Regional Asian Training Workshop on The establishment of Pest Free Status

Abel Ximenes
Adalgisa Guterres
National Directorate of Quarantine and Biosecurity Timor leste

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Jakarta - Indonesia

ORGANIZATION OF NPPO TIMOR-LESTE

- **Plant Protection Department** under the National Directorate of Agriculture and Horticulture (PPD-NDAH)

  Current: Mr. Americo Alves Brito, as Chief of Plant Protection as well as IPPC Contact Point

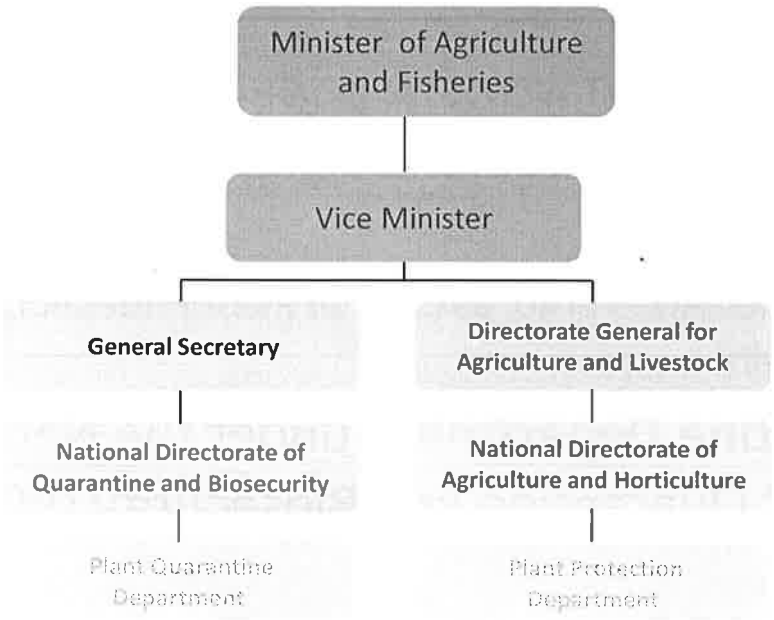
- **Plant Quarantine Department** under the National Directorate of Quarantine and Biosecurity (PQD-NDQB)

  Current: Mr. Valente Quintao, as Director of NDQB as well as IPP Editor

Organization NPPO of Timor-Leste Cont....

- PPD-NDAH has the role to run the activities of controlling pests and diseases by applying the Integrated Methods of Pest Management (IPM) and Pesticide Management (PM) in the country.
- PQD-NDQB for the implementation of WTO-SPS Agreement to conduct supervision on Phytosanitary Measures **sanitary control on imports and exportation** of plant products, merchandise, goods or objects, as well as health checks for vehicles, ships and aircraft through **plant quarantine measures** for Inspection, Isolation, Observation, Treatment, Detention, Refusal for entry into the Country, Destruction and Release
-

NATIONAL PLANT PROTECTION ORGANIZATION (NPPO)



Timor-Leste Decree Law and Regulations on Quarantine

1. Decree-Law No. 21/2003 regarding Quarantine and Sanitary Control on Imported and Exported Goods
2. Governmental Decree- Law No. 1/2006 regarding General Quarantine Regulations
3. Decree-Law No. 5/2014, "**Structure of Ministry of Agriculture and Fisheries "(Article 14 National Directorate of Quarantine and Biosecurity**).

Phytosanitary Matters (Plant Quarantine)....cont

Plant quarantine activities and sanitary control of imported agricultural products, currently are ;

1) measures of inspection,
2) detention,
3) refusal for entry into the country,
4) destruction and
5) release,

- while measures to isolation, observation and treatment towards agricultural imported goods haven't implemented yet

Phytosanitary Matters (Plant Quarantine)....cont

- The government has an effort to allocate such amount of budget in 2016 in order to provide infrastructure facilities (laboratory, equipment and material), and specific regulations regarding quarantine and bio-security to carry out the issuance of Phytosanitary Certificate in accordance with the ISPM 12.

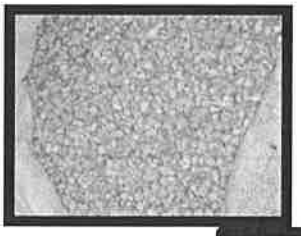
Timor-Leste Quarantine Inspection Services

The Goal of Quarantine Inspection Services

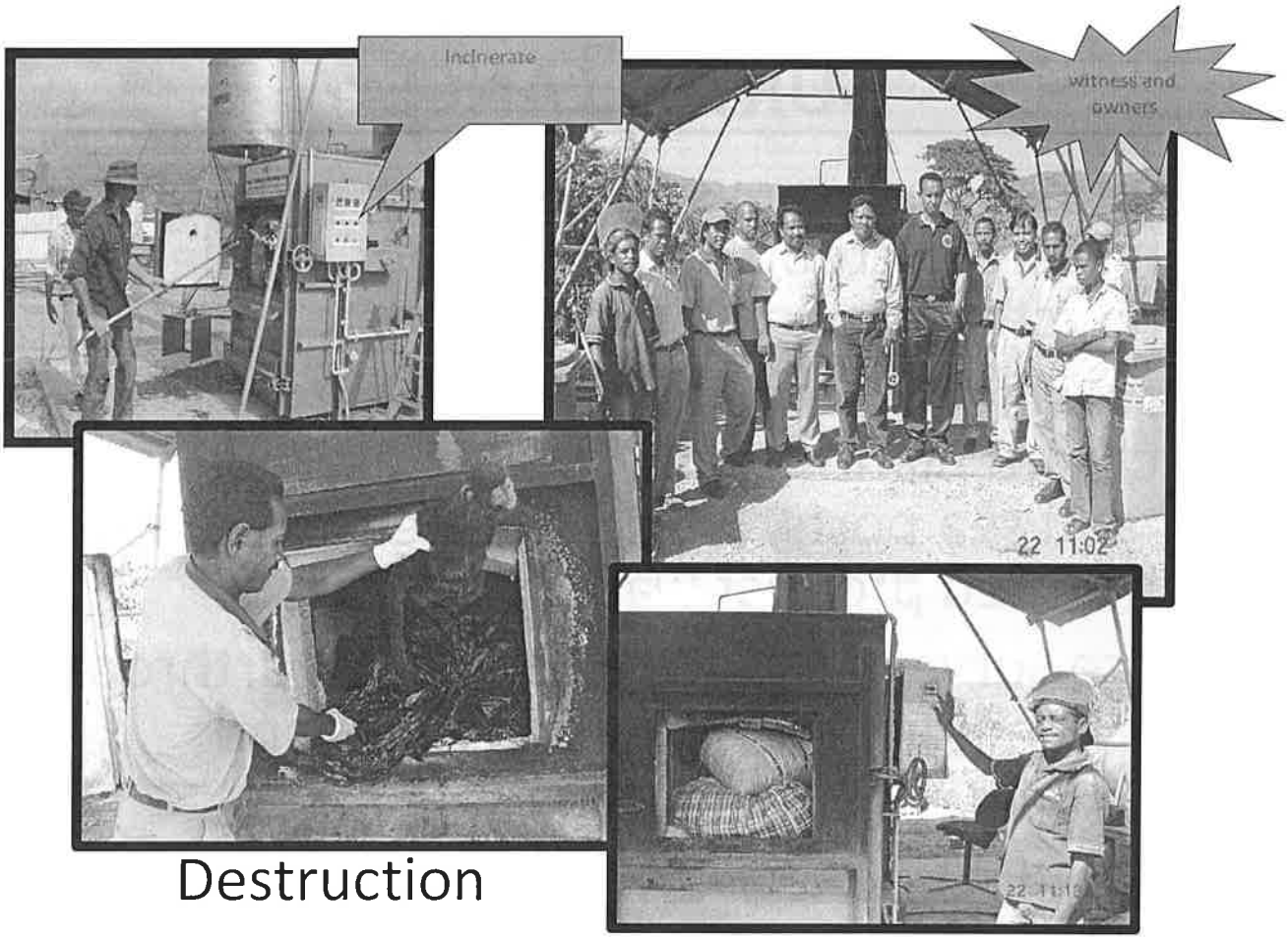
- To protect country from entry of exotic pest and disease through control of importation of agriculture commodities and to provide good quality of agriculture production for export based on country recipient requirement conditions and
- To Increase Country income or economy through development agro-industry program.

Inspection

check document
(phytosanitary)

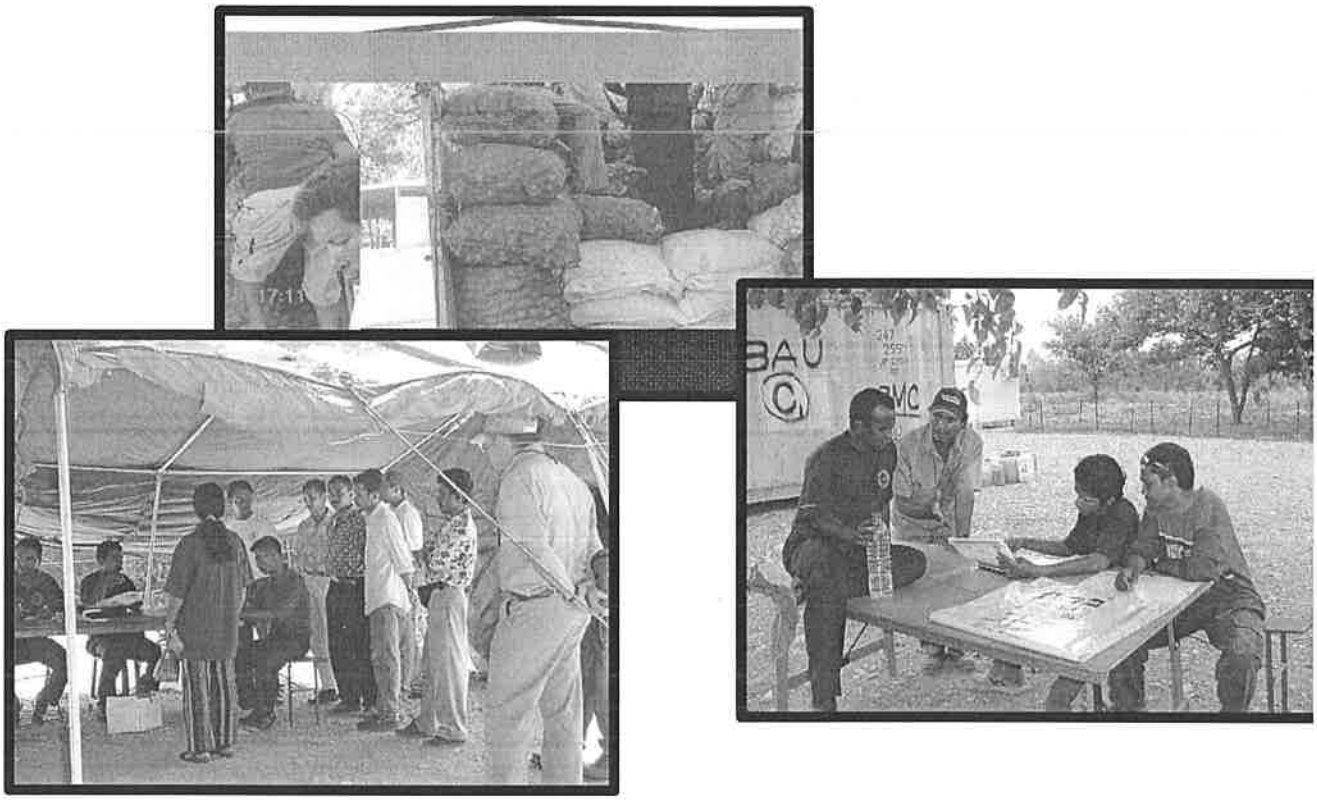


Analisa Lab.



Destruction

Cont.... Border Operations :



SURVEILLANCE

- Plant health surveys targeting a range of commercial crop and other plant species are conducted annually in Timor-Leste.
- Surveillance is concentrated on farms, backyard plantings, forestry plots, nurseries, air and sea ports, land border entry points and stored product warehouses.
- These surveys aim to document all arthropod pests and diseases infesting crops and associated weed flora.

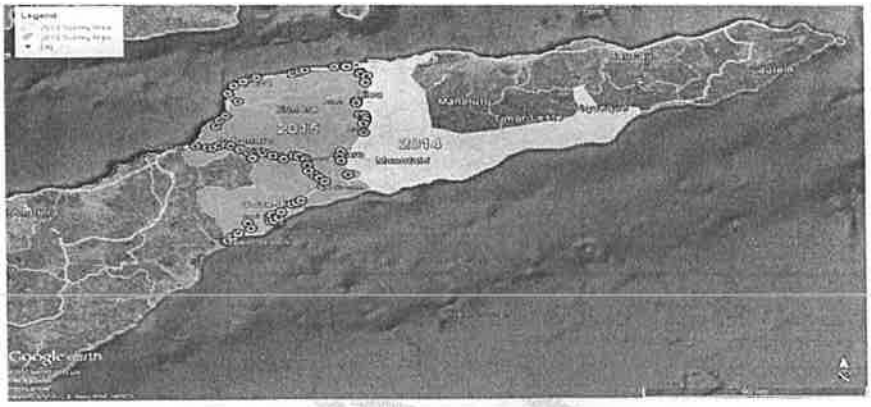
Surveillance...cont

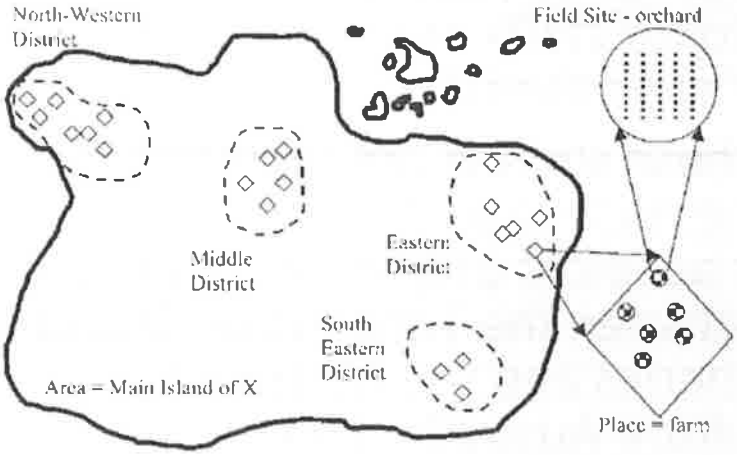
- Preliminary identification of specimens is conducted in the plant quarantine laboratory in Timor-Leste. However, specimens are **sent to Northern Australia Quarantine Strategy - Department of Agriculture** (NAQS-DoA) Australia which will coordinate forwarding of specimens **to specialists (This done due to limited capacity of staffs and facilities to identify the regarded specimens)**
- The vast majority of these surveys are undertaken **jointly** with staff of the Australian Department of Agriculture under the auspices of a **Memorandum of Understand** (MoU) between the Timor-Leste Ministry of Agriculture and Fisheries and the Australian Department of Agriculture Australia, 2005.

Surveillance...cont

- Annual plant health surveys are designed to target production areas of crops that are exported in order to **produce specimen-based pest lists to facilitate the export trade in these products.** These surveys also target to those areas that receive imported commodities that pose a biosecurity risk

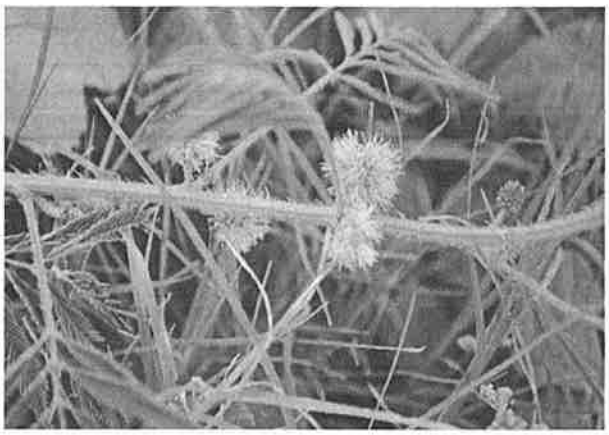
Map displaying survey area





Diagrammatic map illustrating the concepts of area, district, place and field site.

Identifying the 'district(s)'



We look for

Unusual weeds

Symptoms of disease

Insect damage

Survey places

To detect incursions in:

- Border crossings
- Rubbish dump
- Ports




To create a pest list from:

- Farms
- Backyard gardens
- roadsides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Field activities

P Plant pathology:

- Investigate symptoms and collect sample diseased plant parts


- trunk sampling
- Identifications

B Botany:

- Pressing and drying plant specimens
- Recording the distribution of weeds

Field Activities - Entomology

- inspection and direct collection

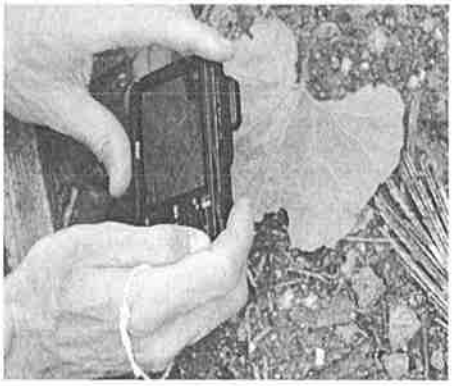
- Sweep net

- Beating

- Trapping

Data collection

- Electronic data capture
- Written notes
- Photography



Specimen processing

- Drying
- Culturing
- Rearing

Field lab

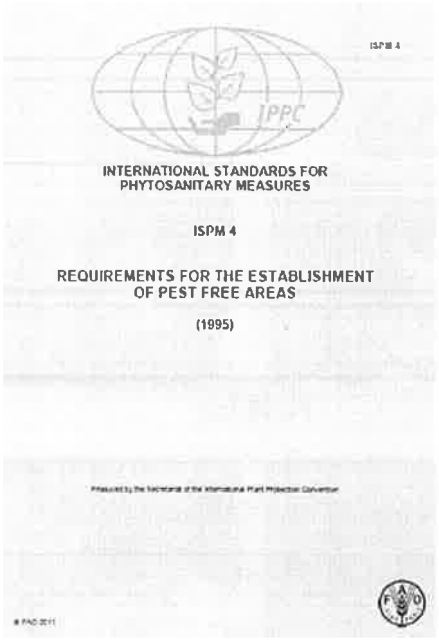
- Pinning
- Labelling

Surveillance Systems for Pest Free Areas (PFA's)

Surveillance Systems

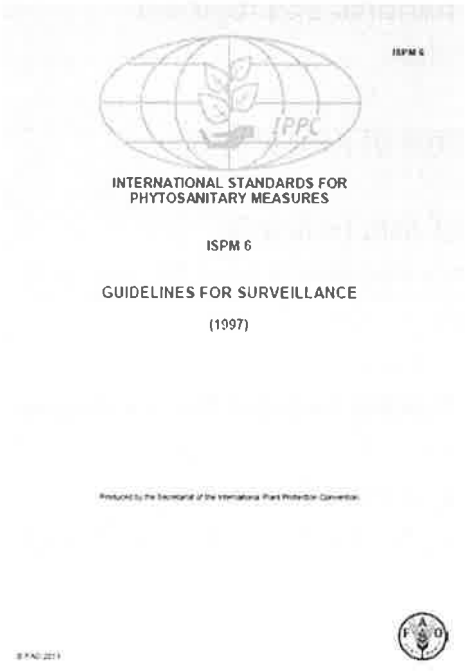
- Determine national and regional biosecurity risks
- Support claims of pest absence
- Develop pest lists to justify phytosanitary measures and inform pest risk analyses
- Inform eradication and control measures
- To meet International reporting requirements (ISPM 17 – pest reporting)

ISPM 4 – REQUIREMENTS FOR THE ESTABLISHMENT OF PEST FREE AREAS (1995)



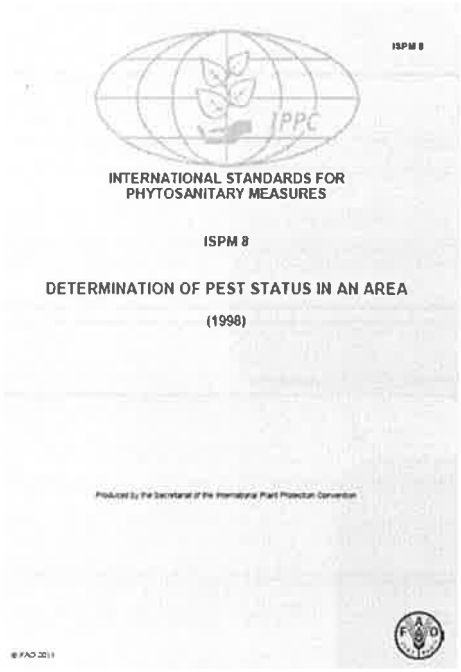
- Describes the requirements for the establishment and use of pest free areas (PFA's).
- A pest free area is an area in which a specific pest (SALB) does not occur as demonstrated by scientific evidence.
- Pest Free areas may include an entire country, an uninfested part of a country in which a limited infestation area is present, or an uninfested part of a country situated within a generally infested area.
- Surveillance activities focus on systems to establish freedom and check to verify freedom has been maintained.
- Surveillance activities – delimiting, detection and monitoring
- Technical details of surveillance or survey and monitoring systems used to support claims of pest absence.
- Pest free areas status is based on verification from specific surveys.

ISPM 6 – GUIDELINES FOR SURVEILLANCE (1997)



- Describes the components of survey and monitoring systems for the purpose of pest detection and the supply of information for use in pest risk analyses, the establishment of pest free areas and, where appropriate, the preparation of pest lists.
- Provides guidelines for the collection, storage and retrieval of surveillance data and information
- Guidelines on specific surveillance activities (detection, delimiting or monitoring) including targeted and random sampling
- Provides guidance on good surveillance practices
- Provides guidance on surveillance record keeping and minimum data requirements to meet international reporting obligations.
- Provides guidance on transparency and validation of surveillance
- Provides guidance on the reporting of surveillance information to other organisations such as RPPO's and FAO

ISPM 8 – DETERMINATION OF PEST STATUS IN AN AREA (1998)

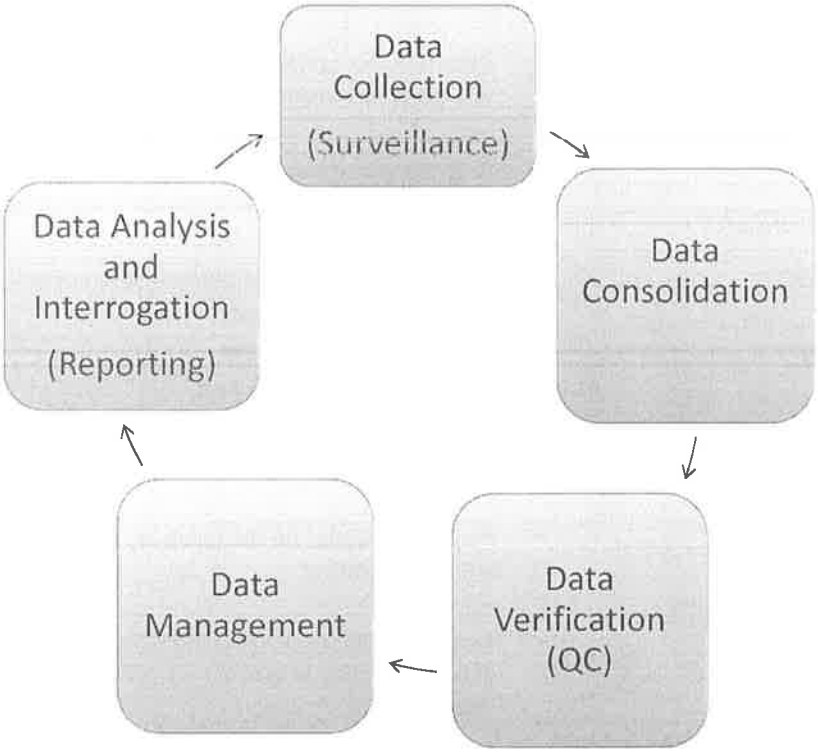


- Describes the content of a pest record and the use of pest records and other information in the determination of pest status in an area
- Provides guidance on pest record requirements (minimum data standards, verification and reference standards)
- Provides guidance n the determination of pest status;
  - Presence of the pest
  - Absence of the pest
  - Transience of the pest
- Provides guidance on the determination of pest status
- Provides guidance on the reliability of the pest record, diagnostics and determination
- Provides guidance on recommended reporting practices the event of pest detection in accordance with international reporting requirements

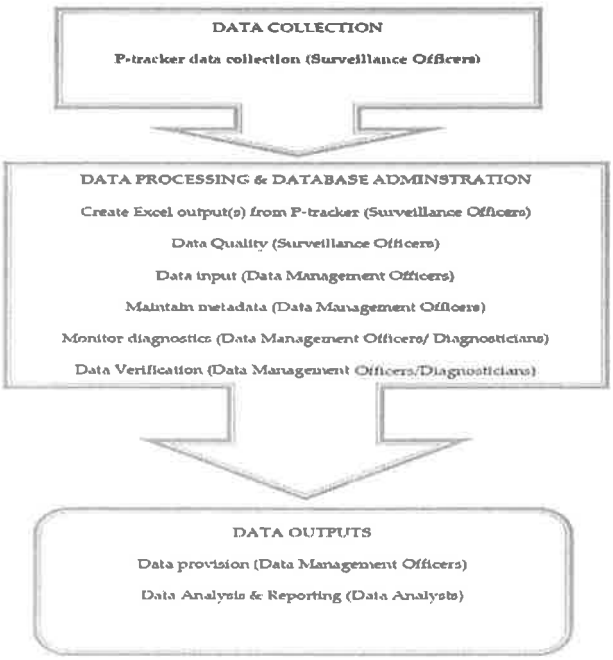
ISPM 17 – PEST REPORTING (2002)

- Describes the responsibilities of and requirements for contracting parties in reporting the occurrence, outbreak and spread of pests in an area for which they are responsible.
- Provides guidance on pest reporting information (identity of the pest, location, pest status, and nature of the immediate or potential danger).
- Provides guidance on NPPO reporting obligations of immediate or potential danger.
- Provides guidance to NPPO's on the reporting of changed status, absence or correction of earlier reports
- Provides detailed guidance on the;
  - content and timings of pest reporting
  - timing of the formal dissemination of pest reports
  - the mechanism of reporting and destination of reports
  - principles of good reporting practices
  - surveillance reporting confidentiality and transparency
  - pest report supporting documentation (for verification purposes)

Surveillance Information Management System (SIMS)



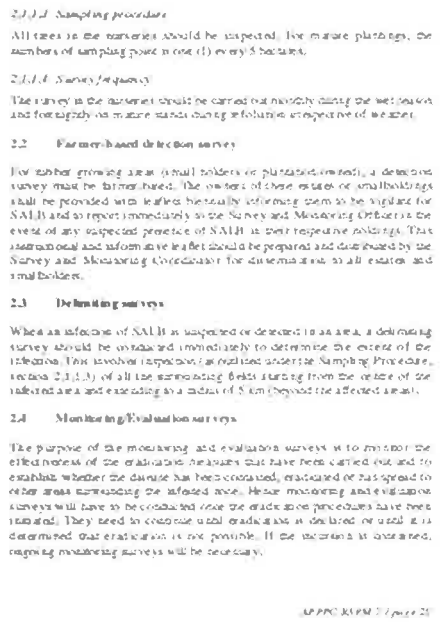
Surveillance Information Management System (SIMS)



- Data and surveillance policy
- Data standards
- Data processing & storage procedures
- Roles and responsibilities (data providers, data owners)
- Data storage and retrieval (databases)
- Data quality procedures (e.g., quality assurance, quality control)
- Data management and analysis
- Data reporting (Nationally and Internationally)

Surveillance Information Management System (SIMS)

Surveillance Data Policy



2.3.1.1 Sampling procedure

All trees in the nurseries should be inspected. For mature plantings, the numbers of sampling point is one (1) every 5 hectares.

