METHODOLOGY for creating PHYTOSANITARY HAZARD PROFILES for plants, plant products, and other regulated articles

IICA
INTER-AMERICAN INSTITUTE FOR COOPERATION ON AGRICULTURE
OAS

METHODOLOGY for creating PHYTOSANITARY HAZARD PROFILES for plants, plant products, and other regulated articles

Written by Velia Arriagada Ríos, Consultant,
Inter-American Institute for Cooperation on Agriculture (IICA)

IICA
INTER-AMERICAN INSTITUTE FOR COOPERATION ON AGRICULTURE
OAS

This publication is also available in electronic form (PDF) on the Institute's website: www.iica.int.

Publishing coordinators: Lourdes Fonalleras and Erick Bolaños
Translation: Susana Raine
Layout: Karla Cruz Mora
Title page design: Ana Catalina Lizano Quesada
Printing: IICA Headquarters

Methodology for creating phytosanitary hazard profiles for plants, plant products and other regulated articles/ IICA–San Jose, C.R.: IICA, 2010.
96 p.; 23 cm.

ISBN13: 978-92-9248-222-0
Also published in Spanish

1. Phytosanitary measures 2. Plant protection 3. Pest control 4. Regulations I. IICA II. Title

AGRIS H10

DEWEY 632.9

San Jose, Costa Rica
2010

Contents

1. Introduction

One of the most pressing challenges facing the directors of plant protection organizations (PPOs) is for their teams of inspectors to grasp the systemic vision of their work. This means understanding that they and what they do are part of a quarantine system where non-execution or under-execution of phytosanitary interception and inspection tasks will result in a general failure of the system. Therefore, improving the communication and involvement of their teams in the organization's processes of assessment and analysis can contribute significantly to improving the internalization and practical application of established standards and procedures.

In many plant protection organizations, border post inspectors request guidelines or instructions to strengthen their certainty and safety with regard to the decisions they make related to the plants and plant products they intercept during the course of their work. They want to understand the technical bases of their action and not just act in a mechanical fashion.

While this is true for officers who have been engaged in inspection work for many years, it is even more so for new inspectors who may not have received the necessary introductory training, or when the work is performed in shifts by people whose normal tasks are different from those of border post inspectors.

Plant protection organizations also need to establish transparent relationships with the people they supervise. As passengers go through border control points, they can often be heard commenting about how a product was taken away from them without explanation, or asking why certain products are authorized for entry during certain shifts and the same product is taken away or destroyed in another shift. These observations make it necessary to standardize decisions: all inspectors should adopt the same measure for a given product and give the same explanation. Phytosanitary Hazard Profiles (PHP) are expected to significantly improve the image of consistency projected by the organization, as well as inspectors' security and self-esteem. Inspectors' work will be consistent and uniform and they will be able to show people that their decisions are not arbitrary and dependent on the inspector who happens to be on duty. For a given plant product, the decision and explanation will be consistently the same. Moreover, creating the profiles also fosters a process of critical thinking that contributes to learning and team-wide discussion of decisions to be made when plant products are intercepted that they are unsure about.

Although PHPs can be seen as the technical justification for emergency phytosanitary measures taken by border post inspectors, they are not the scientific justification for phytosanitary measures, which must always be based on risk analysis, as stipulated in Article II.1 of the New Revised Text (NRT) of the International Plant Protection Convention (IPPC): *"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."*

The PHP must be based on pest risk analysis during the identification stage of the pathway that constitutes a potential pest hazard. Risk analysts should lay the bases for the design of PHPs by preparing lists of pests that can be related to the pathways (intercepted commodities), combining information from official sources, databases, scientific and other types of documents, or consultations with experts.

In this regard, International Phytosanitary Measure No. 2 (ISPM 2) *Guidelines for pest risk analysis,* points out in the introductory section, that in identifying a pathway: *"A list of organisms likely to be associated with the pathway should be assembled, including organisms that have not yet been clearly identified as pests. When a PRA is carried out for a commodity for which trade already exists, records of actual pest interceptions should be used as the basis for the listing of associated pests."*

If the plant protection organization does not have systematized records for intercepted commodities and associated pests, it could conduct a survey among border post inspectors to determine what plants and plant products are normally intercepted. This will provide basic, initial information that can be used to initiate the development of the profiles, while at the same time create the information-recording system.

Border post inspectors generate a considerable amount of data that, if properly integrated and analyzed, can produce information and knowledge. It is therefore important to recognize the value of quality information and encourage that it be recorded as an input for decision-making at the operating, standard-setting, and strategic risk management levels.

Finally, making phytosanitary hazard profiles using the proposed methodology can provide an opportunity to foster team thinking and to recognize the work of border post inspectors who intercept during the course of their work plants, plant products and other articles not included in cargo, and whose decision-making process and modus operandi are different. This paper proposes a methodology for the teams of inspectors working at the border control posts of plant protection organizations, to prepare phytosanitary hazard profiles by rating parameters that are easy to observe and to assess.

