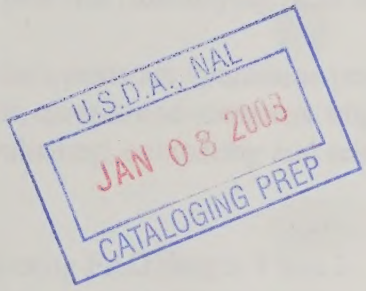
Guidelines for Pathway-Initiated Pest Risk Assessments



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Introduction

This document presents guidelines for pathway-initiated, qualitative pest risk assessments conducted by Plant Protection and Quarantine (PPQ) within the Animal and Plant Health Inspection Service (APHIS) of the U.S. Department of Agriculture. The goal is to harmonize PPQ risk assessment procedures with guidelines provided by the Food and Agriculture Organization (FAO) and the North American Plant Protection Organization (NAPPO). The use of biological and phytosanitary terms conforms with the FAO Glossary of Phytosanitary Terms (FAO, 1999) (included as Appendix 1 of this document), the Definitions and Abbreviations (Introduction Section) in International Standards for Phytosanitary Measures, Section 1—Import Regulations: Guidelines for Pest Risk Analysis (FAO 1996) and the NAPPO Compendium of Phytosanitary Terms (NAPPO 1996).

Pest risk assessment is one of three stages of an overall pest risk analysis (FAO, 1996):

Stage 1: Initiating the process for analyzing pest risk (identifying pests or pathways for which the pest risk analysis is needed)
Stage 2: Assessing pest risk (determining which pests are quarantine pests, characterized in terms of likelihood of entry, establishment, spread, and economic importance)
Stage 3: Managing pest risk (developing, evaluating, comparing and selecting options for dealing with the risk)

This document provides a template for conducting FAO Stages 1 and 2. The FAO process (1996) also describes two general categories of initiating events for pest risk analyses. A pest risk analysis can be either "pest initiated" (a quarantine pest is discovered in a new area, a pest is intercepted at a port of entry, *etc.*) or "pathway initiated" (international trade is initiated in a new commodity, *etc.*). This document describes procedures used by PPQ for pathway-initiated pest risk assessments.

PPQ conducts pathway-initiated pest risk assessments at both qualitative and quantitative levels. This document outlines the process for qualitative pest risk assessments. Both types of assessments are similar in most respects, however, in quantitative assessments quarantine pests are examined in greater detail and provide a quantitative assessment of the likelihood of introduction (see Step 6). PPQ completes six basic steps in pathway-initiated pest risk assessments:

Stage 1 (FAO): Initiating Pest Risk Analysis Process
Step 1. Document the initiating event(s) for the PRA.

Stage 2 (FAO): Assessing Pest Risk
Step 2. Assess Weediness Potential (of the species to be imported).

Step 3. Identify Previous Risk Assessments, Current Status of Importations, and Pertinent Pest Interceptions.

Step 4a. Pest Categorization. Produce a list of pests of the commodity parent species and then determine their quarantine status.

Step 4b. Identify Potential Quarantine Pests. Identify pests of potential quarantine significance reported to be associated with the host species in the exporting country/region.

Step 4c. Identify Quarantine Pests Likely to Follow the Pathway. Determine which quarantine pests may reasonably be expected to follow the pathway.

Step 5. Assess Consequences of Introduction. For each quarantine pest expected to follow the pathway, estimate the consequences of introduction. Issues to consider include "...the establishment, spread and economic importance potential in the PRA area" (FAO, 1996). Environmental impacts are also addressed.

Step 6. Assess Introduction Potential. For each quarantine pest expected to follow the pathway, estimate the likelihood of introduction via the pathway.

Step 7. Conclusion / Phytosanitary Measures: Pest Risk Potential of Quarantine Pests. Produce a single rating which represents an overall estimate of the risk posed by each quarantine pest. Comment briefly on the meaning of the Pest Risk Potentials for each quarantine pest. Although this document focuses on risk assessment, the risk assessment (FAO Stages 1 and 2) and risk management (FAO Stage 3) stages are interrelated. Accordingly, the risk assessor may occasionally make brief comments regarding risk management options associated with the requested commodity importations.

Methods: Pest Risk Assessment Guidelines

FAO Stage 1: Initiating Pest Risk Analysis (PRA) Process

Step 1. Document the Initiating Event(s) for the PRA

Document the reason(s) for initiating the pathway-initiated PRA, *e.g.,* importation of a new commodity or new importation from a new area provides a potential pathway for the introduction of plant pests.

Stage 2 (FAO): Assessing Pest Risk

Step 2. Assess Weediness Potential (Table 1)

Assess the weediness potential of the imported species. This step is important to the initiation process because if the assessment finds that the species being considered for import poses a risk as a weed pest, then a "pest-initiated" pest risk assessment may be initiated. If the species to be imported passes the weediness screening, the pathway-initiated pest risk assessment continues. Table 1 shows how weediness potential is assessed and can be used to present findings and conclusions.

Table 1. Process for Determining Weediness Potential of Commodity

Commodity: (Scientific and common names of commodity)

Phase 1: Consider whether the species is new to or not widely prevalent in the United States (exclude plants grown under USDA permit in approved containment facilities)?

Phase 2: Answer Yes or No to the following questions:
Is the genus, species, or subspecies listed in:

____ Geographical Atlas of World Weeds (Holm *et al.*, 1979)
____ World's Worst Weeds (Holm *et al.*, 1977)
____ World Weeds: Natural Histories and Distribution (Holm *et al.*, 1997)
____ Report of the Technical Committee to Evaluate Noxious Weeds; Exotic Weeds for Federal Noxious Weed Act (Gunn and Ritchie, 1982)
____ Economically Important Foreign Weeds (Reed, 1977)
____ Weed Science Society of America list (WSSA, 1989)
____ Is there other literature reference indicating weediness (*e.g.*, AGRICOLA, CAB, Biological Abstracts, AGRIS; search on "species name" combined with "weed").