2.3.1.2 Survey frequency

The survey in the nurseries should be carried out monthly during the wet season and fortnightly in mature stands during all months irrespective of weather.

2.2 Farmer-based detection surveys

For rubber growing areas (small holders or plantation owners), a detection survey must be implemented. The owners of these estates or smallholdings shall be provided with leaflets basically informing them to be vigilant for SALB and to report immediately to the Survey and Monitoring Officer in the event of any suspected presence of SALB in their respective holdings. This instructional and information leaflet should be prepared and distributed by the Survey and Monitoring Coordinator for dissemination to all estates and smallholders.

2.3 Delimiting surveys

When an infection of SALB is suspected or detected in an area, a delimiting survey should be initiated immediately to determine the extent of the infection. This involves inspection, as outlined under the Sampling Procedure, section 2.3.1.3) of all the surrounding fields starting from the centre of the infested area and extending to a radius of 5 km (beyond the affected area).

2.4 Monitoring/Evaluation surveys

The purpose of the monitoring and evaluation surveys is to monitor the effectiveness of the eradication measures that have been carried out and to establish whether the disease has been contained, eradicated or has spread to other areas surrounding the infested area. These monitoring and evaluation surveys will have to be conducted once the eradication procedures have been initiated. They need to continue until eradication is declared or until it is determined that eradication is not possible. If the infection is contained, ongoing monitoring surveys will be necessary.

NPPO MPM 2 (page 2)

Defines strategic long-term goals and provides guiding principles for data management

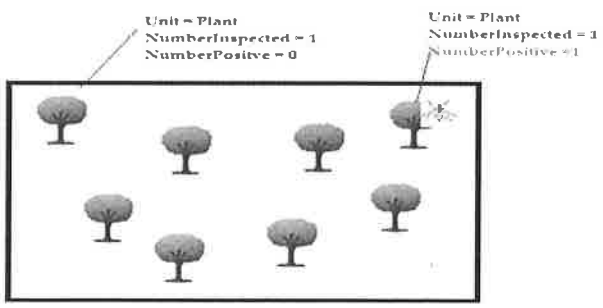
ISPM6: 1.3 Use of information

- to support NPPO declarations of pest freedom
- to aid early detection of new pests
- for reporting to other organizations such as RPPOs and FAO
- in the compilation of host and commodity pest lists and distribution records.

Surveillance Information Management System (SIMS)

Surveillance Activities

- General Surveillance
- Specific Surveillance
  - Early Warning Surveillance
  - Delimiting Surveys
  - Monitoring and Evaluation



Surveillance Information Management System (SIMS)

Pest Record and Data Standard Requirements

South American Leaf Blight Surveillance Sequence (Patracker) 2015

- Scientific name of pest and Bayer code if available
- Family/order
- Scientific name of host locality, e.g. location codes, addresses, coordinates
- Date of collection and name of collector
- Date of identification and name of identifier
- Date of verification and name of verifier
- References, if any
- Additional information, e.g. nature of host relationship, infestation Status, growth stage of plant affected, or found only in greenhouses.
- Specimen collection ID's
- Digital images etc.

Surveillance Information Management System (SIMS)

Surveillance Roles and Responsibilities

DATA COLLECTION

•P-tracker data collection (Surveillance Officers)

DATA PROCESSING & DATABASE ADMINSTRATION

•Prepare Excel output(s) from P-tracker (Surveillance Officers)
•Data Quality (Surveillance Officers)
•Data input (Data Management Officers)
•Maintain metadata (Data Management Officers)
•Monitor diagnostics(Data Management Officers/ Diagnosticians)
•Data Verification (Data Management Officers/Diagnosticians)
•Data provision (Data Management Officers)
•Data Analysis & Reporting (Data Analysts)

Surveillance Information Management System (SIMS)

Data Verification and Quality Assurance

- Surveillance records from general and specific surveillances need to be checked and validated for accuracy in terms of their:
- Spelling (all fields within the record)
- Taxonomic classification of the pest
- Scientific name currency of the classification (Old or out of date scientific names)
- Geospatial information (latitudes, longitudes, country, province)

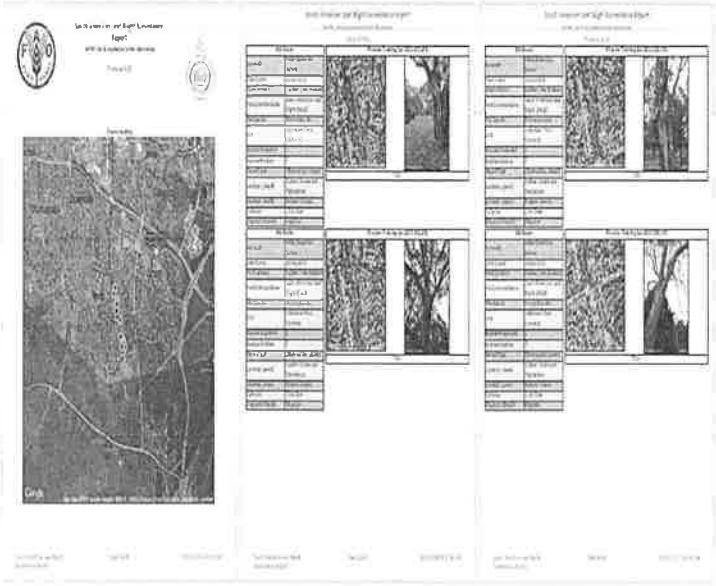
Surveillance Information Management System (SIMS)

Surveillance Data Management

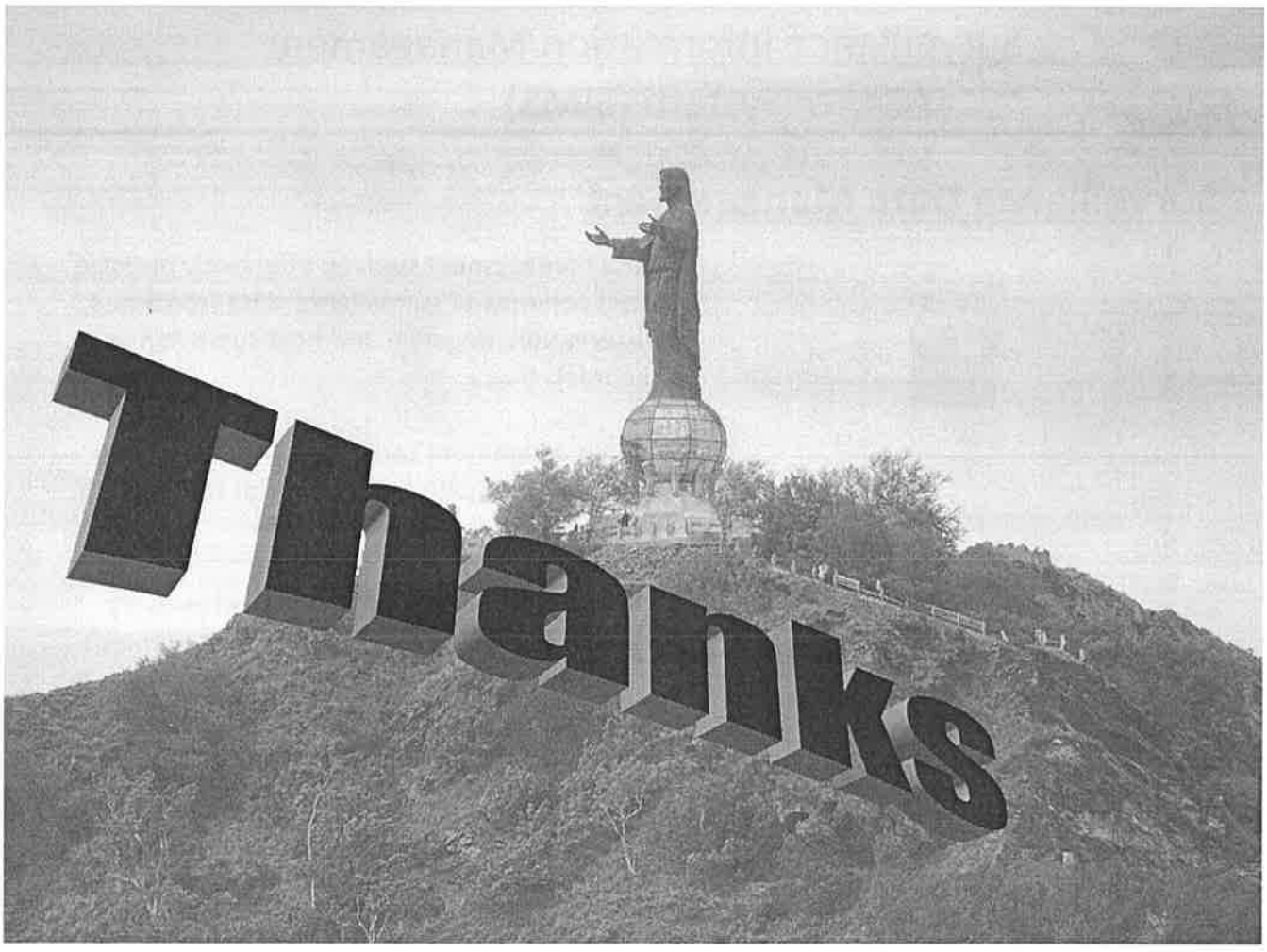
- Data management tools to effectively manage large volumes of surveillance data (specimen, observation, negative and host surveillance records).
- Data management tools to search and query large datasets with multiple fields to generate pest lists, location level datasets.
- Data management tools that can effectively manage multidisciplinary surveillance records (entomology, pathology, botanical related data) into one functional data management system to enable effective pest and host surveillance data.

Surveillance Information Management System (SIMS)

Surveillance Data Analysis and Reporting



- Provide pest status reporting in accordance with international and national reporting obligations
- Pest reporting can be presented in a number of forms providing it details evidence of surveillance activities.
- The publishing of surveillance data in scientific journals and publications does not represent official reporting given the limited publication and access considerations.



REGIONAL ASEAN TRAINING WORKSHOP ON THE ESTABLISHMENT OF PEST FREE STATUS

"Enhancing the Effectiveness of Phythosanitary Measures to Facilitate Trade"

The implementation of establishment of pest free area status in Vietnam

Prepered by: Nguyen Tuan Anh
Nguyen Trong Thuong

Bekasi, Indonesia, 3 – 9th September 2017

Vietnam's phytosanitary regulations are related to the establishment of PFAs

- Law of Plant Quarantine and Protection No 41/2013/QH13

Clause 5 of Article 43: PFA must be must be monitored regularly to maintain the pest free status

- Circular 35/2015/TT-BNNPTNT dated 14 October 2015 on domestic phytosanitary inspection.

Article 6. Establishment of PFAs:

Establishing PFAs for locally major crops which have the potential to export, meeting the regulations of plant quarantine of exporting countries.

Applying measures to maintain the established PFAs.

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PLANT PROTECTION DEPARTMENT

In accordance with International Standards

- ISPM No. 4: Requirements for the establishment of pest free areas
- ISPM No. 10: Requirements for the establishment of pest free places of production and pest free production sites
- ISPM No.26: Establishment of pest free areas for fruit flies (Tephritidae)
- ISPM 29: Recognition of pest free areas and areas of low pest prevalence

The implementation of establishment of pest free area status in Vietnam

- Difficulties

✓ Vietnam shares land borders with Cambodia, China and Laos and there are many border crossing opened at the borders.

✓ Vietnam has not developed many large areas of intensive farming for crops. The average size of cropland operated by farmers in Vietnam is only 0.63 ha. Not only are the farms amongst the world's smallest, they are also highly fragmented.

✓ Lack of experience in establishing pest-free areas.

The implementation of establishment of pest free area status in Vietnam

- Solutions

✓ Cooperate with Vietnam's neighbor countries in managing pests and establishing PFAs

✓ Participating in workshops regarding the establishment of pest free status to enhance the capacity of policy-makers in this matter.

Cooperation program for fruit fly monitoring in the border areas between Vietnam and China

- Started in 2009
- Purpose

✓ Surveillance to detect, collect and identify the fruit fly species in the border areas between Vietnam and China.

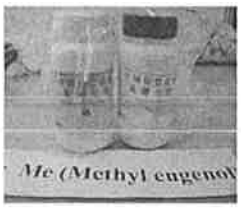
✓ Establishment of pest free areas for The Mediterranean fruit fly, *Ceratitis capitata* (Wiedemann).

- Method

✓ Based on ISPM No.4, 26

✓ Action plan between Vietnam and China is signed annually

✓ Using pheromone trap: ME (Methyl eugenol), CUE (Cue-lure) and TML (trimedlure) and Protein Bait between Langson, Mong Cai (Vietnam) and Guangxi (China); Lao Cai, Lai Chau, Dien Bien (Vietnam) and Yunnan (China) to survey.



Cooperation program for fruit fly monitoring in the border areas between Vietnam and China

- Results

✓ Published Atlas of the component of fruit fly species in the border areas between Vietnam and China

✓ The survey results from 2009-2016 showed that there is **no present** of the Mediterranean fly (*Ceratitis capitata*) in the border areas between Vietnam and China.

Establishment of PFAs for major crops

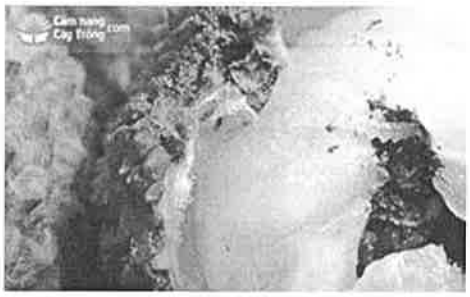
- Lychee

Vietnamese fresh lychee fruits have exported to many countries in the world such as China, Australia and The U.S.

The fruit borer, *Conopomorpha sinensis* Bradley (Lepidoptera: Gracillariidae) is major insect pest on litchi orchards.

Vietnam is working hard to establish and maintain PFA for the pest in Luc Ngan, Bac Giang province.

Method: Based on ISPM No. 4, 10, 29, including:

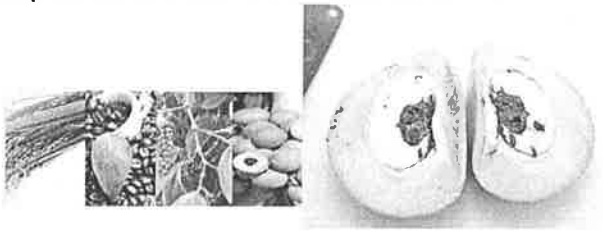


- ✓ Data assembly
- ✓ Surveys (delimiting, detection, monitoring)
- ✓ Regulatory controls
- ✓ Audit (review and evaluation)
- ✓ Documentation (reports, work plans).

Establishment of PFAs for major crops

- Mango

- ✓ Vietnamese fresh mango fruits have been exported to many countries in the world such as Australia, China and The U.S.
- ✓ Previously, CABI announced the present of the mango seed weevil *Sternochetus mangiferae* (Fabricius) in Vietnam.
- ✓ PPD conducted a survey to confirm the distribution of this species in Vietnam between 2006 to 2009.
- ✓ The survey results indicate that ***Sternochetus mangiferae*** **(Fabricius) is absent** in Vietnam.
- ✓ CABI has acknowledged Vietnam as a country free of the mango seed weevil *Sternochetus mangiferae* and published the information on its website.



Establishment of PFAs for major crops

- Other crops

✓ Vietnam is identifying major crops and related pests in specific areas to establish PFAs.

✓ Region Plant Quarantine Sub-Departments conduct phytosanitary inspection to ensure that commodities are free from living pest, especially Vietnamese quarantine pests.

✓ Plant Protection Sub-Departments conduct weekly survey and monitor at production sites as well as implement pest management methods to mitigate pests of concern.

Network Distribution

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PLANT PROTECTION DEPARTMENT

Thanks for your attention!

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PLANT PROTECTION DEPARTMENT

The experience of establishing pest free status in Taiwan

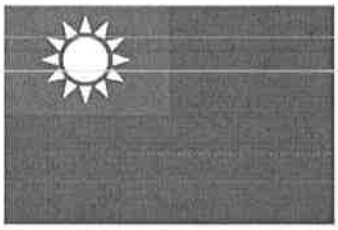
Tien-Cheng, Liu
Tang-Kai, Wang

Outline

- Introduction of Taiwan
- Confirmation of pest free status of Khapra beetles (*Trogoderma granarium* (Everts))
- Confirmation of pest free status of Guava fruit fly（*Bactrocera correcta*）
- Pest Free Area (PFA) – The Red Imported Fire Ant (RIFA)

Introduction of Taiwan

- Area：36,194 square kilometers
- Population：23millions
- Agricultural population: 1.15 millions (5%)

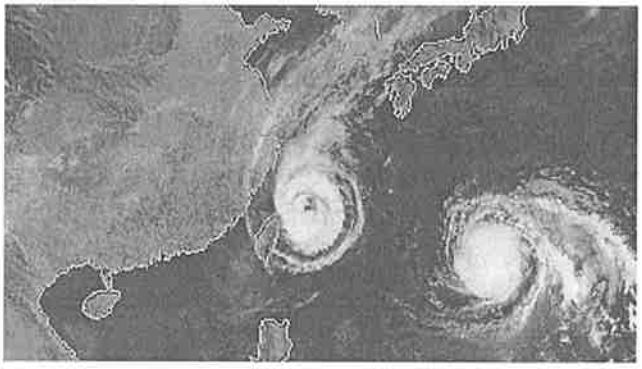


Introduction of Taiwan

- Taiwan is about 395 km long vertically and about 144 km in width with a total land area of around 36,000 square kilometers (about 14,400 square miles).
- 70% of the island are mountainous areas.
- Taiwan is endowed with steep mountain ranges; therefore, great altitude differences occur throughout the island.
- Average cultivation area: 1.02 ha

Introduction of Taiwan

- Because the various landscapes, there are also many pests live in Taiwan such as Oriental Fruit Flies and etc.
- Moreover, many typhoons, earthquakes occur each year, the development of agriculture is not easy.
- Different stages of development: from asparagus and banana to orchid and ornamental fish



Confirmation of pest free status of Khapra beetles (*Trogoderma granarium* (Everts))

- Khapra beetles are quarantine pests which occurred and were recorded in Taiwan.
- Rice exported to mainland China is required to be fumigated by phosphine (PH_3).

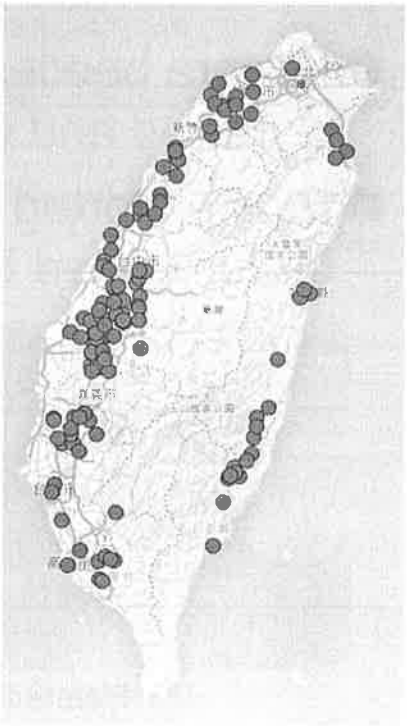
Picture from CABI

Confirmation of pest free status of Khapra beetles (*Trogoderma granarium* (Everts))

- Taiwan conducted several of national wide detection surveys starting from 1990, and the obtained results confirm that the pests are absent in Taiwan.
- In order to be regarded as pest free area of the pests and to request mainland China to exempt the quarantine treatment based on ISPM 4, a systemic detection survey is necessary.
- ISPM4
  - The establishment and use of a PFA by an NPPO provides for the export of plants, plant products and other regulated articles from the country in which the area is situated (exporting country) to another country (importing country) without the need for application of additional phytosanitary measures when certain requirements are met.

Confirmation of pest free status of Khapra beetles (*Trogoderma granarium* (Everts))

- The detection survey was done from Oct. 2012 to Dec. 2015 (3 years and 3 months).
- Conducted at the 58 rice mills which exported to mainland China, 48 local rice warehouses, 30 importation rice warehouses, 2 cereal importation warehouses and 2 harbor warehouses (a total of 140 places).

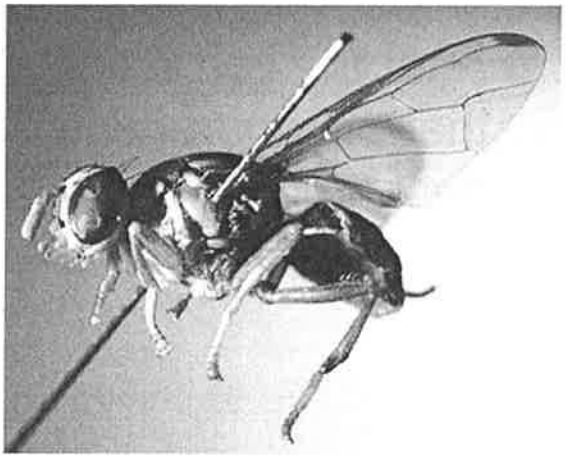


Confirmation of pest free status of Khapra beetles (*Trogoderma granarium* (Everts))

- The Centre for Biosciences and Agriculture International（CABI）has marked the pest status as “absent (formerly present)” in Taiwan in 2016 upon Taiwan’s request.
- Taiwan is requesting that mainland China exempt the quarantine treatment of Taiwanese rice.

Confirmation of pest free status of Guava fruit fly（*Bactrocera correcta*）

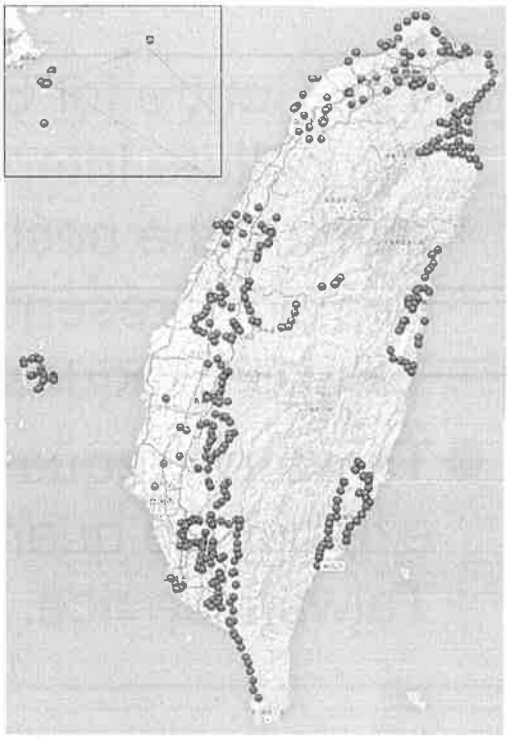
- The Centre for Biosciences and Agriculture International (CABI) and the European and Mediterranean Plant Protection Organization (EPPO) quoted the paper published by Wen-Gang, Lu, from mainland China in 2010 stating that the pests occurred in Taiwan.
- After reviewing the paper and the resource quoted by the paper, we confirmed that the information in the paper is wrong.



Picture from CABI

Confirmation of pest free status of Guava fruit fly (*Bactrocera correcta*)

- Taiwan has conducted national wide surveillance starting from 1989 at 490 places including harbors, production areas, agricultural distribution centers and markets.
- McPhail traps with Methyl Eugenol were used as detection tools.

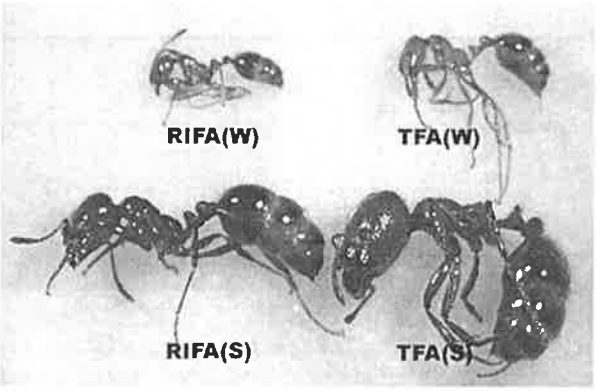


Confirmation of pest free status of Guava fruit fly (*Bactrocera correcta*)

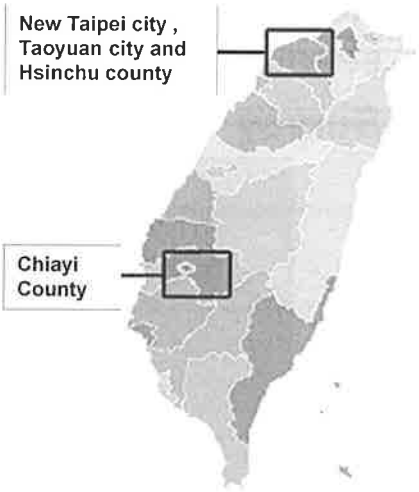
- CABI corrected its database and marked the status of the pest in Taiwan as “absent, invalid record” based on our surveillance data and application.
- After the correction of CABI, Japan accepted that the quarantine or control information of the pest do not need to be provided when applying for the market access by Taiwanese.

Pest Free Area (PFA) – The Red Imported Fire Ant (RIFA)

- The RIFA was first reported in Taiwan in 2003.
- The RIFA was found to have invaded some areas of Taiwan.



