record book
- Glossary of Phytosanitary Terms
- National Technical Regulations

Presentations

- Presentations to cover all the pest identification workshops and manuals listed above/below
- Presentations describing all surveillance programmes carried out by MAF New Zealand (e.g. fruit fly, gypsy moth, ants, etc.)
- Presentations covering biosecurity activities in New Zealand (border, post-border)
- Presentations on Plant quarantine Act/Plant quarantine regulations
- Basic information of pest
- Presentations of quarantine pests
- Surveillance method
- Sample collection
- Presentations on plant pest surveillance report/pest report

Videos

- Basic information of pest
- Bio-control of crop pests and weeds
- IPM on rice and cotton crops
- White grubs control in Nepal

E-learning

- PaDIL
- Google scholar
- Pest Net
- Bio-Link
- Pacific Pest List Database

Manuals

- Pictorial Manual: Part 1 (242 pages); Pictorial Manual: Part 2 (472 pages)
- Pathogen Identification Manual 1: Import Commodities
- Pathogen Identification Manual 1: Export Commodities
- Pest Surveillance, forecasting and Early Warning Manuals (in Bangla)
- Handbook of plant quarantine pest
- Insect Diagnostic Pest book
- Insects of Australia Vol. I & II
- Plant Nematodes of Agriculture importance
- Diagnostic manual for plant diseases Viet Nam
- National Standards on Phytosanitary measures (NSPM)
- NSPM on establishment of PFA for potato soft rot and ring rot bacterium
- NSPM requirements for surveillance of fruit fly
- NSPM surveillance for establishment of PFA/ALPP for mango nut weevil

Guidelines

- ISPM
- Guidelines for pest surveillance for plant pests in Asia and the Pacific
- Guidelines for locust surveillance
- Small Forest Field Guide
- Practical Plant Nematology: A field and laboratory guide

Standard operating procedures

- Surveillance guideline of Imported Fire Ant
- Standard surveillance for Fruit Flies
- Quarantine Surveillance in the Pacific
- Surveillance guideline of some important EU quarantine pests in plant for planting place of production
- Surveillance and eradication method for *Salvinia molesta*
- SOP on e-pest surveillance

Advocacy materials

- Posters, brochures and leaflets of quarantine pests
- Notice to Airport and Seaport Passengers
- Plant Quarantine Flyers /Brochures
- Pamphlets and posters – Surveillance (Fruit fly, Gypsy moth, Ants, etc.) and diagnostics
- Pamphlets and posters – quarantine pests
- Rice pest & disease pamphlets and posters
- Natural enemies poster
- Rodent pamphlets and posters
- Brown Planthopper pamphlets and posters
- Booklet and leaflet on white grubs control using insect pathogenic fungus
- Websites: http://www.biosecurity.govt.nz/ and Surveillance http://www.biosecurity.govt.nz/pests/surv-mgmt/surv

Other

- Compendium of Corn Diseases The Department of Crop Sciences
- Compendium of potato Diseases The American Phytopathological Society
- Compendium of tropical fruit diseases The American Phytopathological Society
- Compendium of corn The American Phytopathological Society
- Booklets of rice, vegetable, pea and bean, sesame, tomato and groundnut pest and disease
- Atlas of Biosecurity Surveillance
- http://www.biosecurity.govt.nz/files/pests/surv-mgmt/surv/atlas-of-biosecurity-surveillance.pdf

Survey responses

Country	Title	Date of publication	Description of technical resource	Author/Editor
Tools (e.g. software, diagnostic aids, etc.)				
Australia	PaDIL, www.padil.gov.au/		Online image library of plant pests	
China	1. Pest trap 2. Camera 3. Identification soft		1. Trap the pest 2. Take the photo for the pest 3. For long distance diagnoses	
Fiji	1. Pest trap 2. Camera 3. Nets 4. Specimen bottles 5. Inspection kits 6. Latex gloves 7. Diagnostic Insect pest book 8. Fruit fly lures	1. 2. 3. 4. 5. 6. 7. 2008	1. Steiner traps 2. Olympus digital camera 3. Catch flying insects 4. Collect pests 5. Contains scalpels, forceps, probes, magnifying glass 6. Gloves 7. Diagnostic books produced by NZMAF 8. ME, CUE and Trimedlure	
India	1. Data logger Hand Held Device for e-pest surveillance 2. Global positioning system (GPS) 3. Software for e-pest surveillance 4. Mobile handsets for transferring data through SMS 5. Electron microscope for pest diagnosis-2 Nos. Oneeach at NPQS, New Delhi and another at RPQS, Channai 6. CABI crop pest compendium 7. e-locust device with Ramses system	1. 2008 2. 2008 3. 2008 4. 2008 5. 2000 6. 2006 & 2007 7. 2004		
Indonesia	1. Diagnostic protocol for plant bacteria 2. Diagnostic protocol for plant viruses 3. Diagnostic protocol for plant parasitic nematodes 4. Diagnostic protocol for quarantine weeds	1. 2009 2. 2010 3. 2011 4. 2011	1. Identification technique 2. Identification technique 3. Identification technique 4. Identification technique	1. Center for PQ 2. Center for PQ 3. Center for PQ 4. Center for PQ
Korea, Republic of	1. Seed-born fungi identification 2. Coleoptera Identification 3. National Pest Management Systems (http://npms.rda.go.kr)	1. January 2005 2. January 2008. 3. December 2009	1. Intranet access only 2. Intranet access only 3. Public web site	1. NPQS 2. NPQS 3. RDA
Lao PDR	Crop protection compendium	2005, 2007	Plant health and integrated pest management	CAB international

Country	Title	Date of publication	Description of technical resource	Author/Editor
Malaysia	1. Camera 2. GPS 3. GIS		1. take the photo for the disease 2. to take the waypoint infested area 3. for mapping infested area	
Myanmar	1. Crop Protection Compendium 2. SAFRINET 3. Lucid Keys 3.3	1. 2007 2. 2005 3. 2010	1. CABI 2. South Africa Scientific Institute 3. Centre for Biological Information Technology (CBIT)	1. CABI Team 2. Individual Scientist 3. CBIT Team
Nepal	Monitoring of white grubs using light traps	2010/2011	In the website	Dr Yubak Dhoj GC
New Zealand	1. PaDIL (New Zealand Biosecurity) 2. Lepidoptera: Identification guide 3. Coleoptera: Identification guide 4. Crop Based Taxonomic Keys: Part 1 (202 pages) 5. Crop Based Taxonomic Keys: Part 1 (420 pages) 6. Organism Order Descriptions: Part 1 (172 pages) 7. Organism Order Descriptions: Part 2 (362 pages) 8. http://www.biosecurity.govt.nz/ Pest Lists:- http://www.biosecurity.govt.nz/pests/registers	1. 2011 2. 2011 3. 2011 4. 2008 5. 2011 6. 2008 7. 2011 8. 2011	1. Biosecurity image library of pests and diseases found on fresh produce imports to New Zealand (NZ) 2. Identification guide to families, genera & species of commonly intercepted moth and butterfly larvae in NZ 3. Identification guide to commonly intercepted families of beetles in NZ 4. Pest identification manuals for common invertebrate interceptions on fresh produce (Basil – Ginger). 5. Pest identification manuals for common invertebrate interceptions on fresh produce (Grapes – Tomatoes). 6. Pest identification manuals containing order description and morphological characters of commonly intercepted families (Acari – Gastropoda). 7. Pest identification manuals containing order description and morphological characters of commonly intercepted families (Hemiptera – Thysanoptera). 8. Website explaining actions required for biosecurity and providing information on pest risk species to enhance passive surveillance.	1. MAF Biosecurity New Zealand (MAF NZ) 2. Franz-Rudolf Schnitzler 3. Franz-Rudolf Schnitzler 4. Lalith Kumarasinghe 5. Lalith Kumarasinghe 6. Lalith Kumarasinghe 7. Lalith Kumarasinghe 8. MAF NZ

Country	Title	Date of publication	Description of technical resource	Author/Editor
	9. Identification fact sheets	9. 2008-2011	9. Pest species fact sheets to assist staff & the public in identifying/reporting pests with potential to harm NZ	9. MAF NZ
	10. HRSS Mobile	10. 2010	10. Software for electronic field capture of High Risk Site Surveillance data (downloads to database and GIS).	10. MAF NZ/Bryan O'Leary
Philippines	From CABI			
Thailand	1. Pests trap (plant diseases, insects and mites)		1. Various kind of traps for collecting plant disease and pests	
	2. Pest museum		2.	
	3. Camera		3. Taking the photo for the pest	
	4. Software (Lucid key, PaDIL, CABI crop protection compendium)		4. To assist pest identification and pest information	
	5. Pest illustrated handbook		5. Pictures of economic pests	
Viet Nam	1. Crop Protection Compendium	1. Online version	1. Morphology, biology and ecology characteristics of specific plant pests	1. CABI
	2. Remote microscopy session	2.	2.	2. Asean Regional Diagnostic Network – ARDN
	3. Identification of weevils in Genus *Sternochetus*	3. 2008	3. Morphology chracteristics of weevils in Genus *Sternochetus*.	3. Sirinee Poonchaisri and Sunadda Chaowalit (DOA, Thailand)
Training materials				
China	1. Quarantine pest illustrated handbook	1. July 2001	1. The biology and infestation rules of several quarantine pest	1. NATESC
	2. Work plan of pest surveillance		2. The work plan of several pest surveillance	
	3. pest atlas		3. The picture of main pest	
Fiji	1. quarantine pest illustrated handbook	1. 2008	1. Taxonomy of insect orders	1. NZMAF
	2. Surveillance team work plan	2. January 2012	2. Business Plan 2012	2. BAF, PPS-KRS
	3. Pest Advisory Leaflets		3. Information on economically important pests	
	4. Brochures		4. Information on exotic target pests	
	5. Posters		5. Information on exotic target pests, identification and hosts	

Country	Title	Date of publication	Description of technical resource	Author/Editor
India	1. Specimens of pests or its photographs 2. Plant symptoms photographs 3. Pest data sheets 4. Herbarium			
Indonesia	Guidelines for plant pest surveillance	not published	Specific surveillance technique	adopted from ACIAR
Korea, Republic of	1. Compendium of Exotic Plant and Weeds 2. Identification of chrysomelid larvae based on morphological characters (Coleoptera: Chrysomelidae) 3. Identification of Plant Quarantine Fungi for Beginners 4. Identification for mealybug species of quarantine significance (Hemiptera: Pseudococcidae) 5. A key to species of armored scales (Diaspidiae) intercepted on imported seedlings and fruits	1. October 2010 2. January 2011 3. May 2003 4. January 2011 5. January 2010	1. Fact sheets with photos for 102 species of exotic pest in Korea(In Korean) 2. Larval taxonomic keys for Chrysomelidae (Coleoptera) (In Korean) 3. Mycology training books for plant quarantine inspectors(In Korean) 4. Taxonomic keys with morphology (pdf file, in Korean) 5. Taxonomic keys with morphology (pdf file, in Korean)	1. NPQS 2. NOQS 3. NPQS 4. NPQS 5. NPQS
Lao PDR	1. 100 genus of fungi 2. Introduction nematode and diagnostic protocols for regulated pest pictorial glossary of morphological terms in Nematology	1. 2009 2. 2006, 2009	1. Identification of plant fungi diseases 2. Diagnostic and identification	1. Eric McKenzie 2. Tony Pattson, Jenny Cobon and Nikki Seymour.
Malaysia	1. workplan of pest surveillance 2. eradiction programme	1. September-December 2009 2. January-December 2010	1. workplan of surveillance 2. eradiction activities	1. CPPQ (state) 2. CPPQ (state)
Myanmar	1. LCD Projectors 2. Laptop Computer			
Nepal	Integrated Pest Management of vegetables and fruit crops	2010/2011	As a book	Dr.Yubak Dhoj GC and R.K. Subedi
New Zealand	1. Facilitator's Guide: Pest Identification Workshop 1 2. Trainee's Workbook: Pest Identification Workshop 1 (56 pages) 3. Facilitator's Guide: Pest Identification Workshop 2	1-8. 2011	1. Guide to assist in running workshop on pest identification using order and crop keys-workshop 1 2. Workbook for participants in a workshop on pest identification using order and crop keys 3. Guide to assist in running workshop on pest identification using order and crop keys – workshop 2	1-8. Plant Health & Environment Laboratory, MAF Biosecurity New Zealand (PHEL MAF)

Country	Title	Date of publication	Description of technical resource	Author/Editor
	4. Trainee's Workbook: Pest Identification Workshop 2 (80 pages) 5. Facilitator's Guide: Pest Identification Workshop 3 6. Trainee's Workbook: Pest Identification Workshop 3 7. Facilitator's Guide: Pest Identification Workshop 4 8. Trainee's Workbook: Pest Identification Workshop 4		4. Workbook for participants in a workshop covering Diptera, Coleoptera, Hymenoptera and Thysanoptera pest identification. 5. Guide to assist in running workshop on pest identification using order and crop keys – workshop 3 6. Workbook for participants in a workshop covering pest identification of various fresh produce crops. 7. Guide to assist in running workshop on disease identification – workshop 4. 8. Workbook for participants in a workshop covering disease identification of various fresh produce crops.	
Thailand	1. Pests trap 2. Camera, microscope, and magnifier 3. Quarantine pest illustrated handbook 4. Pest record book 5. Training manual 6. Pest sample	1. 2. 3. 4. 5. November 2005 6.	1. Various kind of traps for collecting plant disease and pests 2. Equipment 3. Pictures of quarantine pests 4. 5.	1. 2. 3. 4. 5. Teresa McMaugh 6.
Viet Nam	1. Guidelines for pest surveillance 2. Glossary of Phytosanitary Terms 3. National Technical Regulations	1. 1997 2. 1995 3. 2008	1. Guidelines for general and specific pest surveillance 2. Terms and definitions of Phytosanitary 3. Identification procedure for mango seed weevil [*Sternochetus mangifera* (Fabricius)], a quarantine pest of Viet Nam	1. International Standard Committee – ISC 2. ISC 3. PPD
Presentations				
China	1. The rule of pest report 2. The law of plant quarantine	1. 2010 2. 1983	1. The items and proceeding for pest reporting 2. The content of plant quarantine and the right and responsibility of the involved institution of plant quarantine	1. MOA 2. State Department
India	PPt presentations of quarantine pests			
Indonesia	Outline of plant pest surveillance report	Not published	Form of the report	Centre for PQ
Korea, Republic of	Survey and Control for Agricultural Crop Pests	January 2010	Training material for pest survey	RDA

Country	Title	Date of publication	Description of technical resource	Author/Editor
Malaysia	Plant quarantine law	1976	The content of plant quarantine and the right and responsibility of the involved institution of plant quarantine	
Myanmar	Available			
Nepal	White grubs control-the novel means	2011	In farmers workshop	Dr Yubak Dhoj GC
New Zealand	1. Various 2. Various 3. Various	1. 2011 2. 2010-2011 3. 2010-2011	1. Presentations to cover all the pest identification workshops and manuals listed above/below 2. Presentations describing all surveillance programmes carried out by MAF New Zealand (e.g. fruit fly, gypsy moth, ants, etc.) 3. Presentations covering biosecurity activities in New Zealand (border, post-border)	1. PHEL MAF 2. MAF NZ 3. MAF NZ
Philippines	Provided by resource persons from concerned agencies e.g. PCA, RCPC, UPLB			
Thailand	1. Plant quarantine Act 2. Basic information of pest 3. Surveillance method 4. Sample collection			1. DOA
Videos				
China	1. Video of basic information of pest 2. Telefilm		1. The basic information about pest infestation and control methods	1. NATESC & Institution of Zoology, Chinese Academy of Science
India	1. Video on bio-control of crop pests and weeds 2. Video on IPM on rice and cotton crops			
Nepal	White grubs control in Nepal		In CDs	Dr Yubak Dhoj GC
Philippines	Provided by resource persons from concerned agencies e.g. PCA, RCPC, UPLB			
E-learning				
Australia	1. Plant Biosecurity Curriculum, www.plantbiosecurity.edu.au		1. Online plant biosecurity curriculum	
China	1. Relevant information from internet 2. Database for pest from internet			

Country	Title	Date of publication	Description of technical resource	Author/Editor
Fiji	1. Information on the internet 2. Pacific Pest List Database 3. Fiji Pest List database 4. PaDIL		1. Journals, communications, research 2. Pests and diseases of crops in the Pacific 3. Pest and Disease list of crops in Fiji 4. Diagnostic tool on internet	1. 2. SPC 3. BAF 4. AQIS
India	1. Official website 2. Google scholar			
Indonesia	1. information from the internet 2. Bio-Link	 2. always updated		
Malaysia	Relevant information from internet			
Nepal	White grubs and other insect control	2010 and 2011	In the official web: www.ppdnepal.gov.np	PPD
Philippines	Pest Net			
Thailand	1. Internet 2. CD			
Manuals				
Australia	Guidelines for surveillance for plant pests in Asia and the Pacific, http://aciar.gov.au/files/node/2311/MN119%20Part%201.pdf	2005	Surveillance procedural manual	ACIAR
Bangladesh	Pest Surveillance, forecasting and Early Warning Manuals (in Bangla).	2008		Md. Monirul Islam Entomologist
China	Handbook of plant quarantine pest	December 2006	The identification and control methods of quarantine pest	NATESC
Fiji	1. Insect Diagnostic Pest book 2. Insects of Australia Vols. I & II	1. Junuary 2008 2. 2000	1. The identification of quarantine pest 2. Identification/taxonomy	1. NZMAF 2. DAFF
India	1. National Standards on Phytosanitary measures (NSPM) 2. NSPM on establishment of PFA for potato soft rot and ring rot bacterium 3. NSPM requirements for surveillance of fruit fly 4. NSPM surveillance for establishment of PFA/ALPP for mango nut weevil	1. 2004 2. 2006 3. 2006 4. 2006	NSPMs have been developed by Directorate of PPQ&S in consultation with state agricultural universities, Indian Council of Agricultural Research (ICAR) Institutes.	
Indonesia	Quarantine pest data base	2099	Pest description	MOA
Korea, Republic of	1. Manuals for Agricultural Pest Survey 2. Manual for Control of Pine Wilt Disease	1. January 2008 2. November 2005	1. Guidelines for survey and reporting against pests on 15 crops including rice, fruits and vegetables 2. Survey and Control practice for pine wilt disease	1. RDA 2. KFA

Country	Title	Date of publication	Description of technical resource	Author/Editor
	3. Manual for Survey and Control of Pine gall midge	3. April 2007	3. Survey and Control practice for pine gall midge	3. KFA
	4. Manual for Survey and Control of Black pine bast scale…	4. December 2007	4. Ecology and Control for Black pine bast scale	4. KFA
Lao PDR	1. Plant Nematodes of Agriculture importance	1. 2007	1. Give better informed diagnosis	1. John Brige and James L. Starr
	2. Diagnostic manual for plant diseases Viet Nam	2. 2008	2. Give better informed diagnosis	2. Lester W. Burgess, Timothy E. Knight, Len Tesoriero and Hien Thuy Phan
New Zealand	1. Pictorial Manual: Part 1 (242 pages); Pictorial Manual: Part 2 (472 pages)	1. 2011	1. Pictorial guideline to assist biosecurity officers to recognize common & high risk pests intercepted on Pacific Island fresh produce imports & exports	1. Lalith Kumarasinghe
	2. Pathogen Identification Manual 1: Import Commodities	2. 2011	2. Pathogen identification reference guide for recognizing common pathogens that may be intercepted on Pacific Island fresh produce imports.	2. Megan Romberg
	3. Pathogen Identification Manual 1: Export Commodities	3. 2011	3. Pathogen identification reference guide for recognizing common pathogens that may be associated with Pacific Island fresh produce.	3. Eric McKenzie
Thailand	Guide line for surveillance for plant pest in Asia and the Pacific (Thai version)	November 2005		
Guidelines				
China	Relevant document of MOA			1. MOA
Fiji	1. ISPM No. 5 2. ISPM No. 6		1. Glossary of terms 2. Pest Surveillance Guidelines	1. IPPC 2. IPPC
India	1. Guidelines on Farmers Field School methodology 2. Guidelines for locust surveillance		FAO guidelines are being used.	
Indonesia	1. ACIAR 2. ISPM			1. ACIAR 2. IPPC
Korea, Republic of	1. Guidelines for Exotic pest survey 2. Annual Plan for Survey and Control of Forest Pests	1. March 2010 2. January 2011	1. Exotic pests survey and control methods 2. Annual plan for forest pest project	1. RDA 2. KFA