Phase 3: Conclusion:

IF: 1. The species is widely prevalent in the United States and the answers to all of the questions are **no**...
Proceed with the pest risk assessment.

2. The species is widely prevalent in the United States and the answer to **one** or more of the questions is **yes**...
Proceed with the pest risk assessment, provide comments on findings in text, and incorporate findings regarding weediness into the Risk Elements described below.

3. The species is new to or not widely prevalent in the United States and the answers to all of the questions are **no**...
Proceed with the pest risk assessment.

4. The species is new to or not widely prevalent in the United States and the answer to **one or more** of the questions is **yes**...
Consult authority under the Federal Noxious Weed Act for listing plant species as a noxious weed and consider the advisability of performing a pest-initiated pest risk assessment on the plant species. Provide explanations of findings in text.

Step 3. Identify and Cite Previous Risk Assessments
Identify previous pest risk assessments from the same country/region and the same, or related commodity. If there is an existing risk assessment that adequately assesses the risks in question, the risk assessment stops. Describe appropriate current importations, *e.g.*, same commodity from other countries, other commodities from the country in question. Report pertinent pest interceptions at United States ports of entry.

Step 4a. Pest Categorization (Table 2)
PPQ adheres to accepted international definitions of quarantine pest: a pest of potential economic importance to the area endangered thereby and not yet present there, or present but not widely distributed and being officially controlled (FAO, 1996; NAPPO, 1996). The first step in identifying quarantine pests is to present a comprehensive pest list of potential quarantine pests known to occur in the country or region from which the commodity is to be exported (Table 2). The list includes all pests in the exporting country known to be associated with the parent species of the proposed export commodity. Because all pests on the list are associated with the plant species they are considered to be "of potential economic importance" (FAO, 1996). The listed pests may or may not also occur in the United States.

There are two primary components to the definition of quarantine pest (FAO, 1996; NAPPO, 1996). First, a pest must be "of potential economic importance." To be included on the comprehensive list of potential quarantine pests, an organism is considered to be of potential economic importance because scientific evidence, as indicated in the literature, demonstrates that an organism has an association with the plant species being assessed. Thus, all of the listed organisms are potential quarantine pests. Second, to be considered a quarantine pest, an organism must satisfy geographic and regulatory criteria, specifically, the pest must be "not yet present there, or present but not widely distributed and being officially controlled" (FAO, 1996; NAPPO, 1996). Information should be collected and provided in the risk assessment which documents how each organism satisfies these criteria. Pertinent geographic and regulatory information, *i.e.*, with respect to the exporting country and the United States, should be provided on the comprehensive pest list. If none of the potential quarantine pests satisfy the geographic and regulatory criteria as a quarantine pest, the PRA stops. For each pest on the list, include:

- scientific name (when available)
- selected references
- limited pertinent information regarding:
    - the regulatory status of a pest, as determined by APHIS or other Federal Agencies
    - pest biology, *e.g.*, pest-parent species or pest-commodity association, pathway association, life history, climatic tolerance
    - geographic distribution with respect to the exporting country and the U.S.
    - regulatory history, *e.g.*, interception records at U.S. ports.

The list of information sources, at a minimum, should include:

- Literature reviews using electronic databases, *e.g.*, AGRICOLA, CAB database, University of California computer information system, MELVYL

- Previous risk assessments covering importation of the commodity
- The PPQ catalogue of intercepted pests and interception records
- CIE and CMI. Distribution Maps/Descriptions of Plant Pests (Arthropods, Fungi, Bacteria)
- Various texts and indices of plant diseases and pathogens
- PPQ files on Pests Not Known To Occur in the U. S. (PNKTOs) and Insects Not Known To Occur (INKTOs)
- International databases, *e.g.* EPPO, FAO, CABI/CPC

Step 4b. Identify Quarantine Pests Likely to Follow the Pathway
Quarantine pests identified as likely to be associated with the potential export commodity are subjected to steps 5-7. The biology and pest potential for these pests is documented as completely as possible. It must be reasonable to assume these quarantine pest will:

- be present in the exporting country
- be associated with the commodity at the time of harvest
- remain with the commodity in viable form during harvesting, packing and shipping procedures

Because pests associated with the parent species are listed, there will be quarantine pests not expected to follow the pathway. For example:

- a pest may be associated only with plant parts other than the commodity
- a pest may not reasonably be expected to remain with the commodity during harvest and packing

Pests not expected to follow the pathway are not considered further. Supporting information must be documented on the pest list or in the text. The decision not to further analyze a particular pest applies only to the current PRA; a pest may pose a different level of risk for the same commodity from a different country or from a different commodity from the same host plant species. However, should any of the pests be intercepted in shipments of the commodity, quarantine action may be taken at the port of entry and additional risk analyses may be conducted.

IF NO POTENTIAL QUARANTINE PESTS ARE IDENTIFIED , THE PRA STOPS AT THIS POINT.

Table 2. Pests Associated With Commodity in Country					
Pest	Geographic Distribution[1]	Plant Part Affected[2]	Quarantine Pest[3]	Follow Pathway[3]	References
Arthropods					
Pest species Author (Order: Family)					
Viruses					
name (Family)					
Bacteria					
Pest species Author (Order)					
Fungi					
Pest species Author (Class or Superclass: Order)					
Nematodes					
Pest species Author (Family)					
Mollusks					
Pest species Author (Family)					

[1]Use two letter abbreviations to represent countries and states
[2]Use abbreviations, *e.g.*, L (leaf), F (fruit), to indicate affected plant parts
[3]Use "Yes" or "No"
*Additional explanatory notes for Table entries may be placed here

IF NO QUARANTINE PESTS ARE EXPECTED TO FOLLOW THE PATHWAY, THE PRA STOPS.

