# ASIA-PACIFIC FOREST INVASIVE SPECIES NETWORK (APFISN)

**RISK-BASED TARGETED SURVEILLANCE FOR FOREST INVASIVE SPECIES (USDA/FS, FAO, APAFRI)**

Hanoi, Vietnam

20-23 April, 2008

**WORKSHOP REPORT**

A workshop on 'Risk-based targeted surveillance for forest invasive species' was held at the National Convention Centre, Hanoi, Vietnam during 20-23 April 2008 in conjunction with the Asia-Pacific Forestry Week. The workshop was sponsored by USDA Forest Service and organized by APFISN in association with FAO, Asia-Pacific Association of Forest Research Institutions (APAFRI) and USDA Forest Service. The main objectives of the workshop were:

- identify various geophysical, biological, ecological and social data and processes to integrate into a risk based approach to select appropriate pest targets and survey areas to maximize the chance for early detection of forest invasive species,
- identify specific surveillance techniques utilized in early detection of high risk invasives,
- use of general awareness and targeted community engagement for early detection programmes,
- development of appropriate information management techniques for use in surveillance programmes.

## Proceedings

20 April 2008

## Opening session

The workshop began at 9 am with the welcome remarks by Mr. Patrick Durst, Senior Forestry Officer, FAO Regional Office for Asia and the Pacific, Bangkok. He outlined the origin of the APFISN, its objectives and the various activities of the network since its inception. He said that the present one is the sixth workshop organized by APFISN for capacity building in member countries and during this workshop we move towards an operational activity. Dr. Larry Yarger (USDA Forest Service) in his welcome remarks said that invasive alien species (IAS) is a global issue and this workshop is indented to address some of the important issues concerning prevention of new incursions of IAS to the Asia-Pacific region and mitigation of its ill effects. He offered continued support of USDA Forest Service to the activities of APFISN. Mr. Sarath Fernando (APAFRI) in his

welcome address observed that workshops organized by APFISN are a good opportunity for participants for sharing and exchanging information and experience on combating the threat of invasive species. He stressed the need of capacity building in the member countries to deal with pathogens and pests. He also outlined the aims of APAFRI and its role in the genesis of APFISN.

Following the opening remarks by various dignitaries, Dr. Mike Cole (Australia) outlined the purposes of the workshop. He said that the workshop will examine whether the network can develop and implement surveillance activities for early detection to minimize the spread and impact of invasive species across the region. After Dr. Mike's talk, Dr. Sankaran (APFISN Coordinator) discussed the workshop agenda. This was followed by self introduction of participants.

**Country presentations**

**Bhutan**- D.B. Dhital- Dr. Dhital discussed the problem of bark beetle *Ips schmutzenhoferi* on spruce and blue pine forest in Bhutan. In its natural environment, the beetle attacks trees and logs of spruce and blue pine. Drought is one of the factors which trigger attack by bark beetle. To contain the problem, the trees are regularly monitored to identify outbreaks and freshly attacked trees are felled and debarked immediately before beetles become adults and escape from the breeding host.

**Indonesia**- Wida Darwiati – Potential pest attack to forest plantation. Ms. Darwiati said that the most widespread pest on *Pinus merkusii* in West Java is *Pineus boerneri*, a polyphagous insect. Infestation results in decline in growth of older trees and death of young pine trees. Natural insecticides such as pine wood acid or logged wood acid mixed with *Bacillus thuringiensis* is found effective in controlling the insect. Teak is affected by various pests in Indonesia such as *Hyblaea puera*, *Pyrausta macheralis*, stem borer, *Neotermes tectonae* etc.