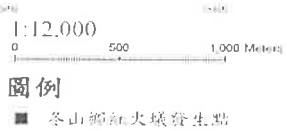
Picture from http://www.fireant.tw/



Picture from http://library.taiwanschoolnet.org

PFA Withdrawal and Reinstatement - Yilan County

In 2015, the RIFA was found to have invaded some areas of Yilan County.



Withdrawal and Reinstatement - Yilan County

- **Phytosanitary measure**
  - **Official Control**
    - Bait treatment
    - Individual mound treatment
  - **Regulatory Action**：Restriction plant seedling.
  - **Survey**：at least 6 months.

Individual mound treatment

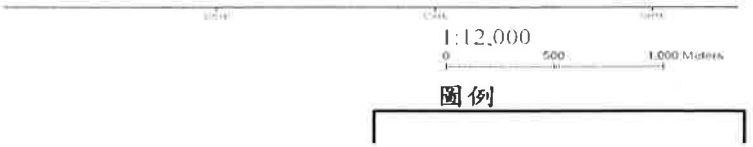
Survey by baited traps

Picture from http://www.daanforestpark.org.tw

Withdrawal and Reinstatement - Yilan County

In 2016.12.

Reinstatement the PFA.



Thank You
For Your Attention

http://www.tanews.org.tw/info/9317

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Market access Process for Commodities into the United States

Devaiah A. Muruvanda, Ph.D.
Senior Risk Manager – Entomology

United States Department of Agriculture
Animal and Plant Health Protection Service
Plant Protection and Quarantine

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Pest Free Area vs Market Access

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Pest Free Area vs Market Access

- A Pest Free Area does not automatically guarantee market access for a commodity.
- Market access is a separate process governed by 7 CFR 319.5
- Countries must submit a request to amend the regulations.
- The request must include detailed pre-requisite information for the commodity as specified in 7 CFR 319.5.

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Market Access and the Import Approval Process

1. National Plant Protection Organization (NPPO) of the exporting country requests market access for a commodity

2. APHIS prepares a Pest Risk Assessment (PRA)
   A. The PRA identifies pests of concern in the import pathway
   B. Risk Management options to mitigate pest risk

3. Rulemaking for market access.

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– The PRA identifies pests of concern in the import pathway

Importation of Citrus from China into the continental United States

A Qualitative, Pathway-Initiated Pest Risk Assessment

Month DD, YYYY

Version 1

Agency Contact:

Plant Epidemiology and Risk Analysis Laboratory
Center for Plant Health Science and Technology

United States Department of Agriculture
Animal and Plant Health Inspection Service
Plant Protection and Quarantine
1730 Varsity Drive, Suite 300
Raleigh, NC 27606

We determined that the following pests are candidates for risk management, because they met the threshold to likely cause unacceptable consequences of introduction, and they received an overall likelihood of introduction risk rating above Negligible:

Pest type	Taxonomy	Scientific name	Likelihood of introduction overall rating
Arthropod	Acari: Tenuipalpidae	*Brevipalpus fujikii* Ma et Yuan	Medium
		Cenopalpus pulcher (Canestrini & Fanzago)	Medium
	Acari: Tuckerellidae	*Tuckerella knorri* Baker & Tuttle	Medium
	Diptera: Ceratopogonidae	*Russellohelea citrifrugis* Jiang	Medium
	Diptera: Tephritidae	*Bactrocera correcta* (Bezzi)	High
		Bactrocera cucurbitae (Coquillett)	Medium
		Bactrocera dorsalis (Coquillett)	High
		Bactrocera latifrons (Hendel)	High

Ver 1 Month Day, Year

Pest Risk Assessment for Citrus from China

		Bactrocera minax (Enderlein)	High
		Bactrocera scutellaris (Bezzi)	High
		Bactrocera tau (Walker)	High
		Bactrocera tsuneonis (Miyake)	High
	Lepidoptera: Cosmopterigidae	*Phyllocnistis citrella* Stainton	Medium

Detailed examination and choice of appropriate phytosanitary measures to mitigate pest risk are part of the pest risk management phase within APHIS and are not addressed in this document.

投影片 5

GABalady3 This one will be difficult to read onscreen: perhaps we could blow up the second photo to take advantage of the space on the slide
gbalady, 2014/6/13

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The PRA determines which quarantine pests follow the pathway and the risk rating of each pest following the pathway

Pest risk ratings are based on the biology of the pest and the biology and management of crop through harvest and shipment. These factors determine whether the pest follows the pathway of that commodity:

Negligible and Low risk rated pests - require port of entry inspection only

Medium risk and High risk rated pests – mitigation other than port of entry inspection may be required

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Risk Management for Q56

Risk Management is the process of determining the appropriate mitigations to remove the risk of pests from imported commodities.

From ISPM 2 Framework for Pest Risk Analysis
2.3 Summary of PRA Stage 3: Pest risk management
"Stage 3 involves the identification of phytosanitary measures that (alone or in combination) reduce the risk to an acceptable level. Phytosanitary measures are not justified if the pest risk is considered acceptable or if they are not feasible (e.g. as may be the case with natural spread). ... The conclusion of the pest risk management stage will be whether or not appropriate phytosanitary measures adequate to reduce the pest risk to an acceptable level are available, cost-effective and feasible."

APHIS uses the Risk Management Document (RMD) to accomplish and document the decision making process for choosing risk management options.

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Risk Management Options Available

- Inspections
- Commodity / Quarantine Treatments
- Systems Approaches
- Areas of Low Pest Prevalence
- **Pest Free Areas**

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How does APHIS choose among risk management options?

- Develop Risk Management based on which option(s) are effective in removing pest risk with the minimum of trade disruption
- Proposed mitigations shared with exporting country

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RMD and CIED provide the scientific support and justification for phytosanitary decisions.

Risk Mitigation based on:

- Science
- Precedents
- Operational Feasibility

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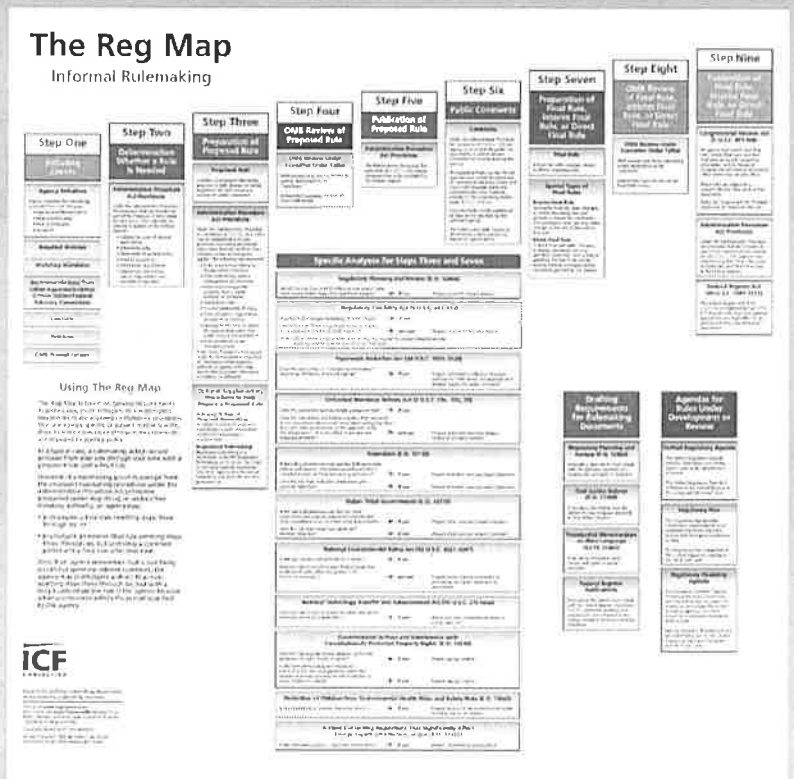
- Rulemaking for market access - timelines.



Rule making for commodity imports typically takes several years (with a range of 2 years to more than 10 years), from the initial market access request to the final rule.

Notice based rulemaking is slightly quicker because some steps are not required.

One of the lengthy steps is developing the PRA for the commodity.

APHIS has a goal of producing 40 priority PRAs per year.

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The priority of a market access request depends upon a combination of APHIS and exporting country's priorities.

Each country will rank their priority for market access requests.

PIM (trade management) further ranks the requests based on trade priorities.

Each Risk Manager may have 100 projects in various stages of rulemaking.

Each Regulatory Project Manager (there are about 6 in Q56) has 30 to 40 projects.

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Pest Free Area vs Market Access

Medfly hosts
and
Anastrepha species hosts

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Pest Free Area vs Market Access

Commodities that are host to Medfly
but not to *Anastrepha* species:

Peppers (except Manzano which is host to *A. ludens*)
Ripe tomatoes* (problems with *Tutu absoluta)*

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Pest Free Area vs Market Access

Options:

Eradication of Anastrepha species?

Anastrepha ludens and *Anastrepha fraterculus* would be the key species that need to be dealt with.

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Pest Free Area vs Market Access Summary

If a country has a Pest Free Area approved, for a certain fruit fly species for example, the commodities that are host to that fly need to have been approved through the market access process.

If a commodity has not been previously approved, then the PRA must be developed to determine if there are other pests that require mitigation.

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Pest Free Areas

Summary

Conclusions

Questions?

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Establishment of Fruit Fly Pest Free Areas

Devaiah A. Muruvanda, Ph.D.
Senior Risk Manager – Entomology

United States Department of Agriculture
Animal and Plant Health Protection Service
Plant Protection and Quarantine

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Why are pests mitigations such as quarantine treatments and Pest Free Areas necessary? Pests that are obvious vs pests that are hidden

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Pest Free Areas

Definition from ISPM 4:

A "pest free area" is: "an area in which a specific pest does not occur as demonstrated by scientific evidence and in which, where appropriate, this condition is being officially maintained".

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Establishment of Fruit Fly Pest Free Areas

Definition from ISPM 4:

A "pest free area" is: "an area in which a specific pest does not occur as demonstrated by scientific evidence and in which, where appropriate, this condition is being officially maintained".

Definition from ISPM 26:

Additional requirements for establishment and maintenance of FF-PFAs

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Establishment of Fruit Fly Pest Free Areas

- Tephritid fruit flies among most injurious pests of fruits and vegetables.
- They have negative direct effect on economy of many countries.
- Quarantine regulations restrict movement from infested countries.
- Limit trade potential of fruit producing countries.

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Establishment of Fruit Fly Pest Free Areas

- PFA concept to produce plants and/or plant products that have minimal phytosanitary restrictions placed on them.

- Fruits and vegetables from PFA can be moved domestically or internationally without postharvest treatment.

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Establishment of Fruit Fly Pest Free Areas

- NPPOs of the exporting and importing countries should cooperate on the parameters of the fruit fly PFA and document the following:

- 1. Requirements as per: ISPM 4 and ISPM:26
- 2. Geographic description
- 3. Movement controls
- 4. Surveillance Activities
- 4. Other Technical Information

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Establishment of Fruit Fly Pest Free Areas

Geographic Description:

- 1. Proposed PFA should be described, with supporting maps demonstrating boundaries of the area, production places and isolation of the area by a natural barrier.

- 2. In the absence of a natural isolating barrier, the steps taken to create a buffer zone adjacent to the PFA should be described with supporting maps and documentation.

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Buffer Zones

The size of the buffer zone must take into account the biology of the pest. Trapping or surveillance is increased in the buffer zone.

If pests are found in the buffer zone, mitigation measures (emergency action plan) must be applied.

If the pests are found in the production zone, exports may be halted (unless there are other mitigations available such as an approved quarantine treatment) until an investigation and further surveillance has found that the pests are eliminated.

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Pest Free Areas
What information is needed to recognize an area as pest free?

Location Location Location !

A Geographic description of the proposed PFA is essential and should include:

Maps with the PFA delineated.
Natural barriers and buffer zones identified.
Locations of places of production
Locations of control points

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Establishment of Fruit Fly Pest Free Areas

Movement controls:

Regulatory movement controls to prevent entry of target pests into the proposed PFA during the establishment phase. These include:

-Identification of pathways and regulated articles that require control to establish the proposed PFA

- Establishment of an inspection program (use of inspection stations and packing houses) for regulated articles moving into the proposed PFA as sampling records, identification of intercepted specimens, verification of documents and confirmation that required treatments occurred.
- Application of any other phytosanitary measures.
- Alternate arrangements for host material after treatment for consumers in PFA.

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Establishment of Fruit Fly Pest Free Areas

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Elements of a Pest-free Area

- Movement Controls
- Road stations, inspection checkpoints

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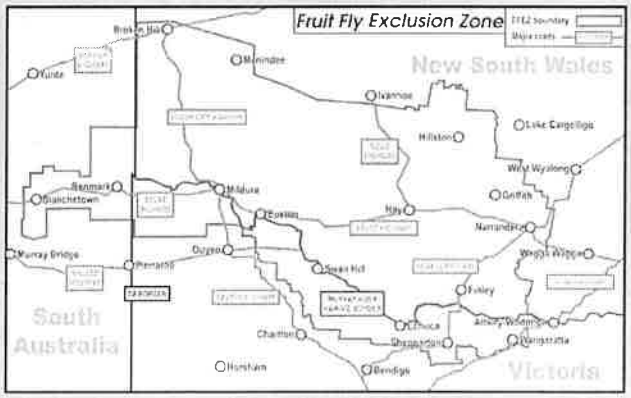
Elements of a Pest-free Area

- Geographic description
- Location of regulatory checkpoints



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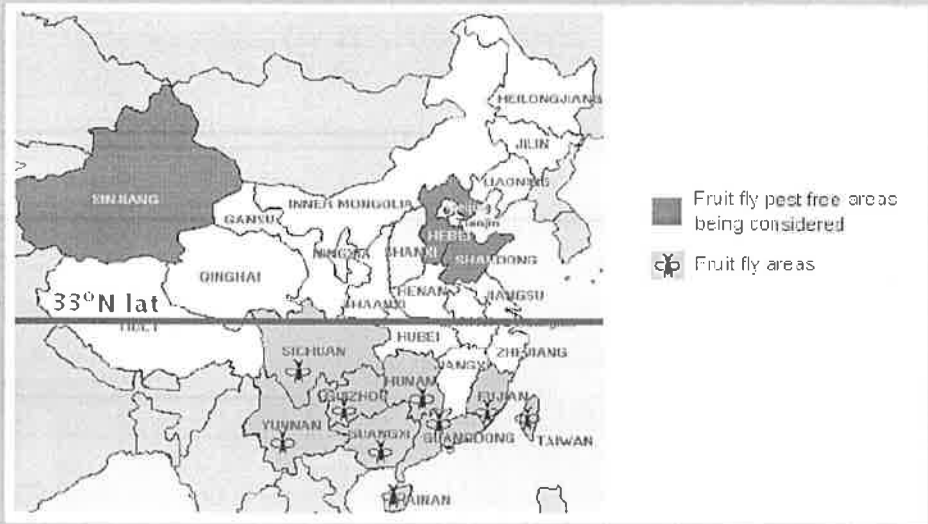
Pest Free Areas



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Pest Free Areas

What information is required to recognize an area as pest free?

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Establishment of Fruit Fly Pest Free Areas

Surveillance Activities:

-Survey data documentation for 12 consecutive months showing no detections in the proposed PFA.

-Monthly reports of fruit fly detections, phytosanitary procedures applied and results of survey activities for a minimum of one year prior to recognition of the PFA.

-Traps placed in host plants with two alternative locations for at least every 12 weeks.

-Surveys for establishment that are more vigorous, should have recommended minimum trap densities.

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Establishment of Fruit Fly Pest Free Areas

Surveillance Activities:

- Surveys should be conducted with appropriate traps/lures with a minimum trap density of 4 traps per km^2 , checked for target flies weekly for multivoltine and biweekly for univoltine species.
- Surveys for fruit flies that respond to parapheromones with Jackson or similar traps with servicing at recommended guidelines-ME 1 trap per km^2 monitored weekly; for others 2 traps per km^2 monitored weekly/biweekly
- QC program by NPPO to verify and document that all protocols are met.

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Pest Free Areas

What information is needed to recognize an area as pest free?

2. Survey protocols for establishment and maintenance of PFA:
a. trap type
b. bait or lure type
c. target pest

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Establishment of Fruit Fly Pest Free Areas

Maintenance of Fruit Fly Pest Free Areas

To maintain the PFA status the NPPO should document movement and surveillance activities on an ongoing basis.

Movement controls:

-Identification of pathways and regulated articles that require control to establish the proposed PFA

-Establishment of an inspection program (use of inspection stations and packing houses) for regulated articles moving into the proposed PFA as sampling records, identification of intercepted specimens, verification of documents and confirmation that required treatments occurred.

-Application of any other phytosanitary measures.

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Establishment of Fruit Fly Pest Free Areas

Maintenance of Fruit Fly Pest Free Areas

Surveillance Activities:

Surveillance for maintenance of PFA are different.

- Trapping is continuous.
- Trap density and trap service schedule dependent on target species and prevailing climatic conditions.

- Survey of fruit flies-not responding to parapheromones:
- 5 traps per km²-in high risk areas-entry points to FF-PFA.
- 2 traps per km²-in urban and suburban areas within the commercial production and in buffer zones.
- 1 trap per km² in commercial production zones.
- Traps to be monitored biweekly.

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Pest Free Areas

Trap Density

Ceratitis capitata

Scenario	Trap type	Attractant	Trap Density/km²			
			Production area	Marginal	Urban	Points of Entry
1-Monitoring of infested area	JT[1]/MULTILURE[2]/OBDT[2]/TEPHRI[2]	TML/3C/PB	0.5 to 1.0*	0.25 to 0.5*	0.25 to 0.5*	0.25 to 0.5*
1-Monitoring for suppression	JT[1]/MULTILURE[2]/OBDT[2]/TEPHRI[2]	TML/3C/PB	2 to 4*	1-2*	0.25 to 0.5*	0.25 to 0.5*
1-Monitoring for eradication	JT[1]/MULTILURE[2]/OBDT[2]/TEPHRI[2]	TML/3C/PB	3 to 5**	3 to 5**	3 to 5**	3 to 5**
2-Delimitation for suppression	JT[1]/MULTILURE[2]/OBDT[2]/TEPHRI[2]	TML/3C/PB	10 to 20**			
2-Delimitation for eradication	JT[1]/MULTILURE[2]/OBDT[2]/TEPHRI[2]	TML/3C/PB	20 to 50**			
3-Detection for exclusion/ containment	JT[1]/MULTILURE[2]/CC[2]	TML/3C/PB	1***	2***	2 to 4***	4-10***

[1]With TML for male captures
[2]With 3C mainly for female captures

From Appendix 5 of the IAEA trapping manual.

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Establishment of Fruit Fly Pest Free Areas

Maintenance of Fruit Fly Pest Free Areas

Surveillance Activities:

Survey of fruit flies- responding to parapheromones:

-Traps monitored bi-weekly.

For species responding to trimedlure, ceralure, cuelure etc.

-3 traps per km² in high risk areas as FF-PFA and known fruit fly pathways.

-2 traps per km² in urban and suburban areas within commercial production areas and buffer zones.

-1 trap per km² in commercial production areas.

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Establishment of Fruit Fly Pest Free Areas

Maintenance of Fruit Fly Pest Free Areas

Surveillance Activities:

For species responding to Methyl Eugenol(ME).

-Traps monitored bi-weekly.

-3 traps per km² in high risk areas as FF-PFA and known fruit fly pathways.

-1 trap per km² in urban and suburban areas within commercial production areas and buffer zones.

-1 trap per km² in commercial production areas.

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Establishment of Fruit Fly Pest Free Areas

Maintenance of Fruit Fly Pest Free Areas

- Specimen identification and reporting:

-All specimens captured should be identified to species, sex and reproductive status where appropriate, within 4 days of their capture to determine if they are quarantine fruit flies.

If single female, whether they are inseminated.

-IPPC pest reporting obligations app as per ISPM:17.

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Elements of a Pest-free Area

- Quality Control Protocols

- Verification of lure efficacy
- Placement and recovery of marked target flies
- Regular reviews of survey documentation
- Audits of trap placement and servicing
- Confirmation of identifier competency

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Pest Free Areas

Emergency Action Plan

a. trigger for plan implementation

b. delimiting survey

c. mitigation measures

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Establishment of Fruit Fly Pest Free Areas

Suspension or loss of Fruit Fly- PFA status

Status of FF-PFA is suspended when an outbreak occurs or based on triggers:

-detection of immature specimen of target Fruit Fly

-two or more fertile adults

-inseminated female within defined period and distance

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Elements of a Pest-free Area

- Emergency Action Plan
  - Trigger for plan implementation
  - Delimiting survey
  - Mitigation measures

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Pest Free Areas

Summary

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Fruit Fly Pest Free Areas Recap

Devaiah A. Muruvanda, Ph.D.
Senior Risk Manager – Entomology

United States Department of Agriculture
Animal and Plant Health Protection Service
Plant Protection and Quarantine

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Establishment of Fruit Fly Pest Free Areas

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Establishment of Fruit Fly Pest Free Areas

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Establishment of Fruit Fly Pest Free Areas

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Establishment of Fruit Fly Pest Free Areas

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Pest Free Areas

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2-Delimitation for suppression	JT[1]/MULTILURE®/OBDT®/TEPHRI®	TML/3C/PB	10 to 20**			
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Elements of a Pest-free Area

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Establishment of Fruit Fly Pest Free Areas

Maintenance of Fruit Fly Pest Free Areas

- Specimen identification and reporting:

-All specimens captured should be identified to species, sex and reproductive status where appropriate, within 4 days of their capture to determine if they are quarantine fruit flies.

If single female, whether they are inseminated.

-IPPC pest reporting obligations app as per ISPM:17.

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Pest Free Areas

Emergency Action Plan

a. trigger for plan implementation

b. delimiting survey

c. mitigation measures

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Establishment of Fruit Fly Pest Free Areas

Suspension or loss of Fruit Fly- PFA status

Status of FF-PFA is suspended when an outbreak occurs or based on triggers:

-detection of immature specimen of target Fruit Fly

-two or more fertile adults

-inseminated female within defined period and distance

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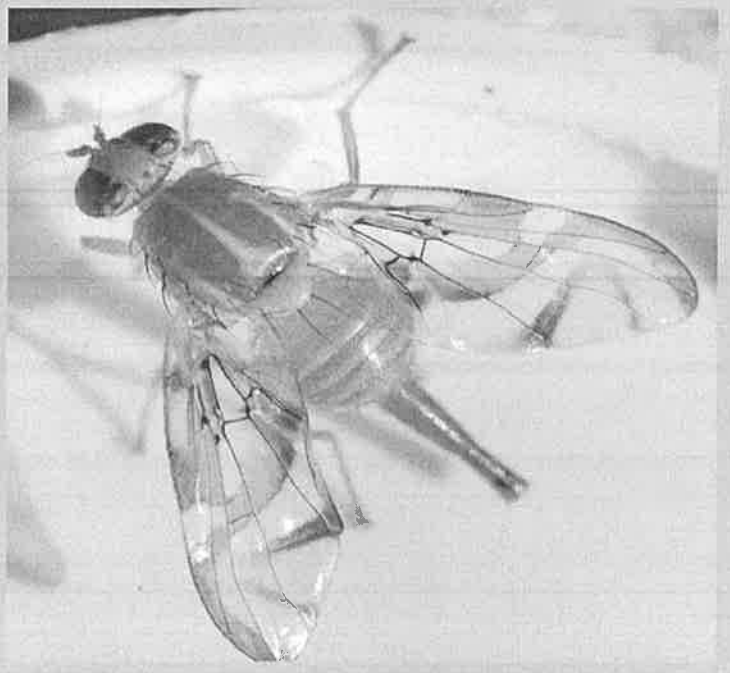
Fruit Fly Pest Free Areas Recap



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Fruit Fly Pest Free Areas Recap

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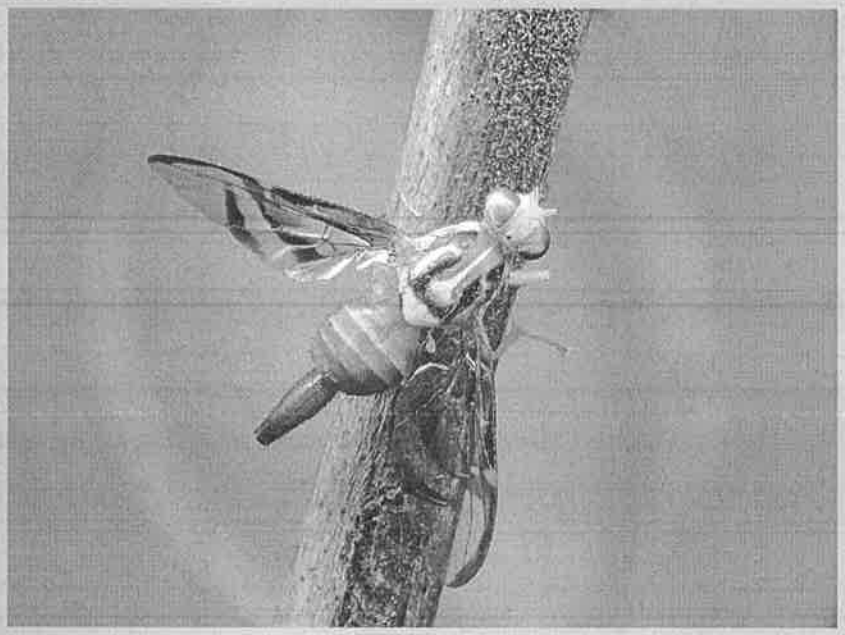

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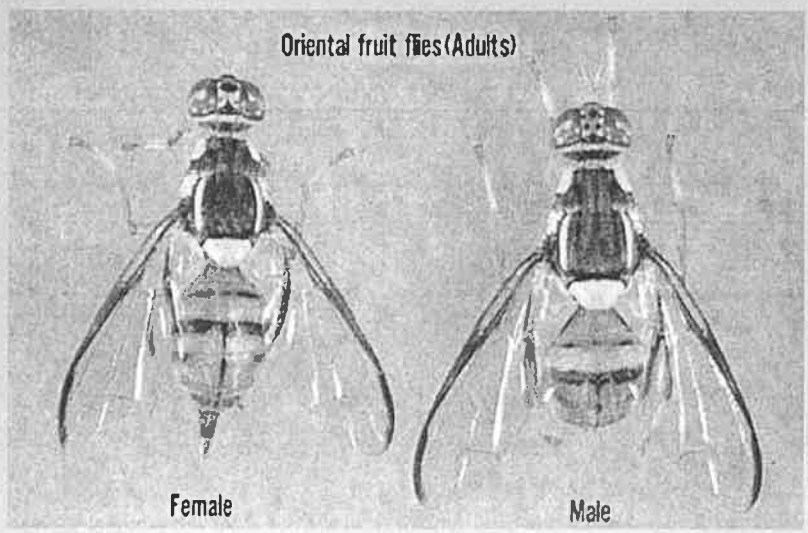