Step 5. Assess Consequences of Introduction (Table 3)
The undesirable outcomes being considered are the negative impacts resulting from the introduction of quarantine pests. After identifying those quarantine pests that could reasonably be expected to follow the pathway, the assessment of risk continues by considering the consequences of introduction (Table 3). For each of these quarantine pests, the potential consequences of introduction are rated using five Risk Elements. These elements reflect the biologies, host ranges

and climatic/geographic distributions of the pests. For each Risk Element, pests are assigned a rating of or or Low (L, 1 point), Medium (M, 2 points) or High (H, 3 points). A Cumulative Risk Rating is then calculated by summing all Risk Element values.

Risk Element #1: Climate—Host Interaction

When introduced to new areas, pests can be expected to behave as they do in their native areas if host plants and climates are similar. Ecological zonation and the interactions of the pests and their biotic and abiotic environments are considered in the element. Estimates are based on availability of both host material and suitable climate conditions. To rate this Risk Element, the U.S. "Plant Hardiness Zones" U.S. Department of Agriculture (USDA, 1990) is used (Figure 1). Due to the availability of both suitable host plants and suitable climate, the pest has potential to establish a breeding colony:

Low (1): In a single plant hardiness zone.
Medium (2): In two or three plant hardiness zones.
High (3): In four or more plant hardiness zones.

IF NONE OF THE QUARANTINE PESTS ARE CAPABLE OF BECOMING ESTABLISHED IN THE PRA AREA BECAUSE OF THE ABSENCE OF SUITABLE CLIMATES OR HOSTS , THE PRA STOPS.

Risk Element #2: Host Range

The risk posed by a plant pest depends on both its ability to establish a viable, reproductive population and its potential for causing plant damage. For arthropods, risk is assumed to be correlated positively with host range. For pathogens, risk is more complex and is assumed to depend on host range, aggressiveness, virulence and pathogenicity; for simplicity, risk is rated as a function of host range.

Low (1): Pest attacks a single species or multiple species within a single genus.
Medium (2): Pest attacks multiple species within a single plant family.
High (3): Pest attacks multiple species among multiple plant families.

Risk Element #3: Dispersal Potential

A pest may disperse after introduction to a new area. The following items are considered:

- reproductive patterns of the pest (*e.g.*, voltinism, biotic potential)
- inherent powers of movement
- factors facilitating dispersal (wind, water, presence of vectors, human, *etc.*)

Low (1): Pest has neither high reproductive potential nor rapid dispersal capability.
Medium (2): Pest has either high reproductive potential *OR* the species is capable of rapid dispersal.
High (3): Pest has high biotic potential, *e.g.*, many generations per year, many offspring per reproduction ("r-selected" species), *AND* evidence exists that the pest is capable of rapid dispersal , *e.g.*, over 10 km/year under its own power; via natural forces, wind, water, vectors, *etc.*, or human-assistance.

Risk Element #4: Economic Impact

Introduced pests are capable of causing a variety of direct and indirect economic impacts. These are divided into three primary categories (other types of impacts may occur):

- Lower yield of the host crop, *e.g.*, by causing plant mortality, or by acting as a disease vector.
- Lower value of the commodity, *e.g.*, by increasing costs of production, lowering market price, or a combination.
- Loss of foreign or domestic markets due to presence of new quarantine pest.

Low (1): Pest causes any one or none of the above impacts.
Medium (2): Pest causes any two of the above impacts.
High (3): Pest causes all three of the above impacts.

Risk Element #5: Environmental Impact (Table 4)

The assessment of the potential of each pest to cause environmental damage (Table 4) (FAO, 1995) proceeds by considering the following factors:

- Introduction of the pest is expected to cause significant, direct environmental impacts, *e.g.*, ecological disruptions, reduced biodiversity. When used within the context of the National Environmental Policy Act (NEPA) (7CFR §372), significance is qualitative and encompasses both the likelihood and severity of an environmental impact.
- Pest is expected to have direct impacts on species listed by Federal Agencies as endangered or threatened (50CFR §17.11 and §17.12), by infesting/infecting a listed plant. If the pest attacks other species within the genus or other genera within the family, and preference/no preference tests have not been conducted with the listed plant and the pest, then the plant is assumed to be a host.
- Pest is expected to have indirect impacts on species listed by Federal Agencies as endangered or threatened by disrupting sensitive, critical habitat.
- Introduction of the pest would stimulate chemical or biological control programs.

Low (1): None of the above would occur; it is assumed that introduction of a nonindigenous pest will have some environmental impact (by definition, introduction of a nonindigenous species affects biodiversity).
Medium (2): One of the above would occur.
High (3): Two or more of the above would occur.

For each pest, sum the five Risk Elements to produce a Cumulative Risk Rating. This Cumulative Risk Rating is considered to be a biological indicator of the potential of the pest to establish, spread, and cause economic and environmental impacts. The Cumulative Risk Rating should be interpreted as follows:

Low: 5 - 8 points
Medium: 9 - 12 points
High: 13 - 15 points

Table 3. Risk Rating for Consequences of Introduction: (Risk Elements #1-5)						
Pest	Risk Element 1 Climate/Host Interaction	Risk Element 2 Host Range	Risk Element 3 Dispersal Potential	Risk Element 4 Economic Impact	Risk Element 5 Environmental Impact	Cumulative Risk Rating
Pest species (Order: Family)	L, M, H (1, 2, 3)	L, M, H (1, 2, 3)	L, M, H (1, 2, 3)	L, M, H (1, 2, 3)	L, M, H (1, 2, 3)	L, M, H (5 - 15)

Step 6. Assess Introduction Potential (Table 4)
Use Risk Element 6 to rate the potential likelihood of introduction for quarantine pests likely to follow the pathway. The cumulative score for the Likelihood of Introduction Risk Elements is referred to as the Likelihood of Introduction Risk Score.