Country	Title	Date of publication	Description of technical resource	Author/Editor
Lao PDR	1. The guidelines for pest surveillance for plant pests in Asia and the Pacific 2. Practical Plant nematology A field and laboratory guide	1. 2008 2. 2007	1. Refer to surveillance method 2. The guide is sample, easy to follow reference for assessing plant parasitic nematode problems, It provide clear instruction, with many illustration.	1. Teresa McMaugh
Malaysia	Relevant document of MOA			
New Zealand	Small Forest Field Guide	2008	A guide to conducting forest health assessments and sampling for New Zealand forest owners.	SPS Biosecurity Ltd.
Philippines	Protocol Surveys			
Thailand	Guide line for surveillance for plant pest in Asia and the Pacific	November 2005	Surveillance methods, pest detection, pest transferring for identification	Teresa McMaugh
Standard Operating Procedures (SOPs)				
China	1. The surveillance guideline of Imported Fire Ant 2. The others surveillance guideline	1. April 2009	1. The items and rules for surveillance of Imported Fire Ant	1. NATESC
Fiji	1. Standard surveillance for Fruit Flies 2. Quarantine Surveillance in the Pacific	1. April 2009		1. MPI 2. SPC
India	SOP on e- pest surveillance	2008		
Malaysia	Eradication of Papaya Dieback guideline	September 2009		DOA
New Zealand	Various	2009-2010	SOPS for field operations and operating standards setting guidelines for surveillance field operations (Fruit fly; Gypsy moth; High Risk Site Surveillance; National Invasive Ants Surveillance) and diagnostics	MAF NZ/AsureQuality NZ
Philippines	As listed in the Protocol Surveys			
Thailand	1. Surveillance guideline of some important EU quarantine pests in plant for planting place of production 2. Surveillance and eradication method for *Salvinia molesta*	1. December 2010 2. June 2010	1. Detection and eradication programme 2. Detection, identification and eradication of *Salvinia molesta*	1. DOA 2. DOA
Advocacy Material (posters, pamphlets etc.)				
China	1. Wall map for quarantine pest 2. Brochure 3. Leaflet	1. March 2011	1. Picture of quarantine pests	1. NATESC

Country	Title	Date of publication	Description of technical resource	Author/Editor
Fiji	1. Posters 2. Brochure 3. Leaflet 4. Specimen 5. Microscope	1. March 2011	1. Illustrations of quarantine pests 2. Illustrations of quarantine pests 3. Illustrations of quarantine pests 4. Specimen as example 5. Better view at diagnostic features	1. BAF 2. BAF 3. BAF 4. BAF 5. BAF
India	1. Quarantine pest lists 2. Quarantine weed manual 3. Crop wise pests and IPM advisories	1. 2003 2. 2006 3. 2001		
Malaysia	1. Poster 2. Pamphlets	1. September 2009 2.	1. Symptoms of Papaya Dieback 2.	1. DOA 2.
Myanmar	1. Rice pest & disease pamphlets and posters 2. Natural enemies poster 3. Rodent, Brown Planthopper pamphlets and posters			
Nepal	White grubs control using insect pathogenic fungus	2011	Booklets, leaflets	Dr Yubak Dhoj GC
New Zealand	1. Pamphlets and posters – Surveillance (Fruit fly, Gypsy moth, Ants, etc.) and diagnostics 2. http://www.biosecurity.govt.nz/ Surveillance http://www.biosecurity.govt.nz/pests/surv-mgmt/surv	1. 2010 2. 2011	1. Various pamphlets describing purpose and importance of biosecurity surveillance and diagnostics work carried out by MAF 2. Website explaining importance of biosecurity and describing bio-security surveillance and diagnostics activities carried out by MAF	1. MAF NZ 2. MAF NZ
Philippines	1. Notice to Airport and Seaport Passengers 2. Plant Quarantine Flyers/Brochures			
Thailand	Poster, leaflet and CD			
Other				
China	1. teaching material 2. relative monograph			
Fiji	Technical presentations	2008-2011	Pests and Diseases	BAF and KRS-PPS
Lao PDR	1. Compendium of Corn Diseases The Department of Crop Sciences 2. Compendium of potato Diseases The American Phytopathological Society 3. Compendium of tropical fruit diseases The American Phytopathological Society 4. Compendium of corn The American Phytopathological Society	1. 1999 2. 2001 3. 1998 4. 1999	1. Identification 2. Identification 3. Identification 4. Identification	1. Donald G. White 2. William J. (Bill) HooKer 3. R.C. Ploetz 4. Donald G. White

Country	Title	Date of publication	Description of technical resource	Author/Editor
Malaysia	Teaching material			
Myanmar	Booklets of rice, vegetable, pea and bean, sesame, tomato and groundnut pest and disease			
New Zealand	Atlas of Biosecurity Surveillance http://www.biosecurity.govt.nz/files/pests/surv-mgmt/surv/atlas-of-biosecurity-surveillance.pdf	May 2011	Description of all MAF biosecurity surveillance programmes	Acosta, H; White, P.

Willingness to make available the resources listed above to others in the phytosanitary community via the International Phytosanitary Portal (IPP)?

☐ Yes We can be contacted to share any or all of the resources listed: Australia; Bangladesh; Fiji; India; Korea, Republic of; Myanmar; Nepal; New Zealand; Philippines and Viet Nam

☐ No I do not agree: Lao PDR, Thailand

☐ No Response: Malaysia

Names and addresses of respondents for getting more information on resources:

Country	Name of respondent	Address	E-mail
Australia	Bart Rossel	GPO Box 858, Canberra City ACT 2601	Bart.rossel@daff.gov.au
Bangladesh	Md. Torikul Islam	Plant Protection Wing, DAE, Khamarbari, Dhaka, Bangladesh	mtitutul@yahoo.com
Fiji	Ilaisa Dakaica	1st Floor, Takayawa Building, Toorak P.O. Box 18360, Suva, Fiji	idakaica@biosecurityfiji.com
China	Feng Xiaodong	730 No.20 Maizidian Street, Chaoyang District, Beijing, China	fengxdong@agri.gov.cn
India	Dr N. Sathyanarayana[1] & Mr Ram Asre[2]	1. National Institute of Plant Health Management, Rajendranagar, Hyderabad – 500 030. India. 2. Directorate of Plant Protection Quarantine and Storage, NH-IV, Faridabad-121001 (Haryana), India	n_sathyanarayana@hotmail.com ramasre56@gmail.com
Indonesia	Hermawan	Perumahan BMW, Bogor, Indonesia	hermawan1961@gmail.com
Republic of Korea	Jong-Ho Lee	Div. Pest Management, Dept. Plant Quarantine, Quarantine and Inspection Agency, 433-1, Anyang-6dong, Anyang city, Gyeonggi-do, Republic of Korea	acarologist@korea.kr
Lao PDR	Plant Protection Center	Nahai Village, Hatxayphong District, Vientiane, Lao PDR	chittarhat_2005@yahoo.com
Malaysia	Rohaina Mat Nawi	Crop Protection and Plant Quarantine Division, Agriculture Department, Telok Chengai, 06600 Kuala Kedah, Kedah, Malaysia	ainarahim@yahoo.com
Myanmar	Dr Khin Thein Nyunt	Department of Agricultural Research, Nay Pyi Taw, Myanmar	ktnyunt@gmail.com
Nepal	Dr Yubak Dhoj G.C.	Plant Protection Directorate, Harihar Bhawan, Lalipur, Nepal	yubakgc@yahoo.com
New Zealand	Paul Stevens	P.O. Box 2095, Auckland 1140, New Zealand	Paul.stevens@maf.govt.nz
Philippines	Joselito L. Antioquia	Plant Quarantine Service NAIA	banglen2001@yahoo.com
Thailand	Sarute SUDHI-AROMNA Siriporn Zungsontiporn	Plant protection research and development office Department of Agriculture, 50 Phaholyothin Road, Chatuchak, Bangkok 10900, Thailand	sarutes@yahoo.com siriporn.z@doa.in.th
Viet Nam	Plant Protection Department	149, Ho Dac Di, Dong Da, Hanoi, Viet Nam	ppdvn@fpt.vn

4. Best practices

Surveys in relation to plant quarantine and international trade

Insect Pests

1. Long term containment strategy for Fruit Flies in Torres Strait, Australia
2. Fruit Fly code of practice, Australia
3. Early detection of exotic fruit flies, Indonesia
4. Surveillance of exotic Fruit Flies, Fiji
5. Fruit Fly infestations in banana, Sri Lanka
6. Surveillance of Mango Weevils, Vietnam

Diseases

7. National Citrus Canker eradication program, Australia
8. National Fire Blight surveillance, Australia
9. Surveillance of Papaya Dieback (*Erwinia papayae*), Malaysia
10. Specific survey and control project for Pine Wilt Disease, Republic of Korea

Weeds

11. Surveillance of Giant Salvinia, Thailand

Surveillance methodology

12. High Risk Site Surveillance, New Zealand

Surveys in relation to pest detection and management

13. Surveillance on minimizing pest risk in rice, Bangladesh
14. Surveillance of Red Imported Fire Ant, China
15. Monitoring of crop pests, India
16. Pest surveillance of maize and cabbage, Lao PDR
17. Pest surveillance in rice seed production field, Myanmar
18. Surveillance of White Grubs, Nepal
19. "Bantay Peste" Nationwide Pest Watch, Philippines

1. Long term containment strategy for Fruit Flies in Torres Strait

Title of activity:	Long Term Containment Strategy for Fruit Flies in Torres Strait
Abstract:	The Long-Term Containment Strategy for Exotic Fruit Flies in Torres Strait was established during the Papaya Fruit Fly eradication campaign. The strategy provides an ongoing monitoring and eradication programme for PFF and other exotic species of concern in the islands between PNG and the Australian mainland.
Indicate the type of surveillance conducted whether General or Specific (i.e. Pest, Commodity/ Host, Random, or Targeted survey):	Pest Surveillance
Summarize the reason for taking the surveillance action:	Without this early-warning monitoring system in the Torres Strait and in other areas with a high risk of entry, the costs of eradicating PFF and other exotic fruit fly outbreaks would be higher by some orders of magnitude.
Summarize the immediate benefit, result or outcome of the surveillance action:	Reduced costs of eradicating PFF and other exotic fruit fly outbreaks.

Provide a narrative of your country's best practice in pest surveillance case:

Fruit flies are a large and important group of insect pests that globally attack a wide range of fruit and vegetables and can have a major impact on Australia's capacity to trade in domestic and international horticultural markets that have an average annual value of $4.8 billion.

One of the most serious exotic plant pest outbreaks in Australia's history occurred in far-north Queensland, when an outbreak of the Asian papaya fruit fly (PFF) (*Bactrocera papayae*) was detected in pawpaws near Cairns, in October 1995.

The Mediterranean fruit fly (*Ceratitis capitata*) and the Queensland fruit fly (*B. tryoni*) are of economic importance in Australia; however, PFF was considered to be a much greater threat to Australian horticultural industries. Financial losses and increased costs were estimated at millions of dollars, due to restrictions on the export of fruit and interstate fruit movement, increases in insecticide usage and social and economic impacts. Trade bans alone were expected to cost more than $100 million per annum. Because of these significant costs, containment of the pest outbreak and eventual eradication was considered an economically viable option.

At the time of detection, limited trapping of adult flies was being conducted near the port and other urban areas of Cairns. The pest had spread over a wide geographical area, and this needed to be delineated as soon as possible to initiate containment and eradication programmes. Although a large area of north Queensland suffered the effects of the pest, the outbreak was detected sufficiently early to be contained, which meant that eradication was feasible.

The eventual eradication of PFF through a nationally cost-shared programme over a four-year period cost approximately $34 million. The impact in dollar terms on industry and the cost of eradication would probably have been considerably lower if there had been an existing national programme that encompassed trapping of fruit flies in high-risk areas.

Although the origin of the outbreak was never clearly established, the pest probably arrived via Torres Strait or from Papua New Guinea (PNG). PFF is present in PNG and invades the Torres Strait islands each year from the PNG mainland. The Long-Term Containment Strategy for Exotic Fruit Flies in Torres Strait was established during the PFF eradication campaign. The strategy provides an ongoing monitoring and eradication programme for PFF and other exotic species of concern in the islands between PNG and the Australian mainland.

Since 1993, the Torres Strait programme has detected 2837 target fruit flies, including *B. trivialis, B. papayae* and *B. cucurbitae*. Swift implementation of routine response activities has successfully eradicated all flies, and no residual populations are present. With the increased proximity of economically important species to Australia in the past decade, this programme has undoubtedly prevented other outbreaks on the Australian mainland since the PFF eradication from north Queensland.

Without this early-warning monitoring system in the Torres Strait and in other areas with a high risk of entry, the costs of eradicating PFF and other exotic fruit fly outbreaks would be higher by some orders of magnitude. Also,

in some cases, it is possible that the decision to eradicate would be unacceptable, such as if the pest had established over a wide geographical area and therefore the technical feasibility of eradication was significantly reduced.

This example clearly demonstrates how the early detection of species of concern can minimise the effects on industry and community.

There are distinct roles in the Long Term Containment Strategy for Fruit Flies in Torres Strait. Surveillance is carried out and funded by AQIS. The response of exotic fruit fly detected by surveillance conducted by AQIS is a Queensland Department of Employment, Economic Development & Innovation (DEEDI) responsibility.

A component of the response work is carried out on a fee for service basis by AQIS (bait spraying) on behalf of DEEDI. The remainder is carried out directly by DEEDI staff (male annihilation blocking).

The main surveillance related components of the Long-Term Containment Strategy for Exotic Fruit Flies in Torres Strait delivered by the Australian Federal Government Department of Agriculture, Fisheries and Forestry (the Northern Australia Quarantine Strategy program) are listed below:

- TARGET FRUIT FLY SPECIES
- TRAPPING
  - Male Lure Traps
  - Trap design – Paton and Steiner traps
  - Paton trap
  - Steiner Trap
- Lure
- Pre-dosed plastic lure cup dispensers
- Thymol wicks
- Field bags/boxes
- Trap installation, placement and decommission
- Trap de-activation and re-activation
- Trap codes and labelling
- Clearance dates, trap runs, job lists and run sheets
- Storage of equipment and materials
- Clearing the trap – Frequency
- Team organisation – outer-island trap clearers
- Procedure for clearing the flies
- Lure replacement – general information
  - Guidelines for zero contamination during lure change
  - The procedure
- Preparation of Flies for Transport
  - General information
  - Wet fly protocol
  - Packing of flies
  - Labelling of boxes
  - Accompanying paperwork
  - Transport procedures
- Trap replacement policy
  - General information
  - Trap replacement procedure – replacement of contaminated trap
- Trap disposal
- Trap cleaning – trap cleaning procedure
- Internal review of the trapping programme
- REARING FRUIT FLIES FROM HOST FRUIT
- General information
- Principles of rearing

- Instructions
- IDENTIFICATION
- General information
- Fruit fly reference collection
- Main publications used in identification
- Molecular diagnostics
- Procedures
  - Fly receival procedures
  - Fly sample processing procedures
  - Suspect target specimens
- NOTIFICATION OF TARGET FRUIT FLY SPECIES
- General information
- Reporting
- DOCUMENTATION
- DATA MANAGEMENT
- REPORTS
- TRAINING

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2. Fruit Fly Code of Practice

Title of activity:	Fruit Fly Code of Practice
Abstract (250 words):	Australia has developed the Fruit Fly Code Of Practice – Operations Standard, to provide an outline of the Australian management procedures for the fruit flies (Tephritidae) of economic importance present within Australia, these species are Queensland fruit fly – *Bactrocera tryoni* and Mediterranean fruit fly – *Ceratitis capitata*. The Standard builds on the lessons learnt over many decades of successful fruit fly management within Australia to further strengthen quarantine integrity with sustainable and cost effective management options for Australian industries and government.
Indicate the type of surveillance conducted whether General or Specific (i.e. Pest, Commodity/Host, Random, or Targeted survey):	Pest Surveillance (Fruit Fly)
Summarize the reason for taking the surveillance action:	Maintain Fruit Fly Pest Free Area
Summarize the immediate benefit, result or outcome of the surveillance action:	Fruit fly PFAs remain one of Australia's primary phytosanitary risk management strategies for trade in host commodities.

Provide a narrative of your country's best practice in pest surveillance case:

Fruit flies are a large and important group of insect pests that globally attack a wide range of fruit and vegetables and can have a major impact on Australia's capacity to trade in domestic and international horticultural markets that have an average annual value of US$4.8 billion.

Unlike the management of many other pests however, fruit flies can have a major impact on Australia's capacity to trade in domestic and international horticultural markets. Fruit flies do not recognize commercial/domestic or state, regional boundaries and jurisdictions. Fruit flies are highly mobile, capable of flying short distances and being transported long distances. They also have the potential to infect a wide range of crops from mangoes to apples and tomatoes to grapes. Also, unlike many other plant pests, the management of these pests cannot be conducted solely on farm and the loss of control on a particular property can have a wide implication for commercial regions and the wider community.

To help protect fruit and vegetable growing regions in South Australia, northern Victoria and southern New South Wales, areas of these states are protected by the Fruit Fly Exclusion Zone, the Greater Sunraysia Pest Free Area and Protected Areas in the Riverina. The status of these areas is underpinned by fruit fly pest surveillance.

Australia has developed the Fruit Fly Code Of Practice – Operations Standard, hereafter referred to as the 'Standard', to provide an outline of the Australian management procedures for the fruit flies (Tephritidae) of economic importance present within Australia, these species are Queensland fruit fly – *Bactrocera tryoni* and Mediterranean fruit fly – *Ceratitis capitata*.

The Standard builds on the lessons learnt over many decades of successful fruit fly management within Australia to further strengthen quarantine integrity with sustainable and cost effective management options for Australian industries and government.

The Standard complies with the International Standards for Phytosanitary Measures (ISPMs) prepared by the Secretariat of the International Plant Protection Convention (IPPC) as part of the United Nations Food and Agriculture Organization's global programme of policy and technical assistance in plant quarantine.

In addition to consideration and incorporation of the relevant ISPMs, Australia's extensive fruit fly management experience over many years and ongoing research and development on target fruit fly species have also contributed significantly to this Standard.

Australia's best practice case for Monitoring and Surveillance systems operating in each state and territory in the context of ISPM No. 6: Guidelines for pest surveillance include the following operational areas:

Monitoring and surveillance

Adequate monitoring and surveillance operations are fundamental to the establishment, validation and verification of PFAs, PFPP, PFPS, ALPPs, AWM and in some instances systems approaches.

Australian fruit fly monitoring and surveillance standards for the various fruit fly management principles have been determined by extensive research into the biology of the target species, consideration of trap efficacy versus cost, desired level of phytosanitary protection and extensive bilateral consultation. Further, these standards have been validated by many years of successful trade in host commodities without phytosanitary risk.

Larval surveys

Larval surveys do not necessarily form part of the normal surveillance operations, as they are usually supplementary methods used to quantify levels of an infestation. Where used, sufficient quantities of fruit to adequately represent the field situation are cut and inspected for infestation. Suspect specimens are forwarded to the reference entomologist, or a nominated delegate, for each relevant state authority within 48 hours. Records of when and where larval surveys were conducted, how much fruit was sampled and the outcomes of the surveys are maintained.

Trap density and layout

For all fruit fly management systems a permanent trapping system must be established and maintained. It should be noted that trap density for ALPPs, PFPPs, PFPSs or AWM can vary dependent on the level of perceived phytosanitary risk from fruit fly infestation determined at a bilateral level.

For PFAs male lure traps are deployed on a 400 m grid in urban areas and a 1 km grid in horticultural production areas. Further, in the case of seasonal freedom under PFPP, PFPS or AWM, traps may only need to be monitored during the season when host commodities are at risk of infestation.

Trap and lure types

Male attractants are the primary monitoring mechanism adopted within Australia for fruit fly management. The Lynfield trap is the recommended trap for male lures for both Queensland fruit fly (Cowley *et al*. 1990) and Mediterranean fruit fly (Wijesuriya and De Lima 1995) because it is a simple, inexpensive and an easily serviced trap. A modified Lynfield trap, the Paton trap is used in some of the high rainfall areas of northern Australia.

Other trap and lure combinations may also be used dependent on a range of surveillance and management variables. In particular, traps using a protein source as an attractant may be used to monitor female populations. The preferred protein trap type is the McPhail trap which is used with wet or dry protein attractants.

Trap servicing

Traps must be checked weekly during the period when detections are most likely to occur and fortnightly at other times. If seasonal PFA, ALPP, PFPP, PFPS or AWM arrangements are in place, traps only require servicing during the period of identified phytosanitary risk.

Identifications

All identifications are made by the reference entomologist, or a nominated delegate, in each relevant state authority. Approved DNA diagnostic methods can also be used for identification of adults or larvae.

If the reference entomologist is unable to identify the suspect fruit fly specimen to species level, the specimen is referred to an appropriate NATA-accredited specialist entomologist nominated by the Australia's relevant authority.

Identifications of adults and larvae occur within 48 hours of receipt, where possible. The State Program Manager is informed of the identification results, if fruit flies of economic concern are detected, within four hours of the positive identification. If the specimen is referred to a Specialist Entomologist, the Reference Entomologist is responsible for liaison with the Specialist Entomologist and notification to the State Program Manager within the four hour period, if fruit flies of economic concern are detected.

The State Program Manager informs counterparts in all states and territories and the nominated contact point within DAFF, within 48 hours of this notification from the Reference Entomologist. Diagram 1 provides a schematic outline of these procedures.

Where sterile insect technique (SIT) is in use, approved diagnostic methods to distinguish sterile adults from non sterile adults are used.

Records of all samples submitted for identification are maintained.