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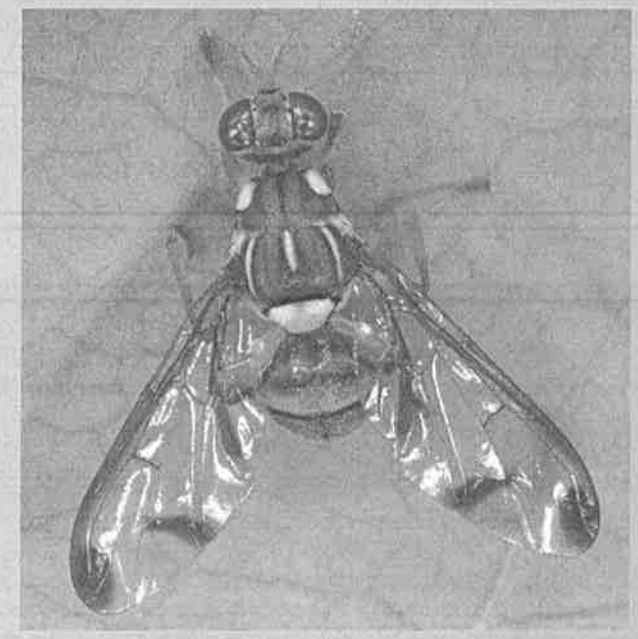

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Fruit Fly Pest Free Areas Recap

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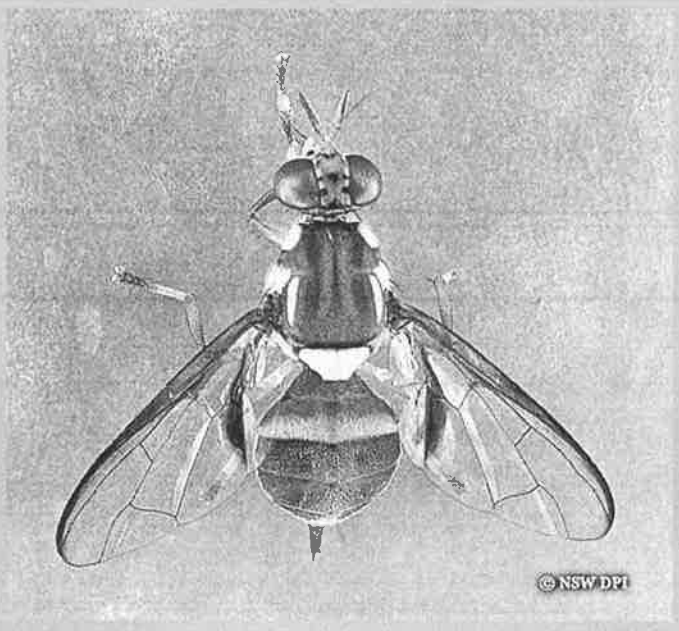
Fruit Fly Pest Free Areas Recap



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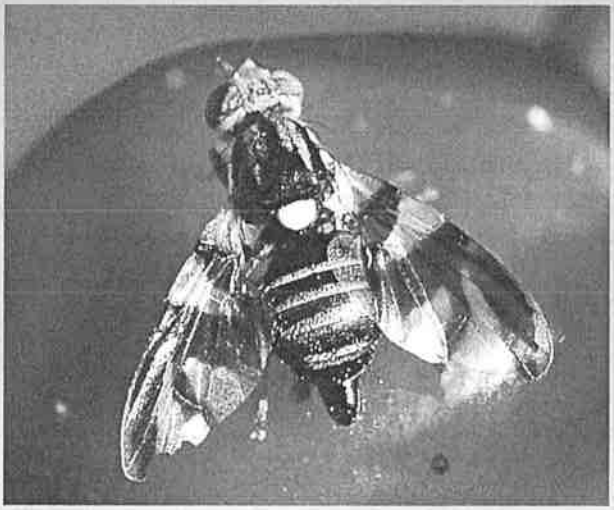

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Pest Free Areas

Summary

Conclusions

Questions?

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Technique for determination of host status of fruit flies (Tephritidae)

Suputa
Plant Protection Department
Faculty of Agriculture, Gadjah Mada University

Applied Research Institute of Agriculture Quarantine (ARIAQ)

http://hpt.faperta.ugm.ac.id/suputa/

Referenses

ISPM 37

- https://www.ippc.int/en/core-activities/standards-setting/ispms/
- https://www.ippc.int/static/media/files/publications/en/2015/01/26/cpm_2015_06_01_2006-031_draftispm_ffhoststatus_2014-12-24.pdf

The Guideline of Fruit Fly (Diptera: Tephritidae) Collection and Preservation.
Suputa, Cahyaniati, A.T. Arminudin, A. Kustaryati, M. Railan, & Issusilaningtyas, 2007. Ministry of Agriculture. Indonesia. ISBN 978-979-3147-28-4