Risk Element #6: Pest Opportunity (Survival and Access to Suitable Habitat and Hosts)

For each pest, consider six sub-elements:

1. **Quantity of commodity imported annually**: The likelihood that an exotic pest will be introduced depends on the amount of the potentially-infested commodity that is imported. For qualitative pest risk assessments, the amount of commodity imported is estimated in units of standard 40 foot long shipping containers. In those cases where the quantity of a commodity imported is provided in terms of kilograms, pounds, number of items, *etc*., convert the units into terms of 40 foot shipping containers. Score as follows:

   Low (1 point): < 10 containers/year
   Medium (2 points): 10 - 100 containers/year
   High (3points): > 100 containers/year

2. **Survive postharvest treatment**: For this sub-element, postharvest treatment refers to any manipulation, handling or specific phytosanitary treatment to which the commodity is subjected. Examples of postharvest treatments include culling, washing, chemical treatment, cold storage, etc. If there is no postharvest treatment, estimate the likelihood of this sub-element as High.

3. **Survive shipment:** Estimate survival during shipment; assume standard shipping conditions.

4. **Not be detected at the port of entry**: Unless specific protocols are in place for special inspection of the commodity in question, assume standard inspection protocols for like commodities. If no inspection is planned, estimate this sub-element as high.

5. **Imported or moved subsequently to an area with an environment suitable for survival:** Consider the geographic location of likely markets and the proportion of the commodity that is likely to move to locations suitable for pest survival. Even if infested commodities enter the country, not all final destinations will have suitable climatic conditions for pest survival.

6. **Come into contact with host material suitable for reproduction:** Even if the final destination of infested commodities are suitable for pest survival, suitable hosts must be available in order for the pest to survive. Consider the complete host range of the pest species.

Rate sub-elements 2-6 as follows:

Low (1 point): < 0.1% (less than one in one thousand)
Medium (2 points): Between 0.1% - 10% (between one in one thousand to one in ten)
High (3 points): > 10% (greater than one in ten)

The events described in sub-elements 2 - 6 should be considered as a series of independent events that must all take place before a pest outbreak can occur, *i.e.*, the estimates for one element should not affect estimates for other elements.

For each pest, sum the six sub-elements to produce a Cumulative Risk Rating for the Likelihood of Introduction (Table 4). This Cumulative Risk Rating is considered to be an indicator of the likelihood that a particular pest would be introduced. Interpret the Cumulative Risk Rating for the Likelihood of Introduction as follows:

Low: 6 - 9 points
Medium: 10 - 14 points
High: 15 - 18 points

Table 4. Risk Rating for Likelihood of Introduction: (Risk Element #6)

Pest	Subelement 1 Quantity imported annually	Subelement 2 Survive postharvest treatment	Subelement 3 Survive shipment	Subelement 4 Not detected at port of entry	Subelement 5 Moved to suitable habitat	Subelement 6 Contact with host material	Cumulative Risk Rating
Pest species	L, M, H (1, 2, 3)	L, M, H (1, 2, 3)	L, M, H (1, 2, 3)	L, M, H (1, 2, 3)	L, M, H (1, 2, 3)	L, M, H (1, 2, 3)	L, M, H (6 - 18)

Step 7. Conclusion/Pest Risk Potential: Pests Requiring Phytosanitary Measures (Table 5) To estimate the Pest Risk Potential for each pest, sum the Cumulative Risk Rating for the Consequences of Introduction and the Cumulative Risk Rating for the Likelihood of Introduction (Table 5). Rate the Pest Risk Potential as follows:

Low: 11 - 18 points
Medium: 19 - 26 points
High: 27 - 33 points

Table 5. Pest Risk Potential

Pest	Consequences of Introduction Cumulative Risk Rating	Likelihood of Introduction Cumulative Risk Rating	Pest Risk Potential
Pest species	L, M, H (5 - 15)	L, M, H (6 - 18)	L, M, H (11 - 33)

Following assignment of the Pest Risk Potential for each pest, the risk assessor may comment briefly on risk management options associated with the requested commodity importations. The following guidelines are offered as an interpretation of the Low, Medium and High Pest Risk Potential ratings:

Low: Pest will typically not require specific mitigations measures; the port-of-entry inspection to which all imported commodities are subjected can be expected to provide sufficient phytosanitary security.
Medium: Specific phytosanitary measure may be necessary.
High: Specific phytosanitary measures are strongly recommended. Port-of-entry inspection is not considered sufficient to provide phytosanitary security.

Identification and selection of appropriate sanitary and phytosanitary measures to mitigate risk for pests with particular Pest Risk Potential ratings is undertaken as part of the risk management phase and is not discussed in this document. The appropriate risk management strategy for a particular pest depends on the risk posed by that pest. APHIS risk management programs are risk based and dependent on the availability of appropriate mitigation methods and are Details of APHIS risk management programs are published, primarily, in the *Federal Register* as quarantine notices.

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Acknowledgments

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APPENDIX 1

GLOSSARY OF PHYTOSANITARY TERMS AND DEFINITIONS
Note: This version of the Glossary is still under consultation/comment by the various National Plant Protection Organizations and Regional Plant Protection Organizations.

