Import Risk Analysis (IRA) on Fresh Banana Fruit from the Philippines

Report of Visit of Chairs of Technical Working Groups to the Philippines in August 2001

Released in April 2002
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REPORT OF VISIT OF CHAIRS OF TECHNICAL WORKING GROUPS TO THE PHILIPPINES

PURPOSE

• To provide a report of travel to the Philippines from 5-11 August 2001 by the Chairs of the three Technical Working Groups (TWGs) concerning the import risk analysis (IRA) on the importation of fresh banana fruit from the Philippines.

BACKGROUND

• Biosecurity Australia is conducting an IRA on the importation of fresh banana fruit (bananas) from the Philippines (please refer to the Issues Paper released in May 2001).

• On 20 April 2001, Secretary Leonardo Montemayor, Department of Agriculture, Philippines, sent an invitation to Plant Biosecurity, Canberra, Australia, for two risk analysis panel (RAP) members to conduct a technical study tour in the Philippines to assist the panel understand the key pests and possible control programs in the Philippines.

• On 17 May 2001, Plant Biosecurity responded to Secretary Montemayor's invitation and proposed a visit to the Philippines by the Chairs of the three Technical Working Groups (TWGs).

• Secretary Montemayor subsequently wrote to Dr Stynes on 21 June welcoming the proposed visit.

• The TWG Chairs: Dr Sharan Singh, TWG1 (Pathogens); Mr Bob Paton, TWG2 (Arthropods) and Mr David Peasley, TWG3 (Horticulture, Environment and Operations) visited the Philippines.

• Stakeholders were consulted on a list of key activities of TWG Chairs, including a list of questions for the Philippines, during the visit (please refer to Plant Biosecurity Policy Memorandum 2001/14 of 27 July 2001; available from www.affa.gov.au/plantcra).

• This report is based on visits by the TWG Chairs observations of banana plantations, packhouses and laboratories and information provided by Philippine experts and stakeholders during many discussions (Attachment 1 & 2). Any extrapolation beyond the observations and discussions of the TWG Chairs during the visit should be made with caution. At the request of the TWG Chairs, the Philippines allowed them to take pictures for viewing by other Risk Analysis Panel members. The Philippines advised the TWG Chairs that they have previously had bad experiences with people taking pictures and then using these out of context for giving bad publicity to the Philippines. The TWG Chairs assured the Philippines that they would be careful with the interpretation of any pictures taken during the visit.
KEY POINTS

Indications of Philippines' high priority for banana exports and commitment to contribute scientific and technical input to the IRA

- The Philippines indicated in clear terms that their proposal to export bananas to Australia is a matter of high importance for their government. Secretary Montemayor has engaged the government officials and private sector to expedite this issue by responding to Australian requests for technical information as a matter of high priority. Secretary Montemayor opened the discussions in Manila on 7 August and also attended a dinner function in Davao on 10 August with Australian and Philippine technical experts and quarantine officials. He advised the TWG Chairs that their President, Ms Arroyo is very interested in this matter and that she was pleased that this visit was taking place. Dr Sharan Singh advised Secretary Montemayor that Australia has accorded high priority for this project and the RAP's recommendations to AFFA will be based on sound science.

- Secretary Montemayor hoped that the RAP's visit to the Philippines would enable the IRA to be completed on schedule by June 2002, or even earlier if possible. Dr Sharan Singh advised Secretary Montemayor that the TWG Chairs hope to collect much technical information during this visit and the availability of information would determine the timing of completion of the IRA.

- In the time available during the visit, the Philippines provided a very comprehensive coverage of laboratory, nursery, plantations, packhouse and transport procedures and also arranged our meetings with many Philippine experts on bananas.

- Philippines provided documentation to the TWG Chairs consisting of:
  - Philippines banana industry profile;
  - *curriculum vitae* of nine members of the Industry Task Force;
  - fact sheets for 11 arthropod pests, two bacteria, four fungi, three viruses and two weed species (these data sheets were prepared at short notice and would require further work particularly in light of discussions during the visit);
  - names of research organisations in Mindanao;
  - Administrative Order No. 14 concerning regulations governing Inter-Provincial Quarantine on all plants of *Musa* spp.;
  - Pesticide Regulatory Policies and Implementing Guidelines; and
  - a copy of a technical bulletin, "The Philippines Recommends for Bananas".

- The Philippine authorities agreed to provide written responses to the RAP's 43 questions that they had received from Australia in advance of the visit. They also agreed to provide written responses to supplementary questions, which
were raised by the TWG Chairs during this visit. A revised list of questions (Attachment 3), including supplementary questions was later submitted to the Bureau of Plant Industry (BPI) Director Blo Umpar Adiong. BPI subsequently provided responses to these questions. The BPI answers to these questions are posted on Biosecurity Australia’s website (www.affa.gov.au/plantcr). Some of the BPI answers beg further questions, which will be put to the Philippines shortly.

- The TWG Chairs sought clarification from the Philippine experts of many issues concerning key pests and diseases of bananas, eg, Moko, bugtok, black Sigatoka, freckle, banana bract mosaic virus, fruit flies, mealybugs, scale insects and whiteflies. They identified and discussed gaps in information for key pests and diseases. The Philippine experts were keen to discuss these issues and address gaps in information by providing further information, including research on certain issues. The TWG Chairs advised the Philippine experts that they had no authority to commission the Philippines to conduct research. However, the Philippines may choose to clarify certain areas by further research, eg. efficacy of fruit disinfectants in killing surface-borne spores of pathogens such as the black Sigatoka fungus; latency of freckle disease; and the likelihood of dissemination of the freckle pathogen from fruit to banana plants, and susceptibility of various stages of banana fruit to oviposition by fruit flies.