2. Phytosanitary Hazard Profiles (PHP)

The phytosanitary hazard profile of a plant, plant product, or regulated article can be defined as the set of characteristics that would give a preliminary indication of their potential as a pathway for a regulated pest. Its purpose is to provide a set of predictive indicators that suggest the phytosanitary risk of a plant, plant product, or regulated article, but without characterizing the hazard or assessing the risk.

The process to develop phytosanitary hazard profiles involves describing the potential of a plant, plant product, or regulated article to be a pest itself, or to serve as a host for regulated pests that can enter a given area. It is important to underscore, however, that this is not a standardized concept of the International Standards of Phytosanitary Measures (ISPM).

This document covers the set of characteristics that will make it possible to preliminarily identify the phytosanitary hazard of plants, plant products or regulated articles that border post inspectors should consider before taking emergency phytosanitary measures at their stations. Emergency measure is defined in ISPM 5 as a ***phytosanitary measure*** *established as a matter of urgency in a new or unexpected phytosanitary situation. An emergency measure may or may not be a* ***provisional measure*** (ICPM, 2001; revised ICPM, 2005).

Phytosanitary hazard profiles only take into account factors that can be observed and assessed by a border post inspector. They are thus not a study that can be used, for example, to assess the probability of pest entry, i.e., the probability of entry, transfer to a suitable host in the receiving environment, establishment, and subsequent spread of pests that may be intercepted, except those previously characterized as quarantine pests.

Thus, a phytosanitary hazard profile is not the same as a pest risk analysis (PRA), and does not eliminate the need to conduct pest risk analyses for the purpose of establishing phytosanitary measures.

The hazard profile may be considered an expression of Article 5.7 of the WTO Agreement on the Application of Sanitary and Phytosanitary Measures (WTO/SPS Agreement), which refers to provisional measures that may be taken in the absence of information (called the *precautionary principle* by some experts and countries). When a plant, plant product, or regulated article is suspected of being an agent or hosting agents that can be injurious to plant health in the area, measures are adopted regardless of whether a scientific test has been conducted or the causal link has been established by means of a PRA. Nonetheless, a PRA should be conducted subsequently to determine appropriate phytosanitary measures.

In conclusion, a phytosanitary hazard profile is not a tool for assessing **pest risk** (for quarantine pests), which is defined as the *probability of the introduction and spread of a pest and the magnitude of the associated potential economic consequences* (Supplement 2 of the Glossary of Phytosanitary Terms) (ISPM 2, 2007).

It is also important to underscore that the different elements of a phytosanitary hazard profile must be considered together when classifying the phytosanitary hazard posed by a plant, plant product, or other regulated article since a single factor by itself will not define the hazard profile.

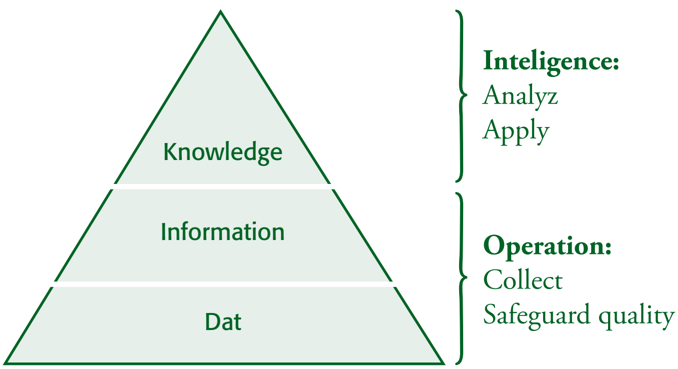
Phytosanitary hazard profiles can be created on the basis of observation, the understanding of certain basic concepts, the appropriate description of certain factors and parameters, and the correct recording thereof to create knowledge.

Bearing this in mind, it is important to understand the difference between the three aspects of the data-information-knowledge pyramid. A datum is a simple unit of information that can be stored. For example, 20 stems of flowers have been intercepted. That is a datum and by itself it does not have much value and is therefore not used to make decisions.

When a datum is transmitted and is added to a context, it becomes information. For example, 20 branches of flowers from country X have been intercepted with presence of pest Z. The datum (20 stems of flowers) is the same, but the information is different. In general, communication within a given context converts the datum into information.

When the capacity exists to make sound decisions based on information, this is knowledge. For example, it is reported that 20 stems of flowers from country X have been intercepted with the presence of pest Z. That information is then used as an input for a PRA that determines the need to change phytosanitary regulations because it had not been known that pest Z was present in country X or that it was associated with that given species of flower. The decision was based on new knowledge of the hazards associated with that pathway. The focus on action converted general information into knowledge.
Databases are very useful for managing information since they make it possible to store, retrieve and send large amounts of information very rapidly and inexpensively. Databases can be used to aggregate data for the purpose of obtaining statistical information. Nonetheless, it takes analysts experienced in and well-acquainted with phytosanitary matters to convert the data and information into knowledge.

Figure 1: Information pyramid



Therefore, it is of critical importance to establish an information recording system so as to be able to keep phytosanitary hazard profiles up to date.