Additional declaration	A statement that is required by an importing country to be entered on a phytosanitary certificate and which provides specific additional information pertinent to the phytosanitary condition of a consignment [FAO, 1990]
Antagonist*	An organism (usually pathogen) which does no significant damage to the host but its colonization of the host protects the host from significant subsequent damage by a pest [ISPM Pub. No. 3, 19961
Area	An officially defined country, part of a country or all or parts of several countries [FAO, 1990; revised FAO, 1995; CEPM, 1999; based on the World Trade Organization Agreement on the Application of Sanitary and Phytosanitary Measures]
Area endangered	See Endangered area
Area of low pest prevalence*	An area, whether all of a country, part of a country, or all or parts of several countries, as identified by the competent authorities, in which a specific pest occurs at low levels and which is subject to effective surveillance, control or eradication measures [IPPC, 1997]
Authority*	The National Plant Protection Organization, or other entity or person officially designated by the government to deal with matters arising from the responsibilities set forth in the Code [ISPM Pub. No. 3, 1996]
Biological control agent*	A natural enemy, antagonist or competitor, and other self-replicating biotic entity used for pest control [ISPM Pub. No. 3, 1996]

**Indicates terms with specific use*

Biological control (Biocontrol)*	Pest control strategy making use of living natural enemies, antagonists or competitors and other self-replicating biotic entities [ISPM Pub. No.3, 1996]
Biological pesticide* (Biopesticide)	A generic term, not specifically definable, but generally applied to a biological control agent, usually a pathogen, formulated and applied in a manner similar to a chemical pesticide, and normally used for the rapid reduction of a pest population for short-term pest control [ISPM Pub. No. 3, 1996]
Buffer zone*	An area in which a specific pest does not occur or occurs at a low level and is officially controlled, that either encloses or is adjacent to an infested area, an infested place of production, a pest free area, a pest free place of production or a pest free production site, and in which phytosanitary measures are taken to prevent spread of the pest [ISPM Pub. No. 10, 1999]
Bulbs and tubers	Dormant underground organs of plants intended for planting [FAO, 1990]
Certificate	An official document which attests to the phytosanitary status of any consignment affected by phytosanitary regulations [FAO, 1990]
Classical biological control*	The intentional introduction and permanent establishment of an exotic biological agent for long-term pest control [ISPM Pub. No.3, 1996]
Clearance (of a consignment)	Verification of compliance with phytosanitary regulations [FAO, 1995]
Commission*	The Commission on Phytosanitary Measures established under Article XI, [IPPC, 1997]
Commodity	A type of plant, plant product or other regulated article being moved for trade or other purpose [FAO, 1990]
Commodity class	A category of similar commodities that can be considered together in phytosanitary regulations [FAO, 1990]

Commodity pest list	A list of pests occurring in an area which may be associated with a specific commodity [CEPM, 1996]
Competitor*	An organism which competes with pests for essential elements (e.g. food, shelter) in the environment [ISPM Pub. No. 3, 1996]
Compliance procedure (for a consignment)	Official procedure used to verify that a consignment complies with stated phytosanitary requirements [CEPM, 1999]
Consignment	A quantity of plants, plant products and/or other regulated articles being moved from one country to another and covered by a single phytosanitary certificate (a consignment may be composed of one or more lots) [FAO, 1990]
Consignment in transit	Consignment which passes through a country without being imported, and without being exposed in that country to contamination or infestation by pests. The consignment may not be split up, combined with other consignments or have its packaging changed [FAO, 1990; revised CEPM, 1996; CEPM 1999; formerly country of transit]
Containment	Application of phytosanitary measures in and around an infested area to prevent spread of a pest [FAO, 1995]
Contaminating pest	A pest that is carried by a commodity and, in the case of plants and plant products, does not infest those plants or plant products [CEPM, 1996; revised CEPM, 1999]
Contamination	Presence in a commodity, storage place, conveyance or container, of pests or other regulated articles, not constituting an infestation (See Infestation) [CEPM, 1997; revised CEPM, 1999]
Control (of a pest)	Suppression, containment or eradication of a pest population [FAO, 1995]
Controlled area	A regulated area which an NPPO has determined to be the minimum area necessary to prevent spread of a pest from a quarantine area [CEPM, 1996]

Country of origin (of a consignment plant products)	Country where the plants from which the plant products are derived were grown [FAO, 1990; revised CEPM, 1996; CEPM, 1999]
Country of origin (of a consignment of plants)	Country where the plants were grown [FAO, 1990; revised CEPM, 1996; CEPM, 1999]
Country of origin (of regulated articles other than plants and plant products)	Country where the regulated articles were first exposed to contamination by pests [FAO, 1990; revised CEPM, 1996; CEPM, 1999]
Country of re-export*	Country into which a consignment of plants, plant products, or other regulated articles has been imported and was stored, split up, had its packaging changed or was otherwise exposed to contamination by pests, prior to export to a third country [ISPM Pub. No. 7, 1998]
Cut flowers and branches	Fresh parts of plants intended for decorative use and not for planting [FAO, 1990]
Debarking	Removal of bark from round wood (debarking does not necessarily make the wood bark-free) [FAO, 1990]
Delimiting survey	Survey conducted to establish the boundaries of an area considered to be infested by or free from a pest [FAO, 1990]
Detection survey	Survey conducted in an area to determine if pests are present [FAO, 1990, revised FAO, 1995]
Detention	Keeping a consignment in official custody or confinement for phytosanitary reasons (See Quarantine) [FAO, 1990; revised FAO, 1995; CEPM, 1999]
Dunnage	Wood used to wedge or support cargo [FAO, 1990]
Ecoarea*	An area with similar fauna, flora an climate and hence similar concerns about the introduction of biological control agents [ISPM Pub. No. 3, 1996]

Ecosystem*	A complex of organisms and their environment, interacting as a defined ecological unit (natural or modified by human activity, e.g. agroecosystem), irrespective of political boundaries [ISPM Pub. No. 3, 1996]
Endangered area	An area where ecological factors favor the establishment of a pest whose presence in the area will result in economically important loss [FAO, 1995]
Entry (of a consignment)	Movement through a point of entry into an area [FAO, 1995]
Entry (of a pest)	Movement of a pest into an area where it is not yet present, or present but not widely distributed and being officially controlled [FAO, 1995]
Equivalence	The situation of phytosanitary measures which are not identical but have the same effect [FAO, 1995; revised CEPM, 1999; based on the World Trade Organization Agreement on the Application of Sanitary and Phytosanitary Measures]
Eradication	Application of phytosanitary measures to eliminate a pest from as area [FAO, 1990; revised FAO, 1995; formerly Eradicate]
Establishment	Perpetuation, for the foreseeable future, of a pest within an area after entry [FAO, 1990; revised FAO, 1995; IPPC, 1997; formerly Established]
Establishment (of a biological control agent)*	The perpetuation, for the foreseeable future, of a biological control agent within an area after entry [ISPM Pub. No. 3, 1996]
Exotic*	Not native to a particular country, ecosystem or ecoarea (applied to organisms intentionally or accidently introduced as a result of human activities). As this Code is directed at the introduction of biological control agents from one country to another, the term "exotic" is used for organisms not native to a country [ISPM Pub. No. 3, 1996]