**Japan**- Takeshi Toma - Invasive species potentially threatening Japanese forestry and forest biodiversity- Pine wilt nematode, Asian longhorned beetle, Erythrina gall wasp, *Quadristichus erythrinae* are the main threats to forestry in Japan. Potential invasive species through international trade of wood include *Ips cembrae*, *Xyleborus perforans*, *Ips sexdentatus* etc. The Govt. of Japan has proclaimed an Invasive Species Act. The objectives of the act are: 1) to regulate various actions such as raising, planting, storing, carrying and importing IAS; 2) to mitigate IAS that are already existing in Japan; 3) to contribute to preventing damages against biodiversity, human safety, or agriculture in Japan. Japan has produced a list of invasive insects of imported timbers and a checklist of Japanese insects.

**Malaysia**- Grace Tabitha Lim- Pests and Diseases of some forest plantation species in Malaysia- Rubber, *Acacia mangium*, teak and *Azadirachta excelsa* are the main forest plantation species in Malaysia. Leaf wilt and root rot are the main disease problems in rubber while *Acacia mangium* is affected by phyllode rust and red root rot (caused by

*Ganoderma philppi*). In teak, leaf defoliators *Hyblaea* and *Paliga* caused the most damage. The mahogany shoot borer *Hypsipyla robusta* is successfully controlled by the ant *Oecophylla smaragdina*. Infestation by barnacles on *Avicennia offcianalis* is a recently encountered problem. Malaysia has facilities for interception surveillance of rubber and oil palm diseases. The challenges for conducting forest surveillance include lack of training for foresters for on-the-ground surveillance, lack of pests and lists and associated information.

**Myanmar** – Wai Wai Than- Risk-based targeted surveillance for the grass *Pennisetum* in Myanmar – Ms. Than explained the damage caused by three species of *Pennisetum*, viz., *P. polystachyon*, *P. pedicellatum* and *P. purpureum* in teak plantations in Myanmar. These species thrive well on road sides, open dry land and plantations. Manual weeding has not been very useful in containing the weeds. Other important weeds in Myanmar include *Imperata cylindrica*, *Chromolaena odorata*, *Saccharum* sp., *Thysanolaena maxima* etc.

**Nepal**- H.B. Thapa- Sections in Department of Forest Research and Survey for Surveillance of Forest Invasive Species – Mr. Thapa outlined the mandate of Department of Forest Research (DFRS) in Nepal. The DFRS has various sections under which the inventory section falls under the Survey Division. Tree disorders can be surveyed but the concerned staff may need training. Likewise, reporting mechanisms can be developed and specimens referred for identification through DFRS. Lack of expertise in identifying causal organisms is a big hurdle which can partly be solved by coordinating with the Agriculture Department. Mr. Thapa said that aerial photographs of forests and other landscapes and forest maps are available in Nepal which will aid in forest surveillance for insects and pathogens. Facility for data storage and storing and rearing of specimens may have to be developed.

**Pakistan**- Rizwan Irshad- Significant forest invasive species: Pakistan's status – practices and prospects – Mr. Irshad said that as with other parts of the world, forest resources in Pakistan are under pressure from factors like increasing human population, poverty and other socio economic factors and natural and biological factors. Limited awareness of the invasive species problem and lack of capacity to address the problem has resulted in poor attention to the issue. Also, relatively less effective and delayed response in reporting, reacting and managing the invasive species has increased negative impacts due to IAS. Some of the important invasive species in the country are: *Broussonetia papyrifera* (paper mulberry), *Lantana camara*, *Parthenium hysterophorus* and Prosopis *juliflora*. Of late, recognizing the importance of IAS, Government of Pakistan has allocated and amount of Rs. 102 m for a project to deal with the IAS problem in the country. The main objectives of the project include 1) raise awareness of invasive species impacts and their control; 2) develop management strategies for the control of alien aquatic weeds etc.

**Technical Session -1**

**1. Selecting target pests for hazard site surveillance** by Dr. Ross Wylie, Queensland, Australia. According to Dr. Wylie, globalization, increased volumes of containerised freight and competition for space at domestic ports means that goods are increasingly being first opened at premises some distance from the port of entry, thus dispersing risk away from the main inspection point. A system of post-border surveillance targeting these areas, often referred to as 'hazard site surveillance', is being developed in several countries as a backstop to border control to ensure early detection of invasive species. This is particularly important for some of the more cryptic forest pests whose presence in a forest often is not discovered until populations are already high and the pest is well established. In choosing which pests to target for hazard site surveillance there are a range of factors to consider and a nine-step guide is presented to assist in this process.