Once the record system (forms for information collection, software or database where it will be recorded) has been set up, tailored to the actual conditions of each country and the specific posts, the quality of the data should be safeguarded to ensure its usefulness in the decision-making process.

Data quality has several related but different dimensions:[1]

- **Accuracy** This measures the degree to which the information reflects what is being intercepted. For example, if roses are intercepted, that datum does not say anything because it could refer to rose plants or cut flowers, which have completely different phytosanitary hazard profiles.

- **Completeness** This measurement reflects the degree to which databases have all the necessary critical information. For example, an inspector may decide not to record the interception of a bunch of roses *"because it has been intercepted before and it is not a new development."* Information is being lost here: on frequency, periodicity, point of entry where the interception occurred, as a result of which analyses will be subject to a higher margin of error.

- **Timeliness** This measures if the information will be available when needed to make a decision. If information on the interception of a pest in a pathway is timely, a shortcoming in regulations can be corrected in time and the pest kept out, or a targeted surveillance process can be rapidly designed for early detection of a possibly unnoticed entry of a pest.

- **Relevance** The information should be useful for phytosanitary purposes. For example, recording the interception of oils or marmalades may not be relevant from the phytosanitary standpoint.

- **Degree of detail** The information should have the degree of detail necessary for analysis and for making regulatory decisions, or to determine if the phytosanitary measures adopted were correct.

1 (Adapted from http://www.gestiopolis.com/canales5/emp/pymecommx/27.htm)

- **Consistency** At all points where information is collected, the information recorded is the same for the same product or regulated article.

When all these dimensions are taken into consideration, the work of interception will not only provide quality information, it will also strengthen the plant protection organization by making good use of information to meet the objective of preventing the entry and spread of regulated pests.

3. Basic concepts

The following concepts are important for understanding the scope and limitations of phytosanitary hazard profiles, as defined herein. The differences should be clearly understood and confusion avoided.

3.1. Hazard vs. risk

The purpose of phytosanitary hazard profiles is to identify hazards associated with a plant, plant product, or other regulated article. They are not, however, specific and detailed characterizations of the hazard or an assessment of associated risks.

Phytosanitary hazard is understood as the **potential** that any plant species, strain or biotype, animal or agent, has to be injurious to plants or plant products.

For its part, pest risk (for quarantine pests) is defined as the **probability** of the introduction and spread of a pest and the magnitude of the associated possible economic consequences (Supplement 2 of the Glossary) (ISPM 2, 2007); and pest risk (for regulated non-quarantine pests) is defined as the **probability** that a pest in plants for planting affects the intended use of those plants with an economically unacceptable impact (Supplement 2 of the Glossary) (ISPM 2, 2007).

Hazard is a factual situation and risk is a probability. A hazard can increase but risk can be kept under control or at a low level with the application of appropriate phytosanitary measures. Phytosanitary hazard profiles can make risk more visible and support the decision-making needed to keep it under control. If inspectors are aware of phytosanitary hazards, they will adopt consistent measures to avoid risk.

3.2. Area vs. endangered area

An **area** is *"an officially defined country, part of a country, or all or parts of several countries"* (FAO, 1990, revised FAO, 1995; ICPM, 1999; the definition is based on the WTO/SPS Agreement). This concept emphasizes the internationally accepted definition of "area" as characterized by administrative limits.

For its part, **endangered area** is defined as: *"An area where ecological factors favor the establishment of a pest whose presence in the area will result in economically important loss"* (Supplement 2 of the Glossary) (FAO, 1995). This definition requires that a risk analysis be conducted to determine if the environmental and ecological requirements of a given pest are present in a given territory or area, such that the pest could be established and cause economic loss considered to be unacceptable.

For border post inspectors, phytosanitary hazard profiles refer exclusively to the concept of "area," as defined above.

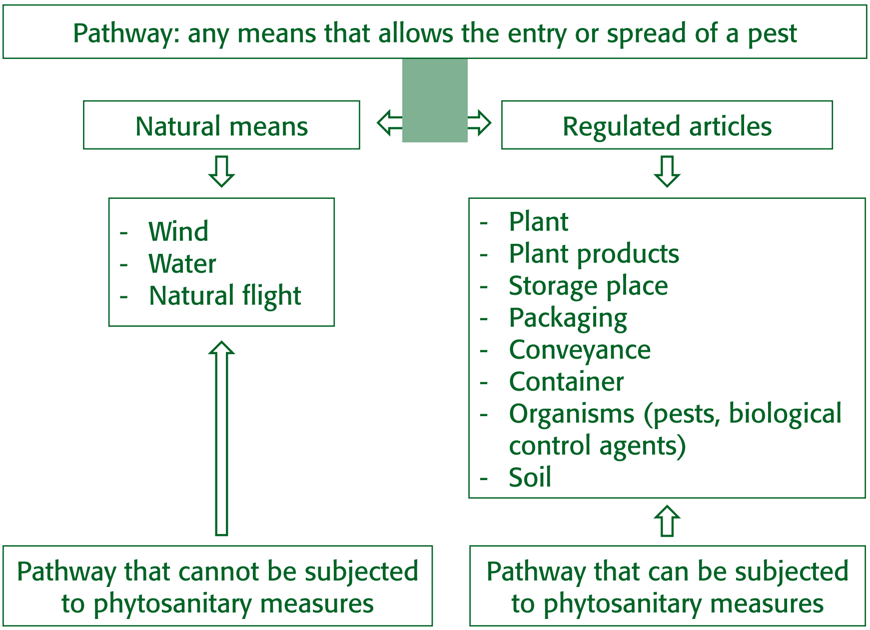
3.3. Pathway, regulated article, plant, plant products, commodity, stored product

Pathway is *"any means that allows the entry or spread of a pest"* (FAO, 1990; revised FAO, 1995). This concept includes both natural pathways and pathways facilitated by human activity.