Field	A plot of land with defined boundaries within a place of production which a commodity is grown [FAO, 1990]
Find free	To inspect a consignment, field or place of production and consider it to be free from a specific pest [FAO, 1990]
Free from (of a consignment, field or place of production)	Without pests (or a specific pest) in numbers or quantities that can be detected by the application of phytosanitary procedures [FAO, 1990; revised FAO, 1995; CEPM, 1999]
Fresh	Living; not dried, deep-frozen or otherwise conserved [FAO, 1990]
Fruits and vegetables	Fresh parts of plants intended for consumption or processing [FAO, 1990]
Fumigation	Treatment with a chemical agent that reaches the commodity wholly or primarily in a gaseous state [FAO, 1990; revised FAO, 1995]
Germplasm	Plants intended for use in breeding or conservation programs [FAO, 1990]
Grain	Seeds intended for processing or consumption and not for planting (See Seeds) [FAO, 1990]
Growing medium	Any material in which plans roofs are growing or intended for that purpose [FAO, 1990]
Growing season	Period of the year when plants will actively grow in an area [FAO, 1990]
Harmonization	The establishment, recognition and application by different countries of phytosanitary measures based on common standards [FAO, 1995; revised CEPM, 1999; based on the World Trade Organization Agreement on the Application of Sanitary and Phytosanitary Measures]
Harmonized phytosanitary measures*	Phytosanitary measures established by contracting parties to the IPPC, based on international standards [IPPC, 1997]

Hitch-hiker pest	See Contaminating pest
Host pest list	A list of pests that infest a plant species, globally or in an area [CEPM, 1996; revised CEPM, 1999]
Host range	Species of plants capable, under natural conditions, of sustaining a specific pest [FAO, 1990]
Import permit	Official document authorizing importation of a commodity in accordance with specified phytosanitary requirements [FAO, 1990; revised FAO, 1995]+
Import permit (of a biological control agent)*	An official document authorizing importation (of a biological control agent) in accordance with specified requirements [ISPM Pub. No. 3, 1996]
Infestation (of a commodity)	Presence in a commodity of a living pest of the plant or plant product concerned. Infestation includes infection [CEPM, 1997; revised CEPM, 1999]
Inspection	Official visual examination of plants, plant products or other regulated articles to determine if pests are present and/or to determine compliance with phytosanitary regulations [FAO, 1990; revised FAO, 1995; formerly Inspect]
Inspector	Person authorized by a National Plant Protection Organization to discharge its functions [FAO, 1990]
Interception (of a consignment)	The refusal or controlled entry of an imported consignment due to failure to comply with phytosanitary regulations [FAO, 1990; revised FAO, 1995]
Interception (of a pest)	The detection of a pest during inspection or testing of an imported consignment [FAO, 1990; revised CEPM, 1996]
Intermediate quarantine	Quarantine in a country other then the country of origin or destination [CEPM, 1996]
International Plant Protection Convention	International Plant Protection Convention as deposited with FAO in Rome in 1951 and as subsequently amended [FAO, 1990]

International Standard for Phytosanitary Measures	An international standard adopted by the Conference of FAO, the Interim Commission on Phytosanitary Measures or the Commission on Phytosanitary Measures, established under the IPPC [CEPM, 1996; revised CEPM, 1999]
International standards*	International standards established in accordance with Article X paragraph 1 and 2 of the IPPC [IPPC, 1997]
Introduction	The entry of a pest resulting in its establishment [FAO, 1990; revised FAO, 1995; IPC, 1997]
Introduction (of a biological control agent)*	The release of a biological control agent into an ecosystem where it did not exist previously (see also "establishment") [ISPM Pub. No. 3, 1996]
Inundative release*	The release of overwhelming numbers of a mass-produced, invertebrate biological control agent in the expectation of achieving a rapid reduction of a pest population without necessarily achieving continuing impact [ISPM Pub. No. 3, 1996]
IPPC	Acronym for the International Plant Protection Convention, as deposited in 1951 with FAO in Rome and as subsequently amended [FAO, 1990]
ISPM	Acronym for International Standard for Phytosanitary Measures [CEPM, 1996]
Legislation*	Any act, law, regulation, guideline or other administrative order promulgated by a government [ISPM Pub. No. 3, 1996]
Lot	A number of units of a single commodity, identifiable by its homogeneity of composition, origin etc., forming part of a consignment [FAO, 1990]
Micro-organism*	A protozoan, fungus, bacterium, virus or other microscopic self-replicating biotic entity [ISPM Pub. No. 3, 1996]
Monitoring	An official ongoing process to verify phytosanitary situations [CEPM,1996]