- The private and public sector in the Philippines are very interested in exports of bananas to Australia and they are working cooperatively in progressing this issue.

Clarification of export areas

- The Filipino Banana Growers and Exporters Association, Inc. (PBGEA) and the Banana Exporter Industry Foundation, Inc. (BEIF) had suggested in their comments on the Issues Paper on the IRA on Philippines’ banana that there have been geographic subdivisions of production areas. They had stated that:

  - Davao province now covers the provinces of Davao del Norte, Davao del Sur, and Davao Oriental;
  - Cotabato has now been divided to South Cotabato, North Cotabato, Sarangani Province, Sultan Kudarat, and Maguindanao; and
  - Bukidnon remains the same.

- The PBGEA and BEIF had also indicated that the provinces of Agusan del Sur and Agusan del Norte should have been included in the IRA.

- At the discussions in Manila on 7 August, the Philippines banana industry representatives indicated that they would like to include the provinces of Agusan del Sur and Agusan del Norte in the IRA. Dr Sharan Singh advised them that BPI should write formally to Biosecurity Australia if they wish to seek extension to the proposed export areas.

- BPI advised us that the Philippines had developed their submission for export of bananas to Australia in 1995 and they had overlooked incorporation of
information on the geographic subdivisions of the new proposed export areas in their latest submission of May 2000. They said their industry had not advised them of their interest in exporting bananas from Agusan del Sur and Agusan del Norte.

- Following further consideration of the issue, the Philippines advised the TWG Chairs that they have decided at this stage against their industry proposal for extension of exports to include Agusan del Sur and Agusan del Norte. They said they would wait for a decision on the currently proposed export areas and consider extensions to export areas at a later date.

**Clarification of exports of Gros Michel**

- The Philippines had nominated Gros Michel, within the cultivars proposed for export to Australia. At the entry meeting it was clarified that Gros Michel is no longer commercially grown in the Philippines and that they will not be exporting Gros Michel to Australia. PBGEA and BEIF had also said this in their comments on the Issues Paper. They said that the cultivation of Gros Michel in the Philippines has phased out since the development of their initial export proposal.

**Quarantine requirements for imports and exports**

**Imports**

- BPI advised that Philippines does not import banana fruit from any country and they will conduct risk analysis if they receive an application to import this commodity. They said no one has considered exporting bananas to the Philippines because they are one of the largest banana exporters in the world.

- BPI also advised that their import conditions for planting material are consistent with the international guidelines for the movement of *Musa* germplasm. BPI officials were aware of the risk of introduction of exotic pests and diseases, such as blood disease from Indonesia.

- BPI agreed to provide documentation regarding their import conditions for banana plants and fruit.

**Exports**

- BPI advised us that they are meeting the overseas countries' quarantine requirements. Some countries, eg. Japan, Korea, New Zealand and China have specific quarantine requirements while others have minimal quarantine requirements, i.e., a phytosanitary certificate without any additional declarations. They said Japan requires, among other things, on-arrival fumigation (subsequently clarified the fumigation is with hydrogen cyanide) of imported consignments of bananas infested with pests. The exporters advised the TWG Chairs that banana fruit handles methyl bromide fumigation very well. They also said they were considering the option of pre-export fumigation for the Japanese market.
• BPI said they have had very little quarantine problems with banana exports; the importing countries sometimes report interceptions of scale insects, mealybugs, whiteflies and mites. They said mainly New Zealand was reporting interceptions to BPI and there were some interceptions (scales and mealybugs, etc) by Japan and China. We said Australia has already obtained New Zealand interception records.

• BPI said the Philippines has been exporting bananas for decades and fruit flies were never intercepted in any consignment.

• BPI agreed to provide Australia with overseas countries' import requirements for bananas from the Philippines and also interception data. However, BPI officials said that some of the import requirements were bilateral arrangements with other countries and they were reluctant to release these documents.

Pesticides

• Philippines agreed to provide a list of pesticides registered for use in banana plantations and the commonly used pesticide application schedules.

Fungicide resistance management

• The private companies producing Cavendish bananas in the Philippines use the guidelines of the Fungicide Resistance Action Committee (FRAC) to manage development of resistance in the black Sigatoka fungus. The protectant and systemic fungicide sprays are alternated to minimise build up of black Sigatoka resistance. Resistance monitoring results are used to decide if some fungicides should be withdrawn from spray schedules. The TWG Chairs were advised by the Philippine experts that if there is any evidence of build up of resistance to a fungicide in a plantation then that fungicide is not used for one to three years and reintroduced only if and when the resistant population has declined. They were also advised that the Philippines has not lost any fungicide from their armour against foliar diseases and that the full suite of internationally recommended fungicides is still available to them.

Environmental regulations

• Philippines agreed to provide information concerning their environmental legislation, particularly the Environment Compliance Certificate (ECC) requirements for banana plantations. The commercial plantation managers are aware of their role in the protection of the environment and were taking steps to minimise environmental damage by measures such as treatment of water before disposal to the rivers and creeks, minimisation of pesticide applications and soil erosion control.

• Commercial banana plantations are following the environmental standard, ISO 14001 to address environmental issues.
Quality Assurance

- As the fruit produced in commercial plantations is almost exclusively intended for exports, including the fastidious Japanese market, quality assurance systems are rigorously followed in commercial banana plantations and during fruit cleaning, sorting, inspection, packing and transport.

- The commercial plantations use quality assurance systems, mainly ISO 9002, and one company was moving to SQF 2000. The companies can trace-back non-compliance to the individual packer, packing line, date of packing and the time of the day of packing.

Occupational Health and Safety

- The private companies in the Philippines were aware of the occupational health and safety (OH&S) issues and appeared to take pride in caring for their workers.