Within this framework, regulated articles are generally defined as *"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 require phytosanitary measures, particularly where international transportation is involved."* (FAO, 1990; revised FAO, 1995; IPPC, 1997).

Phytosanitary hazard profiles refer only to non-natural pathways that are facilitated by human activity. Thus, hazard profiles will refer

Figure 2: Diagram of a pest pathway



to plants *(live plants and plant parts, including* ***seeds*** *and* ***germplasm****)* (FAO, 1990; revised IPPC, 1997; clarification, 2005); 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; clarification, 2005; previously **plant product**), and more specifically commodities that are *"a type of plant, plant product or other article being moved for trade or other purposes."* (FAO, 1990; revised IPPC, 2001). The latter can refer to stored products, defined as *"unmanufactured plant products intended for consumption or processing, stored in a dry form (this includes in particular grain and dried fruits and vegetables)."* (FAO, 1990).

3.4. Pest entry vs. introduction

Entry (of a pest) is the *"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). The introduction (of a pest) is defined as the *"the entry of a pest resulting in its establishment"* (FAO, 1990; revised FAO, 1995; IPPC, 1997).

As previously explained, phytosanitary hazard profiles only assess a pest's potential for entry into a given administrative area. In order to be able to assess introduction, it is necessary to know the endangered area and the environmental conditions required by the pest to survive. It is also necessary to know the pest's biological information in order to assess the probability of it transferring from the pathway to the receiving environment, becoming established, then spreading and causing unacceptable economic damage. It is important to note that not all pest entries result in introduction.

3.5. Pest, regulated pests, non-quarantine pests

The objective of the work of border post inspectors is to intercept pests, which is defined as the *"the detection of a pest during inspection or testing of an imported consignment" (FAO) (of a pest) 1990; revised ICPM, 1996).*

A pest (defined as *any species, strain or biotype of plant, animal, or pathogenic agent injurious to plants or plant products* (FAO 1990; revised FAO, 1995; IPPC, 1997) intercepted by inspectors can be a regulated pest (a quarantine pest or a regulated non-quarantine pest; IPPC, 1997) or a non-quarantine pest (*pest that is not a quarantine pest for an area;* FAO, 1995).

Regulated pests can be quarantine pests, which are defined as *"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), or regulated non-quarantine pests: *"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."* (ICPM, 1997).

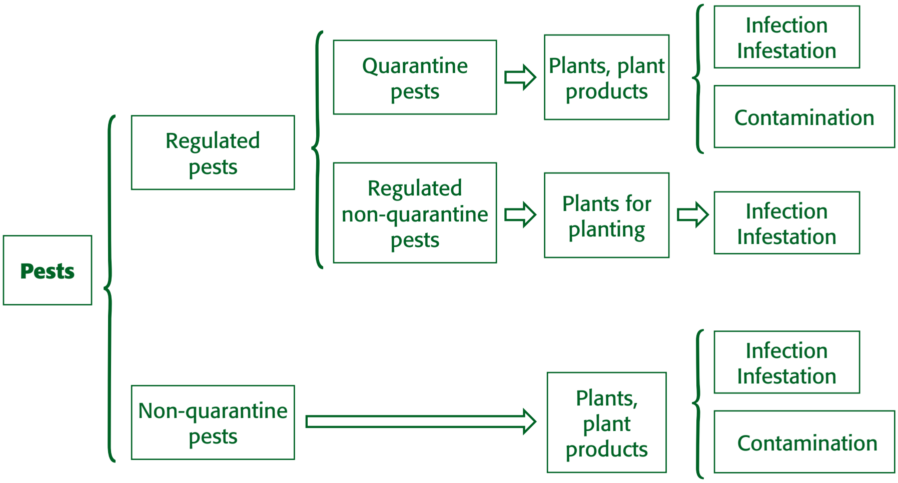
Inspectors often make decisions when they intercept pests (without qualifying them). To fine tune the profiles, however, organisms associated with a given plant or plant product need to be identified and compared with the official list of regulated pests (both quarantine and regulated non-quarantine) and with the record of pests present in the country that are not considered regulated. ISPM 5 defines the pest record as *"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." (ICPM, 1997).*

3.6. Infestation (or infection) vs. contamination

Infestation (of a commodity) is defined as the *"presence in a commodity of a living pest of the plant or plant product concerned. Infestation also includes infection." (ICPM, 1997; revised ICPM, 1999).* This contrasts with the concept of contamination: *"the presence in a commodity, storage place, conveyance or container of pests or other regulated articles, not constituting an infestation" (see Infestation) (ICPM, 1997, revised ICPM, 1999). It follows then that a contaminating pest is "a pest that is carried by a commodity and, in case of plants and plant products, does not infest those plants or plant products."* (ICPM, 1996; revised ICPM, 1999).