Monitoring survey	Ongoing survey to verify the characteristics of a pest population [FAO, 1995
National Plant Protection Organization	Official service established by a government to discharge the functions specified by the IPPC [FAO, 1990; formerly Plant Protection Organization (National)
Natural enemy*	An organism which lives at the expense of another organism and which may help to limit the population of its host. This includes parasitoids, parasites, predators and pathogens [ISPM Pub. No. 3, 1996]
Naturally occurring*	A component of an ecosystem or a selection from a wild population, not altered by artificial means [ISPM Pub. No. 3, 1996]
Non-quarantine pest	Pest that is not a quarantine pest for an area [FAO, 1995]
NPPO	Acronym for National Plant Protection Organization [FAO, 1990]
Occurrence	The presence in an area of a pest officially reported to be indigenous or introduced and/or not officially reported to have been eradicated [FAO, 1990; revised FAO, 1995; formerly Occur]
Official	Established, authorized or performed by a National Plant Protection Organization [FAO, 1990]
Organism*	Biotic entity capable of reproduction or replication, vertebrate or invertebrate animals, plants and micro-organisms [ISPM Pub. No. 3, 1996]
Outbreak	An isolated pest population, recently detected and expected to survive for the immediate future [FAO, 1995]
Parasite *	An organism which lives on or in a larger organism, feeding upon it [ISPM Pub. No. 3, 1996]
Parasitoid*	An insect parasitic only in its immature stages, killing its host in the process of its development, and free living as an adult [ISPM Pub. No. 3, 1996]

Pathogen*	Micro-organism causing disease [ISPM Pub. No. 3, 1996]
Pathway	Any means that allows the entry or spread of a pest [FAO, 1990; revised FAO 1995]
Pest	Any species, strain or biotype of plant, animal or pathogenic agent injurious to plants or plant products [FAO, 1990; revised FAO, 1995; IPPC, 1997]
Pest free area	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 [FAO, 1995]
Pest free place of production*	Place of production in which a specific pest does not occur as demonstrated by scientific evidence and in which where appropriate, this condition is being officially maintained for a defined period [ISPM Pub. No. 10, 1999]
Pest free production site*	A defined portion of a place of production in which a specific pest does not occur as demonstrated by scientific evidence and in which, where appropriate, this condition is being maintained for a defined period and that is managed as a separate unit in the same way as a pest free place of production [ISPM Pub. No. 10, 1999]
Pest record	A document providing information concerning the presence or absence of a specific pest at a particular location at a certain time, within an area (usually a country) under described circumstances [CEPM, 1997]
Pest risk analysis	The process of evaluating biological or other scientific and economic evidence to determine whether a pest should be regulated and the strength of any phytosanitary measures to be taken against it [FAO, 1995; revised IPPC, 1997]
Pest risk assessment	Determination of whether a pest is a quarantine pest and evaluation of its introduction potential [FAO, 1995]

Pest risk management	The decision-making process of reducing the risk of introduction of a quarantine pest [FAO,1995]
Pest status (in an area)	Presence or absence, at the present time, of a pest in an area, including where appropriate it distribution, as officially determined using expert judgement on the basis of current and historical pest records and other information [CEPM, 1997; revised ISPM, 1998]
PFA	Acronym for pest-free area [FAO, 1995]
Phytosanitary certificate	Certificate patterned after the model certificates of the IPPC [FAO, 1990]
Phytosanitary certification	Use of phytosanitary procedures leading to the issue of a phytosanitary certificate [FAO, 1990]
Phytosanitary legislation	Basic laws granting legal authority to a National Plant Protection Organization from which phytosanitary regulations may be drafted [FAO, 1990; revised FAO, 1995]
Phytosanitary measure	Any legislation, regulation or official procedure having the purpose to prevent the introduction and/or spread of pests [FAO, 1995; revised IPPC, 1997]
Phytosanitary procedure	Any officially prescribed method for performing inspections, tests, surveys or treatments in connection with regulated pests [FAO, 1990; revised FAO, 1995; CEPM, 1999]
Phytosanitary regulation	Official rule to prevent the introduction and/or spread of pests, by regulating the production, movement or existence of commodities or other articles, or the normal activity of persons, and by establishing procedures for phytosanitary certification [FAO, 1990; revised FAO, 1995; CEPM, 1999]
Place of production	Any premises or collection of fields operated as a single production or farming unit. This may include production sites which are separately managed for phytosanitary purposes [FAO, 1990; revised CEPM, 1999]

Plating (including replanting)	Any operation for the placing of plants in a growing medium, or by grafting or similar operations, to ensure their subsequent growth, reproduction or propagation [FAO, 1990; revised CEPM, 1999]
Plant pest	See Pest
Plant products	Unmanufactured material of plant origin (including grain) and those manufactured products that, by their nature or that of their processing, may create a risk for the introduction and spread of pests [FAO, 1990; revised IPPC, 1997; formerly Plant product]
Plant protection organization (national)	See National Plant Protection Organization
Plant quarantine	All activities designed to prevent the introduction and/or spread of quarantine pests or to ensure their official control [FAO, 1990; revised FAO, 1995]
Plants	Living plants and parts thereof, including seeds and germplasm [FAO, 1990; revised IPPC, 1997]
Plants for planting	Plants intended to remain planted, to be planted or replanted [FAO, 1990]
Plants in tissue culture	Plants in an aseptic medium in a closed container [FAO, 1990; revised CEPM, 1999]
Point of entry	Airport, seaport or land border officially designated for the importation of consignments, and/or entrance of passengers [FAO, 1995]
Post-entry quarantine	Quarantine applied to a consignment after entry [FAO, 1995]
PRA	Acronym for pest risk analysis [FAO, 1995]
PRA area	Area in relation to which a pest risk analysis is conducted [FAO, 1995]
Practically free	Of a consignment, field, or place of production, without pests (or a specific pest) in numbers or quantities in excess of those that can be expected to result from, an be consistent with good cultural and handling practices employed in the production and