These steps are: (1) What do we want to protect? (e.g., tree plantations, timber in buildings, lumber) (2) What exotic pests could be a threat to this resource? (Information on potential forest pests and disease threats comes from international forest health or quarantine networks, scientific literature meetings and internet) (3) Does the pest have the potential to be transported by trade/ human movement? (Depends on the lifecycle and behavior of the pest, what are its hosts, where does it lay eggs, feed and pupate, whether it is associated with a commodity etc.) (4) Is there a pathway for the pest into the country? (Whether commodities that could harbor the pest are being imported and history of past pest interceptions, living plants, logs, dunnage and packaging are high risk) (5) What is the likelihood of establishment? (Environmental suitability of the country, geographical location of ports, reproductive potential of the pest) (6) What is the likelihood of spread? (Pests ability for natural dispersal, potential for human assisted dispersal, distribution and abundance of hosts, natural barriers) (7) What are the potential consequences of establishment? (Economic, environmental and social impacts) (8) What is the ability to detect the pest? (9) What is the ability to eradicate/ manage the pest once detected? (Detecting early enough improves the chances for eradication/containment, breeding for resistance and biological control arte better management approaches. Dr. Wylie discussed these steps using an example from the Pacific (*Hypsipyla robusta* shoot borer of mahogany and other trees) and from Asia (*Sirex noctilio* wood wasp affecting many species of *Pinus*).

**2. A hazard assessment method and survey sample design** by Marla Downing, USDA Forest Service. Dr. Downing discussed the method of assessing hazards and identifying sites for sampling invasive pests citing the example of Sirex *noctilio.* The steps involved are: collecting information on commodities associated with the pest, distribution of the pest, identifying principal ports (first point of introduction), distribution centers (second location to find invasive species) and markets. The places to target lie in the overlapping areas between port of entry and distribution centers. A susceptibility potential map can be prepared by identifying and mapping potential hosts and rating disease establishment potential of trees (over dense sites, stress sites) and locating where places overlap. The Google earth can be used to determine sample areas where to set a trap. Patches of trees

near ports where the pests can hop on are also areas where traps need be set. To identify stressed trees, soil wetness and dryness index can be used.

**3. Surveillance methods for early detection of pathogen incursions** by Tim Wardlaw, Forestry Tasmania, Australia. Detecting forest pathogens is a big challenge since the vegetative stage is hidden in host, damage symptoms are non-specific and fruiting bodies and spores more diagnostic but very small. So, specialized and expensive methods are needed for detection. The methods of detection include visual symptoms, fruiting bodies, screening asymptomatic plants (culturing onto agar, DNA tests), soil/water sampling etc. The general surveillance methods are: forest health surveillance, sentinel surveys, blitz surveys, quarantine surveys, area freedom surveys and ad hoc detection - the inspection platforms are aerial, vantage point, roadside and ground. The forest health surveillance relies on highly trained observers inspecting forests. They should have the capacity to detect new incursions and symptoms due to diseases (whole tree symptoms, crown symptoms, stem symptoms). Sentinel tree surveys involve regular inspection of specifically located areas – near hazard sites or disease-free areas beyond infection fronts. Blitz surveys are detailed inspection for damage of trees in a local area covering all trees present. Area-freedom surveys are designed for surveys in defined areas to prove absence of a pathogen often targeted for specific pathogens. The quarantine screening may be focused on a small number of plants and is generally based on symptoms. Ad hoc detection is an unplanned detection usually carried out during routine forest activities.

In short, surveillance for early detection of forest pathogens must have a substantial ground component, must be done on a regular cycle, must be done by trained people and must be restricted to relatively small areas or number of trees. A thorough understanding where new incursions are likely to establish and information on pathogen threats to host are also vital points.