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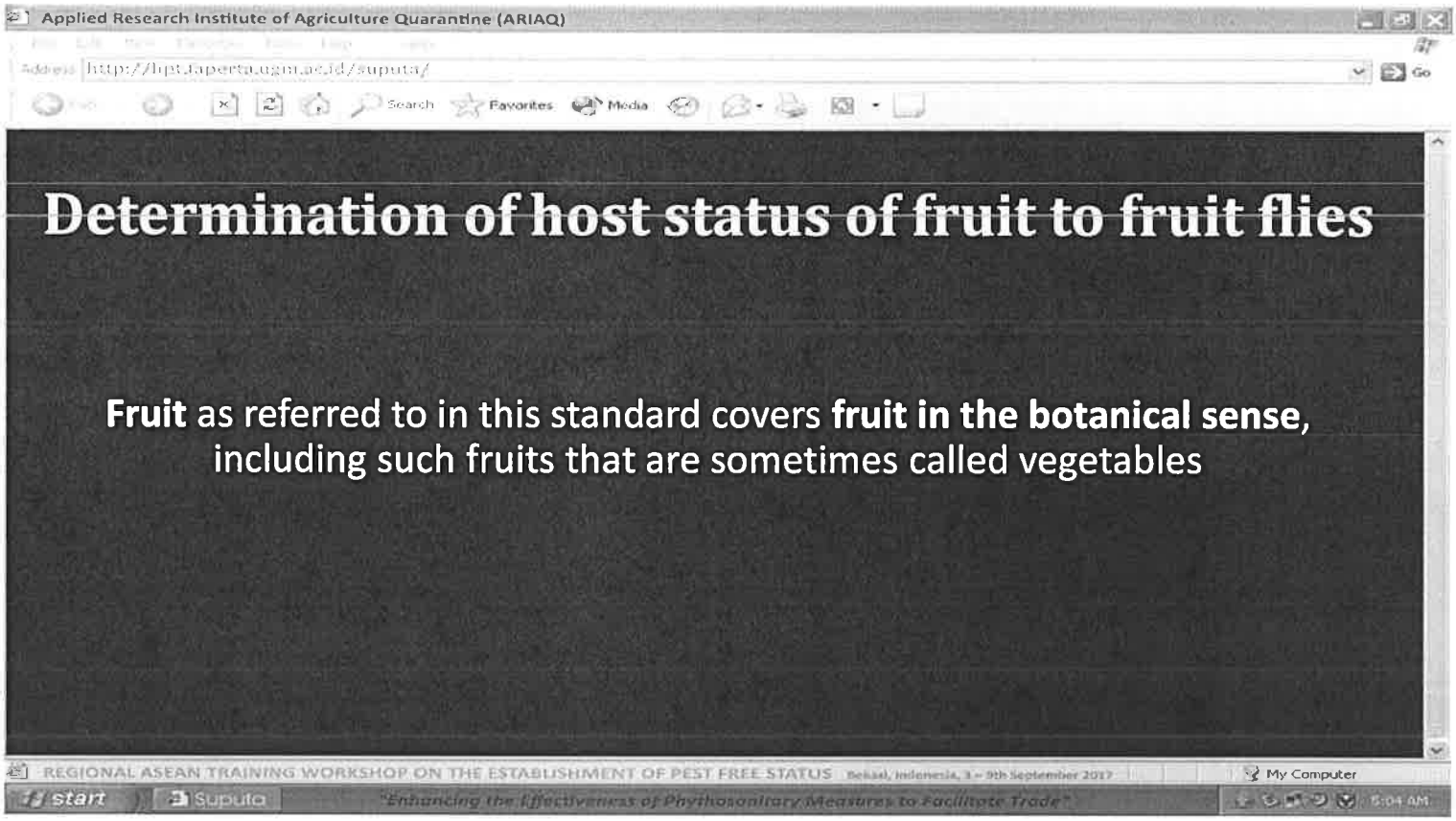
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Determination of host status of fruit to fruit flies
Fruit as referred to in this standard covers fruit in the botanical sense, including such fruits that are sometimes called vegetables
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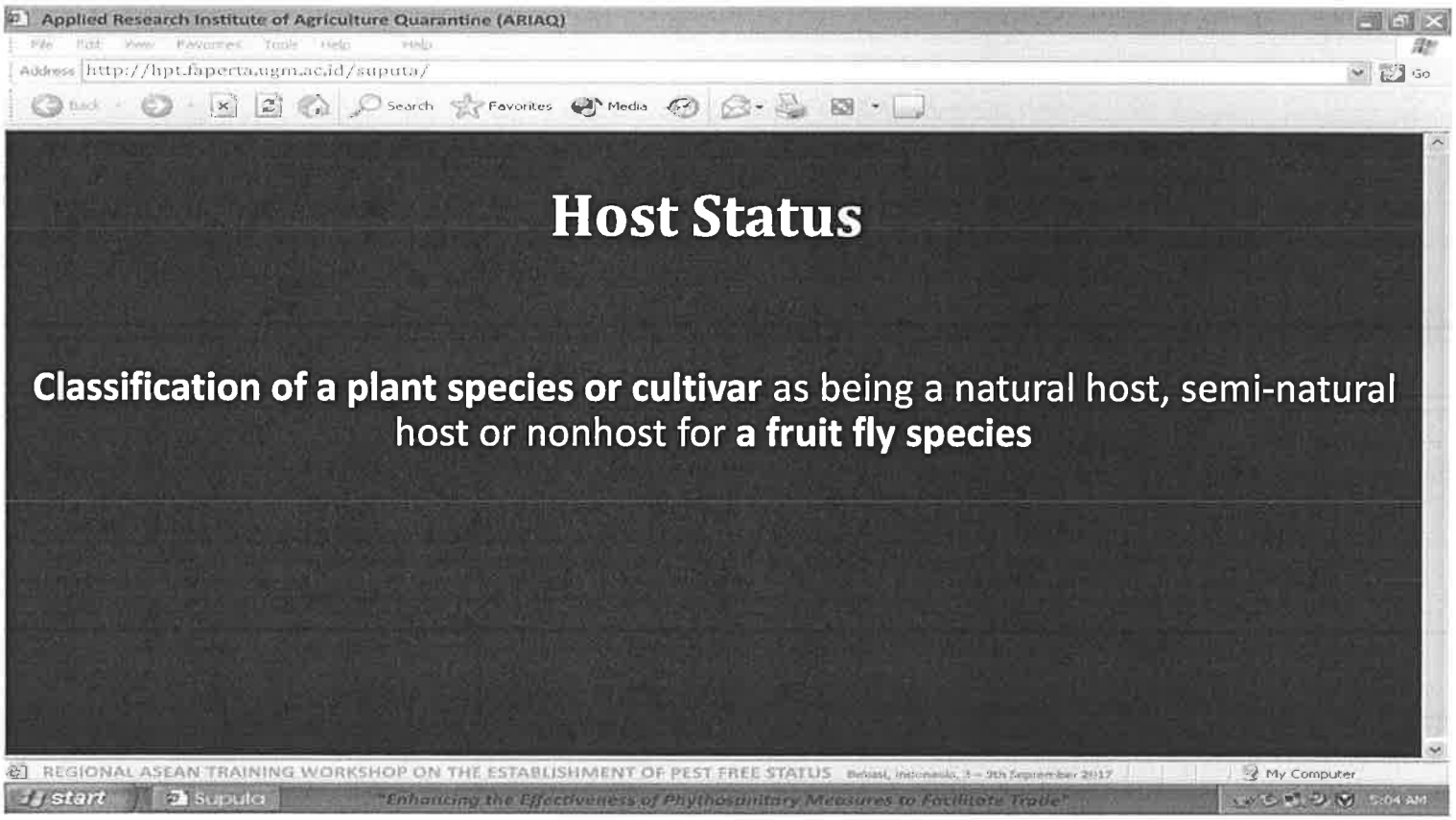
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Host Status
Classification of a plant species or cultivar as being a natural host, semi-natural host or nonhost for a fruit fly species
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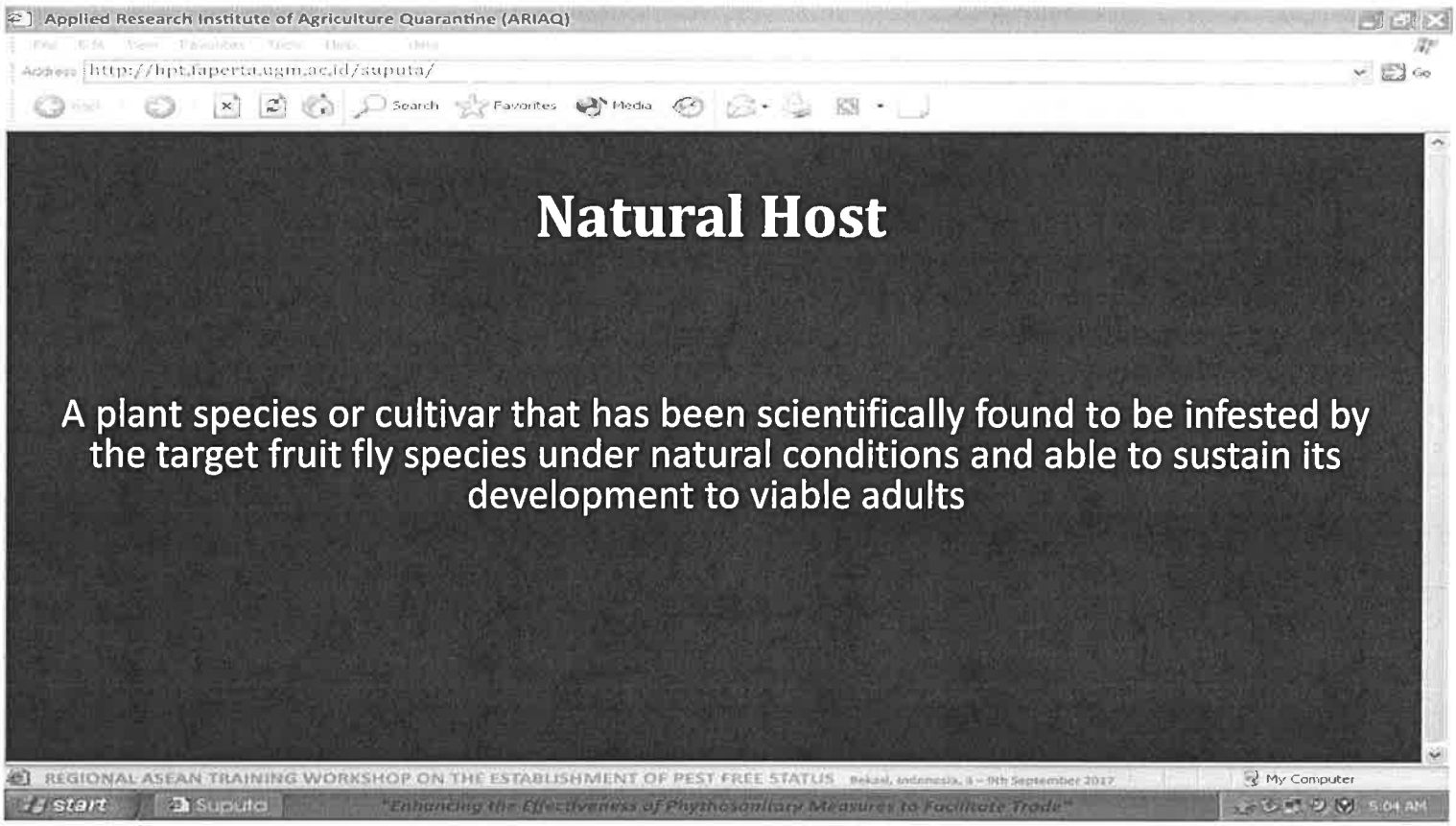
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Natural Host
A plant species or cultivar that has been scientifically found to be infested by the target fruit fly species under natural conditions and able to sustain its development to viable adults
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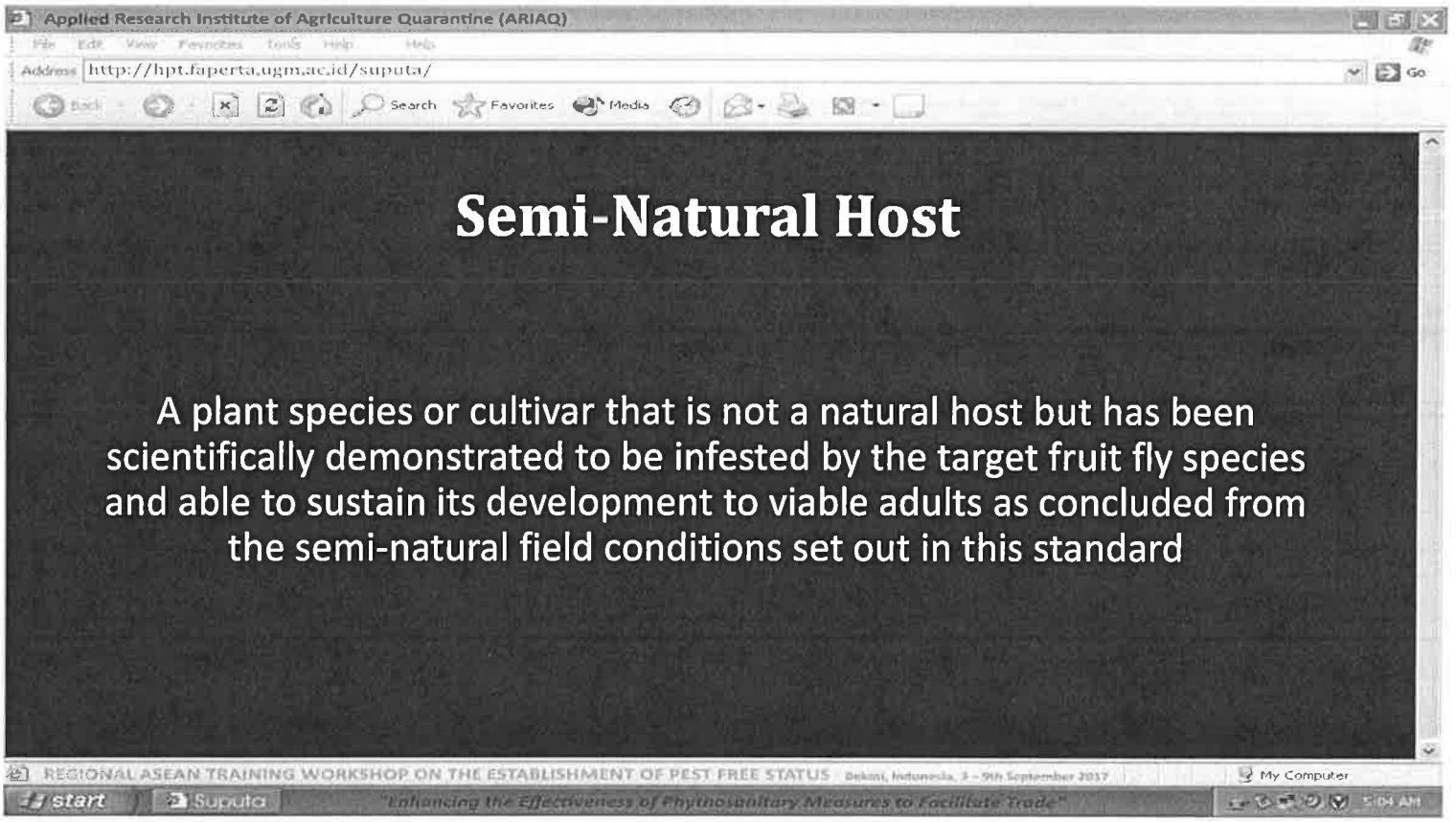
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Semi-Natural Host
A plant species or cultivar that is not a natural host but has been scientifically demonstrated to be infested by the target fruit fly species and able to sustain its development to viable adults as concluded from the semi-natural field conditions set out in this standard
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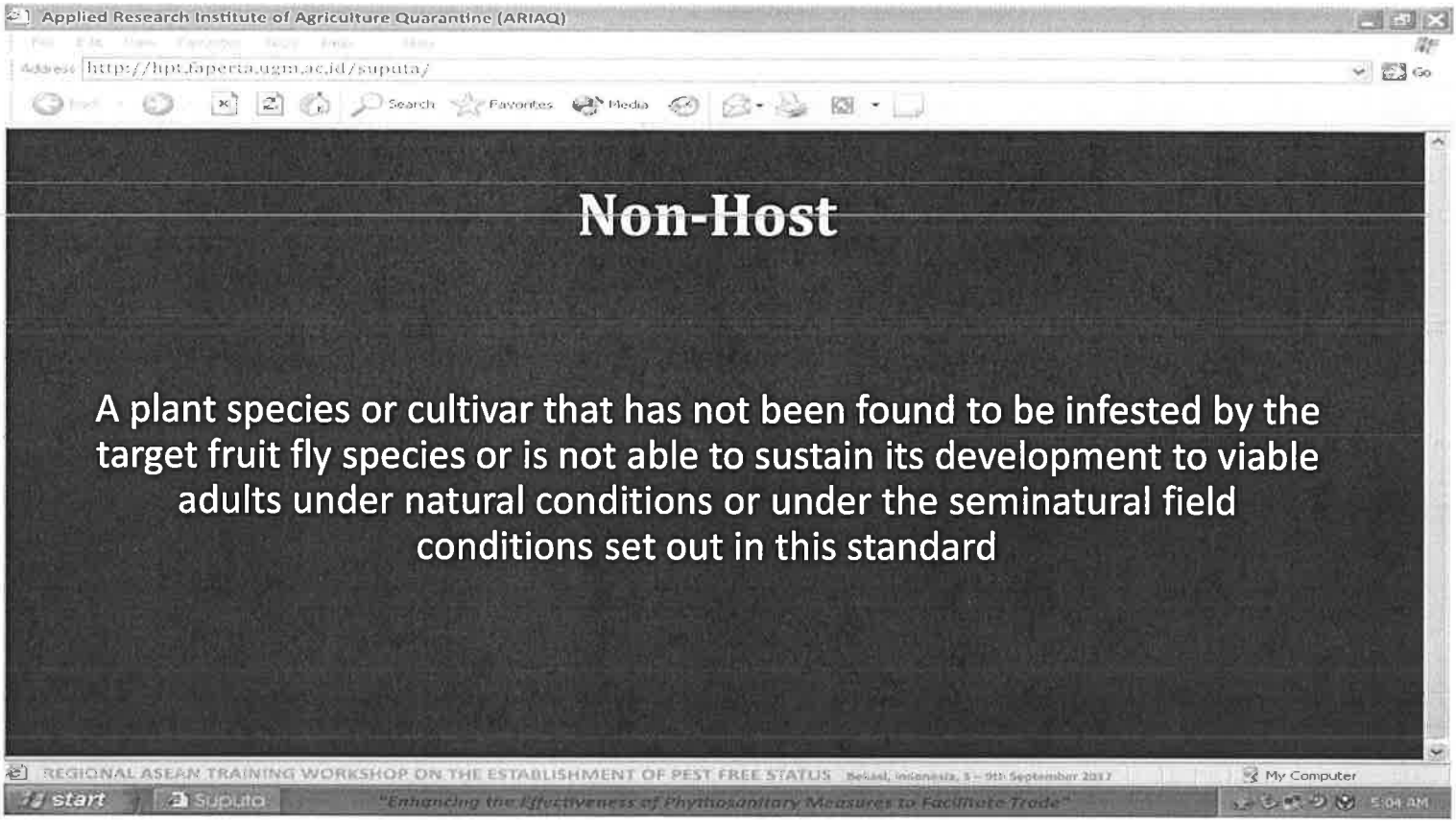
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Non-Host
A plant species or cultivar that has not been found to be infested by the target fruit fly species or is not able to sustain its development to viable adults under natural conditions or under the seminatural field conditions set out in this standard
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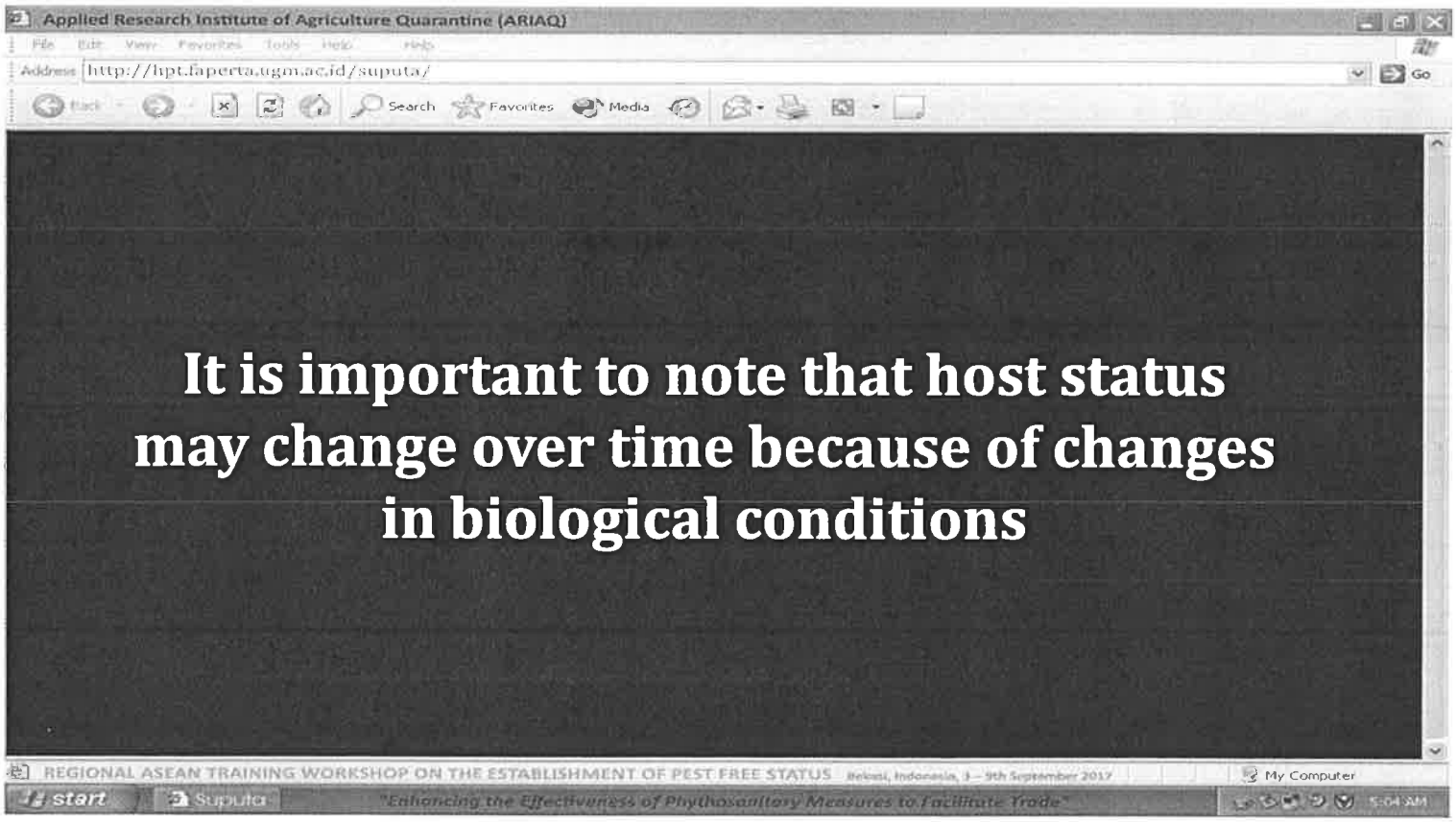
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It is important to note that host status may change over time because of changes in biological conditions
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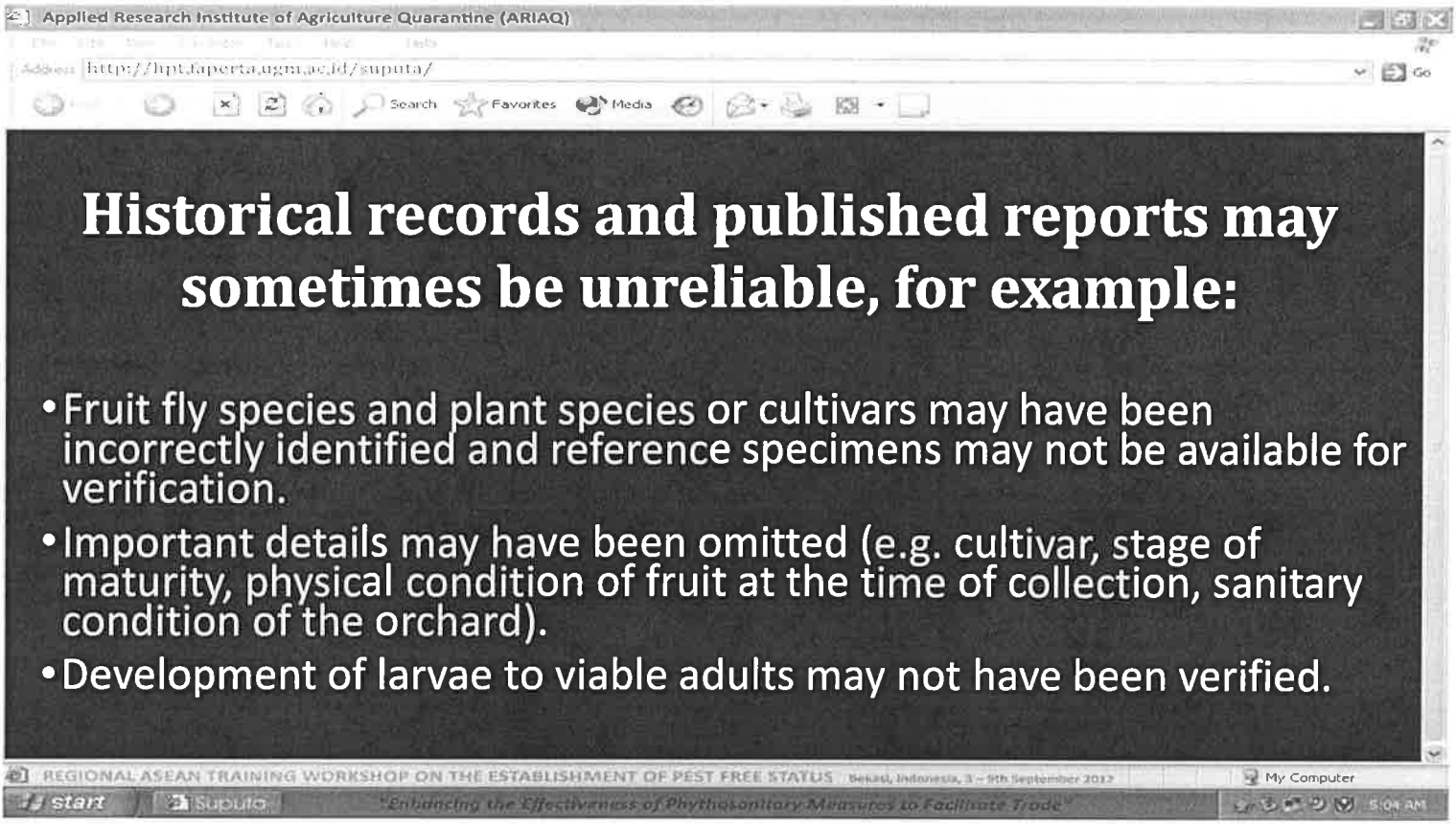
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Historical records and published reports may sometimes be unreliable, for example:
•Fruit fly species and plant species or cultivars may have been incorrectly identified and reference specimens may not be available for verification.
•Important details may have been omitted (e.g. cultivar, stage of maturity, physical condition of fruit at the time of collection, sanitary condition of the orchard).
•Development of larvae to viable adults may not have been verified.
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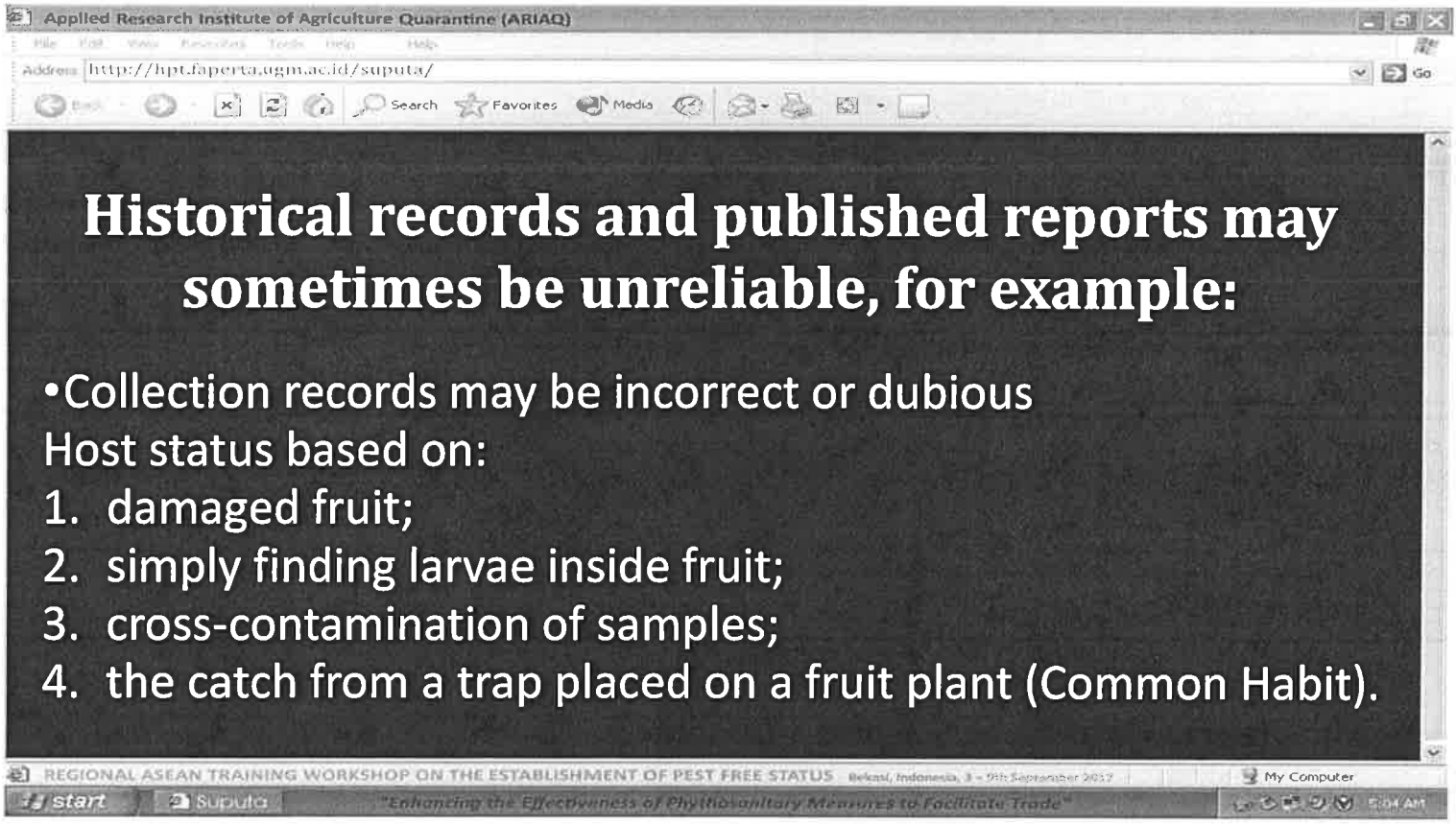
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Historical records and published reports may sometimes be unreliable, for example:
•Collection records may be incorrect or dubious
Host status based on:
1. damaged fruit;
2. simply finding larvae inside fruit;
3. cross-contamination of samples;
4. the catch from a trap placed on a fruit plant (Common Habit).
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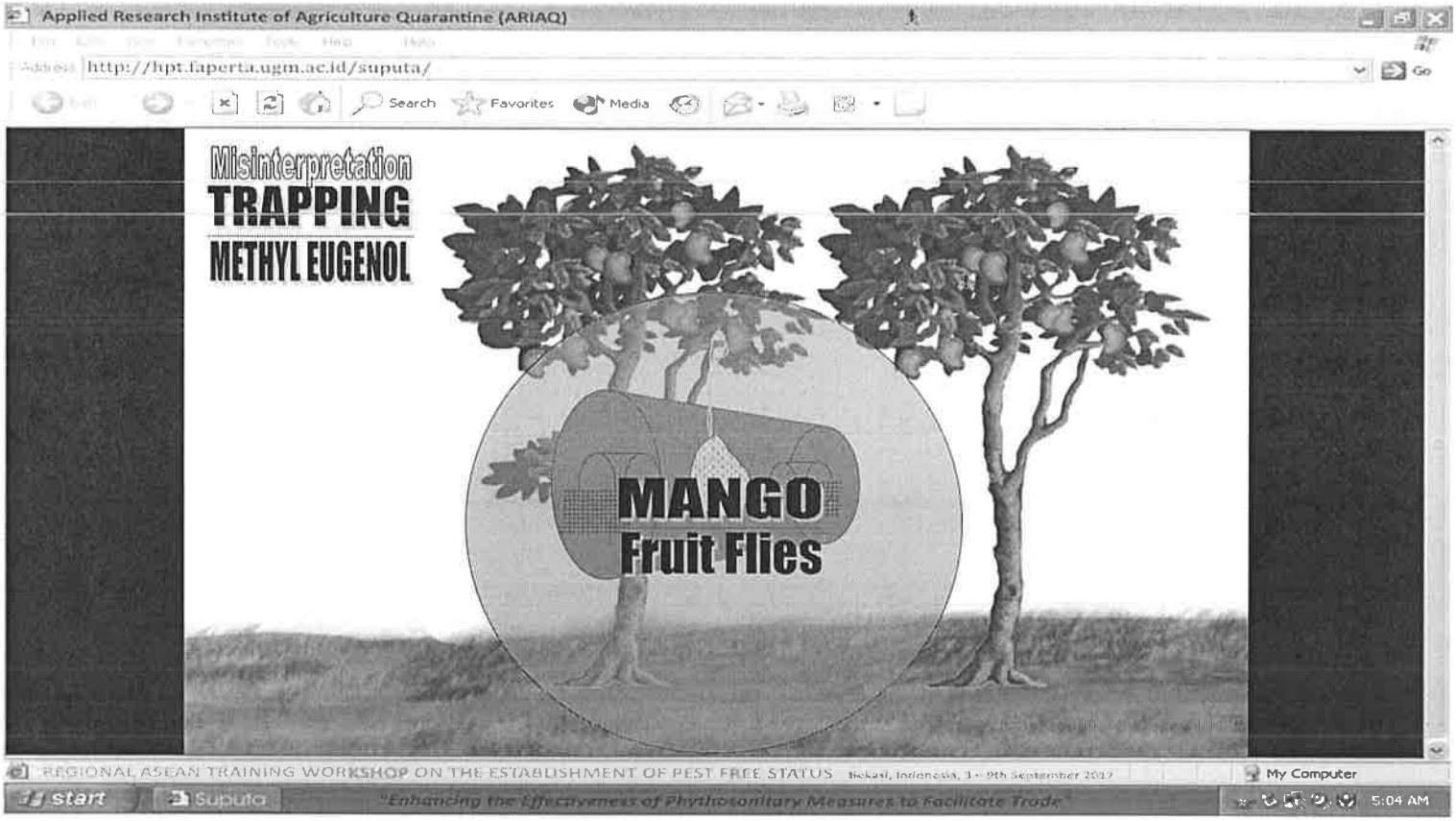
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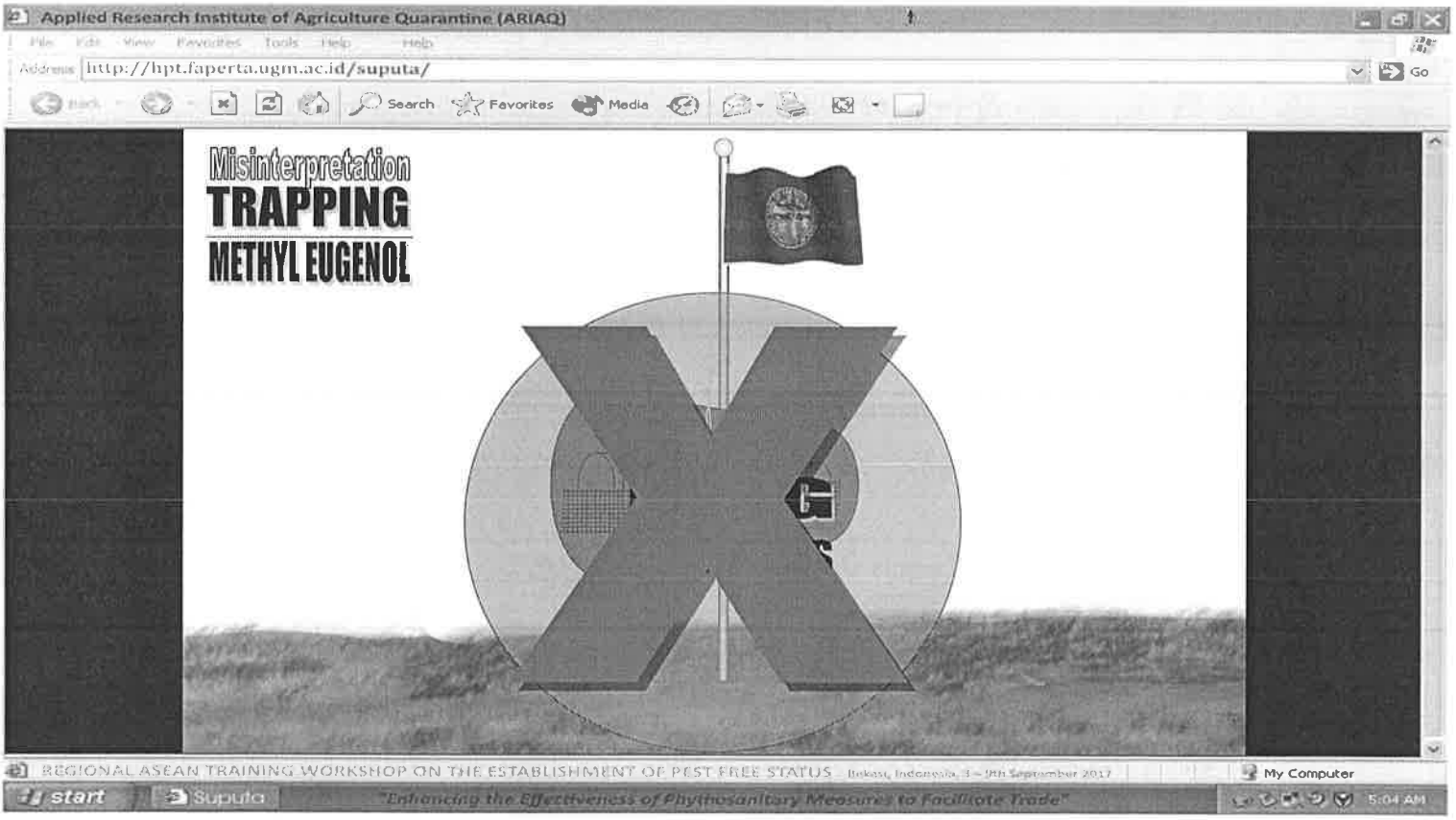
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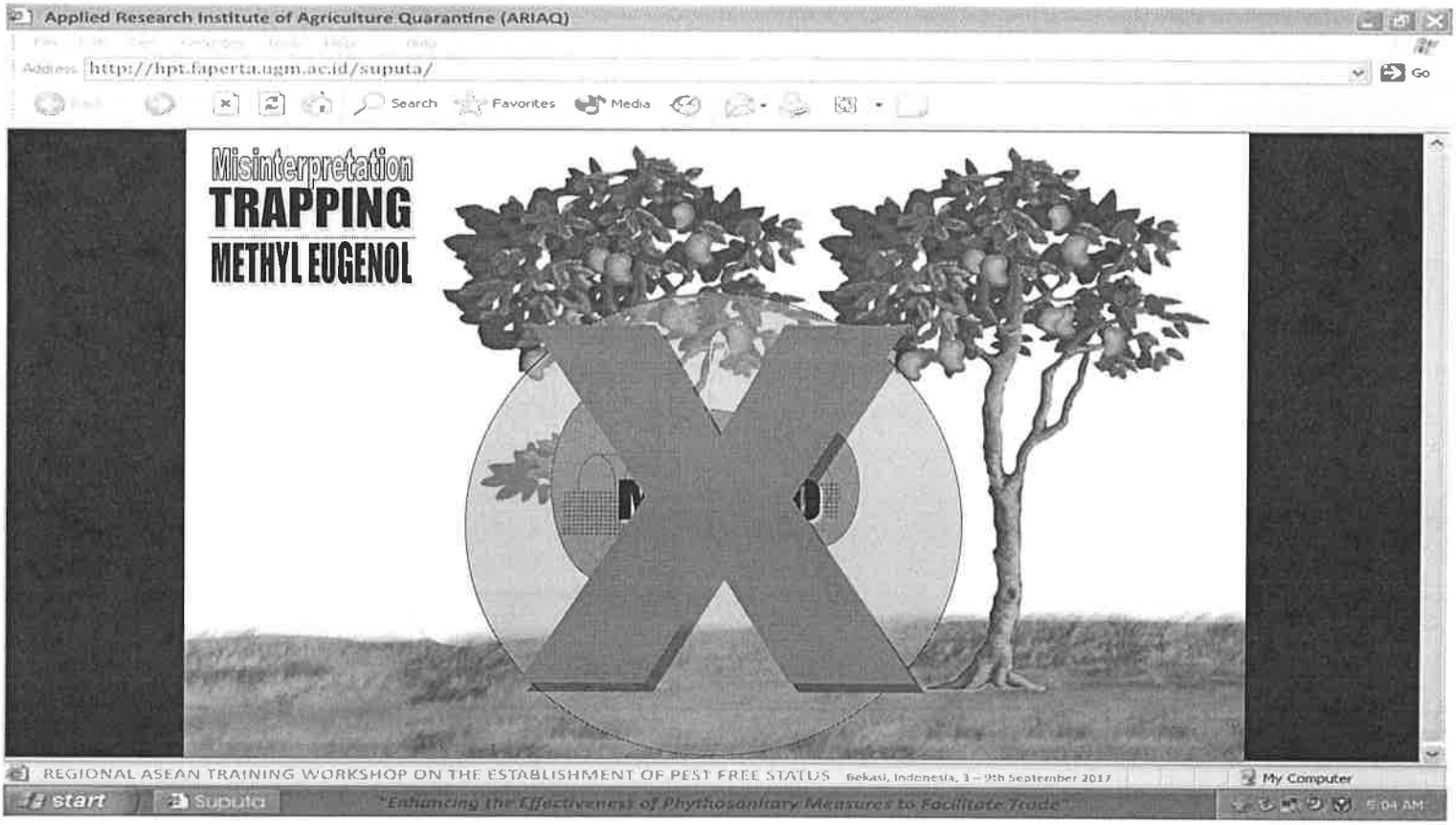
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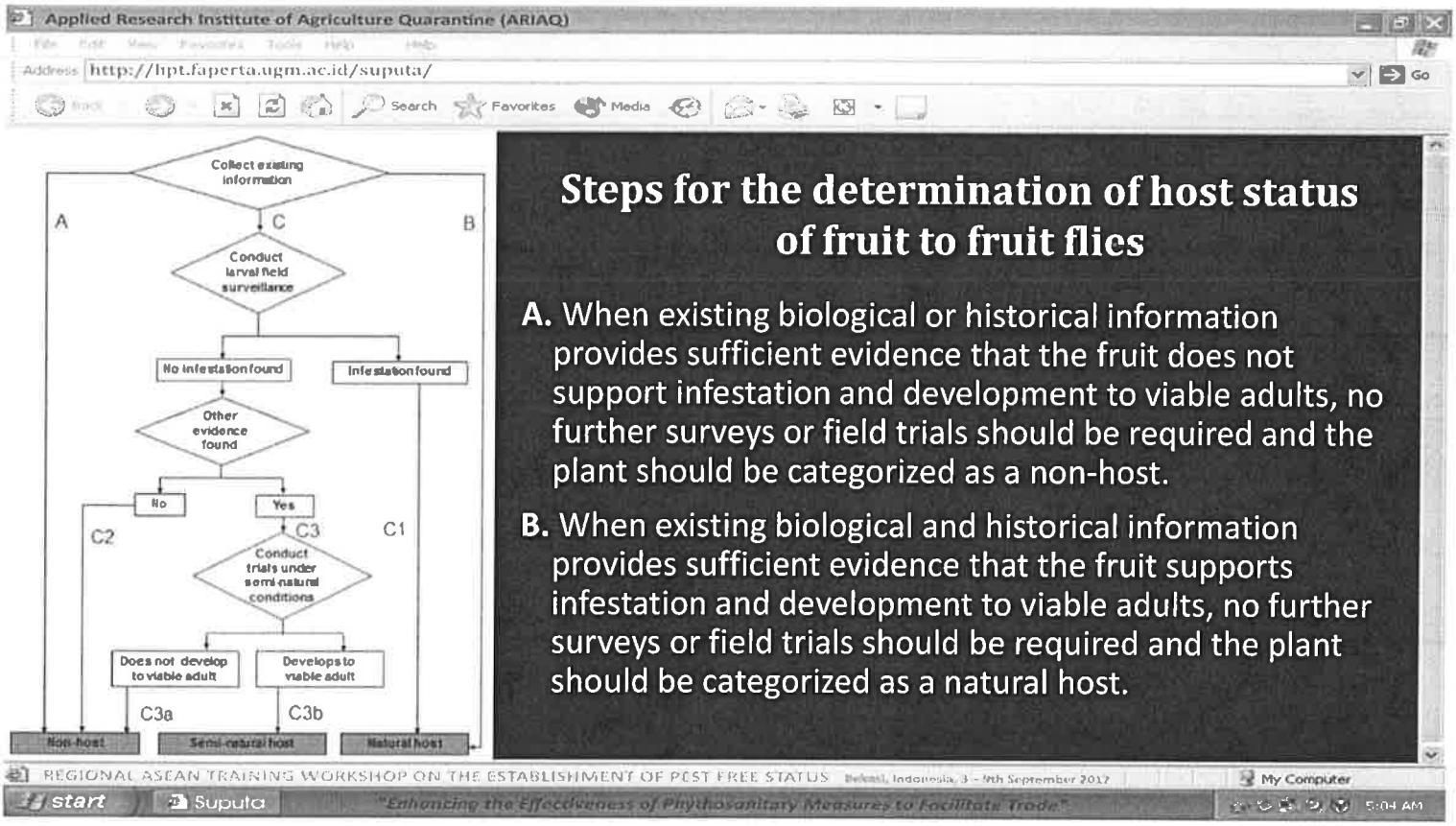
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Collect existing information
A
C
B
Conduct larval field surveillance
No infestation found
Infestation found
Other evidence found
No
Yes
C2
C3
C1
Conduct trials under semi-natural conditions
Does not develop to viable adult
Develops to viable adult
C3a
C3b
Non-host
Semi-natural host
Natural host
Steps for the determination of host status of fruit to fruit flies
A. When existing biological or historical information provides sufficient evidence that the fruit does not support infestation and development to viable adults, no further surveys or field trials should be required and the plant should be categorized as a non-host.
B. When existing biological and historical information provides sufficient evidence that the fruit supports infestation and development to viable adults, no further surveys or field trials should be required and the plant should be categorized as a natural host.
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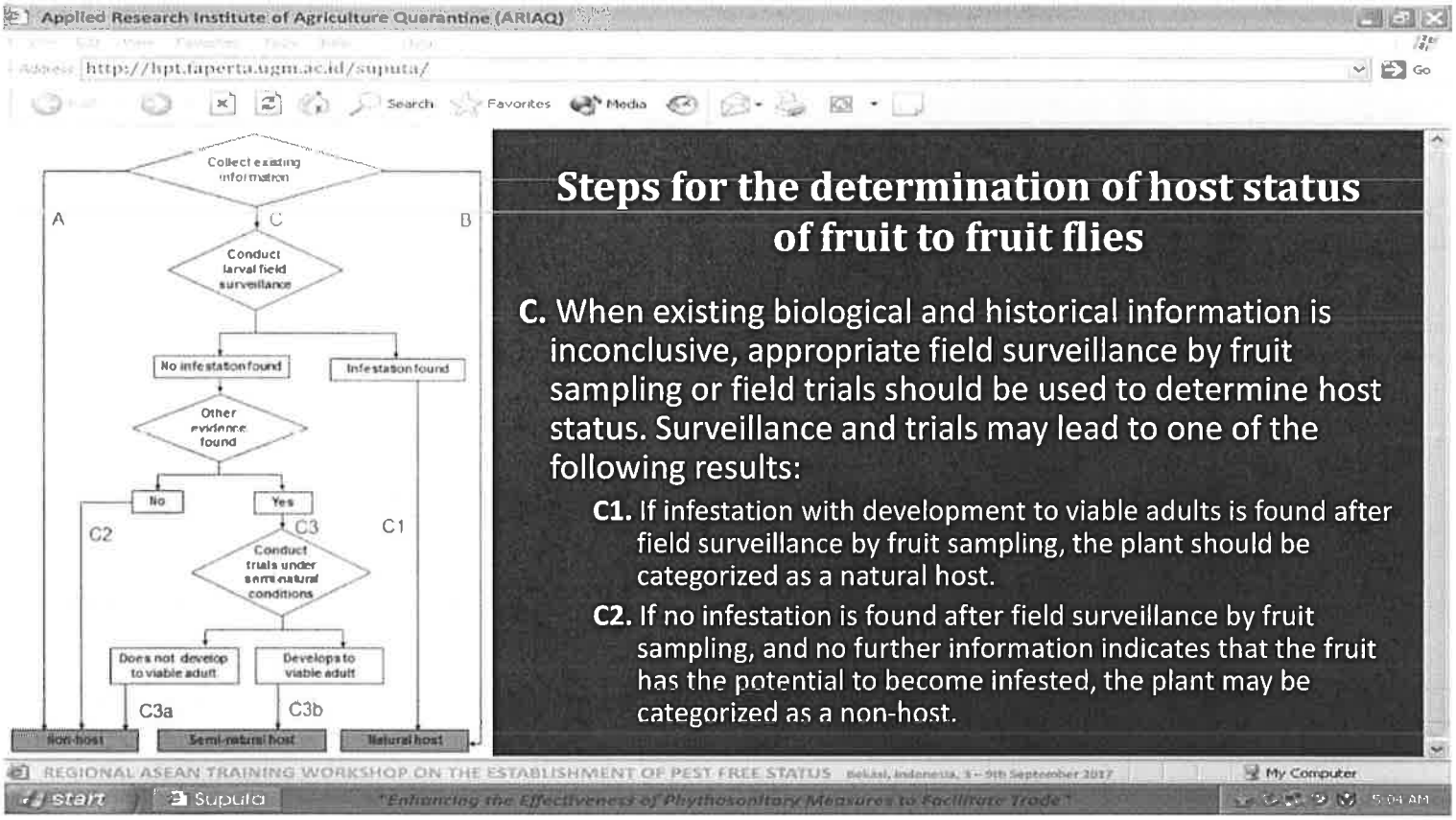