Lure types

For Queensland fruit fly, Lynfield traps are charged with 5 mL of a mixture of the Cuelure with an approved killing agent. For Mediterranean fruit fly, Lynfield traps are charged with 5 mL of Capilure (Trimedlure with an extender, refer to Hill 1987) on cotton wicks with an approved killing agent placed within the trap.

For protein based traps using a protein liquid attractant (wet trap) a mixture of water and hydrolyzed protein water and Torula Yeast/borax tablets are used. A dry protein trap using a food based attractant in pellet, patch or plug form can also be used. Protein based lures are generic by nature and tend to catch a wide range of other flies and other insects. In addition, they are comparatively expensive to establish service and maintain. For these reasons they are not widely used within Australian fruit fly management systems.

Trap placement

Traps are best hung in host trees that are bearing fruit, and moved to other fruiting host trees when the first crop falls or is harvested. If fruiting trees are not available, large broad-leaved trees are preferred. The traps are hung within the tree canopy about 1.5-2 m above the ground, or lower in crops such as trellised grapes. The traps are placed at least 3 m from any other fruit fly traps. Traps are not placed in trees that are regularly sprayed with pesticides.

Maintenance of traps and lure replacement

The male trap lures are recharged as necessary, but at a minimum of twice yearly. Traps are replaced annually or when deemed unserviceable, whichever comes sooner. When used, wet protein traps are serviced weekly, or more frequently, to ensure trapped specimens do not deteriorate.

Identification and notification procedures

Administrative responses following the detection of one or several target fruit flies, at different physiological stages of development, have been determined based on relevant scientific literature and many decades of successful fruit fly management within Australia. These standardised responses have proven to be very effective for the management of detections and outbreaks of Queensland and Mediterranean fruit flies under Australian production conditions over many years.

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3. Early detection of exotic fruit flies

Title of activity:	Early detection of exotic fruit flies
Abstract (250 words):	Two main techniques (trap and host rearing) were used to collect fruit flies that may brought along with imported fresh fruits. Traps were installed around warehouse where imported fresh fruits were kept before distributed domestically. The target was rotten fruits which usually discarded close to the warehouse. At least three traps with three different kind of lure (Cue lure, Methyl eugenol and Trimed lure) were used. Traps are monitored once a week. Rotten fruit and other sign of pest infestation were collected both from warehouse and super markets for host rearing. Fruits were put in insect cages for two weeks to observe the emergency of fruit flies.
Indicate the type of surveillance conducted whether General or Specific (i.e. Pest, Commodity/Host, Random, or Targeted survey):	It is a specific survey to detect the introduction of exotic fruit flies at early phase. The surveillance conducted by plant quarantine inspectors at Tanjung Priok sea port, Jakarta.
Summarize the reason for taking the surveillance action:	Early detection of exotic fruit flies can be followed by quarantine measures such as eradication programme since their population and distribution still limited. The incident can be inform earlier to the exporting country, to be able that country to conduct necessary measure.
Summarize the immediate benefit, result or outcome of the surveillance action:	To prevent the spread of exotic fruit flies that may potential to be dangerous pest.

Provide a narrative of your country's best practice in pest surveillance case:

I. Preparation

1. Set up 15 traps (modified Stainer) will be installed at 5 warehouse
2. Plastic jars (diameter ±20 cm) for host rearing
3. Identification of location
4. Equipment for insect collection and preservation
5. Work plan

II. Surveillance practice

Trapping method

1. Three traps was installed out side the warehouse with three different lure. The distance between trap about 10 meters.
2. Monitoring conducted every one week in the morning.
3. Collect fruit flies into vials or plastic bag for flies that still alive.
4. Chilled for identification.
5. Pinned collection.
6. Surveillance duration for 6 months.

Host rearing

1. Rotten fruits and other sign of pest infestation were put in the plastic jar have been filled with sterilized send or saw dust.
2. Cover the opening of the plastic jar with another plastic jar (slightly different in size) which its base already replaced with insect proof screen.
3. Observe for the presence of fruit fly for about 2 weeks.
4. Emerged fruit fly feed with sugar solution or honey for maturation.
5. Chilled for identification.
6. Pinned collection.

III. Result

No exotic fruit fly recorded

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4. Surveillance of exotic fruit flies

Title of activity:	The surveillance of exotic fruit flies
Abstract:	Fiji has 7 species of fruit flies where three (3) *Bactrocera passiflorae*, *B. xanthodes* and *B. kirki* are of economic importance. *B. kirki* only exists on Rotuma, the furthest northern island of Fiji and is absent in any other part of Fiji. Aircrafts and vessels arriving from Rotuma are regularly monitored for host fruits. Rotuma is now also declared a Biosecurity Controlled Area where the movement of host fruits is strictly prohibited. CUE, ME and MAT lures used in Steiner traps are set up all over Fiji including the Yasawa and Mamanuca Is to monitor populations of existing fruit flies and detect new incursions. Traps are cleared every 2 weeks and serviced once a month. Specimens are authenticated at the Fruit Fly Section, Research Division at Koronivia Research Station. In addition to trap catches, host fruits are also collected for fruit fly emergence tests. The fruit flies are also identified and authenticated.
Indicate the type of surveillance conducted whether General or Specific (i.e. Pest, Commodity/Host, Random, or Targeted survey):	General: Host surveillance Specific: Exotic fruit flies to Fiji
Summarize the reason for taking the surveillance action:	Exotic fruit flies pose a risk to Fiji's export of fruit fly host commodities such as eggplant, pawpaw, mango and breadfruit. The current heat treatment used in Fiji (HTFA-High Temperature Forced Air) is calibrated to treat for *B. passiflorae* and *B. xanthodes*. A new fruit fly would mean a suspension in exports.
Summarize the immediate benefit, result or outcome of the surveillance action:	Monitor the population trend of Fiji's fruit fly populations,early detection and response to exotic fruit flies and maintain market access of host fruits and vegetables
Provide a narrative of your country's best practice in pest surveillance case:	

The surveillance method for exotic fruit flies to Fiji

1. Prepare

   Make local surveillance workplan

   Check Steiner traps for damages

   Prepare bait and dip cotton wicks

   Install baited cotton wicks to Steiner traps

   Install wire gauze

2. Areas

   Traps are placed directly on a known host tree in farms, residential areas, close proximity to ports and airports and in forests.

3. Duration

   Fruit fly specimens are collected every 2 weeks, identified and recorded. Servicing of traps is done once a month.

4. Material

   Steiner traps, lures, adhesive glue, latex gloves, permanent markers.

5. Method

   Set up

   Identify location for trap sites.

   Identify host trees at site such as mango, citrus, guava, pawpaw and eggplant.

   Hang trap with lure to tree at an appropriate height.

   Apply adhesive glue to wire tied to tree to prevent ants from entering the traps.

Clearing

Traps are cleared every two(2) weeks

Requires 3-4 people to clear; 1 clears ME, 1 clears CUE, 1 clears Trimedlure

Fruit fly specimens are transferred to small boxes and labeled.

Fruit fly specimens taken to Koronivia Research Station Fruit Fly Laboratory for identification

Number and species are recorded.

Changing of lures and/or traps is done once a month.

Links or attachments in support of the best practice case provided:

1. Pest Advisory Leaflet No. 28, 2000. Secretariat of the Pacific Community
2. Emergency Response Plan for Fruit Flies in the Fiji Islands
3. www.spc.int/pacifly/
4. http://www.spc.int/pacifly/Success_stories/Quarantine_surveillance_2.htm

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5. Fruit fly infestations in banana

Title of activity:	Studies on fruit fly infestion in banaa cultivars in Sri Lanka
Abstract:	*Bactrocera dorsalis* (Hendel), *B. kandiensis* (Drew and Hancock), *B. correcta* (Bezzi) and *B. tau* are species of fruit flies that cause substantial economic damage to local fruits. During the latter part of 1998 and the first quarter of 1999 severe infestations of fruit flies in ripe banana were observed in some parts of the country. Investigations where carried out to identify species of fruit flies responsible for these infestations and to determine susceptibility of different banana cultivars to fruit fly. The most susceptible maturity stage of fruits to fruit fly attack and the effect of **Clorox® (NaOCl)** on egg hatchability on banana fruits were also determined. Banana fruits collected from 20 locations from Kandy, Matale and Kegalle districts found to be infested with *B. kandiensis* and *B. dorsalis* of which the former species was more prevalent than *B. dorsalis*. Almost all cultivars of banana (Sinhalese: Embul, Alu kehel, Anamalu, Embun, Rathambala and Sini) were susceptible to the fruit fly. Both fruit fly species didn't infest immature stages (>55 d old) of banana fruits while mature green stage (70-75 d old) fruits were slightly attacked. Fruits more than 90 d old showed significantly higher infestations than green bananas (<75 d old). Among ripe banana fruits that were 90-95 d old were more attractive to fruit flies than fruits that were 100-105 d old. Four concentrations of **Clorox® (NaOCl)** tested significantly reduced the egg hatchability of fruit flies but resulted in skin damage on fruits. Therefore, **Clorox®** as a dipping treatment for infested banana fruits to prevent egg hatching of fruit flies should not be recommended.
Indicate the type of surveillance conducted whether General or Specific (i.e. Pest, Commodity/Host, Random, or Targeted survey):	Specific surveillance Pest – Fruit fly Commodity Host – Banana Targeted survey
Summarize the reason for taking the surveillance action:	The investigation was carried out to identify fruit fly species responsible for the attack, the susceptibility of different banana cultivars and different maturity stage to fruit flies.
Summarize the immediate benefit, result or outcome of the surveillance action:	By finding remedies to cope with the problem availability of bananas for the consumer was assured while limiting the losses for sales outlets.
Provide a narrative of your country's best practice in pest surveillance case:	
–	

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6. Surveillance of mango weevils

Title of activity:	Surveillance on mango weevils in major mango plantations in Viet Nam
Abstract:	In order to expand the international markets for our agricultural products, developing the pests list for major crops, especially on fruit crops, is very necessary for doing the pest risk analysis. In the past, we have already provided the pests list of dragon, rambutan, litchi, longan and pomelo for the NPPOs of the US, Korea Republic, Australia and Japan. Mango seed weevil [*Sternochetus mangiferae (Fabricius)*] is a dangerous insect pest for mango crop and the importing countries always request to apply "pest free area" for this insect pest. This insect species is considered as present in Viet Nam from Crop Protection Compendium (CABI/CPC), EPPO website and China. The purpose of this surveillance is to have the list of mango weevils in Viet Nam and have scientific evidence that can be used to determine the pest status of mango seed weevil in Viet Nam.
Indicate the type of surveillance conducted whether General or Specific (i.e. Pest, Commodity/ Host, Random, or Targeted survey):	This is a specific surveillance that concentrates to the mango weevil and mango host plant in Viet Nam.
Summarize the reason for taking the surveillance action:	Having a scientific evidence to determine the pest status of mango seed weevil in Viet Nam.
Summarize the immediate benefit, result or outcome of the surveillance action:	CABI has already changed the pest status of mango seed weevil in Viet Nam in Crop protection compendium.

Provide a narrative of your country's best practice in pest surveillance case:

1. **Time of surveillance**: Two years (2008-2009).

2. **Method of surveillance, collecting samples and surveyed area:**
   - Surveyed area: Son La Province (The North), Khanh Hoa (Central region), Tien Giang and Dong Thap (South).
   - Surveyed time: 60 days after flowering to before harvesting
   - surveyed area: at least (2 districts/province; 3 communes/district; 1 plantation/commune)
   - Surveillance is carried out at interval time of 6 days/plantation

Figure 1. Son La province (2 district)

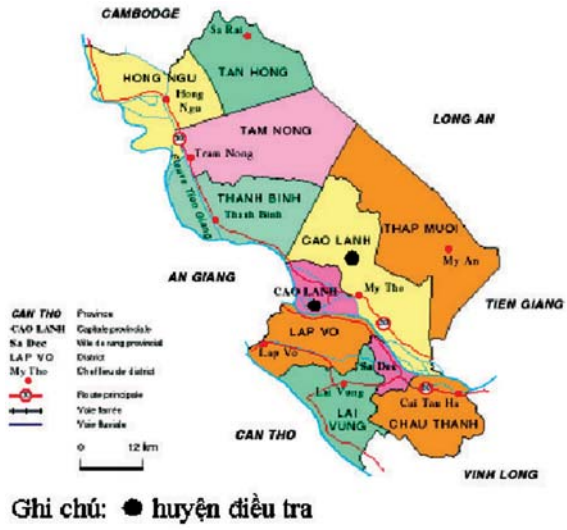

Figure 2. Dong Thap province

3. Collecting and preserving samples of mango weevils



4. Internal co-identification

Plant Quarantine Diagnostic Centre (PQDC), Plant Protection Research Institute (PPRI) and Expert of Land care Research (New Zealand)


5. Using a Remote Microscopy Session for identification of collected samples of mango weevil Hanoi, Viet Nam and Canberra, Australia

a. [*Sternochetus mangiferae* (Fabricius)]

Chinese reference specimen in VN

Reference specimen in Australia

b. [*Sternochetus frigidus* (Fabricius)]

Collected sample in VN

Reference specimen in Australia

c. [*Sternochetus olivieri* (Faults)]

Collected sample on Thailand imported

Reference specimen in Australia

6. Conclusions

a – Mango seed weevil [*Sternochetus mangiferae* (Fabricius)] is not occurred in Viet Nam;

b – All collected samples of mango weevil on major mango plantations in Viet Nam are mangofruit weevil [*Sternochetus frigidus* (Fabricius)];

c – The first record on occurrence of mango seed weevil [*Sternochetus olivieri* (Faults)] onimported mango fruits from Thailand into Viet Nam.

After receiving scientific evidence and surveillance report from Viet Nam NPPO, CABI/CPC agreed and modified the distribution of this insect pest in Viet Nam in 2009 as: Absent, unreliable record.

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7. National Citrus Canker eradication program

Title of activity:	National Citrus Canker Eradication Program – Australia, 2004
Abstract:	As part of the response to the incursion of citrus canker in Queensland (April 2004) surveillance and tracing procedures were developed to: – support initial delimiting of the pest to determine if citrus canker was present in Queensland outside of the original infested premise, and – confirm the absence of the pest in other parts of Queensland and Australia and thereby restore Australia's national Pest Free Area (PFA) status. Surveillance procedures for the delimiting survey and PFA status were developed to provide a level of confidence equivalent to the then draft International Sanitary for Phytosanitary Measures (ISPM) 'Guidelines for Surveillance for Specific Pests: *Xanthomonas axonopodis* pv. *citri*'. The procedures included all relevant elements listed in the current ISPM No. 6: Guidelines for surveillance. Surveillance included both general and specific surveys with the latter having targeted and random sampling components. Diagnostic requirements were determined by a group of technical experts and implemented by appropriate laboratories. Surveillance records were generated for all aspects of the surveillance programme and consolidated into comprehensive reports. Regular reporting to stakeholders of pest status was provided to differing levels of detail depending on the stakeholder and their needs. The surveillance strategy supported the demonstration of the successful eradication of citrus canker and the absence of the pest in other parts of Queensland and Australia.
Indicate the type of surveillance conducted whether General or Specific (i.e. Pest, Commodity/Host, Random, or Targeted survey):	General and specific pest surveys of hosts were conducted. The specific surveys included targeted and random components.
Summarize the reason for taking the surveillance action:	To determine if citrus canker was present in Queensland outside of the original infested premise; and to confirm the absence of the pest in other parts of Queensland and Australia.
Summarize the immediate benefit, result or outcome of the surveillance action:	Surveillance demonstrated the successful eradication of citrus canker and the absence of the pest in other parts of Queensland and Australia leading to restoration of Australia's national PFA status and resumption of trade in citrus and citrus material from the affected area.
Provide a narrative of your country's best practice in pest surveillance case:	
Following the incursion of citrus canker in the Emerald region of Queensland in April 2004, and the declaration of a Pest Quarantine Area (PQA) in that region, a comprehensive surveillance programme was implemented to delimit the extent of the incursion and provide support for pest free area status outside of the PQA. A small working group consisting of representatives from the Commonwealth and state and territory governments was established to develop a surveillance protocol for citrus canker that would meet domestic and international requirements for pest freedom. Specific activities included determining: • a statistical basis for sampling trees and sites and appropriate prevalence criteria (95 percent confidence that the prevalence of infected blocks in Australia (outside of the PQA) is less than 1 percent) • an inspection methodology for each tree and a detection efficiency based on that methodology • how other hosts, small holdings and non commercial plantings would be treated. The surveillance strategy was developed based on international and domestic guidance on surveillance available at the time, including:	

- FAO (1997) 'Guidelines for Surveillance.' (Food and Agriculture Organization of the United Nations: Rome)
- FAO (2002b) 'Guidelines for surveillance of specific pests: *Xanthomonas axonopodis* pv. *citri* (Citrus canker).' (Food and Agriculture Organization of the United Nations: Rome)
- Jorgensen K., Cannon R., Muirhead I. (2003) 'Guidelines for the Establishment of Pest Free Areas for Australian Quarantine.' Plant Health Australia Ltd & Australian Government Department of Agriculture, Fisheries & Forestry.
- QDPIF (2004) 'Property Surveillance and Tracings – Delimiting Surveys.' Queensland Department of Primary Industries and Fisheries, Brisbane.

Data from the Australian Bureau of Statistics (ABS) 2001 Agricultural Census was used to compile summary information on citrus trees in production by state. This was subsequently used in statistical analyses to determine the extent of surveillance activity required in each state to meet the required surveillance confidence level.

A dedicated full-time communications and industry liaison officer was appointed to develop and implement a public relations strategy for the eradication programme, including the surveillance components. The strategies used included media releases and articles, internet sites, brochures and posters, letterbox drops, radio and television coverage, public forums, call centre hotline, signage, attendance at industry trade days and agricultural shows and the production of the *Canker Community Newsletter*. Although these strategies were employed to cover the entire eradication programme, they included information on surveillance as necessary. A Citrus Canker Community Liaison Committee was also established to provide opportunities for interaction and communication with the wider public. Intergovernmental committees were established to manage and oversight the programme.

Surveillance was conducted during Spring 2004 through to Autumn 2005, on a sample of trees in blocks throughout the rest of Queensland and other States in Australia within commercial citrus growing areas. The Gayndah-Mundubbera region in Queensland was comprehensively surveyed because of an identified potential link to the PQA. Further ongoing surveys were undertaken within the pest quarantine area following destruction of susceptible hosts. These were targeted to confirm absence of the disease on

- host plant re-growth during the 18 month host-free period
- native citrus during the host free period
- replanted citrus at completion of the host-free period.

Each state and territory was provided with a template for reporting on the surveillance and at completion the populated templates were collated at the national level. The surveillance procedure included information on the pest, surveillance objectives and strategies, criteria to conduct preliminary surveillance activities and field surveillance activities, decontamination protocols, inspection methods, sample collection and handling procedures, waste disposal and forms for record keeping. The recording method for surveillance data was not prescribed, but specific information requirements were identified with each record required to include the following information:

- Block location – a spatial coordinate representative of the block (e.g. latitude and longitude at the approximate centre of the block)
- Number of trees in block
- Type/variety of trees in block
- Number of trees examined in block
- Number of trees sampled for testing (if any) and test results
- Unique Descriptor (e.g. Name) of Property
- Date
- State/Territory
- Name or identifier of person collecting the data
- Notes (e.g. weather conditions, age of trees)

Table 1 summarises the surveillance done as reported by each state and territory (with the exception of the surveillance undertaken in the PQA and the Gayndah Mundubbera region).

Table 1. Summary of surveillance for citrus canker conducted between July 2004 and March 2005. This does not include the comprehensive surveillance undertaken in the Pest Quarantine Area and the Gayndah-Mundubbera district.

State	Trees in State (ABS, 2001)	Trees in blocks inspected	Trees Inspected		Blocks inspected	
			Requested	Reported	Requested	Reported
Qld	1 851 000	406 463	32 400	234 480	54	973
NSW[1]	4 389 000	1 848 845	77 400	217 867	129	195
Victoria	1 684 000	110 045	29 400	107 747	49	77
SA	2 614 000	323 267	46 200	56 601	77	90
WA	370 000	61 698	6 600	12 538	11	22
NT	20 000	5 936	600	1 894	1	3
Grand Total	10 926 000	2 756 254	192 600	631 127	320	1 360

[1] includes inspection of 81 100 immature trees in 3 nurseries containing 198 100 trees in total

The bulk of the diagnostic testing was carried out by a laboratory in Queensland with confirmatory diagnostic testing carried out by a laboratory in NSW.

Surveillance and tracing activities were specifically budgeted and costs were shared between the Commonwealth and five of the state governments.

The surveillance was completed in Autumn 2005 and no citrus canker was detected in these surveys. The surveys provided sufficient evidences to support that there was no establishment of the pathogen arising from movement of nursery stock originating in the PQA. On this basis the Gayndah-Mundubbera region was considered equivalent to other parts of Australia outside of the PQA in terms of the likelihood of citrus canker being present.