4**. Using static traps for hazard site surveillance** by Ross Wylie, Australia. According to Dr. Wylie hazard site surveillance (HSS) is a system for post-border detection of new pest incursions targeting sites which are considered potentially of high risk of such introductions. A primary necessity of HSS is that we need to know 1) what pests we have got, 2) what pests you don't want, 3) assess the likely pathways for exotic pest entry, 4) identify and categorize risk sites , 5) have a methodology for detection of target pests, and 6) be able to identify what you find. The primary risk sites are port environments and international airport environments. Secondary risk sites include container emptying sites, quarantine approved premises and importers of raw material. The tertiary risk sites are botanic gardens and military camps and quaternary risk sites are forests or forest parks within city boundaries.

The primary risk sites are first choice for trapping and inspections. With the help of quarantine officials, sites/premises can further be ranked for risks according to the goods they handle. Untreated logs, timber packaging are high risk goods and container depots, forest parks and areas with recycled and imported timber with vegetation adjacent are high risk habitats. Traps commonly used are Panel traps, Lindgren traps and Japanese traps. Different types of lures used depending on the target taxa. Preservatives used in

traps also vary based on climatic conditions- the most preferred preservative is a mixture of ethyl alcohol (20%), glycerol (5%), non-scented detergent (1%) and water (74%). The positioning of traps is important. They are best positioned under shelter to reduce evaporation and rain problems. Trees are convenient to hang traps but expect leaves; dust sites are not suitable to set a trap. Traps need be set in secure sites to avoid stealing. The catch should be collected every two weeks and the preserving fluid changed; lures should be changed every 4 weeks. Empty the fluid plus the specimens onto a piece of gauze, fold gauze and place in plastic bag with trap number and date. Place bag with gauze and insects in the freezer until ready to sort the catch. Diagnostic capacity is a major factor determining the scope of the detection program. Initial sorting may be done to pest groups of interest. Specimens may be stored for eventual identification.

**5. Practical issues of diagnosis** by Tim Wardlaw (Australia). In general, surveillance can result in much detection of damage symptoms of insects/fungi on host. The step from detection to diagnosis may be huge and full diagnosis of every detection would be beyond the capacity of most countries. Dr. Wardlaw explained how to make judgments of when to proceed to formal diagnosis citing the example of stem gall on *Pinus radiata*. Type of damage symptoms can be general (low diagnostic value), distinctive (high diagnostic value and the symptoms contain elaborate features such as fungal fruiting bodies and insects associated with the damage) and unusual (of neutral diagnostic value with symptoms rarely or not previously seen on the host). The responses should vary with the symptoms. For general symptoms, it would be necessary to establish current damage levels (if the host is only half dead the causal organism is still around), exclude possible causal factors and monitor the affected area for progression of symptoms. In cases where distinctive symptoms are observed, the possible suspects need be identified *(scan literature/internet) and short-listed. If unusual symptoms are observed, there is likelihood of symptom being caused by an agent new to the area. If so, additional information need be collected to aid diagnosis.

In the case of stem galls on *Pinus radiate* both distinctive and unusual symptoms were observed and the photo of symptoms was e-mailed to colleagues familiar with the disease. Preserved samples of the rust were also sent to experts to find out whether western gall rust was a possibility. DNA studies were conducted to detect rust DNA in galls which confirmed that the disease in question was not western gall rust. Resources available to assist in diagnosis, colleagues (pathologists and entomologists), reference sites of pests and pathogen images, visual glossary of damage symptoms and internet searches for suspected pests/pathogens and damage symptoms would be of immense help.

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**Field trip to a wood yard near Hanoi**: During the field trip, participants were trained on setting up of various types of insect traps for surveillance for invasive alien pests (led by Dr. Ross Wiley) and how to identify disease problems on trees to facilitate early detection of invasive pathogens (led by Dr. Tim Wardlaw).