- Private company personnel told us that the OH&S issues are also covered in the ISO 14001.

- The Fertilizer and Pesticide Authority (FPA) approves pesticide applicators, trained in the safe use of chemicals.

Stakeholder meetings

- The TWG Chairs met with key stakeholders everyday in the evening on 7-10 August and held a broader stakeholder meeting in Davao on 10 August (Attachment 1). At the broader stakeholder meeting the key issues discussed were:

  - Australia’s quarantine policy, including conservatively high appropriate level of protection (ALOP);
  - the Quarantine Act, regulations and the Quarantine Proclamation
  - the World Trade Organization agreement on the application of sanitary and phytosanitary measures (the SPS agreement);
  - the IRA process, including coverage of routine and non-routine pathways;
  - ongoing review of the IRA process;
  - status report on the Philippine banana IRA, including steps already completed and further steps in the process; and
  - comments from the Philippines and Australian stakeholders on the Issues Paper.

Visit to tissue culture laboratory/nursery

- The TWG Chairs visited a tissue culture laboratory and a tissue culture nursery and observed procedures for the production of high health tissue cultured plantlets (commonly known as seedlings in the Philippines).

  - This facility is capable of producing approximately 14 million seedlings per year.
- The laboratory employs 160 tissue culture technicians.
- The selection of high health suckers and inspection of resultant plantlets and plants is an essential part of the process to ensure freedom of tissue cultures from virus diseases.
- The use of tissue cultures is increasing. A large private company currently grows 50 per cent of its plantations as annual plantations derived from tissue cultured plantlets and is planning to increase this figure to 100 per cent by year 2005.
- Annual plantings produce fruit in less than a year, about 9 -10 months. Following fruit harvest, the plants are disced into the ground and the field is replanted.
- We were advised that the incidence of diseases is much lower in annual plantations and pesticide use for the control of black Sigatoka is reduced by 35 - 40 per cent in annual plantations as compared with traditional, perennial plantations.

Visits to commercial plantations

• The TWG Chairs observed a range of banana plantations in Davao, Bukidnon and Cotabato (Attachment 1) and developed an understanding of the situation of important pests and diseases.

• The commercial plantations are well managed and regularly monitored, including weekly surveys, for pests and diseases in a professional manner. The TWG Chairs observed that pest and disease monitoring records were kept. They were told that some well-managed commercial plantations are as old as 31 years.

• The TWG Chairs were advised by the Philippine experts that the following are part and parcel of the regular farm practices in commercial banana plantations and trained workers conduct these operations paying attention to avoid the spread of Moko during operations involving cutting and injection of plant parts:
  - manual de-suckering to manage population density and fruit size and quality;
  - de-leafing of older, lower leaves to particularly reduce the inoculum threshold of foliar pathogens;
  - propping of plants to protect against wind damage;
  - bell injection to control thrips,
  - fruit bagging to control pests and diseases;
  - de-flowering to minimise marking of fruit by hard dried floral remnants;
  - pesticide sprays of plantations to control foliar diseases, particularly black Sigatoka;
  - fruit dusting or sprays to control pests and diseases;
  - pest and disease monitoring at weekly intervals; and
  - eradication of Moko and banana bunchy top virus infected plants, if these diseases are detected.

• Farm workers routinely disinfect cutting, pruning and injecting tools by dipping these in formalin solution to prevent spread of Moko. A dye, crystal violet is
added to the solution to check that the workers are regularly disinfecting the tools.

- In some plantations, pseudostem de-sheathing is conducted to control mealybugs and scale insects.

- In commercial plantations, with the exception of organic banana plantations, pesticide sprays are applied to control banana pests and diseases, usually including aerial sprays. Ground sprays are used on some farms to address the sensitivity of local environmental concerns. Banana bunches are also treated 2-3 times with pesticides.

- Thrips, Moko and black Sigatoka are among the most important pests and diseases that require the bulk of the pest and disease control measures used on banana plantations.

- Early detection and destruction of infected plants can contain Moko but its control is variable depending on the plantation operations. In an annual plantation of 250 ha, two plants infected with Moko were found more than a year ago. By contrast a 150 ha perennial plantation had experienced 15 cases of Moko last year.

- Moko sites are treated in at least three different ways:
  - removal of infected plants and other plants within about 5 m buffer and on-site slow burning by adding rice husks as the fuel for fire;
  - removal of infected plants and other plants within a buffer area, treatment of infected sites with formaldehyde; or
  - removal of infected plants and other plants in a buffer area and treatment with a soil fumigant, Basamid (active ingredient, dazomet).

- The size of the buffer area surrounding the Moko infected plants is variable in different plantations.

- In all Moko cases, the infested sites including the buffer area are cordoned off as a measure to prevent spread of the disease with movement of soil on farm workers shoes, etc. The time of fallowing, before replanting on infected sites, depends on the treatment and farm practices. Some farms fallow for up to one year. We were told that it was safe to replant after 45 days of treatment by rice husk burning or Basamid treatment.

- All commercial plantations take precautions to prevent transmission of Moko by disinfecting pruning and injecting tools before and after use. A dye is added to the disinfectant to monitor that the workers are routinely disinfecting these tools.

- The TWG Chairs were advised of some incidences where disgruntled workers had attempted to sabotage plantations by introducing Moko but such situations were addressed by early detection through regular surveys and eradication.
action. Moko is easily detectable on young suckers and such suckers are destroyed immediately after detection during regular surveys.

- The frequency of pesticide sprays of commercial plantations against leaf diseases, primarily black Sigatoka, varies from plantation to plantation but perennial crops are generally sprayed at weekly to 10-day intervals.