	marketing of the commodity [FAO, 1990; revised FAO, 1995]
Preclearance	Phytosanitary certification and/or clearance in the country of origin, performed by or under the regular supervision of the National Plant Protection Organization of the country of destination [FAO, 1990; revised FAO, 1995]
Predator*	A natural enemy that preys and feeds on other animal organisms, more than one of which are killed during its lifetime [ISPM Pub. No. 3, 1996]
Prohibition	A phytosanitary regulation forbidding the importation or movement of specified pests or commodities [FAO, 1990; revised FAO, 1995]
Protected area	A regulated area which an NPPO has determined to be the minimum area necessary for the effective protection of an endangered area [FAO, 1990; omitted from FAO, 1995; new concept from CEPM, 1996]
Quarantine	Official confinement of regulated articles for observation and research of for further inspection, testing and/or treatment [FAO, 1990; revised FAO, 1995; CEPM, 1999]
Quarantine area	An area within which a quarantine pest is present and is being officially controlled [FAO, 1990; revised FAO, 1995]
Quarantine (of a biological control agent)*	Official confinement of biological control agents subject to phytosanitary regulations for observation and research, or for further inspection and/or testing [ISPM Pub. No. 3, 1996]
Quarantine pest	A pest of potential economic importance to the area endangered thereby and not yet present there, or present but not widely distributed and being officially controlled [FAO, 1990; revised FAO, 1995; IPPC, 1997]
Quarantine station	Official station for holding plants or plant products in quarantine [FAO, 1990; revised FAO, 1995;

	formerly Quarantine station or facility]
Re-exported consignment	Consignment which has been imported into a country from which it is then exported without being exposed to infestation or contamination by pests. The consignment may be stored, split up, combined with other consignments or have its packaging changed [FAO, 1990; revised CEPM, 1996; CEPM, 1999]
Refusal	Forbidding entry of a consignment or other regulated article when it fails to comply with phytosanitary regulations [FAO, 1990; revised FAO, 1995]
Region	The combined territories of the member countries of a Regional Plant Protection Organization [FAO, 1990]
Regional Plant Protection Organization	An intergovernmental organization with the functions laid down by Article IX of the IPPC [FAO, 1990; revised FAO, 1995; CEPM, 1999; formerly Plant Protection Organization (Regional)]
Regional standards	Standards established by a regional plant protection organization for the guidance of the members of that organization [IPPC, 1997]
Regulated area	An area into which, within which and/or from which plants, plant products and other regulated articles are subjected to phytosanitary measures in order to prevent the introduction and/or spread of regulated pests (See Controlled area and Protected area) [CEPM, 1996; revised CEPM, 1999]
Regulated article	Any plant, plant product, storage place, packaging, conveyance, container, soil and any other organism, object or material capable of harboring or spreading pests, deemed to requite phytosanitary measures, particularly where international transportation is involved [FAO, 1990; revised FAO, 1995; lPPC, 1997]
Regulated non-quarantine pest	A non-quarantine pest whose presence in plants for planting affects the intended use of those plants with an economically unacceptable impact and which is therefore regulated within the territory of the

	importing contracting party [IPPC, 1997]
Regulated pest	A quarantine pest or a regulated non-quarantine pest [IPPC, 1997]
Release (Into the environment)*	Intentional liberation of an organism into the environment (see also "introduction" and "establishment") [ISPM Pub. No. 3, 1996]
Release (of a consignment)	Authorization for entry after clearance [FAO, 1995]
Replanting	See Planting
Restriction	A phytosanitary regulation allowing the importation or movement of specified commodities subject to specific requirements [CEPM, 1996, revised CEPM, 1999]
Round wood	Wood not sawn longitudinally, carrying its natural rounded surface, with or without bark [FAO, 1990]
RPPO	Acronym for Regional Plant Protection Organization [FAO, 1990]
Sawn wood	Wood sawn longitudinally, with or without its natural rounded surface with or without bark [FAO, 1990]
Secretary*	Secretary of the Commission appointed pursuant to Article X11 [IPPC, 1997]
Seeds	Seeds for planting not for consumption or processing (see Grain) [FAO, 1990]
Specificity*	A measure of the host range of a biological control agent on a scale ranging from an extreme specialist only able to complete development on a single species or strain of its host (monophagous) to a generalist with many hosts ranging over several groups of organisms (polyphagous) [ISPM Pub. No. 3, 1996]
Spread	Expansion of the geographical distribution of a pest within an area [FAO, 1995]
Standard	Document established by consensus and approved by

	a recognized body, that provides, for common and repeated use, rules, guidelines or characteristics for activities or their results, aimed at the achievement of the optimum degree of order in a given context [FAO, 1995; ISO/IEC GUIDE 2:1991 definition]
Stored product	Unmanufactured plant product intended for consumption or processing, stored in a dried form (this includes in particular grain and dried fruits and vegetables) [FAO, 1990]
Suppression	The application of phytosanitary measures in an infested area to reduce pest populations [FAO, 1995; revised CEPM, 1999]
Surveillance	An official process which collects and records data on pest occurrence or absence by survey, monitoring or other procedures [CEPM, 1996]
Survey	An official procedure conducted over a defined period of time to determine the characteristics of a pest population or to determine which species occur in an area [FAO, 1990; revised CEPM, 1996]
Technically justified	Justified on the basis of conclusions reached by using an appropriate pest risk analysis or, where applicable, another comparable examination and evaluation of available scientific information [IPPC, 1997]
Test	Official examination, other than visual, to determine if pests are present or to identify pests [FAO, 1990]
Tissue culture	See Plants in tissue culture
Transience*	Presence of a pest that is not expected to lead to establishment [ISPM Pub. No. 8, 1998]
Transit	See Consignment in transit
Transparency	The principle of making available, at the international level, phytosanitary measures and their rationale [FAO, 1995; revised CEPM, 1999; based on the World Trade Organization Agreement on the

	Application of Sanitary and Phytosanitary Measures]
Treatment	Officially authorized procedure for the killing, removal or rendering infertile of pests [FAO, 1990, revised FAO, 1995]
Wood	Round wood, sawn wood, wood chips or dunnage, with or without bark [FAO, 1990]

Figure 1: Climatic Zones Map (USDA, 1990).