22 April 2008

**Technical session 2**

**6. Diagnostics, record keeping and communications** by Larry Yarger (USDA Forest Service). Presenting a flow chart on early detection and rapid response (detecting and reporting→ diagnostics, recording, communications → rapid assessments → planning → response), Dr. Yarger explained the various steps involved in arriving at the correct diagnostics, record keeping and communications. For diagnostics it is necessary to establish a functional network of diagnostic experts to rapidly and accurately identify and report pests, pathogens and invasive plants. Also, standard protocols need be developed for early detection, submission of specimens, identification and vouchering, verification, archiving of information and reporting of suspected new invasive pests. The success of diagnostics will depend upon effective communications and cooperation among pest specialists in Govt., industry, academia and the general public. The action points in diagnostics are: develop data collection standards, use readily available identification keys, use pest specific information sources, develop web-based identification keys, identify diagnostic locations or centers, identify expertise for difficult identifications etc. The National Plant Diagnostic Network is established to assist the process.

The main objective of communications is to help a rapid and secure communication system. The main components of which are: 1) communications to identify a source of expert identification skills, 2) communications during the identification process, 3) communications after the identification. Rapid response is dependent upon effective and rapid communications. Communications also aid to protect individuals and industry and help quarantine services. Recording of pest information improve abilities for early detection of potential threats to forests. Records contain basic data (plant host name, pest or weed name, name collection locality and date of collection), advanced data (symptoms, host parts affected, host history and additional site- specific information). Examples of good database systems are China Species Information Service, DAISIE (Europe), EXFor (USA), Invasive species information management (APFISN) etc.

**7. Use of ExFor website for entering invasive species risk assessment records** by Marla Downing (USDA Forest Service). Ms. Marla Downing presented the various features of the Exotic Forest Pest Website (ExFor) and explained how invasive species risk assessment records can be included in the website. Pest records in the website include information on pest identification, detection, control methods and biology (documentation) and potential to establish and spread, propensity to cause economic and environmental harm (risk assessment). Risk rating may be 1 (very low) to 9 (very high). The ExFor is sponsored by the North American Forest Commission and North American Plant Protection Organization. The address is: URL http://www.spfnic.fs.fed.us/exfor/

**8. Forest surveillance for insect pest in Fiji** by Sanjana Lal (Fiji). Potential threats of invasive species in Fiji are *Sirex noctilio* (Pine wood wasp), Hypsipylla sp. (mahogany shoot borer) and Asian gypsy moth. Greater incursion by exotic pests and pathogens through international trade and travel necessitated surveillance in Fiji. Moreover, the quarantine resources in Fiji are inadequate and there is no sufficient capacity to manage

pests in a sustainable way. Earlier on, surveillance for invasive species in Fiji were based on ground surveys, reports of abnormal situations from stations officers, saw millers, quarantine reports from infested ships, light trapping in logged and un-logged forests etc. A research project supported by ACIAR, Australia paved way for improvement on these methods. Initial steps for implementation of the project involved surveys in different aged plantations to determine what is present and data base analyses of timber species. The insect traps used for surveillance include lindgren funnel trap, intercept pane trap. Delta trap for Asian gypsy moth. Specimens collected are either identified at source, compared with voucher specimens, assessed by specialists and stored until dispatch. Sentinel plants were surveyed at frequent intervals for target pests viz., foliar pests of pine, sandal wood, mahogany shoot borer and eucalypt rust.

For fruit fly surveillance, insect traps were set in urban areas, farms, ports of entry, areas of tourism activity etc. Rhinoceros beetle traps were used to survey population size of the beetle and test viability of the *Metarrhizium* biocontrol agent. Identification of insect pests has been a main problem in Fiji since the country lacks taxonomic expertise. However, there are benefits through the improved survey system which helps targeted pest surveillance, regular monitoring of hazard sites, early detection of entry at ports and early identification of potential pests.