- Some companies have adopted annual cropping as a cultural control measure to reduce pesticide usage. The use of pesticide sprays is reduced by 35 to 40 percent in annual crops derived from tissue cultured plantlets. We were advised that a private company is growing organic bananas in an annual plantation with zero pesticide sprays but additional cultural practices, including severe de-leafing, are required to control black Sigatoka.

- The incidence of black Sigatoka was variable depending on the control measures and climatic conditions. In some plantations black Sigatoka was not apparent; some plantations were lightly infected; and in one plantation the disease severity and incidence was very high on lower leaves.

- Freckle was observed in one of the commercial plantations of Cavendish (cultivars, Tall Williams and Grand Nain) and was much less damaging as compared with black Sigatoka that was also prevalent in the same plantation. The TWG Chairs did not find freckle symptoms on banana fruit in this or any other commercial plantations. They were advised by the Philippine experts that fungicides sprays used for black Sigatoka control are also effective against freckle and no additional measures are required for freckle control. The TWG Chairs were also advised that freckle can infect fruit in poorly managed plantations but a zero tolerance applies to freckle on export fruit.

- Freckle is the most prevalent disease in backyard bananas (local cultivars) and is frequently accompanied by the black cross disease.

- In some plantations, banana bunches are treated to control pitmark (*Pyricularia grisea*) and diamond spot (*Cercospora hayi*).

- Banana bunchy top is present in commercial plantations but its incidence is kept at very low levels by regular destruction of infected plants, if detected in routine surveys.

- The Philippine industry representatives advised the TWG Chairs that all commercial plantations were free from banana bract mosaic and banana mosaic virus. This issue requires further clarification.

**Visits to packhouses**

- The TWG Chairs also observed packhouse operations in Davao, Bukidnon and Cotabato (Attachment 1), including procedures used to ensure high quality of fruit and freedom from pests, diseases, contaminants and hitchhikers.
Fruit is inspected on arrival by a quarantine inspector and the packhouse employees for the presence of insect pests and diseases.
- Fruit bunches are washed and de-handed.
- The hands are placed in clean water baths.
- Packhouse workers throughout the packing chain remove poor quality fruit.
- Banana hands are dipped in chlorine and alum bath.
- A quarantine inspector and the packhouse employees inspect hands again.
- Hands are placed in cardboard cartons; padding material, thin polystyrene foam sheets, is inserted between fruit layers to provide protection against fruit damage during long voyages to export destinations.
- Fruit for some markets are vacuum packed; all fruit in a carton is placed in a polythene bag, the air is evacuated and the bag is closed. We were advised that the procedure reduces the risk of fruit spoilage by microbial contaminants. The likelihood of contamination by hitchhikers would also be extremely low in fruit packed in this manner.
- Packhouses keep very good records and can trace back any non-compliance to the packhouse line, packer and plantation.
- Packhouse workers and quarantine inspectors are trained for their respective jobs and they were diligently performing their duties.

- The TWG Chairs also observed the operations of a mobile packhouse unit being used for packing fruit in the field. This method of packing is used to prevent bruising of very high quality fruit intended for export to the Japanese market. Fruit is harvested, dehanded, manually carried to the mobile packhouse, washed, inspected, treated and packed in cartons.

Visit to a wharf

- The TWG Chairs observed the pre-export random inspections by quarantine staff for pests and diseases and fruit maturity, that was being assessed by using callipers.

- They also observed fruit loading operations.

- A private sector expert told us that ship’s hold is ozonised. He said this process is highly effective in killing microorganisms, and hence prolonging the shelf life of the fruit. We asked if data were available on the efficacy of this treatment in killing banana pathogens such as black Sigatoka and freckle. He said he was not aware of such data.

Technical discussions

- The TWG Chairs conducted discussions with Philippines private sector and public sector experts. In the Philippines, most of the applied research work on Cavendish bananas is conducted by the private sector, which has employed qualified scientific and technical experts and established research facilities for, among other things, monitoring of pesticide resistance and pesticide residues and testing of efficacy of pesticides. The public scientists conduct academic
and practical research and have developed expertise in banana diseases such as banana bract mosaic, banana bunchy top virus, bugtok and Panama disease.

- The private sector may not provide commercial-in-confidence information.

- TWG Chairs advised the Philippines officials and experts that if any relevant information is not made available to the RAP then such information could not be considered in the preparation of the IRA documents and the RAP will adopt a conservative approach.

**Moko and bugtok**

- There appear to be two schools of thought on the causal agent of Moko and bugtok.

  - The older school of thought believes that Moko and bugtok are caused by different strains of the bacterium, *Ralstonia solanacearum* because Moko is found on Cavendish banana and is not insect-transmitted while bugtok is found on local cultivars and is insect-transmitted. The TWG Chairs were advised that there is no evidence of insect-transmission of bugtok from backyard plants of local cultivars to commercial plantations of Cavendish bananas.

  - The second school of thought is saying that Moko and bugtok are caused by the one and the same strain of *R. solanacearum* because the isolates of bugtok and Moko are almost identical based on DNA analysis. Limited cross inoculation experiments have indicated that bugtok isolates infect young tissue cultured plantlets of Cavendish bananas. This issue needs clarification and the Philippines agreed to provide further information.

- The Philippine scientists advised the TWG Chairs that strain B of the Moko bacterium is recorded in the Philippines. The insect-transmitted, SFR strain has not been recorded in the Philippines (SFR stands for small, fluidal, round colonies in culture). They agreed to provide results of DNA tests on the Philippines isolates.

**Banana bract mosaic virus**

- Philippines experts advised us that banana bract mosaic is currently not found in any commercial plantations.

- They also advised us that the likelihood of the virus occurring in banana fruit is unknown but fruit symptoms have only rarely been found on heavily infected plants.