One of the challenges faced was regarding legislative powers. At the time there was no power in Queensland legislation to access and survey properties without the permission of the owner and so the voluntary cooperation of all growers in the district was required for effective surveillance. Queensland has since amended their legislation and now has the appropriate powers.

Surveillance was the key component of the long term strategy to enable the affected region to be declared disease-free and for Australia to declare the disease eradicated. Such a declaration led to the restoration of Australia's national PFA status and resumption of trade in citrus and citrus material from the affected area.

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8. National Fire Blight surveillance

Title of activity:	National Fire Blight Surveillance – Australia
Abstract:	The report of the presence of suspected fire blight (*Erwinia amylovora*) in the Royal Botanic Gardens in Melbourne and Adelaide Botanical Gardens in May 1997 triggered one of the most extensive pest surveys in Australia. Three years of targeted surveillance confirmed the absence of fire blight. The initiative was planned and funded by national coordination between the Commonwealth and state and territory governments of Australia. Targets were commercial orchards and host plants in nurseries, parks and gardens. In orchards, sampling methods were designed to ensure a 99 percent level of certainty that fire blight symptoms would be detected at a 0.1 percent infection level. Surveys were timed to coincide with petal fall of the last flowering cultivar. All host plants in nurseries were inspected during spring and early summer. Urban surveys were commissioned in Melbourne and Adelaide as well as in provincial towns across Australia by examining the nearest host plant on a 1, 2 or 5 kilometer grid pattern. An estimated 6.5 million orchard trees, 1.3 million host trees in nurseries and over 8 500 plants in urban environments were surveyed in the autumn and spring of 1997. Similarly, an estimated 2.9 million plants were examined in 1998 and 1999. Where suspicious symptoms were found, samples were taken and tested for *E. amylovora* using a nationally approved diagnostic protocol. More than 620 samples were taken from plants that showed possible symptoms of fire blight. Diagnostic tests showed that *E. amylovora* was not detected from any of these samples.
Indicate the type of surveillance conducted whether General or Specific (i.e. Pest, Commodity/Host, Random, or Targeted survey):	Specific pest surveillance: *Erwinia amylovora* (Fire Blight)
Summarize the reason for taking the surveillance action:	Delimitation surveys following the report of the presence of fire blight from hosts in Melbourne and Adelaide botanical gardens as part of an eradication programme.
Summarize the immediate benefit, result or outcome of the surveillance action:	The surveys confirmed that fire blight was not present in Australia.
Provide a narrative of your country's best practice in pest surveillance case:	
In May 1997, an outbreak of a bacterial disease suspected to be fire blight caused by *E. amylovora* was reported in the Royal Botanic Gardens in Melbourne (RBGM), Victoria. A similar report was received one week later regarding the possible presence of fire blight in the Adelaide Botanical Gardens (ABG), South Australia. A national eradication programme was triggered which required delimitation surveys and eventually surveillance that confirmed the absence of the pest following the eradication programme. The national coordination of the eradication programme was driven by a Consultative Committee which was chaired by the Australian Government with senior plant health and regulatory managers from each State/Territory and industry representatives from the Apple and Pear Growers Association and Nursery Industry Association of Australia. Quarantine zones were declared around the respective botanical garden in Melbourne and Adelaide and surrounds. Intensive surveys of all hosts were commissioned within these zones. The Consultative Committee approved the removal of plant hosts and honey bee nests within the gardens and surrounds. At the RBGM, 985 host plants were removed from within the gardens and surrounds and 34 honey bee colonies were destroyed. At the ABG, 215 host plants were removed from within the gardens and surrounds and honey bee colonies were also killed.	

Immediately after the detection of suspect fire blight, an 'Information Sheet' was circulated widely to the public and industry as a component of passive and early detection surveillance. The sheet contained information on the host plants, the symptoms, photographs of symptomatic plants, and telephone contact details of State agricultural offices to answer public queries and reports. Seminars were held in all pome fruit areas throughout Australia and colour slides of various fire blight symptoms were presented to nearly 700 growers nation-wide.

Following initial surveillance to delimit the suspected outbreak, which included the RBGM and ABG and immediate surrounds, pome fruit orchards, production nurseries and urban areas, the Consultative Committee agreed to adopt a national standard for diagnosis and survey protocols. A national expert committee was convened, which developed protocols for surveying orchards, nurseries, and urban areas. In 1997 national surveys were commissioned that confirmed the absence of the disease outside the Adelaide and Melbourne quarantine zones. These were complemented in 1998 and 1999 with targeted surveys to confirm freedom following completion of the eradication programme.

Two host lists were used during the survey programme. In 1997, a host list was based on reports of natural and artificial infestations of *E. amylovora* such as Chaenomeles, Photinia and Raphiolepis. The second list, used from 1998 onwards, limited surveillance to plants that were known to be naturally infected by the pest including service berry, June berry, cotoneaster, hawthorn, quince, loquat, apple, meddler, firethorn, pear, mountain ash, plum, red raspberry, thornless blackberry.

Survey teams were trained to recognise host plants and disease symptoms, using reference guides and plant samples, before they began surveying. A national "Train the Trainers" workshop was held in early October 1997, prior to the commencement of the spring 1997 survey and a fire blight surveyor's identification guide, in the form of a pocket-sized reference was made available to survey team members and growers. The reference included photographs of symptomatic plants and text to describe the symptoms associated with fire blight.

A standardised survey operations plan was developed to ensure consistency of survey methods in each of the States.

A detailed delimitation survey was undertaken in an area that extended to all properties within one kilometre of the RBGM. A total of 1 627 fire blight host plant on 911 private properties within the area was identified and examined. Survey teams moved along each main arterial road radiating from the RBGM and the Central Business District, and at 500 metre intervals and examined hosts in private properties, parkland gardens and wasteland. Survey teams also inspected volunteer *Cotoneaster* and *Pyracantha* plants growing along railway station reservations for fire blight. In all, 530 host plants were inspected across an estimated area of 350 hectares.

A similar survey was conducted within one kilometre of the ABG. A total of 2 600 private properties associated with the existing fruit fly trapping grid across metropolitan Adelaide (400 m grid) were inspected and 282 fire blight hosts were surveyed.

Surveys of other urban and township areas were based on 1, 2 or 5 km grid patterns. Where possible, the existing national fruit fly trapping programme was used as a framework. Survey teams selected a single host plant within a 100 m radius of the grid point. For small urban/township areas, 10 survey sites (or the maximum number of sites possible) were visited. All major urban parks and gardens were surveyed. Plant types to be surveyed included *Crataegus* spp., *Cotoneaster* spp., *Malus* spp., *Pyracantha* spp., *Pyrus* spp. and *Sorbus* spp. All plants that had samples taken in initial surveys were marked and revisited to inspect for symptoms. In Autumn 1997, over 5 000 survey sites in urban and township areas located near major pome fruit production areas across Australia were surveyed and over 3 400 trees inspected.

All production nurseries that traded in host plants or budwood were surveyed by inspecting all plants on the designated host list. Across Australia, 280 nurseries were surveyed for fire blight susceptible hosts and approximately 1.3 million plants were inspected.

Targeted surveys were designed for orchard growing areas with particular emphasis on the most susceptible cultivars and based on an estimated number of trees for designated growing districts throughout Australia. Surveys were designed to ensure a 99 percent level of certainty that fire blight symptoms would be detected at a 0.1 percent infection level (1:1 000 trees showing symptoms). All orchards of listed susceptible varieties as well as cultivars with unknown susceptibility to fire blight were included in the survey including neglected or disused orchards. Orchard surveys commenced at petal fall of the last flowering susceptible cultivar in growing areas. Each team member surveyed a row each by eyeballing both sides of host trees for symptoms, referring regularly to field guides for reference. The autumn 1997 survey of commercial pome fruit production areas included 814 apple and pear orchards in every major production district in Australia and covered over 1.1 million trees. The 1997

spring survey included 1 650 apple and pear orchards in every major production district in Australia and covered over 1 300 hectares and over 5 million trees. Some 40 properties including commercial plantings of raspberries and thornless blackberries were surveyed in subsequent surveys in autumn and spring of 1998 and 1999.

For sampling, sterilised secateurs blades sprayed with alcohol (70 percent v/v) and flamed for 5 seconds with a blow torch were used to remove symptomatic tissues with at least 5 cm or more of additional unaffected stem sample. The plant samples with suspicious symptoms of fire blight were then placed in press-seal labelled bags and placed into an insulated storage container and forwarded to government diagnostic laboratories in New South Wales and Victoria. Particular emphasis was given to the strict observance of hygiene practices when moving between properties.

All samples submitted for testing were screened for the presence of *E. amylovora*. A combination of *E. amylovora*-specific culture media and PCR assays were used to identify the fire blight bacterium. An attenuated strain of *E. amylovora* (Ea322) was used as a non-pathogenic reference. A range of pathogenicity assays including hypersensitivity tests on tobacco, pear slice inoculations and inoculation assays on pear seedlings were used when required.

Diagnostic tests showed that *E. amylovora* was not detected from any of the 620 samples submitted for testing. The total cost of the national programme to Commonwealth and States was 2.2 million Australian dollars.

The survey programme for fire blight was one of the most extensive and detailed surveys completed in Australia. Three years of targeted surveillance confirmed the absence of fire blight.

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9. Surveillance of Papaya Dieback (*Erwinia papayae*)

Title of activity:	The Surveillance of Papaya Dieback (*Erwinia papayae*)
Abstract:	The Papaya Dieback was first discovered in Malaysia in 2003. It was gazette as dangerous pest in September, 2009. NPPO organized the eradiction and containment programme to restrain the bacteria *Erwinia papayae*. Notices were sent to the farms that show the symptoms. The hosts that infected were removed and the affected farms were sealed in order to control the inoculums spread to other areas nearby. All affected plant were buried in the soil and infected host were burned.
Indicate the type of surveillance conducted whether General or Specific (i.e. Pest, Commodity/Host, Random, or Targeted survey):	It is a specific surveillance focused on Papaya Dieback (*Erwinia papayae)*.
Summarize the reason for taking the surveillance action:	Papaya Dieback is a invasive disease in the world. It can cause seriously destroy the Papaya Plant Industry in Malaysia.
Summarize the immediate benefit, result or outcome of the surveillance action:	To make sure that the inoculums of *Erwinia papayae* eradicted completely.

Provide a narrative of your country's best practice in pest surveillance case:

The surveillance method of Papaya Dieback

1. Prepare

   Collect and analyze relative information about Papaya Dieback (*Erwinia papayae*). Make local surveillance workplan.

2. Areas

   Infested area/zone: the survey activities should be taken at the areas where are representative and marginal (infected).

   The survey aim is to know how serious the area are infected.

   Un-infested area/zone: The monitoring activities should be taken at the areas, 500 metres radius (buffer zone) from the infected zone. The monitoring aim is to make sure that the area are free from *Erwinia papayae*.

3. Duration

   The eradication and containment programme should be taken at least one year.

4. Material

   Sample bag, label, sealer, pen, alcohol, back hoe, digging tools, etc.,

5. Method

Infested area: Notices were sent to the farms that show the symptoms. The hosts that infected were removed and the affected farms were sealed. All affected plant were buried in the soil and infected host were burned.

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10. Specific survey and control project for Pine Wilt Disease

Title of activity:	Specific survey and control project for Pine Wilt Disease
Abstract:	Pine wilt nematode (PWN) is native to North America. It is one of the most important forest pests on the pine trees (*Pinus* spp.) in Republic of Korea where the nematode was designated as a prohibited quarantine pest. The nematode has been expanded its distribution nationwide since it was firstly introduced in southern part of Republic of Korea peninsular in 1988 with wood packing materials for small animals from Japan. Therefore it has been driven to enact the 'Special law for control of Pine Wilt Disease' in 2005 to protect the further spreading and control of the PWN. The nationwide specific survey to control the PWN has been done under the special law and is resulting into the decreasing of the infection from 5.6 million's of infected tree in 2005 to 8 thousand's of infected trees in 2011. The deceasing rate in the last year was about 99 percent of those in 2005. So we are currently expecting to eliminate the Pine wilt disease in 2013.
Indicate the type of surveillance conducted whether General or Specific (i.e. Pest, Commodity/Host, Random, or Targeted survey):	Specific survey on the Pine Wilt Disease caused by PWN on Pine trees
Summarize the reason for taking the surveillance action:	Pine trees are the major coniferous tree among the 40.5 percent of coniferous forestry in Republic of Korea. Pine trees have the special and cultural meanings to Korean including lots of very old trees for national heritage. So, it was need to protect the pine trees as well as our culture from PWN which is so called as the AIDS of pine trees.
Summarize the immediate benefit, result or outcome of the surveillance action:	The infection and damage rates were decreased into about 99 percent of the beginning rate. Lots of previous infected areas have been recovered and designated to the clean area from PWN. The nematodes are now under control and expected to be eliminated in 2013.

Provide a narrative of your country's best practice in pest surveillance case:

Pine wilt nematode (PWN) is indigenous to North America and introduced into Repubic of Korea. It is the most important and fatal forest pest on pine trees (*Pinus* spp.) in Republic of Korea where the pine trees are the main coniferous tree among 40.5 percent of coniferous forestry. So the nematode is called as 'the AIDS of pine trees'. It can be transmitted and expanded by the vector insects, *Monochamus* cerambycid beetles. PWN has been recorded in USA, Canada, Mexico, Japan, China, Taiwan and some parts of Europe. So, it has been regulated as one of the prohibited quarantine pests in Repubic of Korea. However, PWN were firstly occurred in southern part of Korea, October 1988. It was first invaded into Mt. Geumjeong, Pusan city where about one hundreds of pine trees were dead collectively. PWN was confirmed to be introduced along with the wooden packing materials for small animals from Japan.

PWN is transmitted from young adult vector beetles (*Monochamus*) after emergence from their pupal chambers, when they fly to feed on young Pinus shoots. The nematode enters the shoots through the feeding wounds. Since the nematode enters the host shoots, it multiplies in the resin canals, attacking their epithelial cells. About 3 weeks later, the tree shows first symptoms of 'dying out', in the form of reduced oleoresin exudation. The nematodes can now freely throughout the dying tree which becomes attractive to adult vector insects which gather on the trunk to mate. At this stage, intensified wilting and yellowing of the needles is seen. The tree dies 30-40 days after infection, and may then contain millions of nematodes throughout the trunk, branches and roots. Almost more than 80 percent of infested trees get to die in the year and rest of them die the next March.

In spite of continuous control programme after first occurrence of PWN, the nematode has been spread into most of the southern parts in 1990s and invaded into central parts in 2007. The infected areas have been rapidly increased into 7 817 ha in 2007. However, with the revised programme to impede the spreading of PWN, the infestation has been decreased gradually where the infestation areas was 3 547 ha in 2010.

It was pointed out previous mistakes not to stop the early spreading of PWN. That were as followings; an insufficient systemic approaches based on the proper political supports, a miscommunication between relevant authorities, socio-economical factors to facilitate human-made dispersal, and insufficient monitoring and assessing

the control practices. Therefore it has been driven to enact the 'Special Law for Control of Pine Wilt Disease' in 2005 to protect the further spreading and control the PWN. With the increased budgets under the special law, the proactive control and movement regulation have been enforced to protect artificial spreading of PWN. And finally the active survey and control systems were established in 2009 with nationwide 'forest pest survey and control unit'. The unit has almost 1 000 people in 250 teams. As a result of the special law, a total of 24 areas among 67 previously infested areas (county, district, or city) have been resurged from the PWN infestation to the 'Clean area' at present. So, it is expecting to complete control for the eradication of PWN in 2013.

- Acreage of Infection area: (in 2000) 1 677 ha > (2005) 7 811 ha > (2006) 7 817 ha > (2007) 6 855 ha > (2009) 5 633 ha > (2010) 3 547 ha > (2011) 5 123 ha
- No. of Infection Tree: (in 2000) 28 000 trees > (2005) 566 000 trees > (2006) 409 000 trees > (2007) 285 000 trees > (2009) 42 000 trees > (2010) 16 000 trees > (2011) 8 000 trees

Under the special law in 2005, the Central pine wilt disease control headquarters has been established in Korea Forest Service (KFS) along with each regional control centres in the PWN infested local governments. The headquarters and regional centres aim for the establishment of the national pine wilt disease control programme, securing the relevant expenditures and human resources, cooperating with relevant government authorities, making a plan for public awareness, supporting the infected tree elimination and control, periodical evaluating a regional control practice, and promoting nationwide survey to detect an infested trees. Especially, the regional centre constitutes a regional council with local police station, road traffic authorities, and national park services for the cooperation of information sharing about PWN occurrence and control, and collaborate survey and control.

Under the special law in 2005, a total of 250 teams of forest pest survey and control unit has been established in 2009 for the monitoring of 4 kinds of important forest pests including PWN with 22 million's of US dollars. The unit aims to eliminate and cut down the pest infested and infected trees, survey the pests during specific periods, and map the occurring sites by each forest pests. Especially, each team is constituted of about 4 qualified peoples with relevant experiences in any forestry services and certifications, and takes part in training programme at least once a year.

There are two kinds of PWN survey per year; one is monthly-based general survey, ant the other is two times of periodical intensive survey at January-February and September-October. The survey results are managed in 'the IT management system for Pine Wilt Disease'. And, for the public awareness and support, any incidence reports from public are gathered into a home page (www.forest.go.kr) and a new finder wins a prize of maximum 1 800 US dollars. Additionally the basic survey programme, the aerial monitoring (two time per month) and ground monitoring by Korea Forest Research Institute are conducted. And a total of 11 technical consulting units are established and gives a technical support on the new infected areas and damaged areas.

When any new incidences of PWN are reported, the emergency actions are gone according to the designated procedures in the 'annual plan for survey and control of forest pests'. The currently applicable control methods are pesticide injection to the trunk, aerial spraying, and fumigation, burning and chipping after cutting down the infested trees.

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11. Surveillance of Giant Salvinia

Title of activity:	The surveillance of Giant Salvinia
Abstract:	Giant Salvinia: *Salvinia molesta* D.S. Mitchell, the most invasive alien water fern was designated as the most noxious weed of the world. The plant has been prohibited from importation into the kingdom as it is quarantine pest of Thailand according to the Quarantine Act since December 1978 and subsequent announcements of the Ministry of Agriculture and Cooperatives continuously prohibited it. The objective of this surveillance was to monitor and detect giant salvinia which aim to reduce the spreading and establishment of giant salvinia. The surveillance was done during October 2007-September 2010. Two infested areas were found, one in Songkhla province, another is in Mae Klong river. The other detection was occurred in ornamental plant market in Nontaburi province and 3 locations of ornamental aquatic plants in plots. The official control has been applied through local government.
Indicate the type of surveillance conducted whether General or Specific (i.e. Pest, Commodity/Host, Random, or Targeted survey):	Specific surveillance focused on Giant Salvinia
Summarize the reason for taking the surveillance action:	Giant Salvinia is a Quarantine pest of Thailand
Summarize the immediate benefit, result or outcome of the surveillance action:	To monitor the infestation of Giant Salvinia in risk area to delimit the infestation, planning for official control and eradication.

Provide a narrative of your country's best practice in pest surveillance case:

The surveillance method of Giant Salvinia

1. Prepare

   Entry potential analysis

   Pathway analysis

   Planning for detection in risk area and provided information about the pest to staff.

   Questionnaire

2. Areas

   High risk area: The monitoring activities should be taken in ornamental plant and aquatic plant selling. If the target pest was found then the vicinity within 1 km would be concentrate surveyed.

   Low risk area: Questionnaires were distributed to the stations of the Royal Irrigation Department.

3. Duration October 2007-September 2010

4. Material Net, hand lens (magnifier lens), leaflet, questionnaire

5. Method

   High risk area: ornamental plant market, aquatic plant market

   Detection survey by walk through every aquatic plants shop was done.

   Interview: 1-5 persons in each location were interviewed.

   Questionnaire: Whether there is any water body around? Is it public or private property?

   Whether there are any aquatic plants in that water body?

   Are there any people around your resident prefer growing aquatic plant?