**9. Forest invasive species and convention on biological diversity** by Tim Christophersen, United Nations Environment Program. The Convention on Biological Diversity (CBD) was adopted in 1992 at the Earth Summit in Rio de Janeiro. Article 8 (h) of the Convention proclaims that "each contracting party shall, as far as possible and as appropriate prevent the introduction of, control or eradicate those alien species which threaten ecosystems, habitats or species." The suggested activities are: a) reinforce, develop and implement strategies at regional and national level to prevent and mitigate the impacts of IAS that threaten ecosystems, including risk assessment, strengthening of quarantine regulation, and containment or eradication programs taking into account the guiding principles on IAS if adopted at the sixth meeting of the Conference of the Parties. b) Improve the knowledge of the impacts of IAS on forest ecosystems and adjacent ecosystems. The immediate priorities are: 1) preventing international movement of IAS, 2) rapid detection at borders, 3) collaboration among governments, economic sectors and non-governmental and international organizers, 4) building capacity and public awareness and 5) once spread, eradication and mitigation. CBD guiding principles on IAS are grouped under 1) General, 2) Prevention, C) Introduction of Species and 4) Mitigation of impacts. CBD also decided to (Decision VIII/27) consult with IPPC, OIE, FAO and WTO regarding whether and how to address the lack of international standards covering IAS, in particular animals that are not pests of plants under IPPC. Discussions towards the goals of CBD and in-depth review of IAS at COP 9 recommended 1) finding best practices on preventing risks associated with international trade, 2) further invitation to the relevant international organizations, 3) improving partnership and building capacity and 4) further economic valuation of damages on ecosystems by IAS.

**Technical Session 3**

**10**. Mr. Hiroshi Makihara (Japan) talked on the use of different types of insect traps which can be set up on trees including *Artocarpus.*

**11. Invasive forest pest monitoring and forecast in China** by Jianbo Wang and Hongbin Wang (P.R. China). Forest cover in China is increasing; the forest pests also increased. More than 8000 species of forest pest species have been recorded of which about 200 can cause damage and more than 20 of them are very damaging. Main exotic pest in China include, pinewood nematode, red turpentine beetle, fall web worm, Japanese pine needle scale, loblolly pine mealy bug, coconut hispine beetle etc. The Central Government of China has evolved a framework of pest management in China. It is technically supported by Chinese Academy of Sciences, Chinese Academy of Forestry, Chinese Academy of Agricultural Sciences and colleges and institutions. The State Forestry Administration in China has established early warning institutions the base institutions of which are local forest pest monitoring sites. China has established 1000 national forest pest monitoring and forecasting stations and more than 8000 monitoring sites in the whole country. Training has been provided to concerned officials in survey and investigation methods for IAS, trap setting for insects, data recording and exchanging and in soft aware application. Field investigation for IAS was done by walk over survey, sample plot survey and thorough examination of trees (shaking, cutting branches etc.). Investigations were also done using light traps, traps with insect attractants, airborne video monitoring and GIS monitoring techniques.

Data analysis and transmission is done through software named Control & Quarantine Information System of Forest Pest. Sharing of data is done through a website of forest information center. Occurrence and the trend of forest pest can be reflected visually by "Chinese Forest Pest Index". Publications on invasive pest alert and prediction are also released often to create awareness. Public notices through media are also done. Cooperation with in the region is mandatory for pest monitoring techniques, such as pheromone attractant, aerial photography and other advanced techniques, sharing of forest pest information to improve the ability for quick action against invasive pests, control techniques, international collaborative research on IAS, establishing effective early warning systems and quarantine checking and treatment against imported seedlings and other plant parts.

**12. Increasing our chances for early detection- what can we do?** By Mike Cole (Australia). Dr. Cole said that the current situation in most of the countries in the Asia-Pacific region is limited resources, capacity and capability versus need for early detection for more effective incursion response/management of exotic pests. When we think of early detection, the common questions posed are what to look for (impact, chances of detection and eradication), where to look (pest biology, host plants, environmental stability, areas of more movement) and when to look (pest biology/life cycle, host biology/life cycle)? The components of specific surveys are: specific pests, specified sample, specified time, statistical basis and sample survey methodology. For general

surveillance, we need identify and use a range of surveillance sources. For example, industry/consultants, arborists, universities, public, special interest groups such as garden clubs etc. (non-government). In the government sector, we need the support of quarantine, departments of agriculture and forestry and the local government. Also, we need identify stakeholder network (interested people, linkages, coverage), establish two way communication to keep engaged and promote, develop and maintain appropriate training and develop and maintain a reporting system to capture information.