- They said the possibility of transmission of banana bract mosaic virus from fruit to plants is not an issue because the aphid vectors do not feed on banana fruit.
Fruit flies

- BPI advised us that Dr Dick Drew, an Australian expert has studied the fruit flies in the Philippines, and the papaya fruit fly (*Bactrocera papayae*) does not occur in the Philippines. Mr Bob Paton was to discuss this issue with Dr Drew. BPI advised that *Bactrocera philippinensis* is the concern for ripe banana fruit. Mr Paton indicated that *Bactrocera occipitalis* is also present in the Philippines and would require further consideration.

Scales, mealybugs, whiteflies and mites

- The Philippines experts advised us that these pests are not a problem for banana production but they are quarantine pests for some importing countries.

Seed in Cavendish bananas

- The Philippines experts said seed is not found in Cavendish bananas. They said that artificial crosses of the Cavendish bananas with other types of bananas would have been developed using embryo rescue technique. It was agreed that we need to look at the work of the late Dr Phil Rowe to clarify this issue.
# ATTACHMENT 1

## Schedule of visit to the Philippines

<table>
<thead>
<tr>
<th>Date</th>
<th>Location</th>
<th>Activities</th>
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<tbody>
<tr>
<td>Saturday</td>
<td>Travel to Manila</td>
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<td>Sunday</td>
<td>TWG Chairs reviewed stakeholder comments on the Issues Paper and prepared for meetings on 6 August.</td>
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<tr>
<td>Monday</td>
<td>Manila</td>
<td>Met with Ms Karen Gilmour from the Australian Embassy in Manila.</td>
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<td>Participated in the entry meeting with the Bureau of Plant Industry and Philippine industry representatives. Secretary Montemayor delivered the welcome address and opened the discussions.</td>
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<td>Met with the Philippine researchers and pest management specialists (e.g., horticulturists, entomologists, and pathologists with federal/state agencies, universities, private companies) to discuss banana pests and diseases, and to gather published and unpublished information on their biology, ecology, and likelihood of transport and establishment in Australia. Discussed 43 questions and many supplementary questions (Attachment 3).</td>
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<td>Discussed Philippines’ technical market access submission with BPI officials and Philippine industry representatives; clarified the scope of the IRA; and identified further information requirements.</td>
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<td>Philippine participants: Director Blo Umpar Adiong (BPI), Ms Estrella D. Tuazon (BPI), Mr Larry Lacson (BPI); Dr Rene Espino (Department of Agriculture); Dr Edwin Raros (Dole), Mr J.P. Silva (Marsman Drysdale Agribusiness Group).</td>
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<td>Tuesday</td>
<td>Davao</td>
<td>Observed tissue culturing laboratory procedures and a tissue culture nursery. Discussed the role of tissue culture and other techniques in the management of banana pests and diseases.</td>
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<td>Observed two banana plantations and fruit handling procedures, including rail system for transport of fruit from the field to the packhouse, fruit inspections, dehanding, washing, treatment, packing and trace-back systems. The first plantation was very large, approximately 5000-6000 ha, and the second was a small operation of 150 ha.</td>
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<td>Discussed pest and disease monitoring and management measures used in banana plantations.</td>
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<td>Observed operations at a wharf for fruit inspection and loading.</td>
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Observed quarantine inspection procedures at a packhouse and the wharf.

Met with BPI and stakeholders and discussed impressions of visits to plantations, tissue culture laboratory, nursery and the wharf.

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<tr>
<th>Wednesday (8 Aug 2001)</th>
<th>Comval/Davao</th>
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<tr>
<td>Aerial view of banana plantations visited on 7 August, including Moko eradication sites.</td>
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<td>Observed two large banana plantations, several hundred hectares each and two packhouses.</td>
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<tr>
<td>Discussed pest and disease management measures used in banana plantations.</td>
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<tr>
<td>Observed a simulation of Moko eradication.</td>
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<tr>
<td>Observed fruit handling procedures, including overhead butcher's rail system for transport of fruit from the field to the packhouse, fruit inspections, dehanding, washing, treatment, packing and trace-back systems.</td>
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<tr>
<td>Observed quarantine inspection procedures.</td>
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<td>Observed plants of local banana varieties in backyard situations with symptoms of freckle and black cross diseases.</td>
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<tr>
<td>Observed entomology and plant pathology laboratory procedures and discussed work on pesticide testing and black Sigatoka resistance monitoring.</td>
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<tr>
<td>Met with BPI and stakeholders and discussed impressions of visits to plantations, packhouses, backyard plants and laboratories.</td>
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<tr>
<th>Thursday (9 Aug 2001)</th>
<th>Bukidnon</th>
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<td>Observed annual banana cropping practices and fruit handling procedures, including a mobile packhouse.</td>
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<td>Discussed the advantages of annual cropping over conventional plantations, particularly differences in pest and disease prevalence and management measures.</td>
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<td>Discussed pest and disease management measures used in banana plantations and environmental and Occupational Health &amp; Safety issues.</td>
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<tr>
<td>Visited the BPI pesticide residue laboratory and held technical discussions with BPI and industry experts concerning banana bract mosaic, Moko and Panama disease.</td>
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<td>Met with BPI and stakeholders and discussed impressions of visits to the</td>
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**ATTACHMENT 2**