Initially, phytosanitary hazard profiles will include, without distinction, infections, infestations and contaminations, especially since contaminating pests can be either quarantine or non-quarantine. It should be noted that many pests will not be detected because they are asymptomatic or latent, and it will not be possible to determine levels of infection.

Figure 3: Flowchart of pests, according to their classification



3.7. Biological pressure from pests at entry

The outcome or finding of the phytosanitary hazard profile evaluation is the biological pressure from pests at entry. The term "biological pressure" is proposed for the purposes of this paper, but is not included in ISPM terminology. Biological pressure from pests at entry is the measure of frequency, periodicity and infestation levels at which a given pest is intercepted on different hosts from different origins and at different points of entry into an area (country). *(Note: this is the author's definition and is not standardized internationally.)* That pressure can be estimated by analyzing the information from the **interception records on regulated articles and pests.**

Biological pressure from pests at entry can be of two types: real or potential.

Real biological entry pressure from pests is represented by the interception of pests on a host or given pathway. Potential biological entry pressure from pests refers to the interception of hosts or pathways from areas with known presence of pests associated with them; they consequently have the potential of carrying those pests.

The factors for measuring the real biological entry pressure from pests are:

- ✓ Frequency of interception of a pest
- ✓ Levels of infestation of each host where the pest is present
- ✓ Periodicity of interceptions of hosts with the pest
- ✓ Interceptions at multiple points of entry into the country
- ✓ Difficulty of detection and recognition
- ✓ Diversity of hosts for a single pest
- ✓ Diversity of origins for a single pest

The factors for measuring *potential biological entry pressure from pests* are:

- ✓ Frequency of interception of plants or plant products that may carry quarantine pests or regulated pests
- ✓ Periodicity of interceptions
- ✓ Interceptions at multiple points of entry
- ✓ Diversity of origins for a given plant or plant product that can carry quarantine pests or regulated pests

Posts not having easy access to diagnostic laboratories for pest detection and identification will measure potential biological pressure. In those cases, it is recommended that inspectors receive training on recognizing and recording certain symptoms or general signs, or on retrieving and preserving samples to support later analyses.

The *frequency* of pest or pest host interception is the absolute number of interceptions of the pest or its hosts at each point of entry into the country or each control point of an area in a predetermined unit of time.

Periodicity of interceptions refers to their distribution in time.

Infestation level refers to the number of individuals of the pest on each intercepted host or the percentage of units of the intercepted host showing evidence of pest presence.

Biological entry pressure from pests can only be measured if information on the interception of pests and their hosts is recorded in a systematic, timely, constant, and complete manner at all established points of entry and in all inspection activities.

4. The process to profile a phytosanitary hazard

The profiling process begins with an accurate and full identification of the plant, plant product or regulated article, taking into account all observable attributes, which shall be described accurately: identification of host, basic product class, level of processing, intended use, etc.

Immediately thereafter, the attributes or characteristics of the regulated article are examined to determine if they are dependent or independent variables. In other words, what attributes make it relevant to consider other attributes, or to what degree does one attribute modify others.

Each hazard factor is then parameterized, and values are assigned to the parameters. Next, the relative weight of each hazard factor within the overall rating is determined. Finally, the hazard can be rated by adding the results of multiplying the absolute value of each hazard factor by its weighting factor. Taking into account the estimated hazard level, decisions are then made in relation to the regulated product. (See figure 4).

4.1. Comprehensive identification of the plant, plant product, or regulated article: basic contents of a phytosanitary hazard profile

The following basic information is required for creating a phytosanitary hazard profile:

a) Plant host

Indicate the scientific or common name of the plant or plant product intercepted. Example: orange, plum, onion, corn, etc.

Figure 4: The hazard profiling process

Full identification of the plant, plant product or regulated article

⇩

Identify dependent and independent variables independientes

⇩

Parameterize and assign values to the parameters within the hazard factors

⇩

Weight hazard factors

⇩

Add weighted hazard factors

⇩

Rate hazard level of the plant, plant product or regulated article

⇩

Make a decision

Ideally, inspectors will have a list of common names and their respective scientific names to help them become familiar with both. For example:

Orange	*Citrus sinensis*
Plum	*Prunus domestica*
Onion	*Allium cepa*
Corn	*Zea mays*

If the common name of the host is unknown, indicate **Unknown**. However, inspectors should exhaust all possibilities in attempting to identify the host by speaking with the person transporting it. Once the common name has been identified, seek the corresponding scientific name.

b) Commodity

This is defined as *"a category of similar commodities that can be considered together in phytosanitary regulations."* (FAO, 1990).