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Collect existing information
A
C
B
Conduct larval field surveillance
No infestation found
Infestation found
Other evidence found
No
Yes
C2
C3
C1
Conduct trials under semi-natural conditions
Does not develop to viable adult
Develops to viable adult
C3a
C3b
Non-host
Semi-natural host
Natural host
Steps for the determination of host status of fruit to fruit flies
C. When existing biological and historical information is inconclusive, appropriate field surveillance by fruit sampling or field trials should be used to determine host status. Surveillance and trials may lead to one of the following results:
C1. If infestation with development to viable adults is found after field surveillance by fruit sampling, the plant should be categorized as a natural host.
C2. If no infestation is found after field surveillance by fruit sampling, and no further information indicates that the fruit has the potential to become infested, the plant may be categorized as a non-host.
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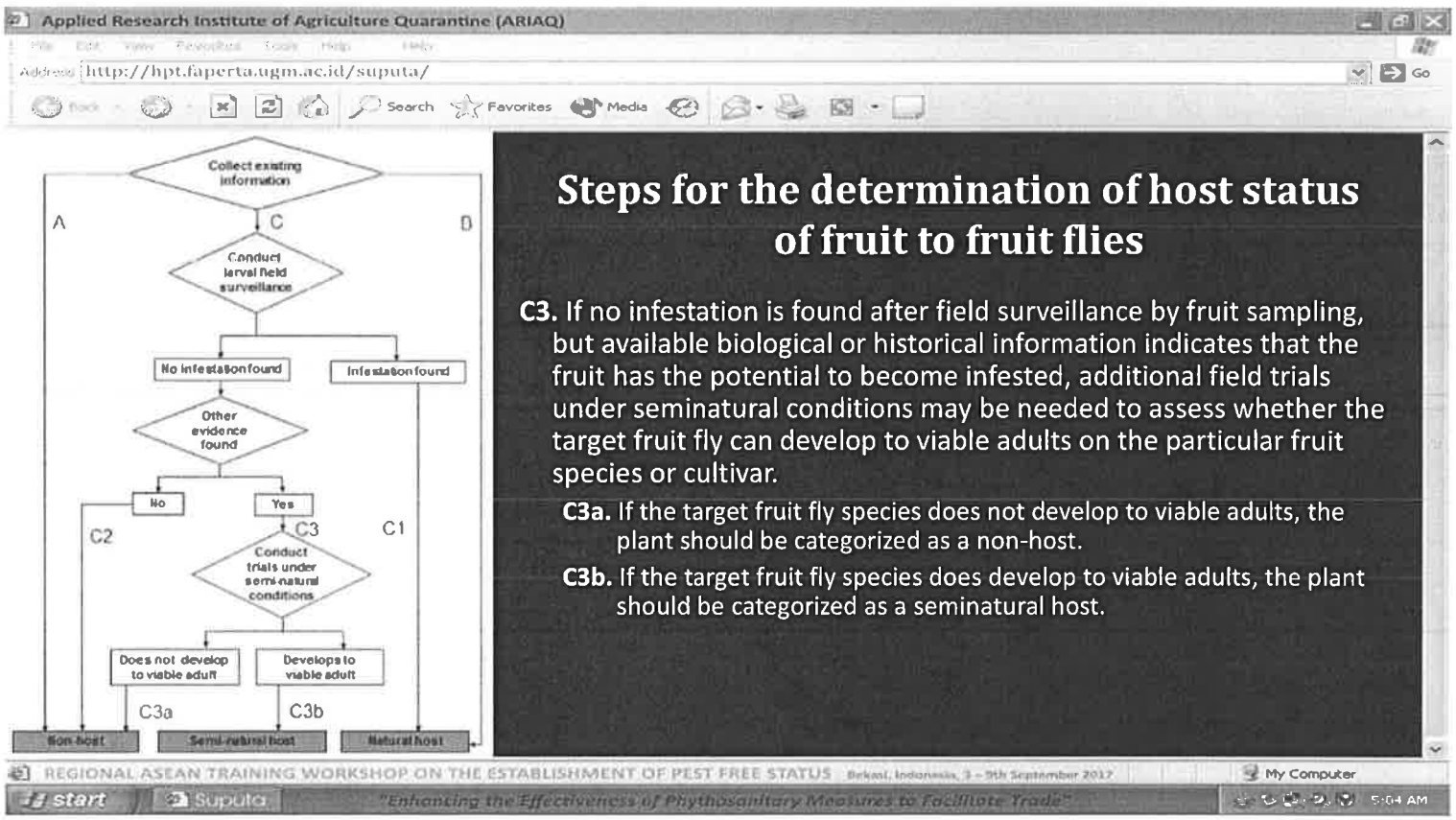
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Collect existing information
A
C
B
Conduct larval field surveillance
No infestation found
Infestation found
Other evidence found
No
Yes
C2
C3
C1
Conduct trials under semi-natural conditions
Does not develop to viable adult
Develops to viable adult
C3a
C3b
Non-host
Semi-natural host
Natural host
Steps for the determination of host status of fruit to fruit flies
C3. If no infestation is found after field surveillance by fruit sampling, but available biological or historical information indicates that the fruit has the potential to become infested, additional field trials under seminatural conditions may be needed to assess whether the target fruit fly can develop to viable adults on the particular fruit species or cultivar.
C3a. If the target fruit fly species does not develop to viable adults, the plant should be categorized as a non-host.
C3b. If the target fruit fly species does develop to viable adults, the plant should be categorized as a seminatural host.
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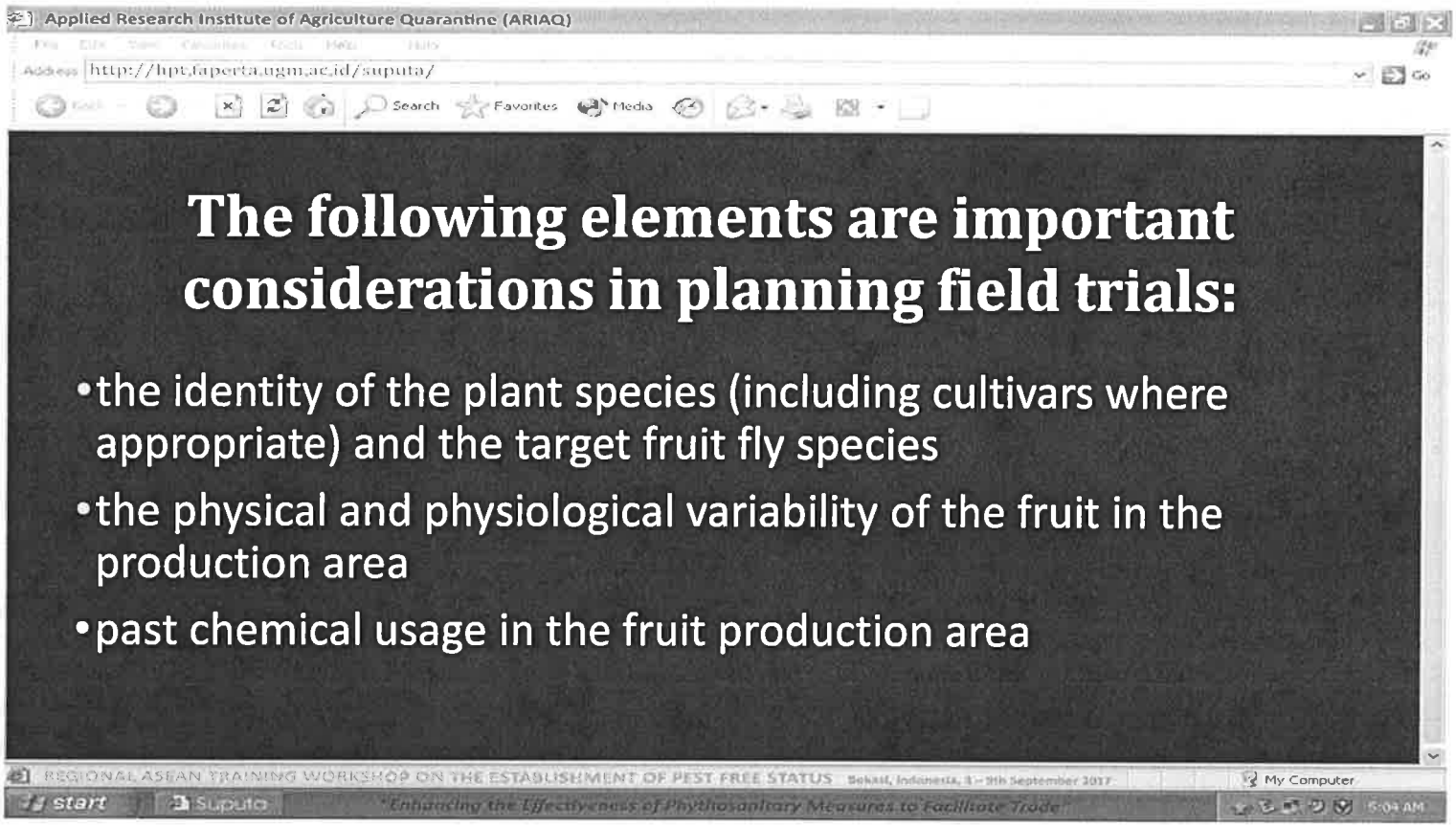
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The following elements are important considerations in planning field trials:
•the identity of the plant species (including cultivars where appropriate) and the target fruit fly species
•the physical and physiological variability of the fruit in the production area
•past chemical usage in the fruit production area
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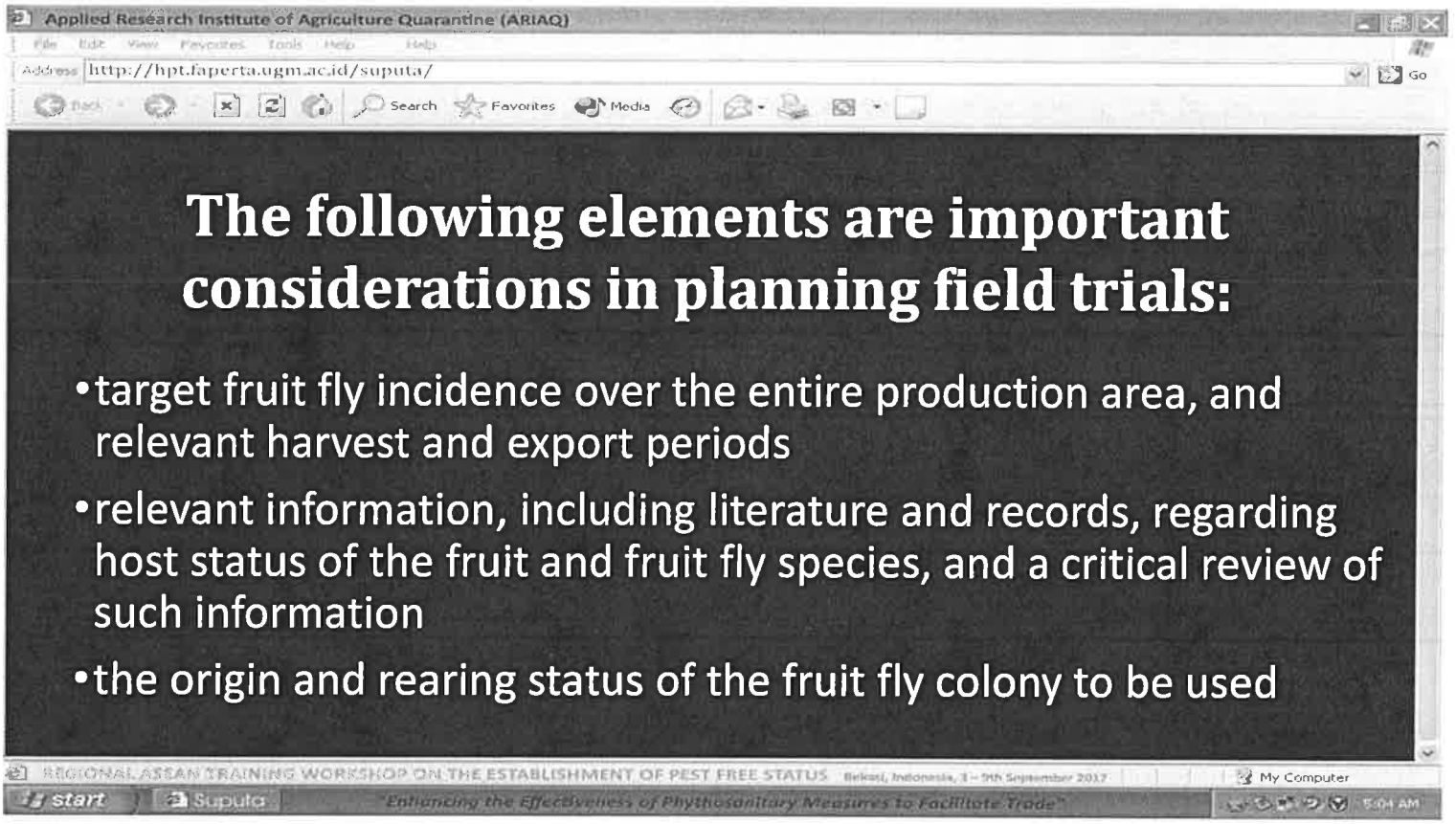
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The following elements are important considerations in planning field trials:
•target fruit fly incidence over the entire production area, and relevant harvest and export periods
•relevant information, including literature and records, regarding host status of the fruit and fruit fly species, and a critical review of such information
•the origin and rearing status of the fruit fly colony to be used
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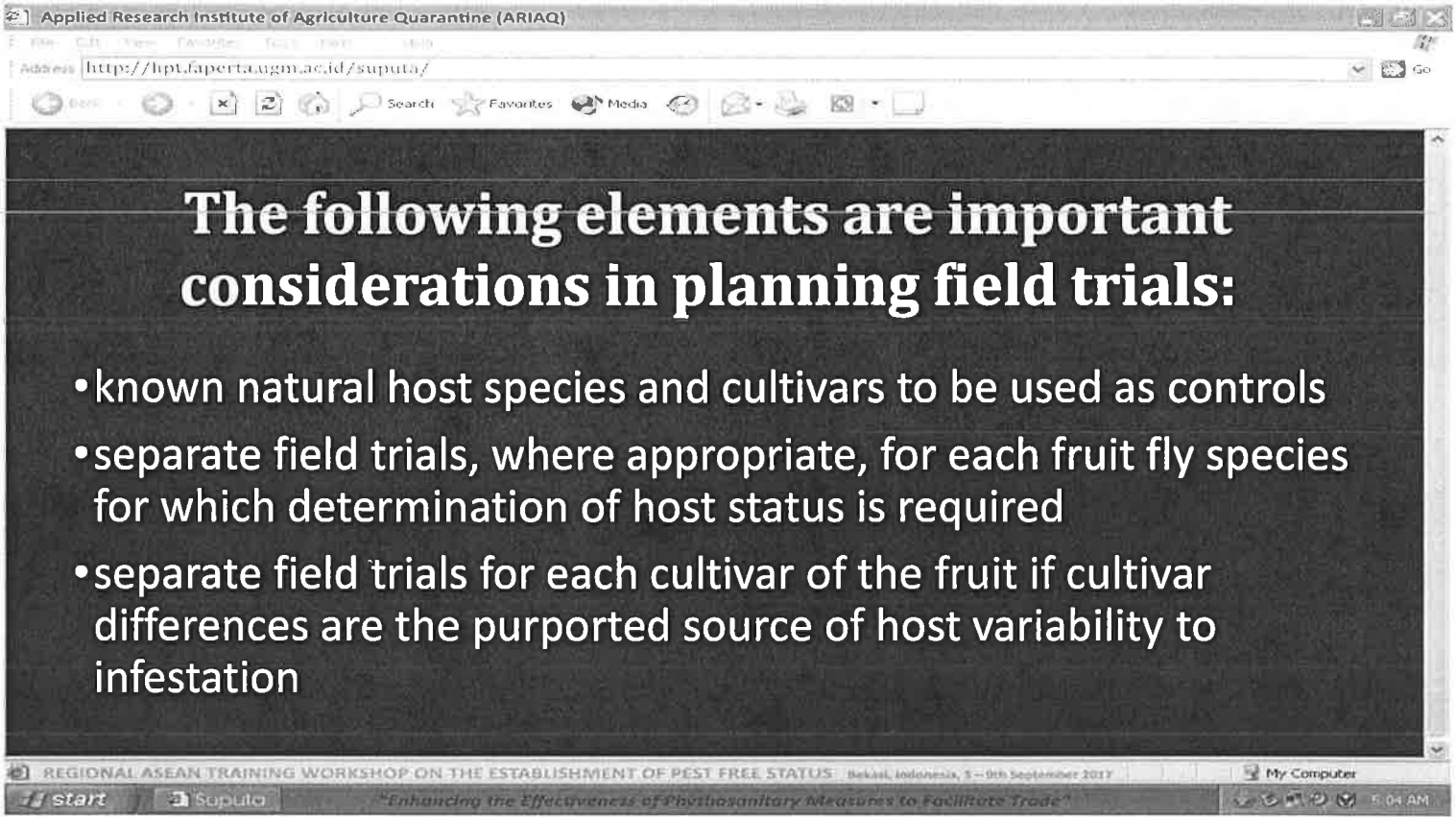
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The following elements are important considerations in planning field trials:
•known natural host species and cultivars to be used as controls
•separate field trials, where appropriate, for each fruit fly species for which determination of host status is required
•separate field trials for each cultivar of the fruit if cultivar differences are the purported source of host variability to infestation
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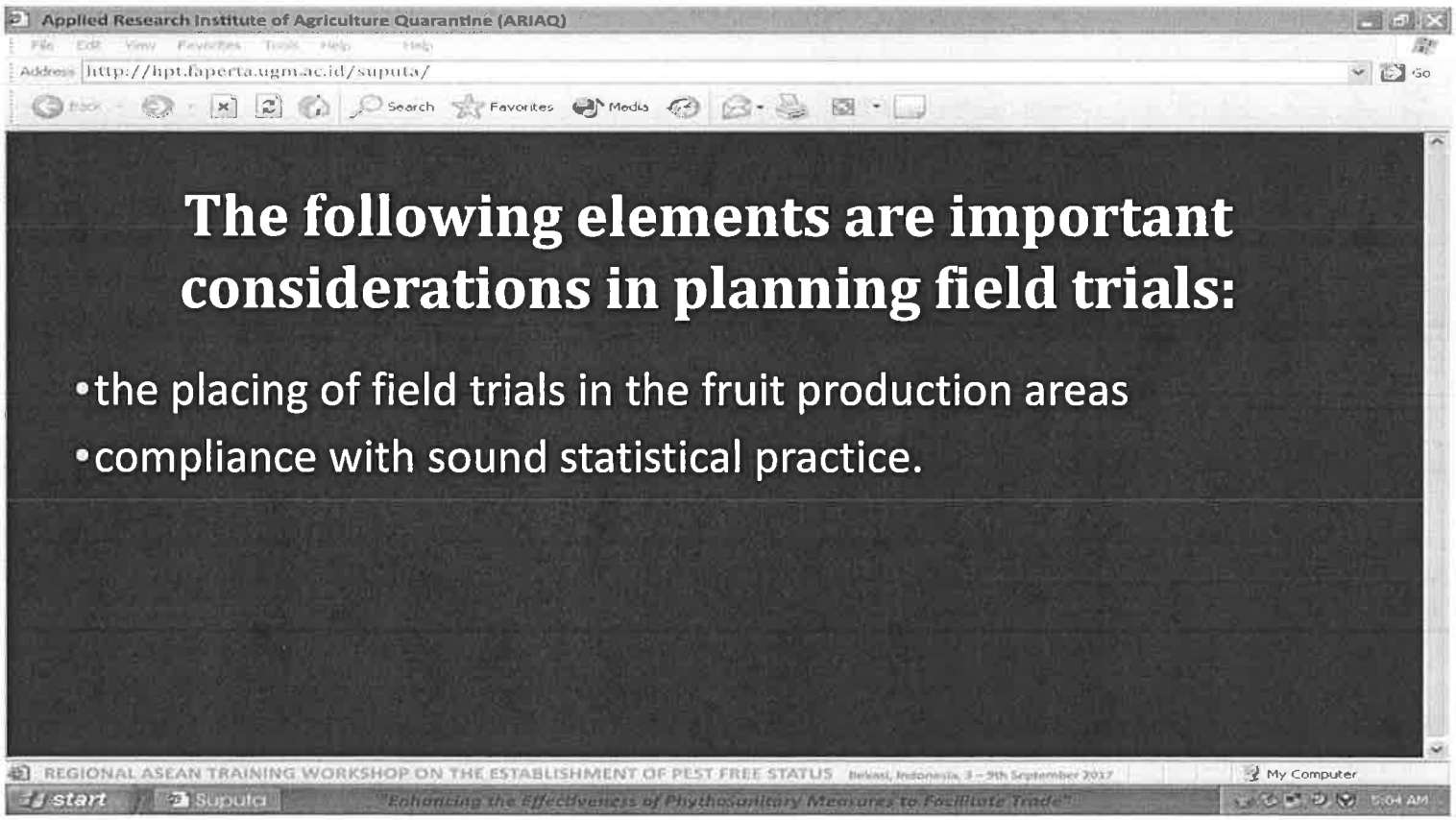
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The following elements are important considerations in planning field trials:
•the placing of field trials in the fruit production areas
•compliance with sound statistical practice.
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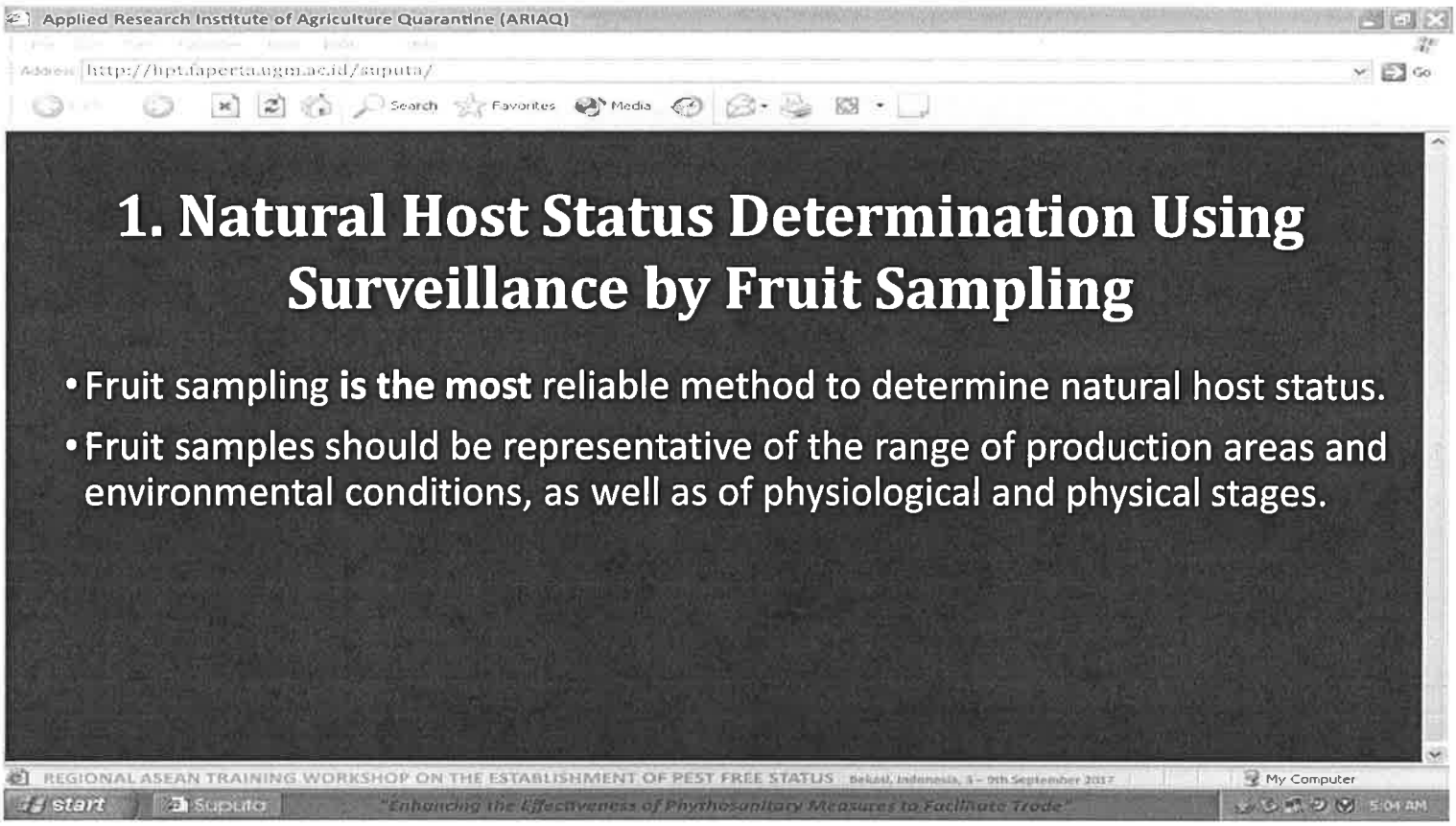
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1. Natural Host Status Determination Using Surveillance by Fruit Sampling
• Fruit sampling is the most reliable method to determine natural host status.
• Fruit samples should be representative of the range of production areas and environmental conditions, as well as of physiological and physical stages.