Specific surveys in Australia are carried out by NAQS, National AGM Program, National Hazard Site Surveillance, State Forest Surveillance Programs and Industry Forest Surveillance Programs. General surveillance in Australia is carried out by the help of general public (national and regional), timber industry and pest control operators, arborists, quarantine workers, and weed spotters. The tools used are: pest awareness material (forest pest field guide), website, e-communications, national plant pest hotline etc. In risk-based site targeting the most important point is where the pest is more likely to be detected? Examples of risk sites are: port/ port environments (primary), loading/unloading areas, quarantine facility areas (secondary), transport corridors, botanic gardens (tertiary) military facilities, University campuses (tertiary) and Urban forests (Quaternary). Australia is currently involved in targeting pests like Asian longhorn beetle, pine wood nematode, pine pitch canker, Asian gypsy moth and eucalypt rust. The underpinning issues are: training and education, appropriate sample/ survey methodology, reporting and recording, identification/diagnostics and linkage to an action upon detection. Dr. Cole concluded by saying that we can do several things through he network to promote and implement forest surveillance in the member countries.

**Technical session 4**

**Panel discussion**: The panel discussion was chaired by Dr. Ross Wiley. He introduced the theme and identified the objectives of the panel discussion. The main objective is to understand the major forest invasive species threats in the region, how the threat changes over time and what are we doing to prevent threats worsening. To accomplish these, the following actins are proposed.

1. It is necessary that current state of knowledge on key pest species in the region is documented and arrangements made to share this knowledge widely (making use of the network).
2. We need to understand the respective country priorities and capacity with respect to forest invasive species.
   What can be done in the short-term using existing resources?
   What can be done in the longer term with additional capacity?
3. We need to develop ways of assisting countries in meeting their aspirations regarding forest invasive species.

To facilitate detailed discussions on these aspects the workshop participants were formed in to three breakout groups. The groups were lead by Ms. Sanjana Lal (Fiji), Dr. Grace Tabitha Lim (Malaysia) and Mr. Hussain Faisal ( Maldives).

The following questions were framed to address in break-out sessions

What are your counties main priorities for forest?
- Native forests for environmental value
- Native forests for timber harvesting
- Plantations-main species
- Timber in service

Does your country have current concerns for forest health?
- Native pest species
- Established invasive species
- Invasive species not present in country
- Forest health is a low priority

What information do you currently have about the pest species in your country?
- Are you able to identify your priority pest species?
- Have you done any surveys to determine the amount of damage caused?
- Does your country currently manage pest species?

What capacity does your country have to survey for forest pests?
- Staff and funding to visit forests and do surveys
- Access to identification services
- Access to plant pathologists or entomologists

What do you think you would be able to do in your country following this workshop?
- Within your current resources
- With additional support
- What do you want the network to accomplish

We would like to identification some achievable projects that can be done in the short term following this workshop. We want to use progress from a small number of short-term projects to make some longer term goals that can be the basis for develop funding proposals.

**Summary of break-out group discussions**

- Plantations and native forests for environmental value are the priorities for most countries
- There is as much, if not more, concern about established invasive species and native pests as about invasives not yet present in a country
- Ability to identify priority pest species was low to moderate for most countries (high in a few)
- Most countries have done some surveys to determine extent of pest damage but few have good pest management plans
- About half the countries had moderate to very good capacity to do surveys and the remainder ranged from none to low capacity
- There seemed low confidence in being able to catalogue pests and determine target pests unassisted
- There was strong demand for training on surveillance and identification
- Most counties said they had internet access but it was sporadic/ unreliable in several countries (some on dial-up access)