They include:

- **Cut flowers and branches:** Commodity class for fresh parts of plants intended for decorative use and not for planting (FAO, 1990; revised IPPC, 2001).

- **Fruits and vegetables:** Commodity class for fresh parts of plants intended for consumption or processing but not for planting (FAO, 1990; revised IPPC, 2001).

- **Stored product:** Unmanufactured plant product intended for consumption or processing, stored in a dry form (this includes in particular **grain and dried fruits and vegetables**)" (FAO, 1990).

  – **grain:** a commodity class for seeds intended for processing or consumption and not for planting (see Seeds) (FAO, 1990; revised IPPC, 2001).

- **wood:** Commodity class for round wood, sawn wood, wood shavings or dunnage, with or without bark (FAO, 1990; revised IPPC, 2001). For wood the following definitions also apply:
  - **sawn wood:** Wood sawn longitudinally, with or without its natural rounded surface, with or without bark (FAO, 1990).
  - **dunnage:** Wood packaging material used to secure or support a commodity, but which does not remain associated with the commodity (FAO, 1990; reviewed ISPM 15, 2002).
  - **debarked wood:** Wood that has been submitted to any process to remove the bark. (Note: Debarked wood is not the same as bark-free wood.) (IPPC, 2008).
  - **raw wood:** Wood which has not undergone processing or treatment (ISPM 15, 2002).
  - **round wood:** Wood not sawn longitudinally, carrying its natural rounded surface, with or without bark (FAO, 1990).
  - **bark-free wood:** Wood from which all bark, excluding the vascular cambium, ingrown bark around knots, and bark pockets between rings of annual growth, has been removed (ISPM 5, 2008).
  - **processed wood material:** Products that are a composite of wood constructed using glue, heat, and pressure or any combination thereof (ISPM 15, 2002).

- **plants for planting:** Plants intended to remain planted, for planting or replanted (FAO, 1990):
  - **plants *in vitro*:** Commodity class for plants growing in an aseptic medium in a closed container (FAO, 1990; revised IPPC, 1999; IPPC, 2002 formerly plants in tissue culture).
  - **germplasm:** Plants intended for use in breeding or conservation programs (FAO, 1990).

- **seeds:** Commodity class for seeds for planting or intended for planting and not for consumption or processing (see Grain) (FAO, 1990; revised IPPC, 2001).

Consideration should also be given here to the concept of **fresh products** *(living, not dried, deep-frozen or otherwise conserved (FAO, 1990)*) as compared to **processed products**.

Based on these definitions, the following basic product classes can be distinguished for the examples given above.

Plants	– Whole plants (root, stem, leaves, flowers, fruits) including the substratum – Plant parts: rooted or non-rooted stakes, buds, thorns, etc. (germplasm or material used for breeding) – Plants *in vitro* – Seeds

For the example above:

Species	Whole plants	Plant parts	Plants *in vitro*	Seeds
Citrus sinensis	- Ornamental orange trees - Bonsai orange trees	- Rooted or non-rooted semi-ligneous cuttings - Buds - Thorns	Orange plants in agar	Orange seeds for propagation
Prunus doméstica	Rare in international trade	- Rooted or non-rooted ligneous cuttings - Buds - Thorns	Plum plants in agar	Plum pits for propagation
Allium cepa	Rare in international trade	Onion bulbs	Plantlets in agar for breeding programs	Botanical seed
Zea mays	Rare in international trade	- Corncobs for evaluations in breeding programs. - Varnished corncobs as part of handicrafts	Rare in international trade	- Commercial seed - Seed for breeding programs

Cut flowers and branches	Fresh orange branches with all leaves, and orange or lemon blossoms for brides' bouquets

Fruits and vegetables	Fresh oranges, fresh plums, fresh onions bulbs
Dried fruits	Sun- or oven-dried and tenderized plums
Grain	Popcorn
Processed product	Citrus seed extract Decorative lyophilized oranges Corn meal Plum pulp for juice Orange or plum juice Orange or plum marmelade Dehydrated onion

Certain structures are included as plants, such as underground propagation structures including corms, bulbs, rhizomes, roots, etc.

Always include this information, along with a brief description of the specific commodity class being intercepted: for example *"non-rooted green cuttings with leaves."* Ideally, information on measurements should also be recorded, such as the length and thickness of the cuttings.

c) Intended use

This is an important element of the profile, and is defined as *"declared purpose for which plants, plant products or other regulated articles are imported, produced or used" (ISPM 16, 2002; formerly intended use).* Inspectors should make this assessment based on the declaration of the holder of the product as well as their own criterion regarding the likely use of the intercepted product.

A product can be used for:

- planting;
- consumption and other uses not requiring further processing, including decorative and functional uses; and
- processing

ISPM 11 indicates that some uses (i.e., planting) are associated with a much higher probability of pest introduction than others (i.e., processing).

In addition to "intended use," the ISPM defines the concept of "plants for planting" as follows:

Plants for planting	**Plants** intended to remain **planted**, for planting or **replanted** (FAO, 1990)

ISPM 11 mentions some intended uses such as planting, consumption and processing.