### Key participants in the TWG Chairs’ visit to the Philippines

<table>
<thead>
<tr>
<th>Name</th>
<th>Position/Title</th>
<th>Organization/University</th>
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<tbody>
<tr>
<td>Mr Leonardo Q Montemayor</td>
<td>Secretary</td>
<td>Department of Agriculture</td>
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<tr>
<td>Ms Estrella D. Tuason</td>
<td>Chief, Plant Quarantine Service</td>
<td>Department of Agriculture</td>
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<tr>
<td>Dr Dario C. Sabularse</td>
<td>Fertilizer and Pesticide Authority</td>
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<tr>
<td>Dr Avelino D. Raymundo</td>
<td>Plant Pathology</td>
<td>University of Philippines Los Banos</td>
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<tr>
<td>Dr Naceo B. Bajet</td>
<td>University of Philippines Los Banos</td>
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<tr>
<td>Dr Ireneo L. Lit, Jr.</td>
<td>Museum of Natural History</td>
<td>University of Philippines Los Banos</td>
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<tr>
<td>Dr Edwin S. Raros</td>
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<tr>
<td>Mr Wencesesia P. Abilay</td>
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<tr>
<td>Mr Estrellita S. Aldaba</td>
<td>Superintendent</td>
<td>Stanfilco’s Musatech Tissue Culture Lab.</td>
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<tr>
<td>Mr Marlo Y. Tabbu</td>
<td>Zone Manager</td>
<td>Stafilco’s Skyland Zone</td>
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<tr>
<td>Mr Alejandro R. Munez</td>
<td>Assistant Scientist</td>
<td>Stafilco’s Skyland Zone</td>
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<tr>
<td>Mr Blo Umpar Adiong</td>
<td>Director IV-CESO II</td>
<td>Bureau of Plant Industry</td>
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<tr>
<td>Mr Larry Lacson</td>
<td>Plant Quarantine Service</td>
<td>Department of Agriculture</td>
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<tr>
<td>Dr Rene Espino</td>
<td>High Value Commercial Crops Program</td>
<td>Department of Agriculture</td>
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<tr>
<td>Dr Asuncion K. Raymundo</td>
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<tr>
<td>Dr Bonificio F. Cayabyab</td>
<td>University of Philippines Los Banos</td>
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<tr>
<td>Dr Juliana S. Samuel</td>
<td>Department of Agronomy</td>
<td>University of Philippines Los Banos</td>
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<tr>
<td>Mr Carlos Mandujano</td>
<td>Director</td>
<td>Dole Asia, Ltd.</td>
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<tr>
<td>Mr Sai Leng</td>
<td>Senior Scientist</td>
<td>Stanfilco’s Musatech Tissue Culture Lab.</td>
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<tr>
<td>Mr Gener Hudieres</td>
<td>Nursery Superintendent</td>
<td>Stanfilco’s Musatech Tissue Culture Lab.</td>
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<tr>
<td>Mr Allan Montenegro</td>
<td>Pest and Disease Supervisor</td>
<td>Stafilco’s Skyland Zone</td>
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<td>Mr Monchito V. Adecer</td>
<td>Environmental Concerns Supervisor</td>
<td>Stafilco’s Skyland Zone</td>
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<tr>
<td>Name</td>
<td>Position/Role</td>
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<tr>
<td>Mr Albert Z. Angela</td>
<td>Engineering Superintendent</td>
<td>Stafilco’s Skyland Zone</td>
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<tr>
<td>Mr Rey L. Casino</td>
<td>Packing Supervisor</td>
<td>Stafilco’s Skyland Zone</td>
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<tr>
<td>Dr Vivencio L. Quiñoñon</td>
<td>Vice-President</td>
<td>Tadeco Tagum Agricultural Development Co., Inc.</td>
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<tr>
<td>Mr Rodolfo A. Paningbantan</td>
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<td>Del Monte Fresh Produce (Philippines) Inc.</td>
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<tr>
<td>Mr Jose Lopez</td>
<td>Senior Director</td>
<td>Del Monte Fresh Produce (Philippines) Inc.</td>
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<tr>
<td>Mr Federico Odio</td>
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<td>Dr Hialrio Justo, Jr.</td>
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<tr>
<td>Mr Rodney del Rosario</td>
<td>Group Manager</td>
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<tr>
<td>Dr Nicolas M. Dawi</td>
<td>Research Manager for Crop Protection</td>
<td>Lapinday Agricultural and Development Corporation (LADECO)</td>
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<td>Ms Maria Emilia Fabregar</td>
<td>Group Manager</td>
<td>Lapinday Foods</td>
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<tr>
<td>Mr Francisco Lorenzo</td>
<td>SVP &amp; General Manager</td>
<td>Lapanday Foods</td>
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<tr>
<td>Mr J.A. Cruz</td>
<td>Group Manager for GFC</td>
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<tr>
<td>Mr A.P. Lazar</td>
<td>Production Manager for EPO</td>
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<tr>
<td>Mr Edin T. Fabregar, Jr.</td>
<td>Senior Group Manager</td>
<td>Lapinday Plantation Agricultural Operations Segment</td>
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<tr>
<td>Mr Macla</td>
<td>Grower</td>
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<tr>
<td>Mr Minolito F. Mendez</td>
<td>Group Manager</td>
<td>Malalag Tortuga Group</td>
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<tr>
<td>Mr Leopoldo C. Enson</td>
<td>Plantation Manager</td>
<td>Tortuga Valley Plantations Inc.</td>
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<tr>
<td>Mr M.E. Butron</td>
<td>Assistant Manager</td>
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<tr>
<td>Mr G.N. Patajo</td>
<td>Assistant Manager</td>
<td>GFC-Tampakan</td>
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<tr>
<td>Mr D. Parcasio</td>
<td>Packinghouse Supervisor</td>
<td>GFC-Tampakan</td>
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<td>Mr Sito Lorenzo</td>
<td>Production Manager for EPO</td>
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<tr>
<td>Mr Joselito P. Silva</td>
<td>Production and Research Consultant</td>
<td>Marsman-Drysdale Agribusiness Group</td>
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<tr>
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<tr>
<td>Mr Robert S. Sebastian</td>
<td>President and Chief Executive Officer Marsman-Drysdale Agribusiness Group (Former Secretary of Agriculture)</td>
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<tr>
<td>Mr Nilo F. Rosario</td>
<td>Plantation Director Marsman-Drysdale Agribusiness Group Nova Vists Management &amp; Dev’t Corp. and MD Isalon Organic Banana Agri-Ventures, Inc.</td>
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<tr>
<td>Mr Carlos Z. Fajardo</td>
<td>Overall Banana Operation Director Marsman-Drysdale Agribusiness Group</td>
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<tr>
<td>Mr Senen Navera</td>
<td>Head Davao Plant Quarantine Station Bureau of Plant Industry</td>
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<tr>
<td>Mr Rodolfo G. Atabug</td>
<td>Research &amp; Development Manger Tristar Group of Banana Companies</td>
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<tr>
<td>Ms Evelyn Fanlo</td>
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<tr>
<td>Ms Karen Gilmour</td>
<td>Department of Foreign Affairs and Trade Australian Embassy in Manila</td>
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<tr>
<td>Mr David Peasley</td>
<td>Chair Horticulture, Environment and Operations Technical Working Group</td>
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<td>Mr Bob Paton</td>
<td>Chair Arthropods Technical Working Group</td>
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<tr>
<td>Dr Sharan Singh</td>
<td>Chair Pathogens Technical Working Group</td>
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Participated in the activity number given below:

1. Entry meeting in Manila on 6 August
2. Discussions in Manila on 6 August
3. Visit to Stanfilco’s Musatech Tissue Culture Lab, 7 August
4. Visit to Tadeco Plantation and packhouse, 7 August
5. Visit to a wharf, Tadeco Pier, 7 August
6. Visit to Macla Farm, 7 August
7. Wrap-up meeting, 7 August
8. Visit to Tortuga Valley Plantations and packhouse, 8 August
9. Visit to Nova Vista plantation and packhouse, 8 August
10. Visit to Delmonte laboratories, Davao, 8 August
11. Wrap-up meeting, Davao, 8 August
12. Visit to Stanfilco’s Skyland Zone plantation, Bukidnon, 9 August
13. Discussions at the BPI Pesticide Analytical Laboratory, Davao 9 August
14. Wrap-up meeting, Davao, 9 August
15. Visit to Tampakan plantation and packhouse, South Cotabato, 10 August
16. Wrap-up meeting, Davao, 10 August
17. Broader stakeholder meeting, Davao, 10 August
18. Dinner function, Davao
19. Meeting on bugtok and Moko, Manila, 11 August
ATTACHMENT 3

List of Questions*

1. What is the banana industry structure in the Philippines, including statistics concerning geographic distribution, production area, production, yield, marketing and export trade?

2. What are the major research organisations and the names of key scientists working on bananas in the Philippines, particularly the Mindanao Province?

3. What are the commonly used horticultural practices and procedures for banana production in the Philippines?

4. What are the cultural methods of managing pests, diseases and weeds of banana in the Philippines?

5. Is "area freedom" used as a management measure in the Philippines for banana pests, diseases and weeds?

6. What is the prevalence and distribution of pests, diseases and hitchhikers likely to occur on bananas?

7. What is the infrastructure in the Philippines for pest surveillance, monitoring, recording and reporting of banana pests, diseases and weeds, including the expertise of personnel conducting these activities?

8. What are the pesticide schedules used in the Philippines for managing arthropod pests, diseases, weeds and other pests?

9. Is "pesticide resistance" a problem in the Philippines and, if so, what measures are used to minimise the development of pesticide resistant strains of banana pests, diseases and weeds.

10. What is the procedure for registering pesticides in the Philippines?

11. What regulations exist to govern use of registered pesticides in the Philippines and how are these enforced?

12. What are the post-harvest chemical treatments used on banana fruit in the Philippines?

13. Are pesticide residues a concern and, if so, what are these pesticides and what measures are used by the Philippines and importing countries to monitor pesticide residues in or on export bananas?

14. How much biological and pest management information is available for banana pests, diseases and weeds in the Philippines?

15. What are the main sources of scientific and technical information on Philippines'
banana pests, diseases and weeds and their management?

16. Has Philippines prepared data sheets on pests, diseases and weeds of bananas in 
    the Philippines, including Moko, bugtok, freckle, black Sigatoka, banana bract 
    mosaic, Panama disease, fruit flies, scale insects, mealybugs and white flies, and 
    vector/pathogen relationships?

17. Can banana fruit act as a source inoculum of banana bract mosaic virus and, if so, 
    can vectors acquire the virus from the fruit and transmit to banana plants?

18. What role does banana fruit play in spreading Moko disease in the Philippines?

19. How many strains of the Moko bacterium occur in the Philippines?

20. How long can the Moko bacterium survive in soil?

21. What are vectors of the Moko bacterium in the Philippines and what is their role 
    in spreading Moko?

22. What are the alternative hosts of the Moko bacterium in the Philippines?

23. Can Bugtok bacteria infect Cavendish bananas, if so, what is the prevalence and 
    distribution of this disease and how is this disease managed in the Philippines?

24. Are banana floral remnants infected/infested with Moko and bugtok bacteria and, 
    if so, how long can these bacteria survive in floral remnants?

25. Which species of fruit flies are known to infest bananas in the Philippines?

26. At what stage do bananas become susceptible to these fruit flies?

27. Are these fruit flies able to lay eggs in hard green bananas?

28. What procedures are used, and how effective they are, in ensuring that packed 
    bananas are free from materials such as leaf trash and contaminated soil, which 
    may act as a source of inoculum for plant diseases (e.g. black Sigatoka, Panama ) 
    and other pests?

29. What are the Philippines quarantine conditions for movement within the country 
    of banana plants, fruit, used farm machinery and containers to exclude pests and 
    diseases?