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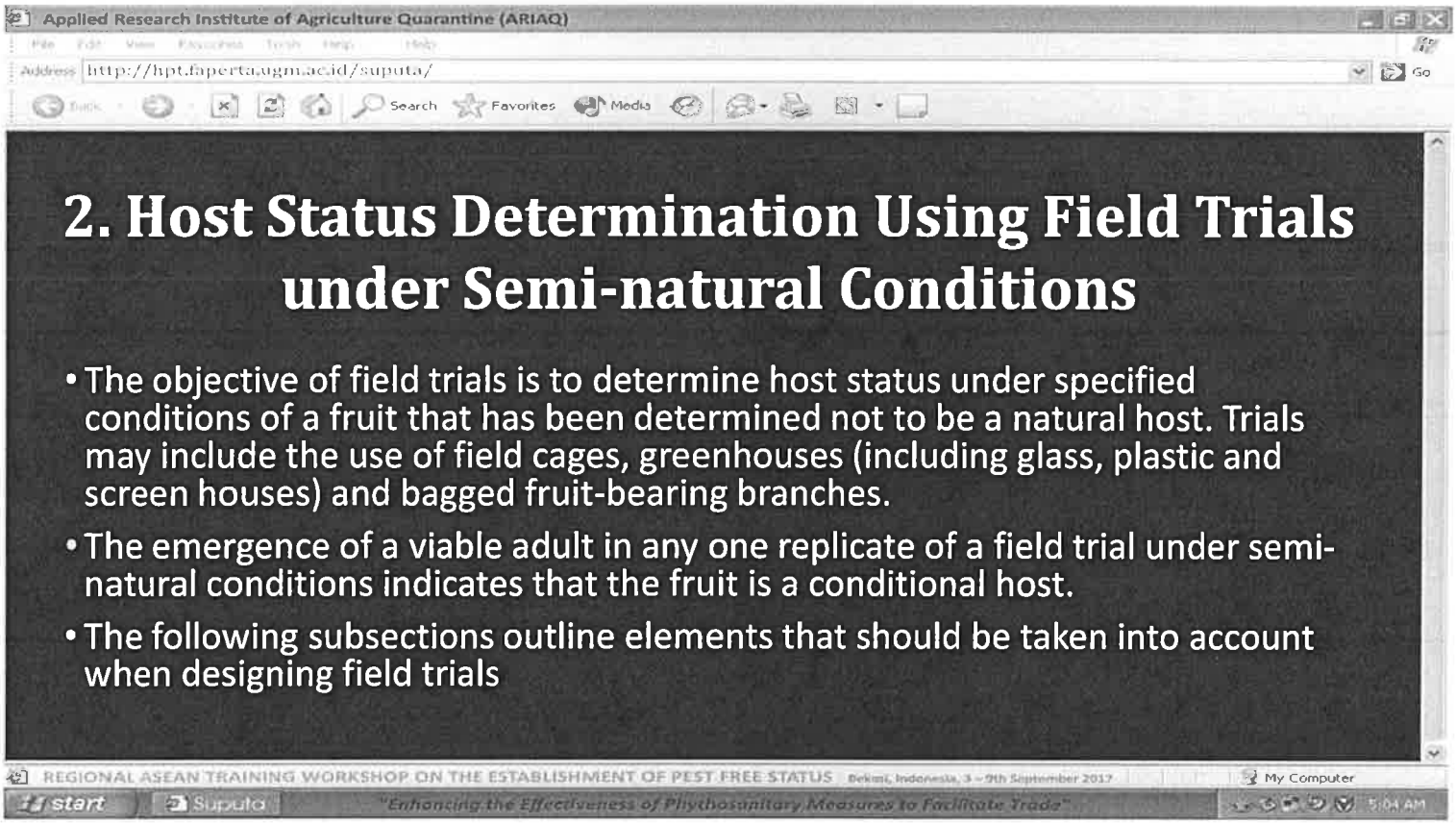
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2. Host Status Determination Using Field Trials under Semi-natural Conditions
• The objective of field trials is to determine host status under specified conditions of a fruit that has been determined not to be a natural host. Trials may include the use of field cages, greenhouses (including glass, plastic and screen houses) and bagged fruit-bearing branches.
• The emergence of a viable adult in any one replicate of a field trial under semi-natural conditions indicates that the fruit is a conditional host.
• The following subsections outline elements that should be taken into account when designing field trials
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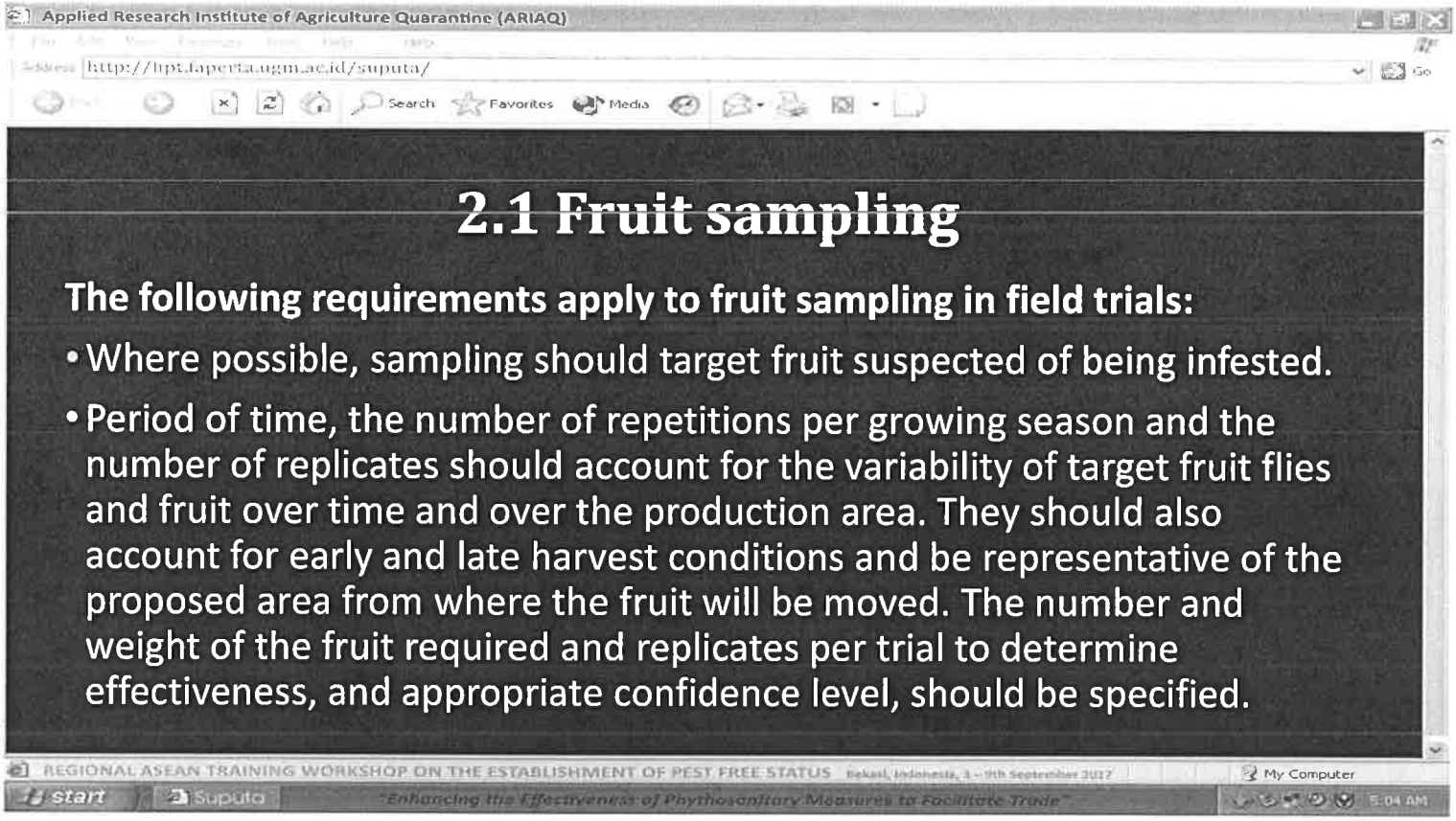
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2.1 Fruit sampling
The following requirements apply to fruit sampling in field trials:
• Where possible, sampling should target fruit suspected of being infested.
• Period of time, the number of repetitions per growing season and the number of replicates should account for the variability of target fruit flies and fruit over time and over the production area. They should also account for early and late harvest conditions and be representative of the proposed area from where the fruit will be moved. The number and weight of the fruit required and replicates per trial to determine effectiveness, and appropriate confidence level, should be specified.
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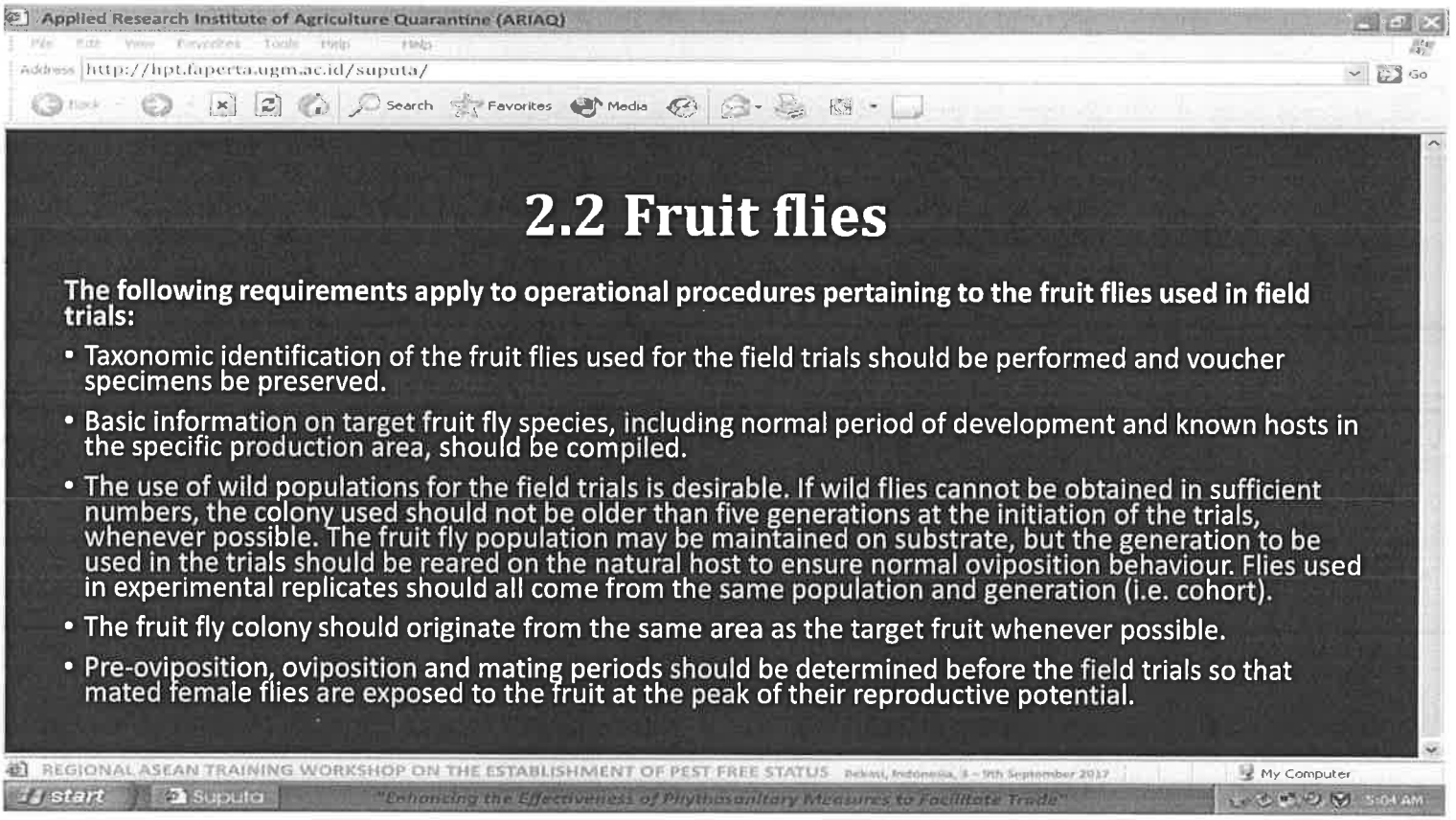
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2.2 Fruit flies
The following requirements apply to operational procedures pertaining to the fruit flies used in field trials:
• Taxonomic identification of the fruit flies used for the field trials should be performed and voucher specimens be preserved.
• Basic information on target fruit fly species, including normal period of development and known hosts in the specific production area, should be compiled.
• The use of wild populations for the field trials is desirable. If wild flies cannot be obtained in sufficient numbers, the colony used should not be older than five generations at the initiation of the trials, whenever possible. The fruit fly population may be maintained on substrate, but the generation to be used in the trials should be reared on the natural host to ensure normal oviposition behaviour. Flies used in experimental replicates should all come from the same population and generation (i.e. cohort).
• The fruit fly colony should originate from the same area as the target fruit whenever possible.
• Pre-oviposition, oviposition and mating periods should be determined before the field trials so that mated female flies are exposed to the fruit at the peak of their reproductive potential.
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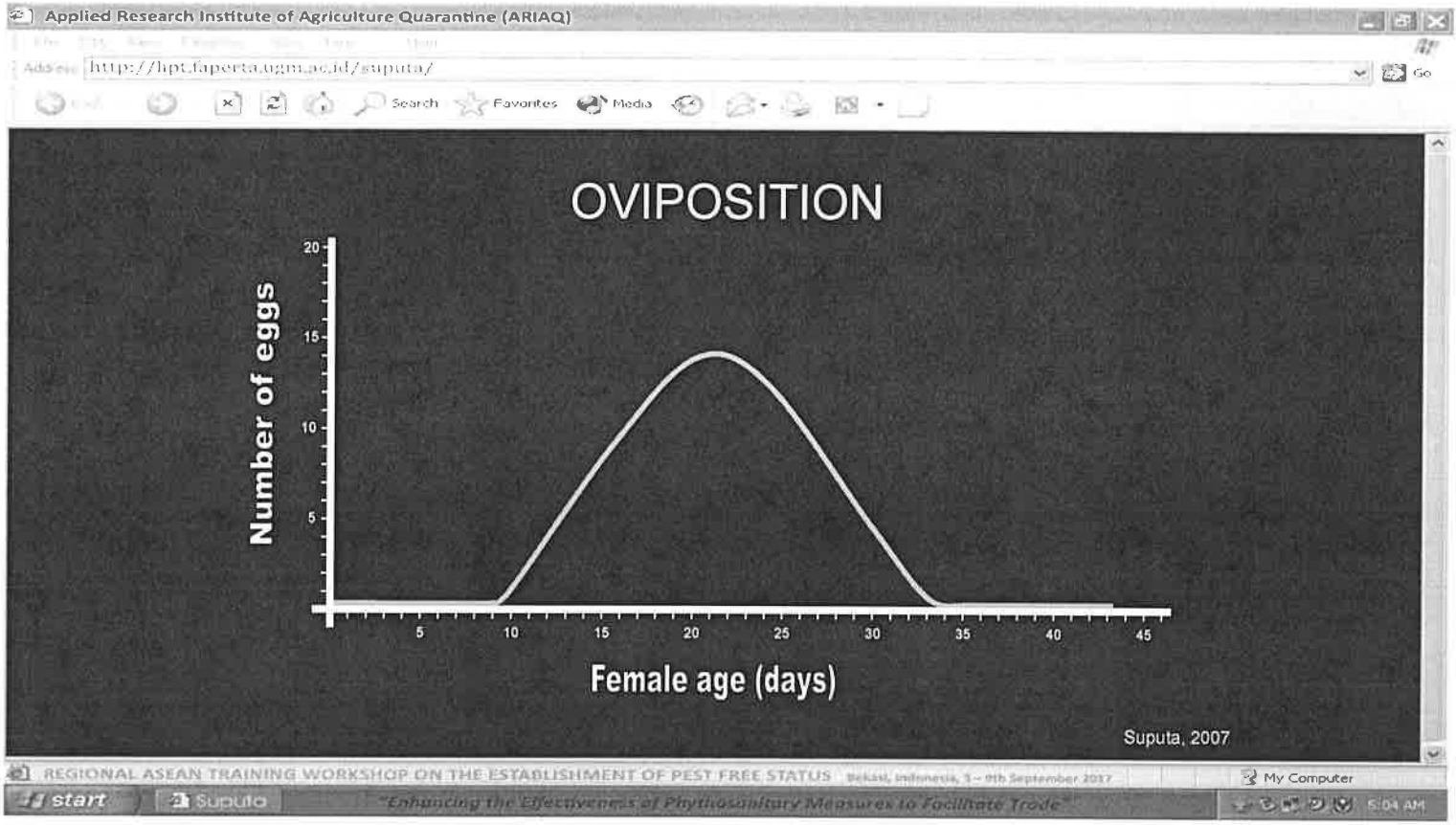
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OVIPOSITION
Number of eggs
20
15
10
5
5
10
15
20
25
30
35
40
45
Female age (days)
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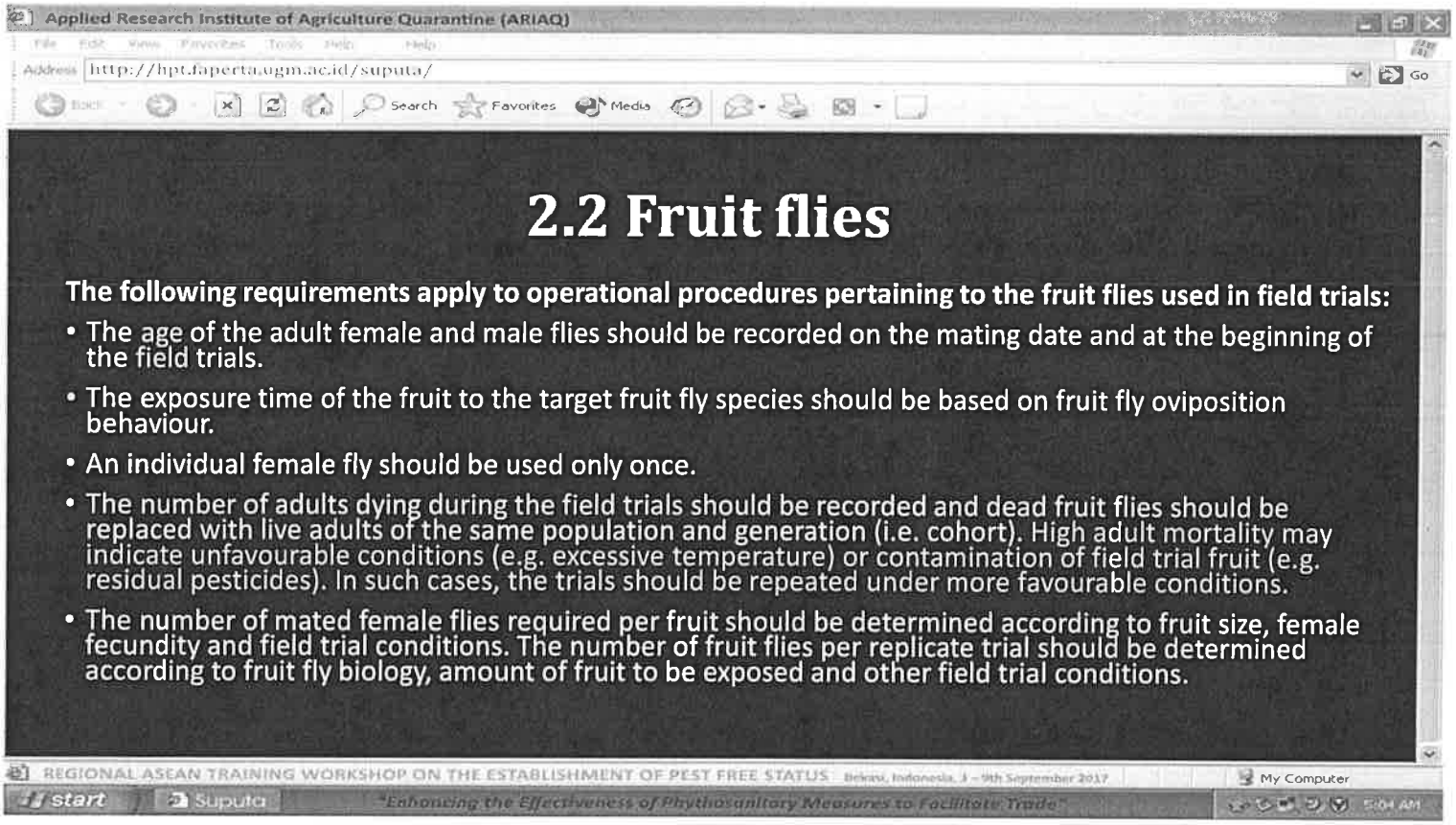
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2.2 Fruit flies
The following requirements apply to operational procedures pertaining to the fruit flies used in field trials:
• The age of the adult female and male flies should be recorded on the mating date and at the beginning of the field trials.
• The exposure time of the fruit to the target fruit fly species should be based on fruit fly oviposition behaviour.
• An individual female fly should be used only once.
• The number of adults dying during the field trials should be recorded and dead fruit flies should be replaced with live adults of the same population and generation (i.e. cohort). High adult mortality may indicate unfavourable conditions (e.g. excessive temperature) or contamination of field trial fruit (e.g. residual pesticides). In such cases, the trials should be repeated under more favourable conditions.
• The number of mated female flies required per fruit should be determined according to fruit size, female fecundity and field trial conditions. The number of fruit flies per replicate trial should be determined according to fruit fly biology, amount of fruit to be exposed and other field trial conditions.
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NUMBER OF LARVAE PER FRUIT