- Some countries with higher capacity/resources offered assistance to others in the network in relation to access to pest databases, identifications and advice on pest management

**Recommendations**

1. Training in methodology for forest health surveillance and provision of some basic equipment to do this is a top priority for the majority of countries
2. A list of key pests (insects, fungi, weeds) should be compiled for the region with information on known distribution, hosts, importance and (where possible) management (network to assist)
3. Each country will select one or more target pests according to its own priorities using the methodology presented at the workshop (network assistance required for some)
4. A list of experts who can assist with identifications is to be compiled and posted on the network website
5. A list of websites of databases and images useful for identifications is to be compiled and posted on the network website.
6. Efforts are to be made to improve communication between members of the network
7. One or two countries (Malaysia, Bhutan) are to commence pilot projects for early detection of target invasives (assistance may be required)

**Field trips**

There were two field trips

21 April 2008: The participants were taken for a visit to a wood yard near Hanoi. Practical demonstrations were held at the site on setting up different types of traps for exotic insects and how to identify tree disorders. The demonstrations were headed by Dr. Ross Wylie and Dr. Tim Wardlaw.

26 April 2008. Cuc Phuong National Park, Nin Binh. During this field trip, participants had the rare opportunity of visiting one of the primitive tropical forests in Vietnam.

## Programme

**20 April 2008**

**Opening session**

0900-0910 Welcome remarks - Patrick Durst (FAO)

0910-0915 - Larry Yarger (USDA Forest Service)

0915-0920 - Sarath Fernando (APAFRI) - Chairman of APAFRI

0920-0935 Objective of the Workshop - Mike Cole (Australia) DAFF

0935-0945 Workshop agenda - K.V. Sankaran (APFISN Coordinator)

0945-1045 Introduction by participants

1045 Tea **Break**

1100-1215 Presentation by participants on important pests in their respective countries which require urgent surveillance (Bhutan, Indonesia, Japan, Malaysia, Myanmar, Nepal, Pakistan)

**Technical session – 1**

Each presentation will be for 30 minutes followed by 15 minutes discussion

1215- 1300 Selecting target pests for hazard site surveillance – Ross Wylie (Australia)

1300- 1345 **Lunch Break**

1345- 1420 A Hazard assessment method and survey sample design
- Marala Downing (USDA Forest Service)

1420- 1500 - Surveillance methods for early detection of pathogen incursions
- Tim Wardlaw (Australia)

1500- 1530 - **Coffee Break**

1530- 1615 - Using static traps in surveillance for forest invasive species- Ross Wylie

1615-1700 - Practical issues of diagnostics – Tim Wardlaw

**21 April 2008**

1300-1830 - Field trip to a wood yard near Hanoi – setting up traps, looking for tree disorders

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**Technical session – 2**

1330-1415 - Diagnostics, record keeping and communication – Larry Yarger

1415-1500 - Use of ExFor website for entering invasive species risk assessment records- Practical session – Marla Downing

1500-1530 - **Coffee Break**

1530-1615 - Forest surveillance for insect pests in Fiji – Sanjana Lal (Fiji)

1615-1645 - Forest invasive species and Convention on Biological Diversity – Tim Christophersen, United Nations Environment Program

**23 April 2008**

**Technical session 3**

1330-1335 - Makihara – Presentation – on use of insect traps

1335-1415 - Invasive Forest pest monitoring and forecast in China –
Wang Jianbo (P.R.China)

1415-1500 - Increasing our chances for early detection- what can we do? - Mike Cole (Australia)

1500-1515 - **Coffee Break**

**Technical session - 4 - Panel discussion**

1515-1530 - Introductory remarks - Ross Wiley

1530-1615 - Break out discussions headed by Sanjana Lal, Grace Tabitha Lim and Hussain Faizal

1630-1745 - Developing an operational surveillance activity for the region. Chair – Ross Wylie

1745 – 17.55 - Closing Remarks – Larry Yarger , Daniel Baskaran

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