   Have you ever seen the plant (with photos) giant salvinia, Salvinia (*S. Cucullata*) and floating fern (*S. natans*)

Low risk area:	20 questionnaires were sent to station of Royal Irrigation Department in each province to interview people around the water body.
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12. High Risk Site Surveillance

Title of activity:	High Risk Site Surveillance
Abstract:	High Risk Site Surveillance (HRSS) is a post-border risk pathway focused surveillance programme, operated by Ministry of Agriculture and Forestry New Zealand (MAF NZ). The primary objective of the HRSS programme is to provide effective early detections of new plant pests with the aim of detecting organisms of biosecurity risk or potential impact on trees and arborescent shrubs (e.g. plantation forests, native forests, urban trees). The HRSS programme identifies high risk sites which are areas or sites that are known to be significant pathways or establishment sites for exotic organisms. A risk model is used to calculate biosecurity risk based on known associations between imported risk goods or international passengers entering New Zealand and biosecurity risk organisms. Grouping identified clusters of high risk sites into Risk Site Areas in a GIS database allows surveillance resources to be efficiently allocated in proportion to calculated risk. Collection of field data is done electronically using hand-held data units with GPS which provide high accuracy for transect and sample location. Collected data is downloaded by surveyors to a HRSS database which is integrated with a GIS allowing storage and spatial analysis of data. As demonstrated by the volume of relevant new pest information generated as a result of HRSS the HRSS programme continues to provide effective detections of new plant pests of biosecurity risk or potential impact on trees and arborescent shrubs (e.g. plantation forests, native forests, urban trees) over a wide range of pest and host species.
Indicate the type of surveillance conducted whether General or Specific (i.e. Pest, Commodity/Host, Random, or Targeted survey):	Targeted survey – pest risk based, pathway focused.
Summarize the reason for taking the surveillance action:	After a number of new pest incursions and successful, although costly, eradications in the late 1990's/early 2000's and significant changes in the way risk goods were processed at the border it was recognized that a new approach for surveillance of forestry pests was required. Given the difficulty in predicting which exotic species would next establish in New Zealand, and the cost of single species surveillance programmes, along with the lack of species-specific lures for many pests, a new programme was designed that concentrated on detecting a broad range of pest types. Stakeholders (including forest owners, regional and city local government, environmental non-governmental organizations, other central government departments) also believed that something needed to be done and endorsed action by the government.
Summarize the immediate benefit, result or outcome of the surveillance action:	• Increased collaboration and support from forestry stakeholders. • Centralisation of all central government forestry-related surveillance leading to efficiencies in resource use and data management. • Ongoing improvements in national host and commodity pest lists and distribution records.
Narrative of country's best practice in pest surveillance case:	
Introduction During the late 1990's/early 2000's New Zealand had a number of incursions by significant forestry pests including White-spotted tussock moth, (*Orgyia thyellina*), Gum leaf skeletoniser (*Uraba lugens*), Painted apple moth (*Teia*	

anartoides), Fall webworm (*Hyphantria cunea*), and Hokkaido gypsy moth (*Lymantria umbrosa*). While these were all eradicated successfully the work was very expensive (e.g. over NZ$65 million for Painted Apple moth). One of the reasons for the expense, in some cases, was the wide establishment of the pests before they were first discovered so that a large area had to be treated. Because of the risk involved and also as a result of significant changes in the way risk goods were processed at the border (i.e. shipping containers which used to be unloaded near ports were being quickly transported to over 6 000 transitional facilities that are spread throughout New Zealand) it was recognized that a new approach for surveillance of forestry pests was required.

Given the difficulty in predicting which exotic species would next establish in New Zealand, and the cost of single species surveillance programmes, along with the lack of species-specific lures for many relevant pests, a new programme was needed that concentrated on detecting a broad range of pest types. Stakeholders (including forest owners, regional and city local government, environmental non-governmental organizations, other central government departments) also believed that something needed to be done and endorsed action by central government.

Using known data on the history of previous incursions, historical pest finds on imported risk goods, slippage surveys of pests through the border, volumes of risk goods entering the country and where goods were unloaded new protocols were proposed that covered a wide range of pest types and areas of risk. A comprehensive series of trials on the proposed methodologies were used to refine the final programme design. Alongside this lengthy consultation was carried out with stakeholders including private forest owners, regional and city local government, environmental non-governmental organizations and other central government departments (e.g. the Department of Conservation who manage over five million hectares of native forest).

Survey methods:

The High Risk Site Surveillance programme identifies high risk sites which are areas or sites that are known to be significant pathways or establishment sites for exotic organisms. A risk model is used to calculate biosecurity risk based on known associations between imported risk goods or international passengers entering New Zealand and biosecurity risk organisms.

Grouping identified clusters of high risk sites into Risk Site Areas in a GIS database allows surveillance resources to be efficiently allocated in proportion to calculated risk. Surveillance transects are allocated within risk site areas to cover areas of potential host vegetation and provide discrete, repeatable, packets of intensive surveillance.

Each year the latest pathway data (e.g. location and numbers of sea containers) is used to calculate risk for the upcoming survey season. Transect inspections are initially allocated to the risk site areas in proportion to the amount of risk each area is calculated to receive. Transect inspection numbers are then adjusted to ensure that the single season minimum detection probability is over 50 percent and the highest risk sites have a detection probability greater than 90 percent.

Field surveyors thoroughly inspect arborescent vegetation and woody material in each of the allocated transects (even in the absence of obvious signs of damage). Suspect samples that, in the opinion of the field surveyor, may be a biosecurity risk are collected and forwarded to the appropriate laboratory for identification.

The designated diagnostic laboratory for insects and pathogens of arborescent vegetation and wooden material from the HRSS programme is Scion's Forest Health Research Laboratory (a Crown Research Institute – www.scionresearch.com). Once identified suspect samples are validated by MAF's Investigation and Diagnostic Centre's Plant Health and Environment Laboratory (IDC-PHEL).

Management and dissemination of information

Collection of field data is done electronically using hand-held data units with GPS which provide one metre accuracy for transect and sample location. Software used is 'HRSS Mobile' which was developed specifically for the HRSS programme from a veterinary package co-developed between MAF and Massey University. Collected data is downloaded by surveyors to the AsureQuality maintained HRSS database which is integrated with a GIS allowing storage and spatial analysis of data.

All organism identifications are recorded in the Forest Health database maintained by Scion. Those organisms which are identified as being either new to New Zealand, new to science, new host association(s), or have new distributions or associations with a new part of a plant within New Zealand are reported to MAF for action. Those organisms reported to MAF are added to MAF's plant pest (PPIN) database which contains records of all important biosecurity risk organisms found in New Zealand. Samples of significant and representative finds are retained in the appropriate physical collection.

An annual report is published by MAF with the latest annual report on the HRSS programme in the Surveillance online magazine (http://www.sciquest.org.nz/node/72874). New, non-urgent, finds are regularly reported to the public in the Surveillance magazine (http://www.sciquest.org.nz/node/72014).

Management and other social/political issues

The HRSS programme is completely government funded with programme management being contracted out to AsureQuality (www.asurequality.com) and the field work being undertaken by SPS Biosecurity (www.spsbiota.co.nz). Both AsureQuality and SPS Biosecurity are ISO/IEC certified for the work they carry out and the diagnostic laboratories are either ISO17025 certified (IDC-PHEL) or in the process of achieving certification (Scion).

Support from the forest industry was vital in highlighting the importance of the programme and in ensuring that it gained, and continues to gain, funding.

Overall outcome

Each year between 500 and 1 000 samples are forwarded to the laboratories for identification. Of these over 20 percent are found to be either new to New Zealand, new to science, new host associations, or have new distributions or associations with a new part of a plant within New Zealand. This strike rate compares favourably with New Zealand's passive surveillance programme where 0.1 percent of calls from the general public lead to positive diagnostic outcomes.

The programme has been recognised by scientists as being very effective. For example, a recent review of the efficacy of different biosecurity sampling strategies found that new to New Zealand pests have been detected firstly in high risk site surveillance at a ratio of 7:1 compared with those found in forest specific surveillance (Kriticos *et al*., 2008).

The programme has also been acknowledged by stakeholders as very valuable and worthy of ongoing support. For example, the New Zealand Forest Owners Association has adopted the methodology as part of their forest health surveillance programme for identified high risk sites within forests.

List of links or attachments in support of the best practice case provided:

1. Biosecurity Magazine – Issue 89, February 2009 [http://www.biosecurity.govt.nz/biosec/pubs-news/pubs/biosecurity/issue-89]

2. Kriticos, D.J., Leriche, A., Bulman, L.S., Kimberley M.O., Alcaraz, S. & Richardson, B. (2008).

Modeling the efficacy of different sampling strategies for estimating disease levels and detecting the spread of new pests. Client Report 12697. Scion, Rotorua, New Zealand. 37 pp.

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13. Surveillance on minimizing pest risk in rice

Title of activity:	Conducting Surveillance on Minimizing Pest Risk in Rice
Abstract:	Rice is an important food grain in Bangladesh. Millions of people depending on rice as their staple food, but there are few skilled people involved in rice cultivation. However, rice cultivation is hampering due to lots of stresses like pest attack, natural disasters and so on. Among all these attack pest is considered the most critical one. To get sustainable rice production an intensive surveillance is to be conducted in rice field all over country through the skilled manpower working in DAE. Importance of surveillance is to make a forecasting and analysis based on earlier data and at the same time suggestions for precaution measures for rice cultivation. In case of severe attack operational guidelines are provided based surveillance report.
Indicate the type of surveillance conducted whether General or Specific (i.e. Pest, Commodity/Host, Random, or Targeted survey):	Specific surveillance on rice pest.
Summarize the reason for taking the surveillance action:	Forecasting, early warning etc.
Summarize the immediate benefit, result or outcome of the surveillance action:	At present generally 10-15 percent rice production is hampering due to pest attack. After surveillance it may come down to 5-7 percent.

Provide a narrative of your country's best practice in pest surveillance case:

1. Selection of the representative surveillance block in each agricultural block comprises the total of 5 in each Upazilla (Sub District).
2. Selection of five units from each surveillance block which measures 20 hectare of rice field.
3. Selection of surveillance plot through randomization from each unit measuring 0.2 ha. of land.
4. Collection of data in every week of month during rice cultivation.
5. Observation of 20 plants across the angular side of the rice field in respect of identifying of the total number of pest and beneficial insects along with identifying the number infected or infested tillers and leaves.
6. Conducting 10 sweeps for identifying harmful and beneficial insects.
7. Total no. of surveillance block:
   No. of upazillas × No. of Surveillance block = 485 × 5 = 2 425.
8. The primary data collected from Surveillance Unit add in upazilla, from upazilla to district and district to headquarter and finally compiled together to get the concrete result for forecasting and other necessary actions.

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14. Surveillance of Red Imported Fire Ant

Title of activity:	The surveillance of Red Imported Fire Ant
Abstract:	The red imported fire ant was found in Guangdong at November 2004. NPPO organized the monitoring and control activities to restrain the pest. Use the trap to allure the pest, mainly at high risk areas, like the areas near road and the piles where storage high risk articles, like soil, garbage, straw, greensward, seedling, etc. Some others areas were monitored also, including grassland, greenhouse, nursery, garden, wasteland, dyke, golf course, freight yards, etc.
Indicate the type of surveillance conducted whether General or Specific (i.e. Pest, Commodity/Host, Random, or Targeted survey):	It is a specific surveillance focused on Red Imported Fire Ant.
Summarize the reason for taking the surveillance action:	Red Imported Fire Ant is a famous invasive pest in the world. It can not only cause economic loss, but also cause seriously harm to environment and humankind.
Summarize the immediate benefit, result or outcome of the surveillance action:	To monitor Red Imported Fire Ant is useful to know the pest infestation trend, postpone it diffusion and alleviate it compromise.

Narrative of your country's best practice in pest surveillance case:

The surveillance method of Red Imported Fire Ant

1. Prepare

   Collect and analyze relative information about Red Imported Fire Ant

   Make local surveillance workplan.

2. Areas

   Infested area: the monitoring activities should be taken at the areas where are representative and marginal.

   The monitoring aim is to follow up the pest infestation and dispersion trends.

   Un-infested area: the monitoring activities should be taken at the areas, like the areas near road and the piles where storage high risk articles, like soil, garbage, straw, greensward, seedling, etc. Some others areas were monitored also, including grassland, greenbeit, nursery, garden, wasteland, dyke, golf course, freight yards, etc.

   The monitoring aim is to find out whether the Red Imported Fire Ant is introduced.

3. Duration

   The monitoring activities should be taken when the temperature is during 20 to 32 ºC.

4. Material

   Trap bait, magnifier, anatomical lens, digging tools, nipper, cuvette, sample bag, label, pen, alcohol, etc.

5. Method

   Un-infested area:

   Interview: 10 persons each county, keep records about local, time

   Questionnaire: whether there are somebody was bitten by Red Imported Fire Ant recently?

   whether there are ant nest be found recently?

   whether there are high risk articles were imported recently?

   general investigation:

   Based on the interview results, the local technician should walk around the area according to the work plan. Technician can search ant nest with a long iron haulm to cleanup grass and other barriers. When the ant nest is found, technician can insert the iron haulm into the nest and observe whether there are some ants emerging and attaching. Take the sample to identify in the field or in the lab and keep the records. If it is confirmed that the Red Imported Fire Ant had invaded, the surveillance should be done continuously as infested area.

Infested area:

Make the interview and general investigation to confirm infested range.

Monitoring method:

____cut the sausage into slice as 0.5 cm and put the slice into the special plastic bottle as the bait.

____Fastness the bottle on the ground and keep the sausage fresh.

____At least 3 sites for each infested county and community should be set up. Five baits for each site should be deposited. The distance between two baits should be more than 10 m. If the monitoring area is slight, deposit one bait each 10 m.

____It is better to deposit bait on where has ants.

____Fasten the bottle on the ground. Take out the ant be trapped after 30 min., identify and count Red Imported Fire Ant.

____Make the sample when necessary.

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15. Monitoring of crop pests

Title of activity:	Monitoring of crop pests
Abstract:	Crop pests surveys are conducted to monitor the pest population on different crops in the country
Indicate the type of surveillance conducted whether General or Specific (i.e. Pest, Commodity/Host, Random, or Targeted survey):	General surveillance
Summarize the reason for taking the surveillance action:	In India the pest surveillance is being under taken for the following purposes: 1. To monitor and forewarn the crop pests, diseases, weeds, and Bio-control agents population build-up in the agricultural crops. 2. To monitor the locust population in the Scheduled Desert Area (SDA) of Rajasthan and Gujarat States of India. 3. To know the occurrence of pest and to provide basis for pest identification, listing of pest, pest status, pest categorization, to conduct risk analysis and to earmark the pest prone and pest free areas as a pre-requisite for phytosanitary measures and agreement for global trade.
Summarize the immediate benefit, result or outcome of the surveillance action:	The surveillance programme found beneficial for: 1. Early detection of pest occurrence, outbreaks , upsurges in the country. 2. For making suitable pest management strategy before the pest causes the economic loss. 3. For adopting timely pest management measures. 4. For earmarking the endemic, hot spots and pest free areas. 5. For making forewarning and issuing of timely advisory to farmers and State Governments. 6. For managing the pest emergencies. 7. For knowing the emerging pest problems. 8. For timely decision making. 9. For checking further spread of the pest in the other areas. 10. For adopting pro-active steps for expected pest problems.
Narrative of country's best practice in pest surveillance case:	
In India crop pest surveillance is under taken by the multiple agencies both at State and national level. Generally the observations are taken manually and visually. The following surveillance activities are under taken by various agencies: • surveillance programmes may be national, and initiated by PPQS/PPD (such the National Integrated Fruit Fly Surveillance Project to monitor fruit fly in mango producing areas); • the 31 Central IPM Centres (CIPMC) undertake regular roving pest surveys (as well as fixed plot surveys); • networks of scientists working for SAU's and ICAR crop specific research institutes also report pest occurrence periodically; • the State Departments of Agriculture (SDA) have a responsibility to monitor pests within the State; • There are other rural kiosks and information movements (such as Kisan call centres) which could also gather first hand pest-related information, while IPM farmer field schools (FFSs) (which in some States are quite extensive) also encourage local pest surveillance.	

THREE TIER PEST SURVEILLANCE AND ADVISORY SYSTEM IN INDIA

A three tier National Pest Surveillance and Advisory system has been established since, 2008 in which the pest surveillance and advisory units have been constituted at national/States/ District level. The composition and functions of these units is given below:

A. National Pest Surveillance and Advisory Unit

Composition

1. Joint Secretary (Plant Protection), DAC – Chairman
2. ADG (PP), ICAR – Member
3. Plant Protection Advisor, Dte of PPQ&S – Member Convener
4. Director, NCIPM (ICAR) – Member
5. Representatives of crop specific ICAR Institutions – Invited by the Committee from season and on area basis
6. Representatives of State Agriculture Universities – to be nominated by the Committee
7. Selected Commissioners/ Director of Agriculture depending on the season and crop
8. Representatives of NIC
9. Representatives of farmers nominated by the unit

Functions

i. Coordinating pest surveillance and providing guidance to the CIPMCs and States
ii. Analysis of pest surveillance data and advice on emerging pest threats
iii. Enabling the research Institutions for taking up special and time bound activities in special areas
iv. Launching campaign for creating farmer awareness on specific situations where community action is required
v. Advising the neighboring States on possible pest migration.

B. State Pest Surveillance and Advisory Unit

Composition

1. Commissioners/Director, State Department of Agriculture – Chairman
2. Director of Research, State Agriculture University
3. Representatives of Entomology and Plant Pathology, State Agriculture University
4. Representatives of ICAR Research Institute in the State
5. Selected District Joint Directors depending on crop season and area
6. Representatives of CIPMC of the State
7. Coordinator of KVK in the State
8. Farmers representatives
9. Selected NGO active in plant protection areas
10. Joint Director/Deputy Director (PP) – Member Convener

Functions

i. Direct State-wide multi-district surveillance activities and manage the data
ii. Arranging training of personnel and extend support for district level surveillance
iii. Analyse reports on the pest and disease situation district wise
iv. Log all issued advisories and ensure that advisories and other activities are consistent with guidance given
v. Confirm issuing of any State-wise advisories prepared by SAU, if needed
vi. Arrange special surveys or surveillance depending on the need

C. District Pest Surveillance and Advisory Unit

Composition

1. Joint Director (Agriculture)
2. Representatives of KVK
3. Representatives of local research institute of SAU and/or ICAR
4. Block Agriculture Officers depending on the season and crop
5. Representatives of farmers groups
6. Assistant Director/Deputy Director (PP) – Member Convener

Functions

i. Direct and coordinate local arrangements/activities on pest and disease surveillance and review results and draft appropriate advisories
ii. Arrange to send the data to State and National units
iii. Communicating the advisories to farmers through mass media and print media
iv. Taking up special campaigns for surveillance and pest control practices
v. Involving the farmers groups, commodity groups, NGOs in surveillance and special campaigns.

e-pest surveillance through hand held device

The different agencies are involved in pest surveillance for recording pest/disease intensity in different ways. E-Pest Surveillance consist of a Hand Held Device for adopting a uniform and standard Pest Surveillance Methodology throughout the country and to arrive at common picture of the country or state or district as whole.

Initially the technical input was given to FAO as well as The device developing software "INFRONICS SYSTEMS" by the Dte of PPQ&S CIPMC, Hyderabad, ANGRAU, Rnagar Hyderabad, Dept. of Agriculture, A.P. and N.C.I.P.M New Delhi.

The Hand Held Device has been developed and was launched by Hon, able Union Agriculture Minister on 26-02-08 at national conference on Kharif 2008 at National Agriculture & Science Centre, PUSA Complex, New Delhi.

The specificities of Hand held device are given below:

1. The hand-held device is an important improved field data capture system (qualitative), quantitative with Geo-referencing.
2. The device has inbuilt Global Positioning System (GPS) so that geo-referenced field data could be collected.
3. At the end of the pest surveillance the device would generate a data file which can be easily transferred through Internet to centralized database at NCIPM website for Analysis and transferring data into usable report.
4. The surveys were carried out by ANGRAU, Hyderabad Scientists, and Field staff of Dept. of Agriculture, A.P. and Staff of CIPMC Hyderabad.
5. The Pilot project on Evaluation of Hand Held Device for Pest Surveillance in A.P. conducted during Rabi 2007-08 in 04 districts in 04 crops.

Besides, the above e-surveillance devices the following two devices are also working in India for transmitting and storage of surveillance data.

- **dacnet/pdmis System:** It is a system on pest observations, at district level; the system runs at state level and a subset of the data is also visible at national level (crop, crop stage, pest, extent of disease/ infestation); the source, and principal user, is State departments of agriculture, and it is also used to manage pesticide availability.
- **http://dacnet/iipm System:** It is a system to support entry of the results of roving survey reports, and includes the potential to report a more complete view with AgroEcosystem Analysis (additionally numbers of pests, predators, field conditions, weather, etc.) and is designed to administer CIPMC roving survey data.

AWARENES CUM SURVEILLANCE PROGRAMME AGAINST PEST OF SOYBEAN AND COTTON IN MAHARASTRA AND ORISSA:

An awareness –cum- surveillance programme for management of major pest in soybean-cotton based cropping system in Maharashtra (2009-10) has been launched as the soybean crop suffered a setback due to epidemic of S. litura and other pests causing yield losses up to Rs.1 000 crores. The programme consist of two parts i.e. i) awareness creation and ii) pest monitoring – cum surveillance based advisory system. To achieve these objectives, the responsibilities were earmarked to all the stakeholders as per their areas of operation and specialisation. The awareness creation programme includes: Coordinator – Master Trainer – Field Staff-Elite farmers while pest monitoring programme includes: Coordinator – Pest Monitor – data Entry Operator-Pest Scout.

The pest monitoring and advisory system includes – recommendation of a number of pesticides to be used for the management of different pests of soybean and cotton. NCIPM is instrumental in the launch of programme in collaboration with the Government of Maharashtra.