30. Does the Philippines government and/or industry require certification and 
    registration of banana plantations and, if so, what measure are required for these 
    purposes?

31. Are the Philippines banana growers/plantation managers required to keep records 
    of pest and disease occurrences and pesticide applications?

32. Are there any environmental concerns in the Philippines associated with the
production and consumption of bananas and, if so, what measures are used to address such concerns?

33. Does the Philippines government and/or industry has an environmental policy for addressing environmental concerns with banana production?

34. Is information available on the occurrence in Philippines of hitchhikers (snails, frogs, snakes, geckos, rodents, spiders, ticks etc) in packed bananas and associated with packing cartons and shipping containers, etc?

35. What is the prevalence and distribution of feral and native banana plants in the Philippines?

36. Is true viable seed found in the banana varieties nominated for export to Australia, particularly when commercial plantations are in the vicinity of pollen source from wild seeded species?

37. Does Philippines import bananas and, if so, what are Philippines' import conditions for bananas?

38. What are the other importing countries' requirements/protocols for the importation of Philippines bananas to address their quarantine concerns?

39. What have been importing countries' quarantine concerns with banana imported from the Philippines?

40. How is the Philippines meeting importing countries quarantine requirements?

41. Does the Philippines maintain records of interceptions and non-compliance reports by importing counties? If so, is the list of interceptions available?

42. Does the Philippines' government operate any pre-clearance arrangements for bananas or other commodities to meet other countries import requirements?

43. What quality assurance systems are used in the Philippines for banana fruit, including harvesting, cleaning, treatment, sorting, packaging, storage, transport, identity preservation and trace-back of produce to the farm?

44. What is the efficacy of post-harvest banana fruit surface disinfestation treatment (chlorine plus alum) in killing surface-borne inoculum of the black Sigatoka and freckle fungi and the Moko bacterium?

45. Would ozone treatment of fruit during transit kill surface-borne inoculum of banana pathogens? If so, what are the treatment details and how much efficacy data are available?

46. Is the Panama disease found on Cavendish banana plants in the Philippines?

47. Is the Panama disease fungus found on the crowns of banana hands and fingers?
48. How many races and vegetative compatibility groups of the Panama disease fungus occur in the Philippines?

49. Is race 4 or tropical race 4 of Panama disease fungus found in the Philippines?

50. Is freckle found on Cavendish banana plants and fruit?

51. What is the prevalence of freckle in banana plantations?

52. Is freckle a more important disease than black Sigatoka on Cavendish?

53. What are the chemicals and pesticide spray schedules required for the control of freckle?

54. Are the chemicals and pesticide spray schedule used for the control of black Sigatoka effective against freckle?

55. Does freckle require any ground sprays in addition to aerial sprays?

56. How many strains of freckle have been recorded in the Philippines?

57. How do the Philippines strains of freckle compare with strains in other parts of the world particularly in terms of their pathogenicity on various banana genotypes?

58. What is the latency of freckle in banana fruit?

59. What are the Occupational Health and Safety measures used by banana industry?

60. Are there any human or animal health issues associated with the production and consumption of Philippines bananas?

61. What are the quality defects found in Philippines bananas, particularly those that could be confused with pest and disease symptoms?

62. What pests, diseases and hitchhikers have been intercepted by the Philippines authorities during pre-export inspections of bananas?

63. Does Philippines grow any genetically engineered bananas?

64. What are the methods used in the Philippines for the identification of banana cultivars?

65. Is breeding of bananas for pest and disease resistance conducted in the Philippines and, if so, how successfully?

66. What are the current geographic boundaries of the proposed export areas and when were the former Davao, Cotabato and Bukidnon subdivided?

67. What is the current usage of calixin in banana plantations and has any black Sigatoka resistance been detected to this fungicide?
68. What is the prevalence and distribution of Moko in Mindanao?

69. Has Moko been identified in other islands and provinces of the Philippines?

70. What are the costs of the Moko eradication program in Mindanao?

71. What is the prevalence and distribution of Bugtok on cooking bananas throughout the Philippines and specifically in Mindanao province?

72. Is Bugtok endemic throughout Cavendish banana production areas in Mindanao?

73. Have any of the insect vectors of Bugtok and Moko disease been identified? Is there any current work in progress on insect transmission of Moko and bugtok diseases in the Philippines?

74. Has Moko or bugtok infection in Cavendish banana been observed in Mindanao? If so, is this the result of insect transmission or systemic infection?

75. What is the explanation for occurrence of random pattern of outbreak sites of Moko in commercial plantations? Is this due to insect-transmission at very low rates or something else?

76. What methods are used to identify virus infections in field plants in the plantations?

77. Do you have protocols that define "hard green" fruit maturity standard and how does the industry ensure that only mature bananas in the "hard green" condition are packed for export?

78. What is the status in the Philippines of the following organisms that have been recorded to occur in the Philippines according to the CABI Global Crop Protection Compendium but were not included in the pest lists in the Issues Paper?

- **Aspergillus niger**
  - collar rot

- **Botryodiplodia theobromae**
  - finger rot

- **Ceratocystis paradoxa**
  - (Chalara paradoxa)
  - corm rot; black end; fingertip rot

- **Cochliobolus lunatus**
  - mould

- Cucumber mosaic virus
  - banana mosaic

- **Guignardia musicola**
  - freckle

- **Helicotylenchus multisectus**
  - banana spiral nematode
79. What is the status of *Fusarium pallidoroseum* in the Philippines?

80. How many sooty moulds and post-harvest rot organisms are recorded on banana plants and bananas (please provide a comprehensive list)?

*Some supplementary questions are somewhat repetitious. Further questions may be added to the list following comments from the TWG/RAP members.*