ISPM 32 (2009): *Categorization of commodities according to their pest risk* categorizes commodities by level of risk and includes some general ideas to help inspectors focus on products associated with higher phytosanitary risk (plant products that have the highest probability of carrying pests).

In short, intended uses can be:

Planting
- Plants for propagation (includes seeds and other plant parts suitable for propagation or multiplication)
- Plants for planting (includes seeds and other plant parts suitable for planting)

Consumption
- Consumption and other uses without further processing, including decorative and functional uses.

Processing
- Processing, transformation.

d) Processing level

International Standard for Phytosanitary Measures No. 32 (2009) *Categorization of commodities according to their pest risk* is the reference for this topic.

Following is a description of each category of phytosanitary risk, along with guidance regarding the need for phytosanitary measures.

Category 1. Product has been processed to the point where it does not remain capable of hosting or spreading regulated pests. Hence, no further analysis is required, nor should phytosanitary measures be applied. Annex 1 of ISPM 32 provides examples of processes and the resulting products that can meet the criteria for category 1.

Category 2. Product has been processed but is still capable of hosting or spreading some regulated pests. The intended use can be, for example, consumption or subsequent processing. The plant protection organization of the importing contracting party determines if a pest risk analysis (PRA) is needed. Annex 2 of ISPM 32 provides examples of processes and resulting products that can meet the criteria for category 2.

Although products in category 2 have been processed, the processing method may not have eliminated all regulated pests of interest. If it is determined that the method and degree of processing do not eliminate the regulated pests, consideration should be given to the intended use of the product when assessing the probability of the establishment and spread of pests. In this case, a PRA may be needed.

To facilitate categorization, exporting contracting parties should provide detailed information on the method or degree of processing (for example, cooking temperature, duration of boiling, or size of particles). This information will assist importing contracting parties to determine, appropriately, into which category the product should be assigned.

If the assessment of the method and degree of processing determines that the processed product presents no phytosanitary risk and therefore should not be subject to phytosanitary measures, the product should be reclassified into category 1.

Category 3. Product has not been processed and the intended use is, for example, consumption or processing. A PRA is necessary to establish the phytosanitary measures.

Fresh fruits and vegetables for consumption and cut flowers are examples of products in this category.

Because products in categories 2 and 3 have the potential to host or spread regulated pests, it may be necessary to determine phytosanitary measures based on a PRA. The phytosanitary measures determined through a PRA may differ depending on the intended use of the product (e.g., consumption or processing). This evaluation can also take into account the risk of a change in intended use.

Category 4. Product has not been processed and the intended use is planting. A PRA is necessary to establish phytosanitary measures.

Examples of products in this category include propagative material (e.g., cuttings, seeds, seed potatoes, other plants for planting).

Because the products in category 4 of phytosanitary risk have not been processed and their intended use is propagation or planting, they have a much higher possibility of introducing or spreading regulated pests than other products with different intended uses. It is therefore always necessary to perform a PRA to determine the need to apply phytosanitary measures. This category often already has some specific phytosanitary measures established.

e) Country of origin

ISPM 5 (Glossary of Phytosanitary Terms) offers three concepts with regard to country of origin. However, it may be difficult to ascertain the place where the articles were exposed for the first time to contamination by pests or in what country the components of an article were cultivated (i.e., handicrafts). In those cases, the country where the product was purchased or obtained by the person carrying it will be indicated as the country of origin.

Country of origin (of **regulated articles** other than **plants** or **plant products**)	Country where the **regulated articles** were first exposed to **contamination by pests** (FAO, 1990; revised ICPM, 1996; ICPM, 1999).
Country of origin (of a **consignment** of **plants**)	Country where the **plants** were grown (FAO, 1990; revised ICPM, 1996; ICPM, 1999).
Country of origin (of a **consignment** of **plant products**)	Country where the **plants** from which the **plant products** are derived were grown (FAO, 1990; revised ICPM, 1996; ICPM, 1999).

When plants, plant products or pests are intercepted in passengers' luggage, the passenger declares the country of origin, which is to be recorded as probable origin.

When plants, plant products or pests are intercepted in transit, the place of probable origin will be the country where the trip began, but countries in transit should also be indicated, if possible.

When cargo or articles are backed by a phytosanitary certificate, the country of origin is the one indicated in the document. In the case of manufactured goods that do not require phytosanitary certification, the country of origin will be the one indicated on the relevant commercial invoice or product label. In the case of certified packaging, the country of origin will be that of the brand. When interceptions occur in traps or storerooms, the origin should be indicated as unknown.

This variety of situations is another reason why it is hazard, and not risk, that is assessed by inspectors at border control posts. For a risk assessment, identification of the area of origin and its phytosanitary status is required.

f) Regulatory status

It is important to indicate whether the plant, plant product, or other regulated article is regulated for entry into the territory of the given country.

A regulated product, from any origin or from a specific origin, is a product for which a risk analysis was performed and therefore its dangers have been identified and its risks are known. This includes products that have been prohibited because their risk is unacceptable. An unregulated product, whether from its origin or totally, is a product having unknown hazards and therefore can be a threat.