Similar type of e-Pest Surveillance programme is also being implemented in Orissa State in Rice Crop . In this state the e-pest surveillance project/programme is funded under RKVY and is being implemented in 13 districts namely Sundergarh, Sambalpur, Jharsuguda, Deogarh, Baragarh, Bolagir, Sonpur, Kalahandi, Nuapada, Koraput, Rayagada, Nawarangpur and Malkanagiri to render pest surveillance and monitoring in Paddy. During the project period the paddy areas having endemic pockets of Swarming caterpillar is being given the top priority for monitoring and surveillance through roving survey . There will be three to four rapid roving survey being done by officials of department i.e. OUAT,NCIPM,CIPMC and state agriculture department.

The field diagnosis camps @ one per each block to solve the day to day problem of farmer starting from soil health to pest control are also being established. More emphasis is being given to control and management of Swarming caterpillar by spot application method.

In addition to this the pest monitoring of all the districts at directorate level through tele-Conferencing and SMS based programme is also being done. The farmers can dial to 0674-6530653 to inform the village under pest attack and this information is being transferred to the concerned DDA/DAO/AAO/PPO at field level and DDA, PP/PPO (Hqr) at head quarter level in form of SMS for pest monitoring and management.

VIDEO CONFERENCING AND CROP WEATHER WATCH GROUP MEETING (CWWGM):

The prevailing pest and disease situation in the country is also monitored and reviewed through video conferencing and Crop weather watch Group Meeting (CWWGM) on very Friday in DAC, New Delhi.

e-LOCUST:

Indian Locust Warning Organization (LWO) is using e-Locust system for monitoring Locust activities in Indian scheduled Desert areas of Rajasthan and Gujarat States. This device supplied by FAO. It is an electronic data recording and transfer system, which facilitates rapid transmission of field information from far distances directly to the Locust Information Office of the national Locust Control Units (LCU) without delay and without using normal telecommunication facilities, or communicating field data orally by HF radios. E-Locust allows the Locust Control Officer in the field to enter observations and data directly into a database at each survey or control location and view the data on a map. For this purpose a small palmtop computer is being used in conjunction with GPS, a modem and HF radio equipment.

The objectives of the e-Locust system are:

- To improve data collection in the field,
- To improve data transmission,
- To facilitated data management at the Locust Information Office of the LCU.

With this equipment it is possible to view at any time the survey route, the current location, or any aspect of data entered on a series of maps. These maps are displayed as overlaps on the palmtop computer.

The information stored can be directly transmitted by HF radio modem from the field to the RAMSES computer in the Locust Information Office for analysis and further transmission by E-mail to the SWARMS GIS of the *DLIS* Office at the FAO HQ. This permits real time information of the field conditions, the ongoing activities in the field and better forecasts. The management of the LCU can directly follow the actual position of survey teams and redirect them in case required.

The data can also be uploaded to the *RAMSES* computer upon return to the Locust Information Office and consequently facilitates data management particularly in countries or situations with large amounts of data to be entered and processed for decision making. This helps also to avoid errors while copying and re-entering data by hand and is contributing to a better quality of the data.

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16. Pest surveillance of maize and cabbage

Title of activity:	Pest surveillance in Lao PDR
Abstract:	The guidelines for pest surveillance for plant pests in Asia and the Pacific is very useful to identify situation of insect pest and plant diseases. Plant Protection Center is responsibility for pest surveillance in Lao PDR. National Plant Protection Organization for Lao PDR and its Plant Quarantine Division and Plant Protection Center were selected priority crops which are exported crops and imported crops to implement of pest surveillance including rice, corn, mango and cabbage. The method use to surveillance are specific survey and general survey. Pest surveillance in Lao PDR were supported by government and supported by donor assistance including AusAID and the NZAID Phytosanitary Capacity Building Project. Investment for pest surveillance in Loa PDR is insufficient funding to effectively implement pest surveillance that is little money to undertake pest survey. Lao PDR are too few plant pathologists, nematode science, entomologist, weed science, botanists etc., too little expertise, especially for identifying pests and also is insufficient funding to improve fatalities in the national Laboratory including equipment for diagnostic, identification and pest collection facility and we are not outline important on pest surveillance for stakeholder to understand.
Indicate the type of surveillance conducted whether General or Specific (i.e. Pest, Commodity/Host, Random, or Targeted survey):	Specific survey of maize and cabbage
Summarize the reason for taking the surveillance action:	There are priorities crop for export
Summarize the immediate benefit, result or outcome of the surveillance action:	Establish pest record of maize and cabbage in Lao PDR

Narrative of your country's best practice in pest surveillance case:

The 2006 Sanitary and Phytosanitary (SPS). Action plan for the Lao PDR recommends that improved SPS capacities are needed to gain and maintain market access, and to better protect consumers, crops, and livestock against trade related hazard. The Government of Lao PDR has been making efforts to build SPS capacities with external support, but the major capacity gaps remain in surveillance and diagnostic service.

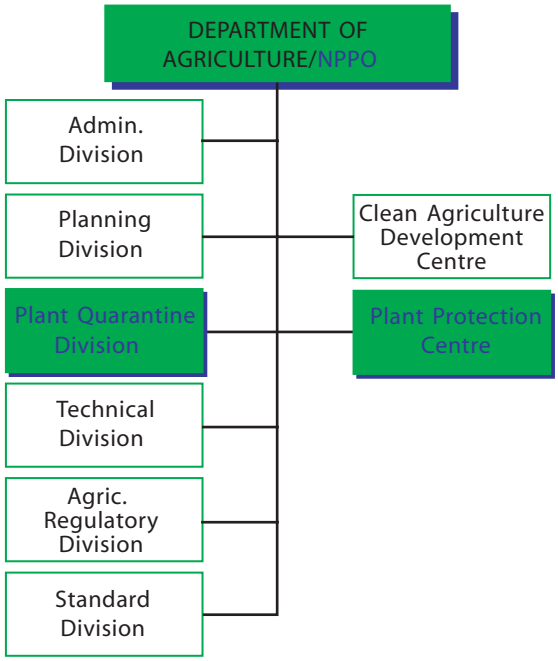
Lao PDR Sanitary and Phytosanitary Measures: Enhancing Trade, Food Safety and Agriculture health expressed concern over the insufficient funding by the government of Lao PDR to effectively operate a viable sanitary and phytosanitary (SPS) system. Despite donor grants and lending actively supporting capacity building and investments in equipment and facilities, operational expenses in this area are needed to make sustainable use of newly created capacities (Reported by World Bank, 2009).

The Department of Agriculture serves as the National Plant Protection Organization for Lao PDR and its Plant Quarantine Division is responsible for phytosanitary measures. The Plant Protection Center (PPC) provides technical support through the conduct of pest survey and diagnosis and identification.

Plant Protection Center carried out of pest surveillance activities including general surveillance and specific survey. There are rice, corn, mango and cabbage. Plant Protection Center has not yet programme for surveys related to detection surveys, monitoring survey and delimiting survey.

Establishing of pest surveillance programme is priority of national database information of insect pest and plant diseases that can be identify to situation of insect pest and plant diseases in Lao PDR and verify to pest free area (PFA), pest-free place production (PFPP) and pest free production site and also that can be identify to quarantine pest, regulated pest and regulated non-quarantine pest. Pest surveillance in Lao PDR is insufficient cooperation to establish network in other organization including stakeholders in local government agencies, research institutions, universities and scientific societies.

Organizational Structure of NPPO, Lao PDR



Pest surveillance in Lao PDR were supported by donor assistance including AusAID supported surveillance activities for mango and the NZAID Phytosanitary Capacity Building Project for maize and cabbage.

Investment for pest surveillance is very importance to improvement for Lao PDR that is basic to establishing phytosanitary measures which is pest surveillance gathering of information on the pest situation in a country and pest information is increasingly importance for market access. Government of Lao PDR is insufficient funding to effectively operate pest surveillance. There are lack of equipment and facilities. Plant Protection Center Department of Agriculture Ministry of Agriculture and Forestry is supporting budget about 50 000 000 kip (6 000 USD) per year to conduct pest surveillance. The number of crop and filed visit per cropping depends on budget.

Plant Protection Center lack of vehicle, GPS, good camera, etc for operation pest surveillance programme. The vehicle is not available for field survey. Laboratory in Plant Protection Center has some basic equipment and some chemical and lack of facility for insect collection and plant diseases herbarium that difficulty cause to isolate and identify and specimen collection of pest and plant diseases system.

Accurate diagnosis of pest and plant diseases is essential to the development of a scientifically sound national database on pest and plant diseases. A database on pest and plant diseases in Lao PDR will be a critical part of successful plant quarantine operations. Furthermore, a national database is a critical element of the bio-security measure that relate to trade in agriculture products, especially for member of the World Trade Organization. Identification of pest and diseases in Lao PDR is necessary for the development of pest lists. Plant Protection Center has too little plant pathologist and entomologist. They can generally identify only to some genus level, identify to species is more difficult. Plant protection staff need more short term and long term training for pest and plant diseases diagnosis and identification. Some of pest and diseases samples were identified to specie by expert from AusAID Project and NZAID Phytosanitary Capacity Building Project.

The national database of plant diseases and insects pest record is very important now that Lao PDR has joined the World Trade Organization. A national database of plant diseases and insects pest record will help Lao PDR to meet the challenges of establishing and maintaining bio-security. The information of plant diseases and insects pest record are too little crops. Plant diseases and insects pest survey some crops are not completed yet that information could not be supporting to pest risk analysis when Lao PDR would be to export and import agriculture products.

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17. Pest surveillance in rice seed production field

Title of activity:	Pest Surveillance in Rice Seed Production Field
Abstract:	Rice is essential not only important starch rich food for the community of Myanmar and but also main source of earning money for the farmers. Base on the Development Millenniums Gold, Eradication of poverty is main task for the nation. 70 percent of the people in Myanmar are engage with farm sectors, so to promote the farmers' living standard is also to fulfill the main purpose of the nation. Transfer the knowledge of high yield varieties production to the farmers is also one of the factors. Seed production for high yield variety is done by a combined group of Agriculturists with different specialization from the all Departments and Enterprises under the Ministry of Agriculture and Irrigation in Yezin Agricultural University (YAU) rice farm. This best practice in pest surveillance activity was conducted at Yezin Agricultural University rice farm at Nay Pyi Taw in 2011. Seven doctors from Department of Entomology from YAU were involved in this case. One Light trap per acre was set from 20 DAS to 100 DAS and trapped insects were collected daily. Rice pests and predators were separated from trapped insects and were indentified in laboratory of YAU. Above the Economic threshold level (ETL) of insects were checked again with field scouting valves and these data were informed to the seed production group for controlling in time these insects. Therefore seed production programme is successfully completed due to the good practice of pest surveillance. Furthermore insect lists of rice pest can update in Nay Pyi Taw area.
Indicate the type of surveillance conducted whether General or Specific (i.e. Pest, Commodity/Host, Random, or Targeted survey):	This survey is covered 100 acres of Monsoon rice field at YAU farm, Nay Pyi Taw in 2011. Light traps for this survey were designed and made by YAU and especially target for rice pests.
Summarize the reason for taking the surveillance action:	To know the incidence and fluctuation of main rice pests and to monitor the new in visit pests were main reasons for this survey.
Summarize the immediate benefit, result or outcome of the surveillance action:	Seed production programme is successfully completed due to the good practice of pest surveillance. Furthermore insect lists of rice pest can update in Nay Pyi Taw area.

Provide a narrative of your country's best practice in pest surveillance case:

Rice is essential not only important starch rich food for the community of Myanmar and but also main source of earning money for the farmers. Farmers in Myanmar grow rice mainly once a year and twice in some water available area. Base on the Development Millenniums Gold, Eradication of poverty is main task for the nation. 70 percent of the people in Myanmar are engaged with farm sectors, so to promote the farmers' living standard is also to fulfill the main purpose of the nation. Transfer the knowledge of high yield varieties production to the farmers is also one of the factors. Seed production for high yield variety is done by a combined group of Agriculturists with different specialization: i.e. Entomologist, Pathologist, Chemist, Plant Physiologist, etc. from the all Departments and Enterprises under the Ministry of Agriculture and Irrigation in Yezin Agricultural University rice farm.

This best practice in pest surveillance activity was conducted at Yezin Agricultural University rice farm at Nay Pyi Taw in Monsoon rice growing season, 2011 and main reasons for this survey to know the incidence and fluctuation of main rice pests and to monitor the new in visit pests. Seven doctors from the Department of Entomology of YAU were involved in this case. Light trap monitoring method were used in this survey and these light trap were designed and made by YAU. One trap per acre was set from 20 DAS to 100 DAS a long the site of the field and trapped insects were collected daily. Rice pests were separated from trapped insects and indentified by these doctors in laboratory of YAU. Above the Economic threshold level of insects were checked again in the fields and these data were informed to the seed production group for controlling these insects.

Normal pests of rice such as thrips, rice hispa, yellow stem borer, brown plant hopper, green leaf hopper, leaf folder, case worm and ear bug etc. were found as usual but whorl maggot (*Hydrellia philippina)* were 100 percent

infected in the seedling stage in this new varieties. Moreover 5 types of stem borer were captured in the light trap; pink stem borer, streak stem borer, Dark headed stem borer, white stem borer and yellow stem borer. All data were recorded and save in YAU. Security for light trap and labour force is the main challenges of this survey and substitute the omitting battery and increase the labour force. All the operating expense were paid by the seed production programme.

Therefore seed production programme is successfully completed due to the good practice of pest surveillance and in time spraying. Furthermore insect lists of rice pest can update in Nay Pyi Taw area.

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18. Surveillance of White Grubs

Title of activity:	Identification of the best practice
Abstract:	A surveillance technique to white grubs was carried out by Plant Protection Directorate, Harihar Bhawan using light traps in Bhaktapur, District and Nuwawork of Nepal with the involvement of District Agricultural Development Offices (DADOs). It was found that, funnel shaped light trap using with a 125 W incandescent light trap was highly useful in trapping of the beetles (Coleopteran insect) of the white grubs. The trapped population showed highest number since the beginning of the March and remained active until the end of June. After that, digging was carried out for sampling of the white grubs larvae, where their abundant number was found since June indicating the information with a beetle control and larvae control techniques. The farmers may apply these tools and coincide with any of the suitable control methods.
Indicate the type of surveillance conducted whether General or Specific (i.e. Pest, Commodity/Host, Random, or Targeted survey):	It was monitoring and random sampling adopted to the study, while doing so, the search was carried out for pest commodity, host (it was in the cereal based farming with maize-millet and minor vegetables). The survey was carried out purposefully as targeted.
Summarize the reason for taking the surveillance action:	Over the years, white grubs' problem in Nepal has been increasing widespread and current farming practices of the farmer have aggravated this problem to a large extent. The primary choice of the farmer is to use the highly toxic dust and granular form of chemical pesticides, even phorate as a means to controlling white grubs. The surveillance was primarily intended to know the peak season of the beetle occurrence and larvae occurrences so as to plan the suitable control measures. Since last year, Plant Protection Directorate (PPD) has produced *Metarhizium anisopliae* based biopesticide targeting this grub. So the reason of choosing this novel option is to see the alternatives whether this product can be used in place of the chemical pesticides in the white grub prone area. The information found in this study will be widely used in other Districts.
Summarize the immediate benefit, result or outcome of the surveillance action:	The current benefit of the study is to know the pest occurrence in terms of time, season, crop stage and its biology which will help in adopting control measures. Second but most important advantage would be the reduction of chemical pesticide, which will help in safe and healthy products; this is the primary objective of the Nepal Government too. The whole approach would regard the increasing attention of human beings, living organisms etc.
Provide a narrative of your country's best practice in pest surveillance case:	
In Nepal, monitoring, sampling and household survey are the common methods for surveillance techniques while attempting to control pest insects. Different pheromones, based with insect sex pheromones, lures, poison baits as well as light traps are used to monitor the insects of different types in different crops. Based on the severity of the insect and available options in the region, different types of monitoring tools are used. In case of white grubs' survey, primarily two approaches the adult control as well as larvae control are practiced. To control the adult surveillances are carried out using light traps even though there are specific pheromones developed for monitoring the adults. Whereas, larvae can be found by simply digging with the hand held equipments in the farming area. Therefore, these two are the primary means for surveillance in the country.	

Linking Integrated Pest Management (IPM) towards organic agriculture: A Case Study of Tharu Ethnic community in Nawalparasi District, Nepal

Yubak Dhoj G.C., PhD

Programme Director and National IPM Coordinator

Integrated pest management (IPM)

IPM is an interdisciplinary approach to reduce crop losses through the use, by farmers, or optimum mixes of pest control techniques. It combines the aims of agricultural productivity, environmental sustainability and cost effectiveness. It has arisen out of the need to avoid the problems of pest resistance build-up (leading to pest resurgence), secondary pest outbreaks, human health problems, the high cost of pesticide control and environmental degradation caused by excessive and inappropriate chemical pesticide use. The approach has become closely associated with enabling farmers to make crop protection decisions in full awareness of factors operating in their agro- ecosystems.

With its emphasis on making the best use of local and human resources, IPM encourages, wherever appropriate, the use of natural control mechanisms (for instance pest predators) and "traditional" pest management techniques used by farmers. However, the adoption of practical alternatives to chemical methods of control may be difficult to apply on farms than simple chemical control techniques. It is still difficult in case of Nepal as the country has no chemical pesticides manufacturing industries in one side and purchasing of such compounds from abroad needs lot of resources in another side. An understanding of not only the biology and ecology of the injury causing agents (pest insects, pathogens and vertebrate pests) is required, but also of all the possible effects of the various control measures on the particular farming system of the farmers' technical solutions, the lack of resources, or socio-economic and other factors should also be considered. IPM considers how a farmer would determine when to use each type of method. IPM is a pest control system that incorporates a variety of techniques to promote the best socioeconomic and environmental conditions. For the effective adoption of the IPM, clearly understanding of the concepts, approach, tools and practices on the technicians, pesticide handlers, farmers and various extension methodologies is mandatory. At the same time, every components of IPM such as biological monitoring, environmental monitoring, action and economic thresholds, choice of control methods should equally be considered, which may lead organic production of the agricultural crops. Adoption of IPM tools and components while producing organic vegetable is largely critical in case of Nepal.

Present pest management differs from control orientation to management, which is the origin of IPM. In recent days it is viewed in relation to human behavior and actions rather than pest killing or eradication motives. It means IPM gives more emphasis to the holistic approach of pest management based on certain principles of pest management whereas; traditional methods were basically oriented with the uses of chemical pesticides. Still there is lack of knowledge among the crop protection technicians involved in Governmental and non-governmental organizations about the recent approach of IPM practices, know how of the IPM tools, their application etc. Therefore, any initiatives through the modules of demonstration aim to anchor the knowledge gaps about the recent approach of IPM principles and practices with that of pesticide orientated pest control in Nepal. In order to raise the awareness on organic production among the producers and technicians it is important to initiate activities like **organic village.** It is largely envisaged these kinds of activities might be one of the cornerstones towards organic agriculture in Nepal.

Lessons learned

FFS has becoming one of the important means of community learning centre, which has to upscale to a wider area, however, most of the organizations has confined it very narrowly. In fact, this should not be only a platform of teaching with a fixed curriculum, but this should be utilised as a important places for changing farmers knowledge, attitude and practices. The environment for this should be informal and has well agro-ecosystem. In case of Nepal, couple of organizations has succeeded in changing the knowledge with very rhetorically blaming to the chemical pesticides, however, they have achieved almost nil towards alternative means. Because of this situation, such schools are less and less sustainable and practicing by almost negligible farm families. Simply such school may be just for keeping the job occupied for some group of people. In majority of the cases, farmers field schools are disappearing soon after the closer of the programmes, that is why they have to be linked to the profit, where the organic approach could be one of them.

Another very important thing is that, FFS may be utilized as a best platform of validating hypothesis and beliefs with that of improved technology, which offers better opportunity for practicing them, seeing them and analysis them whether it is profitable or not. This in fact will help in changing the attitudes of the farmers. The so called

sophisticated research and their associated costs may be reduced significantly. At the same time, blanket recommendation IPM technology may be narrowed down, which has taken as a better outcome of the study. There is wider opportunity of producing some of the selected agricultural commodities in some of the specific location by which the nation may take significant benefits, which however, has to adopt and uptake by the national programmes who are primarily mandated for running such kind of activities. Considering these aspect, since this year, Plant Protection Directorate has been conducting some of the activities towards this direction.

Future outlook

As Plant Protection Directorate is primarily mandated for reducing crop losses caused by various biotic and abiotic constraints, it has to be more proactive towards the changing context nationally and internationally. To this end, it has recently completed its review programme to the country wide and has received its feed back. Looking into its past strategies, it has to utilise the achievements so far and focus its programme on the area of safer food production on the selected commodity and stressed for saving more and more food production to feed its ever growing population while considering better environments. Considering these facts, it has been launching some of the campaign based plant protection through the implementation of plant clinic, pest data base on the district to region and at the national level. Monitoring of the available pesticides and their residues on the crop will discourage the continuous use of chemical pesticides than the desired level. Development of alternatives technologies and compounds such as biorational compounds (botanical and biopesticides) as a means to reduce the use of chemical pesticides. Continuous exploration and exploitation of the useful natural enemies against pest insects will not be limited in principle. Transfer of technology from the researchers' lab to the extension agents' lab will be first step through functional enhancement of the capacity of its regional lab. For this one central lab is going to be established and it will continuously fuel to the regional lab and they further will support to the district programme. In this way, the heart of plant protection will be made stronger. In addition to these, regular services like emergency plant protection, capacity building of the farmers and technicians through Farmers Field School (FFS) and their link towards organic agriculture will be continued. In nutshell FFS is the entry point for organic agriculture and PPD intends to make it bold and loud and expands its hand for joining more hands.