- Melon
- Rambutans
- Guava
- Gnetum
- Mango
- Carambola

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2.4 Controls

Fruit of known natural hosts at known stage of maturity are required as controls for all field trials. These may be of different species or genera from the target fruit species. Fruit should be free of prior infestation (e.g. by bagging or from a pest free area). Fruit flies used in controls and experimental replicates (including control) should all come from the same population and generation (i.e. cohort)

Controls are used to:

- verify that female flies are sexually mature, mated and exhibiting normal oviposition behaviour
- indicate the level of infestation that may occur in a natural host
- indicate the time frame for development to the adult stage under the field trial conditions in a natural host
- confirm that environmental conditions for infestation are appropriate.

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2.5 Field trial design

Fruit flies are released into large mesh field cages that enclose whole fruit-bearing plants or mesh bags that enclose the parts of plants with the fruit. Alternatively, fruit-bearing plants may be placed in greenhouses into which flies are released.

It is important to note that because female fruit flies are artificially confined within the specific enclosure under observation, they may be forced to lay eggs in the fruit of a conditional host.

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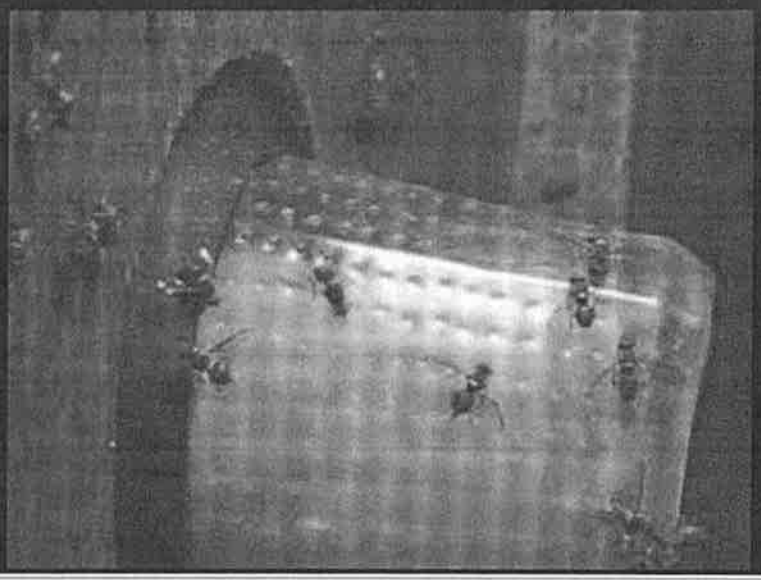
The female fruit flies be forced to lay their eggs in the plastic glass



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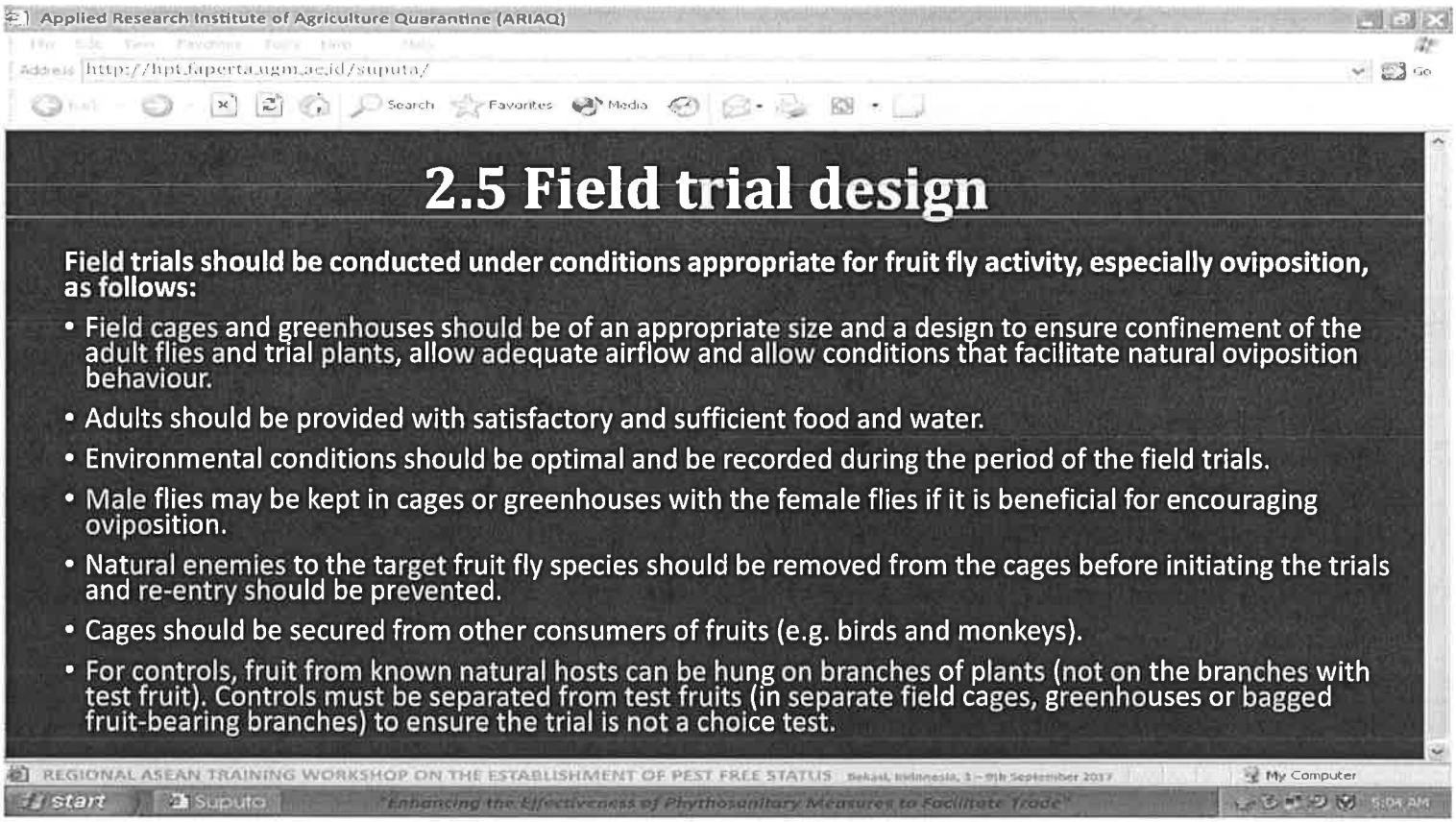
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2.5 Field trial design
Field trials should be conducted under conditions appropriate for fruit fly activity, especially oviposition, as follows:
• Field cages and greenhouses should be of an appropriate size and a design to ensure confinement of the adult flies and trial plants, allow adequate airflow and allow conditions that facilitate natural oviposition behaviour.
• Adults should be provided with satisfactory and sufficient food and water.
• Environmental conditions should be optimal and be recorded during the period of the field trials.
• Male flies may be kept in cages or greenhouses with the female flies if it is beneficial for encouraging oviposition.
• Natural enemies to the target fruit fly species should be removed from the cages before initiating the trials and re-entry should be prevented.
• Cages should be secured from other consumers of fruits (e.g. birds and monkeys).
• For controls, fruit from known natural hosts can be hung on branches of plants (not on the branches with test fruit). Controls must be separated from test fruits (in separate field cages, greenhouses or bagged fruit-bearing branches) to ensure the trial is not a choice test.
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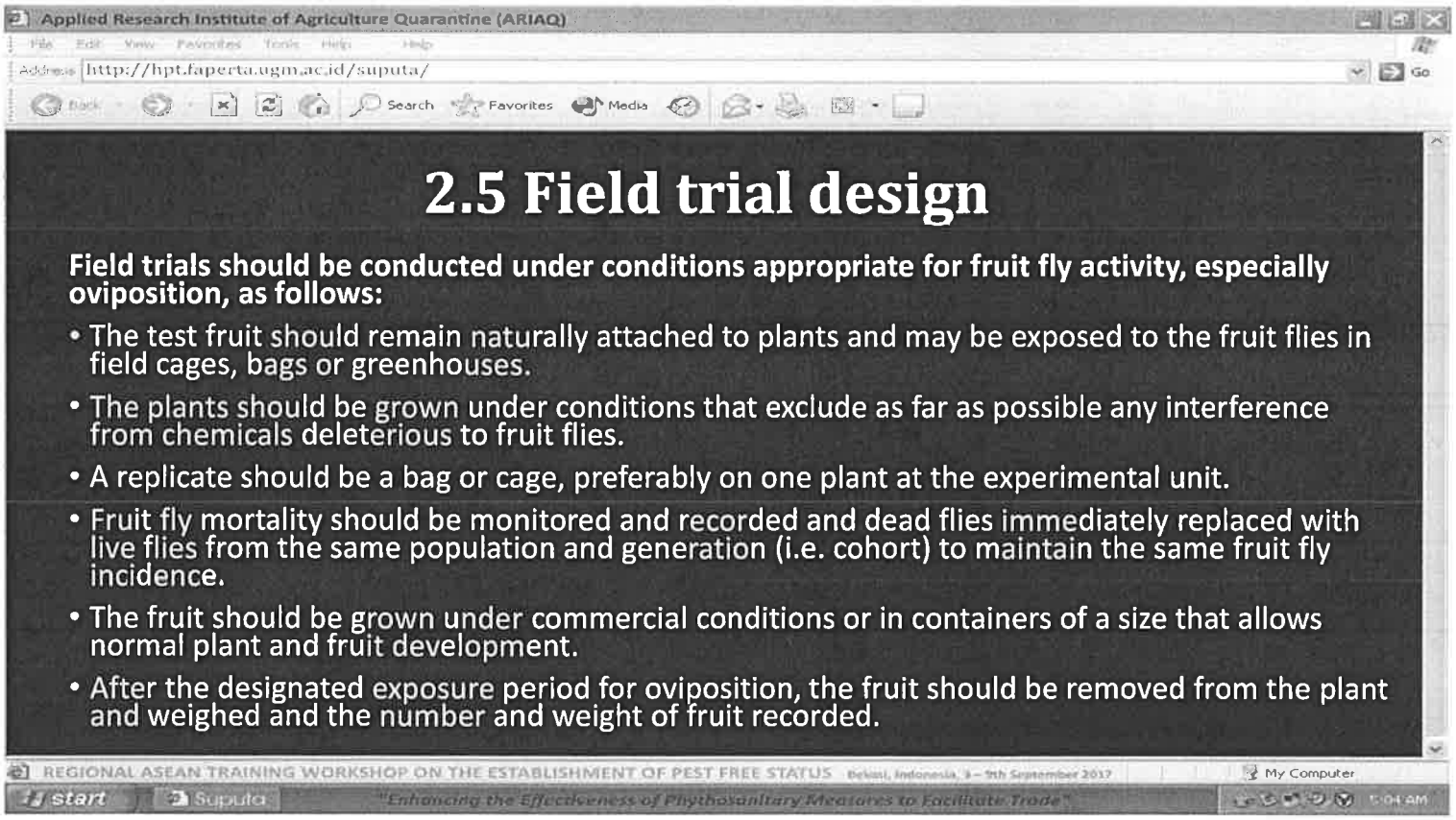
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2.5 Field trial design
Field trials should be conducted under conditions appropriate for fruit fly activity, especially oviposition, as follows:
• The test fruit should remain naturally attached to plants and may be exposed to the fruit flies in field cages, bags or greenhouses.
• The plants should be grown under conditions that exclude as far as possible any interference from chemicals deleterious to fruit flies.
• A replicate should be a bag or cage, preferably on one plant at the experimental unit.
• Fruit fly mortality should be monitored and recorded and dead flies immediately replaced with live flies from the same population and generation (i.e. cohort) to maintain the same fruit fly incidence.
• The fruit should be grown under commercial conditions or in containers of a size that allows normal plant and fruit development.
• After the designated exposure period for oviposition, the fruit should be removed from the plant and weighed and the number and weight of fruit recorded.
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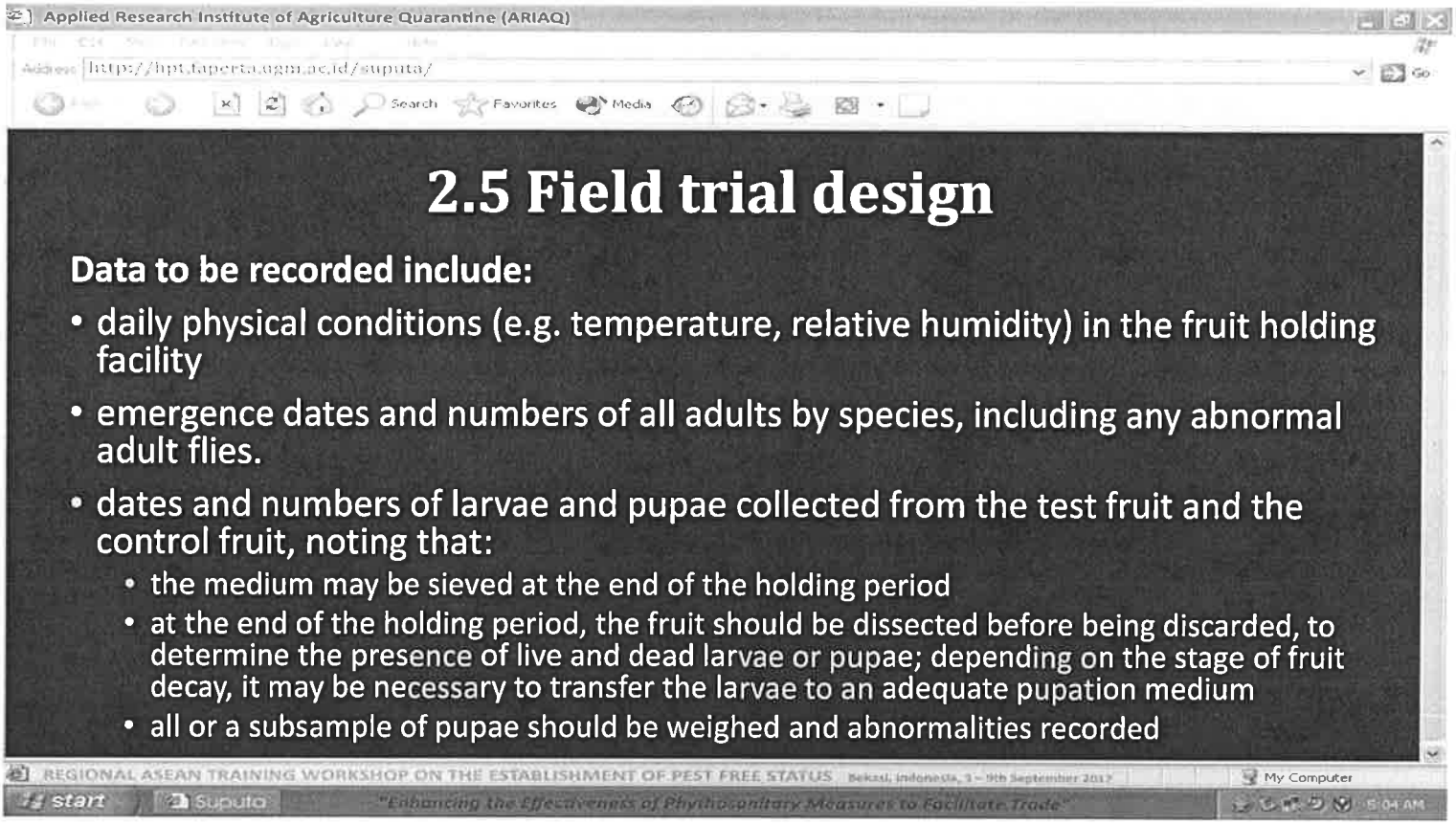
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2.5 Field trial design
Data to be recorded include:
• daily physical conditions (e.g. temperature, relative humidity) in the fruit holding facility
• emergence dates and numbers of all adults by species, including any abnormal adult flies.
• dates and numbers of larvae and pupae collected from the test fruit and the control fruit, noting that:
• the medium may be sieved at the end of the holding period
• at the end of the holding period, the fruit should be dissected before being discarded, to determine the presence of live and dead larvae or pupae; depending on the stage of fruit decay, it may be necessary to transfer the larvae to an adequate pupation medium
• all or a subsample of pupae should be weighed and abnormalities recorded
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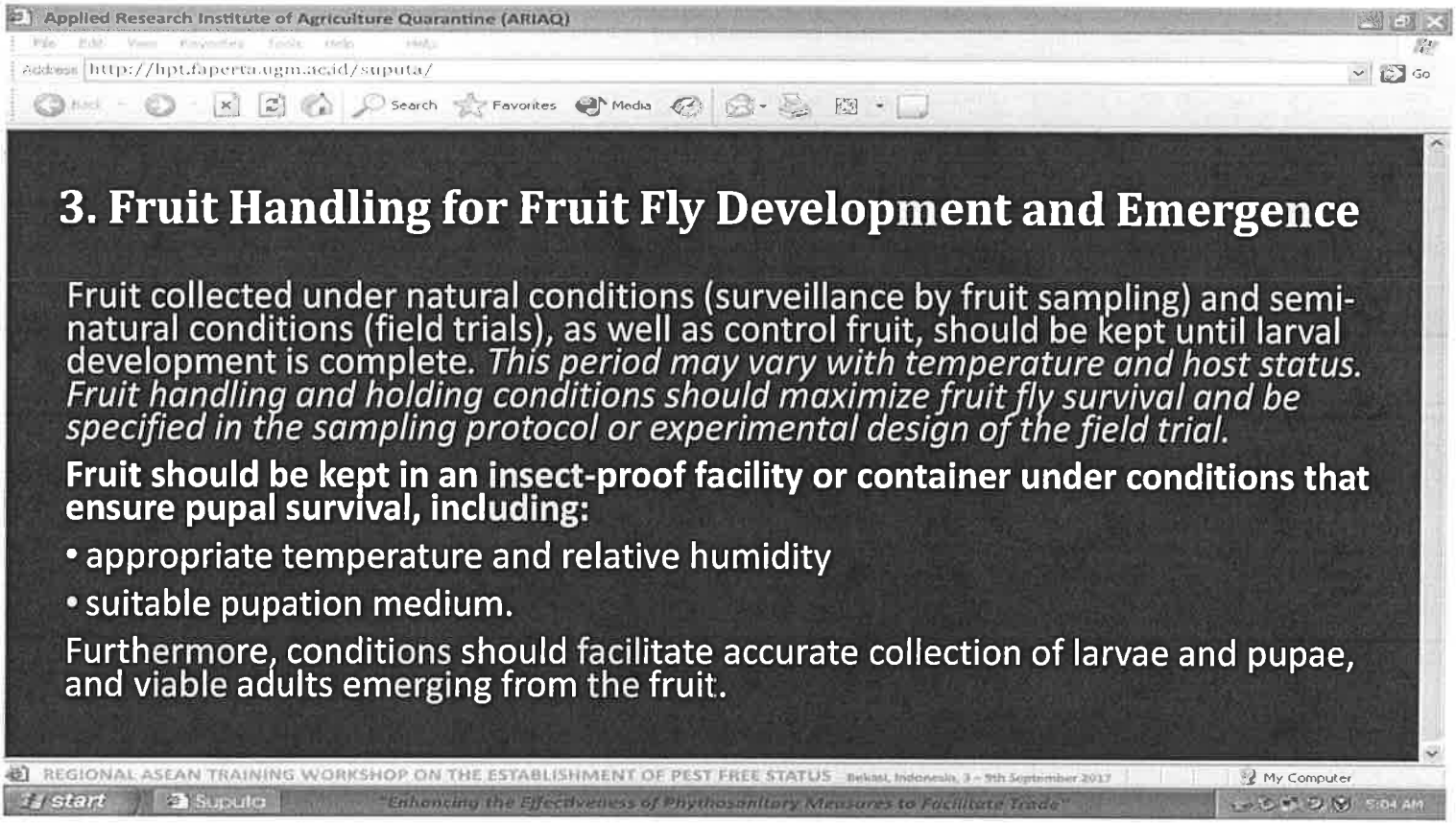
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3. Fruit Handling for Fruit Fly Development and Emergence
Fruit collected under natural conditions (surveillance by fruit sampling) and semi-natural conditions (field trials), as well as control fruit, should be kept until larval development is complete. This period may vary with temperature and host status. Fruit handling and holding conditions should maximize fruit fly survival and be specified in the sampling protocol or experimental design of the field trial.
Fruit should be kept in an insect-proof facility or container under conditions that ensure pupal survival, including:
• appropriate temperature and relative humidity
• suitable pupation medium.
Furthermore, conditions should facilitate accurate collection of larvae and pupae, and viable adults emerging from the fruit.
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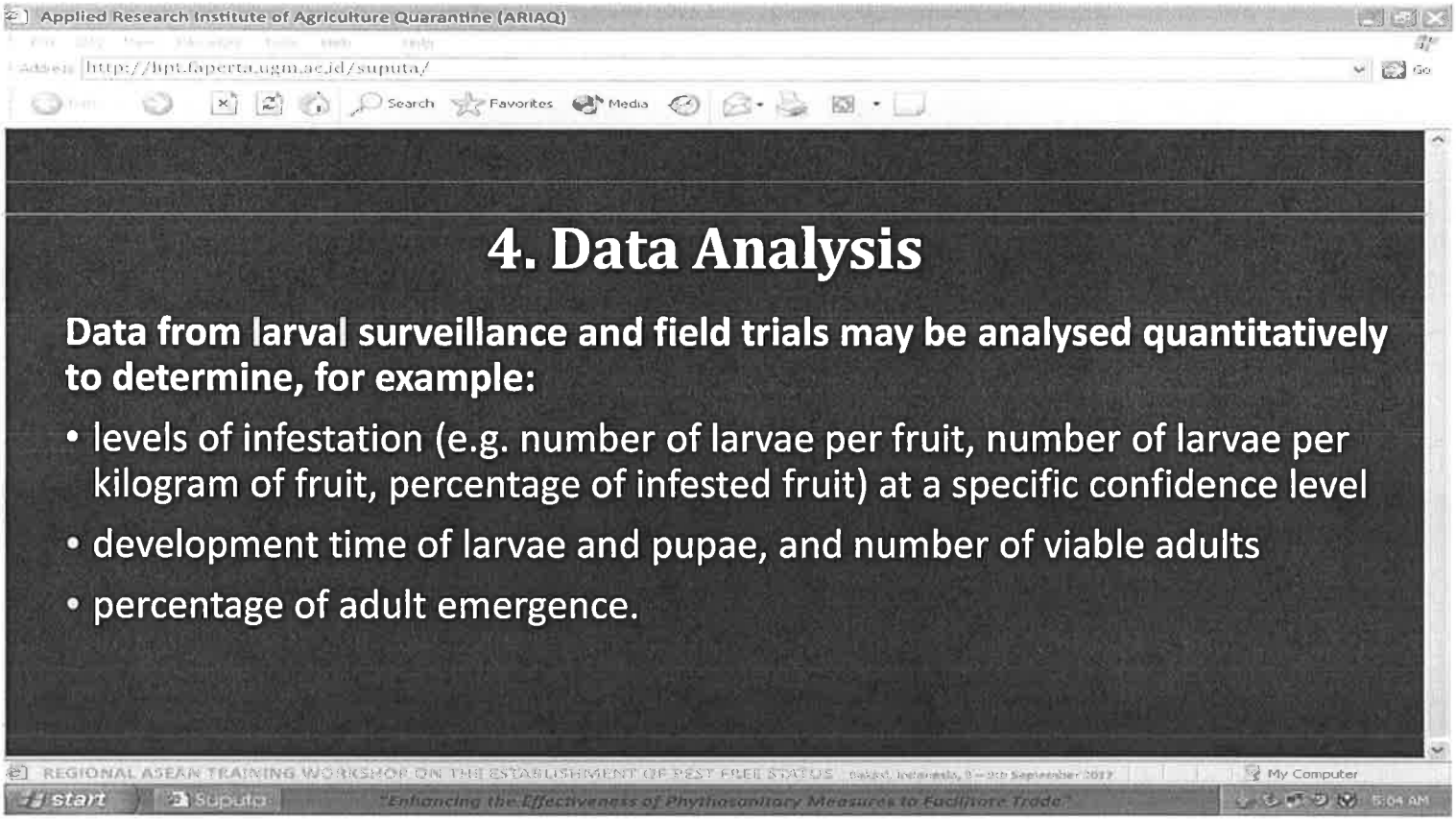
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4. Data Analysis
Data from larval surveillance and field trials may be analysed quantitatively to determine, for example:
• levels of infestation (e.g. number of larvae per fruit, number of larvae per kilogram of fruit, percentage of infested fruit) at a specific confidence level
• development time of larvae and pupae, and number of viable adults
• percentage of adult emergence.
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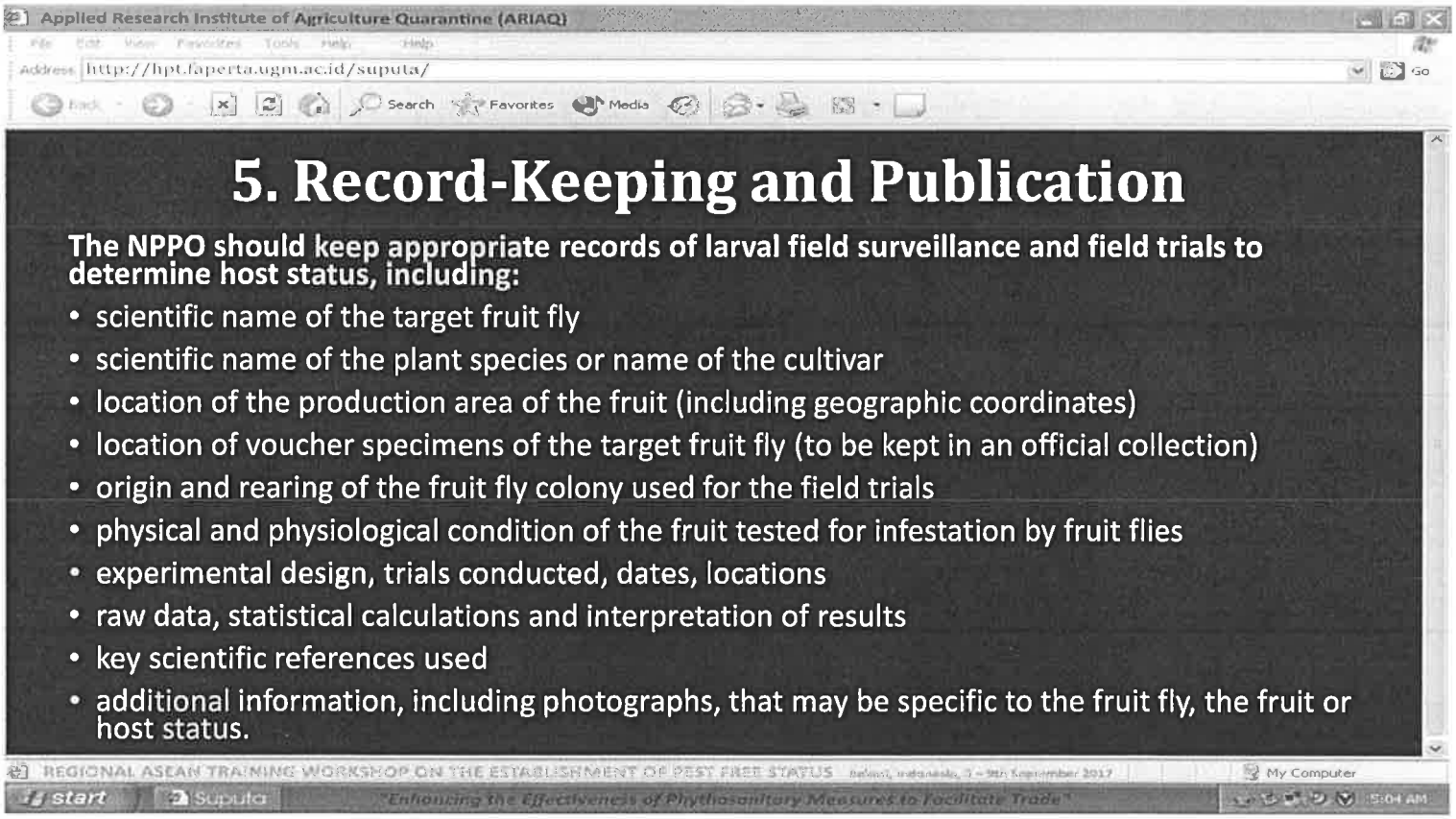
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5. Record-Keeping and Publication
The NPPO should keep appropriate records of larval field surveillance and field trials to determine host status, including:
• scientific name of the target fruit fly
• scientific name of the plant species or name of the cultivar
• location of the production area of the fruit (including geographic coordinates)
• location of voucher specimens of the target fruit fly (to be kept in an official collection)
• origin and rearing of the fruit fly colony used for the field trials
• physical and physiological condition of the fruit tested for infestation by fruit flies
• experimental design, trials conducted, dates, locations
• raw data, statistical calculations and interpretation of results
• key scientific references used
• additional information, including photographs, that may be specific to the fruit fly, the fruit or host status.
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5. Record-Keeping and Publication

Records should be made available to the NPPO of the importing country upon request.

Research should, as far as possible, be peer reviewed and published in a scientific journal or otherwise made available.