Regarding further information, an official website of the Plant Protection Directorate: www.ppdnepal.gov.np can be surfed which will give more ideas.

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19. "Bantay Peste" Nationwide Pest Watch

Title of activity:	General Surveillance – "Bantay Peste"
Abstract:	The Bureau of Plant Industry (BPI) as the NPPO in the Philippines conducts general surveillance through the Crop Protection Division (CPD) and through the Plant Quarantine Service that initiates delimiting, detection and low monitoring surveys on pests as compliance for trade requirement and market access.
Indicate the type of surveillance conducted whether General or Specific (i.e. Pest, Commodity/Host, Random, or Targeted survey):	General Surveillance aptly named as nationwide "Bantay Peste" (Pest Watch) of all crops such as rice, corn, vegetables, citrus, etc. while the Specific surveillance is for the delimiting survey on an specific area as well as nationwide detection and low monitoring survey (LMS) for mango pulp weevil (MPW) and mango seed weevil (MSW).
Summarize the reason for taking the surveillance action:	The reason for the "Bantay Peste" is to forecast the possible occurrence of pests and diseases outbreaks that may affect production/yield of farmers and growers while the detection survey and LMS for MPW and MSW serve as compliance for trade requirement, market access and the eventual certification for area freedom for MPW and MSW.
Summarize the immediate benefit, result or outcome of the surveillance action:	By conducting Pest Watch, farmers and growers are warned for possible occurrence of pests and diseases thereby necessitating the immediate application of control measures. Regarding the detection and monitoring survey, results showed the nationwide absence of MPW (except Palawan) and MSW. This is now the basis for the awaited certification for area freedom and eventually compliance for market access.

Provide a narrative of your country's best practice in pest surveillance case:

General Surveillance is conducted through the CPD of the BPI. In this, the Regional Field Units (RFUs) of the Department of Agriculture, the Regional Crop Protection Centers (RCPCs), Local Government Units (LGUs), State College/Universities (SCUs) in coordination with farmers, growers and non-government organizations (NGOs) monitors pest and diseases. Data gathered is used for trending and forecasting for possible pest outbreak that may occur for employment of appropriate control measures.

Delimiting survey was conducted in Palawan to ascertain the presence of MPW which is confined in the northern part of the province. A detection and low monitoring survey for MPW and MSW as approved by Australian Centre for International Agricultural Research (ACIAR) were also performed for the provinces of Davao, Samal Island and Sarangani in Mindanao. Then the same surveys were expanded nationwide under the funding of the United States Department of Agriculture. Palawan was not included in the surveys since MPW is known to be present in the province. At the moment, the final document for certification for area freedom for MPW and MSW is expected to be awarded by the AQIS and USDA.

List of links or attachments in support of the best practice case provided:

1. L.M. MONTEVIRGEN, CAYANAN, R.M. & L.Q. MARASIGAN. Delimiting and Monitoring of Mango Pulp Weevil (*Sternochetus frigidus* Fab.) in Puerto Princesa City, Palawan: CY 2002-2008
2. PINESE, B., GOLEZ, H. G., WITTENBERG, LEONIE & L. LACSON. 2008. Detection surveys for mango seed and pulp weevils in Sarangani, Davao del Sur and Samal Island, Mindanao, Philippines. ACIAR: Australia. ISBN 978 1 921434 65 5.
3. DA/BPI/USDA. National Survey of the Mango Seed Weevil and Mango Pulp Weevil in the Philippines. Luzon (2006-2007)
4. DA/BPI/USDA. Low Monitoring Survey of Mango Pulp and Seed Weevils in Luzon, Visayas and Mindanao (March – August 2010)

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5. Conclusions and recommendations

At the regional workshop in Chiang Rai, Thailand, the delegates from 17 countries reviewed the survey results and agreed on the following findings, conclusions and recommendations:

Overall conclusions

- The responses provide a representative view of ISPM No. 6 in the region
- There are huge differences between countries in terms of available human, financial and material resources
- The list of technical resources provides an excellent source
- The best practice documents provide some excellent examples

Limitations of the survey

In many cases, the format of the survey (e.g. yes/no questions) did not provide enough differentiation While New Zealand and Australia – which are both highly developed – had 83 percent of the same answers, New Zealand and Lao PDR – which are quite different – had 70 percent of the same answers. Thus the survey responses may not fully reflect the ability of an NPPO to implement ISPM No. 6.

Observations

- NPPO's have wide responsibilities and may include other organizations.
- The definition of pest surveillance is limited compared with actual practice and this creates confusion.
- It would be useful to know more detailed information and this could be included in future surveys:
  - number of pest records collected
  - number of declarations of pest freedom issued
  - number of new pests detected
  - number of IPPC/NPPO pest lists produced
  - number of pest risk analyses performed

Findings

The importance of ISPM No. 6 for the countries in the Asia-Pacific Region was summarized as follows:

Administrative:

- the standard provides an initial basis for convincing and informing policy makers of the needs and requirements of an acceptable surveillance system This is necessary to obtain commitment for the required funding support.
- likewise, it provides the basic argument for legislation to establish and enforce and effective surveillance system.
- it explains and provides credibility for surveillance systems when communicating the need for surveillance and associated funding with stakeholders.

Operational:

- the standard enhances the function of NPPOs in all their operations regarding:
  - food security by promoting more effective pest management
  - the facilitation of trade by providing essential support for producing pests lists and pest free areas
  - the protection of the environment by detecting invasive species

- it provides IPPC members with a harmonised framework for a surveillance system. It describes most of the aspects of a system so that countries know what to use themselves and what to expect from trade partner countries
- the harmonised system with described components allows countries to operate credible surveillance systems which trade partners can have confidence in
- it provides internationally recognised systems to provide information for the resolution of disputes regarding pest absence or presence

Technical:

- the standard provides the basic tool for surveillance systems
- it promotes the development of diagnostic protocols
- surveillance systems provide information that allows countries to take proactive preparation for potential or emerging pests.

The difficulties associated with implementing ISPM No. 6 in the countries included:

Administrative:

- the standard does not provide any assistance, other than its existence, in the promotion of financial support for funding survey programmes, diagnostic stations, record keeping and awareness programmes
- the standard does not help with guidance for coordination between different agencies that may be involved in the different aspects of surveillance work
- likewise, it does not assist with guidance on relating to and communicating with all the stakeholders that may be involved in a surveillance programme on many aspects of surveillance programmes
- the lack of guidance on an auditing system to show the effectiveness (or lack of it) of surveillance systems has not aided the implementation of surveillance programmes
- the understanding between trade partners of surveillance systems could have been increased with more guidance on the interpretation of the standard
- also, there has been a lack of understanding on the part of the general public and teaching and research institutions on the pest reporting role of the NPPO and their links to it.

Operational:

- members have found it difficult to move from the concepts of the standard to the actual procedures and methodology of surveillance programmes.
- there is no support to assist with the setting of priorities in a surveillance programme. The setting of priorities is an essential part of all surveillance systems as there is always more surveillance required than there are funds to accomplish the potential programmes
- the lack of guidance on surveillance system planning regarding training, resources, methodologies has caused difficulties with implementation for some members
- the standard does not provide guidance on information and data exchange between the parts of a surveillance system particularly when different agencies are involved
- the lack of guidance on management systems for the different types of surveillance project has caused difficulties with some members
- there is a lack of information on the types of surveillance associated with pest management and that facilitating market access
- whereas it is recognised that the standard cannot go into too much detail, more information on training and the elements involved would have strengthened its effect.

Technical:

- the lack of guidance on how to remedy the lack of recourse to diagnostic expertise has limited the usefulness of the standard. The lack of diagnostic expertise is a major problem for many countries
- the lack of strong linkages with the related standards is a limiting feature of the standard. Strong links are needed to emergency response programmes.
- the lack of details on many aspects of the standard has caused problems with some members, for example:
  - the insufficient information on surveillance sampling
  - the lack of guidelines for record keeping regarding software
  - the lack of detail in the description of good surveillance practice
  - insufficient diagnostic guidance
  - the lack of guidelines for ongoing pest monitoring (e.g. the time required to produce acceptable results)
  - insufficient information on the collection and preservation of material
- the lack of information of quality levels including targets for statistical validity has limited the effectiveness of the standard.

RECOMMENDATIONS

The meeting discussed the tools and resources required to implement ISPM No. 6 and proposed some recommendations for improving the standard.

To fully implement ISPM No. 6, the following tools and technical resources are needed:

Administrative:

- regarding general surveillance this should be supported by:
  - public awareness campaigns
  - publicity/communications staff training
  - contact and communication with
    - ≠ professional bodies (teaching and research organizations, NGOs)
    - ≠ the public
    - ≠ private agencies (e.g. pest exterminating firms)
    - ≠ industry and industry representative bodies.

Operational:

- greatly improved training arrangements need to be made available including:
  - guidelines for different surveillance systems
  - SOPs for major pests with technical manuals
  - best practice examples
  - for the training of public/grower volunteers (farmers field school)
- more information needs to be made available on the use of databases in surveillance (guidelines, requirements, hardware recommendations)

Technical:

- a major resource required by many countries is diagnostic services. Various resources and tools were suggested that could assist in solving this problem including:
  - the use of readily available databases (e.g. PaDIL)
  - virtual techniques (remote microscopy for diagnosis)
  - the use of a Help desk
  - identification keys (e.g. LUCID)

  - the availability of lists of experts
  - training programmes
  - the development of more skilled lab staff and diagnosticians e.g. morphological taxonomists
  - the development of more diagnostic protocols and reference material
  - improved diagnostic facilities and the improved sharing of such facilities
  - manuals and guidelines to assist with the interpretation of the standard.
- associated skilled manpower should be available – management staff, technical programme designers, field personnel, auditors, diagnosticians)
- Other tools that should be available, perhaps with the necessary assistance, could include:
  - GIS systems
  - data logger systems plus GPS (e.g. e-pest surveillance)
  - rapid test kits (e.g. bar code, protein techniques)
  - pheromones for field traps
  - field identification materials (e.g. manuals, photos, pamphlets)
  - information for using tools and guidelines, and when their use is appropriate.

To improve the ISPM No. 6 guidelines, the following recommendations were made:

Administrative:

- a section could be added to stress the importance of surveillance by noting:
  - that surveillance provides the basis for other standards (PFA, pest reporting, pest lists, eradication)
  - the links with food security
  - the links with market access and trade facilitation
  - the links with the protection of the environment
- advice on the content of surveillance legislation could be considered
- a section should be added on auditing
- further information could be added on the requirement for the coordination of the agencies involved in surveillance programmes
- a recommended system, including a range of elements, could be proposed to assist with priority setting that considers aspects of food security, trade facilitation, environmental protection, financial support and cost benefits
- guidance on surveillance management systems could be included
- the review of ISPM No. 6 could include a recommendation on how regularly countries should review their surveillance systems.

Operational:

- more information could be included on training requirements and guidelines including the level of diagnostic and surveillance expertise
- links to relevant ISPMs should be added.

Technical:

- more information on the statistical basis of specific surveys is required
- there could be a section on pest monitoring that includes advice on time intervals.

Annex 1

Country responses to open questions

A. Policy and legislative environment

•	List the most important policy issues that shape your country's surveillance programme (e.g. trade policy, free trade agreements etc.)?	
	Australia	1. Trade policy (domestic & international) 2. risk return 3. value for money (public good v private benefit)
	Bangladesh	–
	China	The Plant Protection statuts IPPC WTO/SPS
	Fiji	The Plant Protection statuts IPPC WTO/SPS
	India	1. [National Farmers Policy 2007.The agencies involved in pest surveillance are Central Integrated Pest Management Centers (CIPMCs), State Department of Agriculture/Horticulture, State Agriculture /Horticulture Universities, ICAR Institutes etc.] 2. [Locust Warning Organization (LWO) of Govt.of India having 11 Locust Circles Offices (LCOs) is conducting constant locust surveillance in Scheduled Desert Areas (SDA) of about two Lakh Hectares]
	Indonesia	Trade policy, Define pest status Quarantine measure
	Japan	1. trade policy 2. pest management
	Korea, Republic of	Protection of Agriculture and Environment; Agricultural Product Trade
	Lao PDR	1. The Plant Quarantine Degree No. 66/PM dated 21 March 1993. 2. The Plant Quarantine Regulation No. 0639/MAF dated 02 July 1993. 3. Plant Protection and Plant Quarantine Law No. 06/NA, dated 9 December 2008.
	Malaysia	1. Plant Quarantine Act 1976 2. Trade Policy 3. Country Crop Protection Policy/Strategy
	Myanmar	–
	Nepal	Free trade
	New Zealand	1. Biosecurity 2. Trade policy …Pest management
	Philippines	Market access, compliance for trade requirements, foundation for effective control strategies
	Thailand	1. Trade policy 2. Free trade agreements
	Sri Lanka	1. Trade Policy subject to the regulation of Plant Protection Act 2. Seed Importation Policy 3. Pesticide Policy Seed Import Policy 4. Trade Agreements
	Viet Nam	Trade policy

B. Organizational structure, competences and culture

•	List the organizations that are involved in carrying out pest surveillance in the country?	
	Australia	list other agencies including industry, research, commercial crop monitors undertake surveys
	Bangladesh	1. [Director, Plant Protection Wing, DAE, MOA] 2. [NPPO] …[Add additional points here]
	China	NPPO Plant Protection in Province
	Fiji	NPPO Plant Protection Services NGO's
	India	1. [Directorate of Plant Protection, Quarantine & Storage (Dte'PPQ&S), State Department of Agriculture/Horticulture, State Agriculture/Horticulture Universities] 2. [Indian Council Agriculture Research (ICAR)]
	Indonesia	NPPO Local gov. agencies
	Japan	1. [NPPO] 2. [Local government agency] 3. [National Federation of Agricultural Cooperation Associations]
	Korea, Republic of	Quarantine and Inspection Agency (QIA as NPPO); Rural Development Administration(RDA); Korea Forest Service (KFS); Local Government
	Lao PDR	Plant Protection Center
	Malaysia	1. Department of Agriculture 2. Malaysian Palm Oil Board 3. Forest Research Institute Malaysia 4. MUDA Agriculture Development Authority 5. Kemubu Agriculture Development Authority 6. Malaysian Pineapple Industry Board 7. Malaysian Rubber Board 8. Malaysian Cocoa Board 9. Sime Darby Berhad 10. Federal Land Development Authority
	Myanmar	1. Department of Agricultural Research 2. Yezin Agricultural University 3. Government Agricultural Institute
	Nepal	RPPL, DADO
	New Zealand	1. Ministry of Agriculture and Forestry 2. Local government (e.g. regional councils and unitary councils) 3. Industry led surveillance programmes
	Philippines	CPD, RFUs, LGUs, SCUs, NGOs, Farmer Groups,
	Thailand	1. Department of Agriculture 2. Department of Agricultural Extension
	Sri Lanka	All Institutes under the Department of Agriculture – Plant Protection Service (PPS), Rice Research & Development Institute (RRDI), Horticultural crops Research & Development Institute (HORDI), Field Crop Research & Development Institute (FCRDI), Fruit Crops Research & Development Centre (FCRDC), Grain Legume, Oil Crops Research & Development Centre (GLORDC). For Plantation crops such as Tea Research Institute (TRI), Rubber Research Institute (RRI), Coconut Research Institute (CRI) Sugarcane Research Institute (SRI)

	Viet Nam	1. Plant Protection Department (NPPO) and units under NPPO 2. Plant Protection Research Institute (PPRI) 3. Other Research Institutes under MARD 4. Universities of Agriculture, Forestry and College of Science (Vietnam National Universities)
•	**List the indicators you use to measure the relevance and performance of the pest surveillance programme?**	
	Australia	1. Ad hoc review of risk posed by target pests & cost of surveys 2. Reference of surveillance 3. Detections 4. Number of incursions
	Bangladesh	1. [Early Warning] 2. [Forecasting] …[Pest Risk Analysis]
	China	The infested area The lost
	Fiji	Implementation of work planTimely reports
	India	1. [Monitoring, Reporting and Reviewing the system by competent Authority] 2. [Comparing the data obtained with previous record]
	Indonesia	–
	Japan	1. [pest management] 2. [pest detection]
	Korea, Republic of	Nil
	Lao PDR	Pest list Project is supported by government
	Malaysia	1. Pest incidences 2. Pest severity
	Myanmar	
	Nepal	No, time
	New Zealand	1. Number of detections 2. Adherence to recognized quality standards and technically sound, science-based criteria
	Philippines	For pest outbreaks, market access, trade requirement
	Thailand	1. The number of pests and diseases identified and categorized. 2. Number of Pest outbreaks reported.
	Sri Lanka	1. Success of the forecasting of pests 2. Number of economically harmful pest out breaks. 3. Number of economically harmful pest categories detected.
	Viet Nam	Pest status Pests list Pest population density Damaged rate

•	If so, with which stakeholders and how?	
	Australia	**States/territories** **SRG** **NPPOs** **NPSRT** **through disseminating pest info to industry as relevant industry bodies engaged to:** – provide advice on pests of concern – distribute of information on Biosecurity threats to members – encourage members to report new pest incursions **Via Industry liaison officers** The general public is engaged to report suspect pest incursions via commercial crop monitors Regional industry focused programmes HortGuard, GrainGuard Targeted pest specific training (usually in emergency response.)
	Bangladesh	1. [Vegetable Growers and Exporter Association] 2. [Inspection] …[Export]
	China	The Agro-research institution, relative organizations and industries. NPPO organize all relative parts to conduct pest surveillance.
	Fiji	
	India	1. [State Department of Agriculture/Horticulture] 2. [State Agriculture/Horticulture Universities]
	Indonesia	Research institutions Universities
	Japan	1. [Japan Plant Protection Association]
	Korea, Republic of	Nil
	Lao PDR	Koronivia Research Station Crop Extension Division NGO's. Through consolidation of expertise and resources
	Malaysia	Entrepreneur and growers by regular consultation and meeting
	Myanmar	Orchard Grower, Rice – based Specialized Companies
	Nepal	NS
	New Zealand	1. Industry representative groups (e.g. New Zealand Forest Owners Association) 2. Local government (e.g. regional councils)
	Philippines	Meeting Farmer Groups and Commercial Groups
	Thailand	–
	Sri Lanka	In the case of crops which do not come under the mandate of the Department of Agriculture; e.g.: Plantation crops – Tea, Rubber, Coconut, Sugarcane assistance is sought from Tea Research Institute, Coconut Research Institute, Rubber Research Institute, when an outbreak is likely to be to develop in the relevant crops.
	Viet Nam	Research Institutes NGOs Sharing information on relevant ISPMs and auditing results

D. General surveillance

•	**List the information sources from which plant pest records have been compiled** (e.g. NPPOs, other national and local government agencies, research institutions, universities, scientific societies (including amateur specialists), producers, consultants, museums, the general public, scientific and trade journals, unpublished data and contemporary observations).	
	Australia	All; Some are more common than others
	Bangladesh	1. [NPPO] 2. [Research Institution] …[University]
	China	NPPO Research institution Universities Scientific journal
	Fiji	NPPO KRS USP Landcare Research NZ Scientific journal
	India	1. [Dte'of PPQ&S, State Department of Agriculture /Horticulture] 2. [State Agriculture/Horticulture Universities,] Indian Council Agriculture Research (ICAR)]
	Indonesia	Research institutions Universities Local gov. agencies Scientific journals
	Japan	1. [NPPO] 2. [other national and local government agencies] 3. [research institution, universities]
	Korea, Republic of	Quarantine and Inspection Agency (QIA as NPPO); Rural Development Administration (RDA); Korea Forest Service (KFS)
	Lao PDR	NPPO (Plant Protection Center)
	Malaysia	1. NPPO 2. Universities 3. Research institutions 4. Scientific and trade journals 5. Unpublished data 6. Contemporary observations
	Myanmar	(none)
	Nepal	University
	New Zealand	1. NPPO 2. Other national and local government agencies, research institutions, universities, scientific societies (including amateur specialists), producers, consultants, museums, the general public, scientific and trade journals, unpublished data and contemporary observations
	Philippines	NPPOs, RCPCS, LGUs, SCUs, other GOCC, Farmer Groups and Commercial Growers
	Thailand	1. NPPO 2. Research institutions 3. Universities
	Sri Lanka	
	Viet Nam	NPPOs, other national and local government agencies, research institutions, universities and Scientific journals

E. Specific surveys

•	List the plant species using scientific names (genus and species)					
	Australia	*Abies*	Custard apple	Mango	roadsides	Cotton
		Actinidia spp.	Cut flowers e.g. daylily, carnation, chrysanthemum	Mangosteen	Roses	Lettuce
		Allium spp.	*Cydonia* spp.	*Mespilus* spp.	*Salix* spp.	Lupins
		amenity plants – Broad range e.g. *Platinus* spp., sycamore	Dragon fruit	Mulberry	shade trees	Maize
		Apple	Egg plant	*Myrtaceae* spp.	Silverbeet	*Malus* spp.
		Apricot	Elms	Nashi pear	Soil	*Quercus* spp.
		Asparagus	*Eriobotrya* spp.	Native forests	*Sorbus* spp.	rambutan
		Avocado	*Eucalyptus* spp.	Nursery stock	Sorghum	Rice
		Banana	European *Pinus* spp.	Okra	Stone fruit	roadsides
		Bees	Ficus	Oleander	Strawberry	Cotoneaster
		Blueberry	Field crops, Horticulture	Olive Olea	Sugarcane	legumes
		Brassica spp.	Flowering quinces Chaenomeles	Ornamental plants	Sunflower	*Pyrus* spp.
		Capsicums	Forestry – plantation pine	Papaya	Susceptible host crops	
		Carrot	Fraxinus	Passionfruit	Sweet potato	
		Cashew	Fruit	Peach	Timber (softwood)	
		Cassava	Generally open grasslands	Pear	Timber structures	
		Castanea sativa	Grains crops	Persimmon	tobacco	
		Cereals	Guava	*Picea* spp.	Tomato	
		cherry	hawthorns	Pineapple	Triticum	
		Chestnuts	*Heliborus* spp.	*Pinus* spp.	Vegetables	
		Chilli	Hordeum	*Pisum* spp.	Vitis Vinifera	
		Citrus spp.	Horticultural crops	Plum	Weeds	
		Cocoa	Impatiens	Pome	Wild chokeberry	
		Coconut	Juglans	Pomegranate	Ya pear	
		Coffee	Kiwi Fruit	Populus nigra	Cucurbits e.g. melon, pumpkin, zucchini	
		Cool and temperate fruits (mainly pome and stone fruit)	Korean pear	Potato	rice	
			Larix	*Prunus* spp.		
	Bangladesh	1. [*Oryza sativa*] 2. [*Solanum tubarasum*] …[*Tricum aestivum, Zea mays*]				

	China	All kinds of grain crop and cash crop
	Fiji	*Artocarpus altilis (Parkins.) Fosb./Breadfruit* *Capsicum frutescens L./chilli* *Carica papaya L./pawpaw* *Persea americana Mill./avocado* *Psidium guajava L./guava* *Solanum melongena L./aubergine* *Colocasia esculenta* *Manihot esculaenta* *Magnifera indica*
	India	1. [(*Saccharum spp*., *Gossypium spp., Oryza sativa*., *Cajanus cajan* (Pigeon pea), *Cicer aeriatinum* (Chick Pea) piper/Chillies, *Triticum* spp. (wheat) 2. [*Solanum tuberosum, Citrus* spp. (lemon, lime,orange, grape fruit,mandarins,etc.), *CocosNucifera, Arachis spp., Nicotiana* spp., *Abelmoschus esculentus* (Okra). *Allium* species (onion,garlic), *Brassica* spp (canola, Cabbage,Cauliflower, Kohlrabi, Brussels sprouts, Broccoli, Knol Khol, Chinese Cabbage, mustard, Cole Crops etc.)
	Indonesia	Horticulture crops Estate crops Food crops
	Japan	1. [rice] 2. [potato] 3. [wheat]
	Korea, Republic of	–
	Lao PDR	Maize, Rice, Corn, Mango, Cabbage, orange, banana, coconut, sugarcane
	Malaysia	1. *Oryza sativa* 2. *Carica papaya* 3. *Mangifera indica* 4. *Cocos nucifera* 5. *Musa* sp. 6. Artocarpus heterophyllus 7. *Averrhoa carambola* 8. *Hylocereus undatus* 9. *Nephelium lappaceum*
	Myanmar	*Oryza sativa* (Rice) *Zea mays* (Maize) *Vigna radiata* (Mung Bean) *Cajanus cajan* (Pigeon Pea) *Vigna mungo* (Black gram) *Gossypium hirsutum* (Cotton)
	Nepal	*Zea mays*
	New Zealand	1. Wide range of specific surveys carried out at national and regional level e.g. Pinus radiata Agathis australis Potatoes Cherries Tomatoes etc. Also pest specific surveys carried out at a national level (e.g. fruit fly)
	Philippines	Mangifera indica, Oryza sativa, Zea mays, Citrus spp., Abelmoschus esculentum, Cocos nucifera and other palms, Vegetables
	Thailand	*Oryza sativa*

	Sri Lanka	i. To obtain information for risk assessment on request from other National Plant Protection Organizations. ii. To measure the Success of the impact of an establishment of biological control agent. iii. To asses the economic loss from a pest. iv. To initiate pest control measures.
	Viet Nam	1. *Oryza sativa* 2. *Zea mays* 3. *Euphoria longan* 4. *Litchi chinensis* 5. *Mangifera indica* 6. *Hylocereus undatus* 7. *Nephelium lappaceum* 8. *Coffea canephora and C. arabica* 9. *Durio zibethinus* 10. *Musa spp.* 11. *Solanum tuberosum*
•	**Identify the organization, government department or other body who decides which plant species or plant products grown in the country are officially surveyed for pests:**	
	Australia	DAFF & s/t governments
	Bangladesh	[DPPW, NPPO]
	China	MOA State Forestry Administration
	Fiji	MPI BAF Dept. Forestry
	India	[Directorate of Plant Protection, Quarantine & Storage]
	Indonesia	MOA
	Japan	[NPPO, Local government agency]
	Korea, Republic of	Quarantine and Inspection Agency (QIA as NPPO); Rural Development Administration (RDA); Korea Forest Service (KFS); Local Government
	Lao PDR	DOA, MAP
	Malaysia	Department of Agricuture
	Myanmar	Plant Protection Department, Ministry of Agricultural and Irrigation
	Nepal	Maize
	New Zealand	Ministry of Agriculture and Forestry
	Philippines	Plant Quarantine Service
	Thailand	Department of Agriculture
	Sri Lanka	
	Viet Nam	– Ministry of Agriculture and Rural Development (MARD) – Plant Protection Department (PPD-NPPO)

•	List three main reasons for initiating a specific survey?	
	Australia	Early detection Maintain trade – generally proof of absence Delimiting survey
	Bangladesh	1. [Early warning] 2. [Forecasting] 3. [Operationing]
	China	New pest was found in an area Severe lost was caused by a pest Need for establishing new policies
	Fiji	New pest was found in an area Severe lost was caused by a pest Need for establishing new policies
	India	1. [Market access of Indian commodities free from pests in foreign market] 2. [Outbreak of pests] 3. [Domestic importance of crops]
	Indonesia	New pest reported Define pest status Early detection
	Japan	1. [pest management] 2. [pest control] 3. [pest detection]
	Korea, Republic of	1. Newly founded pests 2. Economically important pests on agriculture and forestry products after brief PRA 3. International trade obstacle pests
	Lao PDR	To establish pest list
	Malaysia	1. Pest status 2. Pest management 3. Market access
	Myanmar	1. Reduce pest damage and increase crop yield 2. Population of pest and natural enemies 3. Increase quality and good trade
	Nepal	For record For understanding damage For effective control
	New Zealand	1. Trade requirements 2. Suspected pest incursion 3. Industry request
	Philippines	Market access, compliance for trade requirement, certification of area freedom for expanded market access
	Thailand	1. Pest database updating 2. When quarantine pest is intercepted 3. Conducting PL/PRA
	Sri Lanka	
	Viet Nam	1. Having scientific evidence on pest status to dispute with import partners/ international organizations. 2. To develop the pests list and relevant information for doing pest risk analysis. 3. Modify the current regulations on pest management for specific regulated pests

G. Open ended feedback

•	**List five things that affect your country's ability to conduct effective pest surveillance in order of priority (1 = Highest):**	
	Australia	1. funding 2. Staffing 3. Number of pests 4. Australia is federation of states/territories with responsibilities resting with s/t so no national responsibility 5. Australia is huge country with diverse range of climate, regions, crops
		DAFF Funding Staff resources Scale of area/industry Number of pests Climatic & regional differences **Qld** 1. Funding/resource allocation 2. Diagnostics capability 3. Training 4. Data management and reporting 5. National coordination **Nt** 1. Finance 2. Staff **Wa** 1. [complacency] 2. [limited resources] 3. [budget] 4. [industry awareness]
	Bangladesh	1. [Administrative] 2. [Budgetary allocation] 3. [Lack of skilled personnel] 4. [Shortage of staff] 5. [Inadequate logistic and infrastructural supports]
	China	1. Funding 2. Policy 3. The number and ability of technician 4. Public participation 5. The basic research of the pest infestation and diffusion.
	Fiji	1. Funding 2. Policy 3. The number and ability of technician 4. Public participation 5. The basic research of the pest infestation and diffusion
	India	1. [Lack of centrally organized surveillance system] 2. [Lack of National/centralized pest data record] 3. [Lack of strategic and operational plan] 4. [Shortage of manpower for structured pest surveillance] 5. [Lack of legal power with NPPO to utilize the service of public/private organizations]
	Indonesia	1. Policy, 2. Funding, 3. Training on pest collection and preservation, 4. Expert access, 5. Pest identification.

	Japan	None
	Korea, Republic of	1. Centralized control tower under NPPO; 2. Practical emergency action plan connected with pest survey; 3. Training of national survey managers and incident commenders; 4. Sufficient budget reserved for a specific survey in emergency; 5. Cooperation between public and private sectors (Society, University, Industry, and Producer).
	Lao PDR	1. Stakeholder involved (Insufficient cooperation to establish network in other organization) 2. Insufficient funding for pest surveillance programme 3. Capacity of scientist (Too little of plant pathologists, entomologist or expertise, especially for Identifying pest etc.) 4. Insufficient facilities of diagnostic and pest collection 5. National database of situation pest is not report and publication
	Malaysia	1. Budget constraint 2. Lack of expert in pest identification/diagnostic 3. Lack of training in surveillance and pest identification 4. Lack of accredited and certified laboratory 5. Insufficient manpower to carry out surveillance
	Myanmar	1. Limited source of funds 2. Availability of reference materials 3. Weak coordination with international institutions for pest verification 4. Limited sources of recruits for conducting surveillance trainings for future activities 5. Lack of Technical Assistance from international resources.
	Nepal	1. Lack of trained manpower 2. Lack of coordinated approach 3. Inadequate thrust in the past 4. Lack of motivation and fixed job description 5. Lack of supports from survey surveillances tools
	New Zealand	1. Resources – financial 2. Skilled people 3. Availability of technology (e.g. pest specific lures) 4. Industry willingness to be involved
	Philippines	Insufficient funds allocated for training, capacity building and infrastructures/facilities Peace and Order
	Thailand	1. Budget 2. Man power 3. Training
	Sri Lanka	1. Collecting and Recording Pest Information 2. Absence of National Database plant pest records 3. Absence of coordinator for surveillance activities. 4. Financial support is insufficient 5. Lack of documented procedure
	Viet Nam	1. Budget provided for undertaking pest surveillance 2. Human resource and expertise 3. Diagnostic and identification of collected samples 4. Annual training programme on pest surveillance 5. Enough equipments and tools used for undertaking pest surveillance and pest diagnostic and identification

•	List a maximum of 3 things you would like to see improved in ISPM No. 6 – guidelines for pest surveillance:	
	Australia	As a concept standard, is still relevant and useful. Not sure what else could be put in unless the scope is changed. I think most suggestions from contracting parties would be out of scope e.g. manuals – 'how to'
	Bangladesh	None
	China	1. More resource for surveillance technical or demonstration detail for some important pest 2. More training course or seminar for the guideline 3. More data analysis and report sharing.
	Fiji	1. More resource for surveillance technical or demonstration detail for some important pest 2. More training course or seminar for the guideline 3. More data analysis and report sharing.
	India	1. [Specific guidelines for general pest surveillance]
	Indonesia	training and simulation on pest surveillance, an example of SOP for good surveillance practice, setting up record keeping programme (software)
	Japan	None
	Korea, Republic of	1. It should have more mandatory words in terms of reporting of new pest to IPPC 2. It could be helpful for a NPPO to build a more centralized pest survey and identification system 3. It could have any articles about appropriate training of manager involved in pest survey and emergency action
	Lao PDR	1. Should be put case study of quarantine pest surveillance in guidelines for pest surveillance ISPM No. 6 2. If possible translate to mother language of non developing country including Lao PDR.
	Malaysia	1. Detail out the surveillance procedures 2. Field visit/diagnostic report to be accepted as a basis whether pest present or not in a particular situation
	Myanmar	1. Technical co-operation programmes required 2. Sustainable source of diagnosis almost complete, no specific improvement require for the time being.
	Nepal	1. Acquisition with adequate idea, knowledge and empowerment 2. Knowledge delivery in terms of suitability for the own working situation, i.e. in the existing situation of Nepal 3. To be able to conduct survey and surveillance of the pest in the country and able to teach to the plant protection officers of Nepal
	New Zealand	1. Legislative requirement to report new finds to the NPPO should be made a requirement for general surveillance 2. Minimum measures of quality for "specific surveys" (including pest and commodity or host surveys) 3. Requirement for auditing should be more encompassing
	Philippines	Centralized network of record keeping
	Thailand	None
	Sri Lanka	1. Use of Information 2. Good Surveillance practices 3. Technical requirement for diagnostic service
	Viet Nam	1. Making more details on guideline for a general surveillance and improvement the accuracy of the collected data from a general surveillance. 2. NPPO Confirmation for the record of a general and specific surveillance done by non-NPPO organizations 3. Authorization and responsible of non-NPPO organizations on the results (confidence) of pest surveillance conducting by themselves.

Summary slides presented at the workshop

INTERNATIONAL STANDARDS FOR PHYTOSANITARY MEASURES
ISPM No. 6
GUIDELINES ON PEST SURVEILLANCE

SURVEY RESPONSES FROM APPPC COUNTRIES

Prepared for
Regional Workshop for the Global Review of Phytosanitary Surveillance in the Context of the IPPC standard (ISPM No. 6)
– Identification of Challenges and best Practice
31 January – 3 February 2012
Chiang Rai, Thailand

ISPM No. 6

- Issued 1997
- Content
  - Scope
  - Requirements
  - General surveillance
  - Specific surveys
  - Good surveillance practice
  - Diagnostic services
  - Record keeping

Definitions

- Pest Surveillance = official process which collects and records data on pest occurrence or absence by survey, monitoring or other procedure. Official means that such surveillance has to be established, authorized or performed by a NPPO.
- General surveillance is a process whereby information on particular pests which are of concern for an area is gathered from many sources, wherever it is available and provided for use by the NPPO
- Specific surveillance are procedures by which NPPOs obtain information on pests of concern on specific sites in an area over a defined period of time.

Pest surveillance purposes

- NPPO declaration of pest freedom
- Early detection of new pests
- NPPO pest lists and distribution
- Pest biology research
- Pest outbreak monitoring
- Early warning of outbreaks
- Pest management & control

Problem: By giving to a widely practiced activity a very narrow definition, ICCP created confusion and misunderstanding among plant protection personnel

Purpose of Review

- Challenges faced by NPPO for the implementation of the standard
- Make recommendations to the review panel of ISPM No. 6 on ways to improve the standard
- Gather examples of best practices for the preparation of training materials and manuals

Survey responses

Country	Questionnaire	Technical Resources	Best Practices
Australia	x	x	4
Bangladesh	x	x	1
China	x	x	1
Fiji	x	x	1
India	x	x	1
Indonesia	x	x	1
Japan	x		
Korea, Republic of	x	x	1
Lao PDR	x	x	1
Malaysia	x	x	1
Myanmar	x	x	1
Nepal	x	x	1
New Zealand	x	x	1
Philippines	x	x	1
Sri Lanka	x		1
Thailand	x	x	1
Viet Nam	x	x	1
Total	17 countries	15 countries	16 countries 19 best practices

A. Policy and legislative environment

Regional norm (>2/3 of countries)

- Policy setting: trade (50 percent), pest management (30 percent) and quarantine (20 percent)
- Primary pest surveillance responsibility with NPPO
- There are other organizations that are officially mandated to conduct pest surveillance by law, mission or job descriptions
- NPPO is the national coordinator of mandated organizations
- NPPO can mandate other organizations in emergencies
- Collaboration with other organizations is based on written agreements
- Pest surveillance follows a strategic and operational plan
- NPPO is responsible for surveillance of regulated and non-regulated pests

B. Organizational structure, competence and culture

Regional norm:

- Pest surveillance is centralized under a national manager
- On average, probably more than 10 organizations are involved in pest surveillance
- NPPO maintains formal linkages to external sources and engages them to support and improve pest surveillance
- In emergencies, stakeholders are included in the planning team
- NPPO surveillance programme has a well developed and compatible data system to collect, store and report information
- NPPO pest surveillance programme has procedures to review its performance

C. Documented procedures

Regional norm (>2/3 of countries):

- Majority of NPPO use a computerized retrieval system
- NPPO records include
  - Scientific name of pest
  - Scientific name of host
  - Plant parts affected
  - Date and name of collector
  - Date and name of identifier
  - Location
- Locations are specified by GPS coordinates
- NPPO has an operational manual for general pest surveillance

D. General surveillance

Regional Norm (>2/3 of countries)

- There is an easily accessible national database of plant pest records
- <75% of records are verified
- Plant pest records are compiled from NPPO, research institute and university information
- Sufficiency of resources is rated *intermediate* to *sufficient*
- Pest identification service is open to the public

E. Specific surveys

Regional norm (>2/3 of countries):

- There is a specific, trained manager with overall responsibility for surveillance
- Plant species/products regularly surveyed range from 1 to about 250
- Rice is most often surveyed
- There are no agreements between NPPO and *private* institutions to cover expenditures for surveys
- There are agreements between NPPO and *public* institutions to cover expenditures for PFA, ALPP, etc.
- Pest survey procedures are described in operational manuals
- These manuals are periodically evaluated

F. Resources

Regional norm (>2/3 of countries):

- NPPO annual surveillance investments range from $600 to >$10 million
- Other annual surveillance investments range from $0 to <$50 million
- Percent of NPPO budget for pest surveillance salaries range from 0 percent to 40 percent
- There are no private sector contributions
- Sufficiency of other resources is rated *marginal* to *intermediate*
- The number of human resources is rated *weak* to *average*
- The qualifications of human resources is rated *average*
- In the majority of countries, only about 25 percent of the surveillance staff have been trained to do so
- Training programmes for staff are carried out once every 1-3 years

Things that affect the ability to conduct pest surveillance

- Lack of (skilled) personnel = 17 times (first priority = 1 time)
- Lack of funding = 12 times (*first priority = 7 times*)
- Lack of infrastructure/research = 11 times
- Lack of cooperation and participation = 8 times (first = 1 time)
- Unclear central/federal responsibilities = 4 times (first priority = 2 times)
- Lack of clear policies = 3 times (first priority = 1 time)

Things to improve in ISPM No. 6

- More detailed procedures
- Case studies/examples
- Report format/standard phrases

Note: Many answers related to improving the country's surveillance programme rather than improving the ISPM guidelines themselves.

TECHNICAL RESOURCES

- Many of the technical resources listed by one country may also be of interest to another county. An exchange of relevant resources among countries is encouraged.

Note: Many of the categories are not easily distinguishable. For example, a resource may be listed as training material, manuals, guidelines dependent on one's point of view.

BEST PRACTICES

The best practice examples submitted cover a full range of surveillance applications:

- Early detection of new pests
- Surveillance methodology for high risk sites
- Pest status reports
- Pest management and population dynamics
- Pest control

CONCLUSIONS

- The responses to the survey provide an excellent and representative view of ISPM No. 6 implementation in the region.
- There are huge differences between the countries in terms of available human, financial and material resources which inevitably affect the implementation of ISPM No. 6
- The list of technical resources will be an excellent source for the exchange of ideas, training materials and operational manuals between APPPC countries
- The submitted best practices provide excellent examples for pest surveillances under ISPM No. 6

LIMITATIONS

- Some country responses may have been affected by a different understanding of "pest surveillance"
- The differences in definition between general surveillance, specific surveys, pest surveys, host surveys, targeted and random sampling may have been difficult to understand
- The questionnaire may not have brought out some of the obvious differences between countries; for example, the responses of New Zealand and Lao PDR to Yes/No questions were identical in 70 percemt of the cases despite the huge differences between the two countries (for comparison: New Zealand and Australia responses were identical in 83 percent of the cases)

ISSUES (1)

- National plant protection organizations (i.e. departments, agencies, services, etc.) are usually organizations that have other responsibilities besides acting as NPPO for ICCP. Giving the same name for a very limited IPPC function as for the wider national function of plant protection creates confusion and misunderstanding.
- Likewise, giving a very limited definition to the widely practiced activity of pest surveillance and surveys creates confusion and misunderstanding

ISSUES (2)

- To assess the performance of IPPC pest surveillance in a country, it would also be important to know
  - The number of pest records collected
  - Number of declarations of pest freedom issued
  - Number of new pests detected
  - Number of IPPC/NPPO pest lists produced
  - Number of Pest Risk Analyses performed

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