Inspectors should therefore know the established phytosanitary regulations, which should be available in a compendium or accessed electronically through a website, or made available in electronic form (CD, others).

g) Suspicion of pests

Some phytosanitary stations may not have access to diagnostic laboratories. In those cases, inspectors should be trained to describe symptomatologies. Ideally they should have cameras so that they can keep better records and their descriptions—often subjective—can be more accurately verified.

Inspectors should check plants, plant parts or other regulated articles for symptoms and signs that could suggest the presence of pests.

It is also important to recall that many pests are asymptomatic and latent, which means that if symptoms are not observed this cannot be interpreted as an absence of potential pests. This is another reason why these are hazard profiles and not risk profiles.

h) Pest interception

Pest interceptions are usually of organisms that are easy to see with the naked eye, including insects, some mites, weed seeds, fungi, slugs, snails, etc. For practical reasons, other pests do not appear on the pest interception list because of the difficulty of diagnosis, as in the case of bacteria, virus, viroids, nematodes, and phytoplasmas.

i) Stage of the pest

- ✓ First determine if the specimen is alive or dead. Some stages cannot be determined by inspectors, for example, whether insect eggs, mite eggs, or pupas are viable. Should this be the case, indicate "unspecified."

✓ Next, determine if the stage of the specimen is adult or immature. In some cases, determining the difference between immature and adult stages requires specialization and the inspector might not be able to define it.

✓ In the case of fungi, indicate: mycelium or pustules (e.g., rust), or others indicated in the guide on signs in Annex 7.2 of this document.

✓ In the case of unidentified seeds, indicate unidentified.

✓ In the case of mollusks, specify whether the specimen is a slug or a snail.

ii) Laboratory analysis

If samples are sent to an official or accredited laboratory, indicate which laboratory the sample was sent to and what analysis was requested. For example:

- Taxonomical, to determine the host plant species or the species of unidentified seeds
- Entomological
- General phytopathological, such as mycological, bacteriological, nematological, virological, or malacological

The inspector should receive the results of analyses for inclusion in the interception report, for this is also a very useful feedback.

i) Date

This is the complete date for the day on which the plant, plant product, or other regulated article was intercepted.

This important piece of information is used for purposes of traceability, and to determine periodicity and whether the seasonality of the biological entry pressure from potential pests occurs at a time suitable for the their introduction.

j) Inspectors

The full name of the inspector should be clearly and legibly indicated, as well as the signature. The inspector is responsible for correctly filling out the data record (quality and correctness).

This piece of information is important for purposes of traceability, the need for possible clarifications, and for accountability.

k) Amount intercepted: volume or units of entry

Indicate the estimated volume that entered or was intended for entry, as well as the volume inspected and the corresponding unit of measure, as follows:

- Fruits: Estimated units or kilograms (number of boxes, indicating kilograms/box)
- Wood packaging: Number of boxes or crates
- Seeds: Kilograms or grams, or number of containers of X kg or gm each.
- Bulk: Tons
- Vegetative planting materials: Units
- Contaminating insects in conveyance: Approximate number of insects detected
- Firewood: Kilograms
- Sawn wood and logs: Cubic meters
- Others: Apply criterion

This information is useful for risk analysts who perform subsequent risk assessments, in that the greater the volume admitted, the greater the probability that the article will at times be associated with pests. In addition, infestation levels and sample sizes make it possible to determine if sampling levels (especially in cargo) are suitable for purposes of pest detection.

l) Administrative place where the interception occurred

Indicate the official name of the given border control or internal quarantine post, as well as its geographic location.

In addition, indicate if the interception was made in a means of transport, identifying the type of conveyance: sea, air, land.

4.2 Dependent and independent variables

A variable is a phenomenon whose properties can change value, and this change can be measured. It is an observable characteristic or a discernible aspect of an object under study that can have different values or find expression in different categories. For example, plant hosts can either be known or unknown; commodity classes can be determined: fresh fruit, dried fruit, round logs, cut flowers, etc.; intended uses can be consumption or propagation, and processing level will determine classification into categories 1, 2, 3 or 4. All of these characteristics can be observed by an inspector.

The characteristics or properties of variables can vary quantitatively or qualitatively and they are basic elements of hypotheses, since hypotheses are built based on the relationship between variables.[2]

---

2 Radrigan R., Marisa. Metodología de la Investigación. CLASE 4 VARIABLES. http://www.ust.cl/html/cree/asignaturas/material_profesor/material_met_trabajo_intelectual/clase4.pdf

The degree, level, or value attributed to a variable after being measured make it possible to classify plants or plant products into levels of phytosanitary hazard through the profiling process.

For purposes of this document, the most important classification of variables is as follows:

- Dependent variables: As indicated by the term, these are characteristics of actual conditions that are determined by or are dependent on the value of other independent phenomena or variables. The dependent variable is the explained variable.

- Independent variable: A variable that, when its value changes, causes changes in the values of another variable (dependent variable). Also known as the explanatory variable.

This means that variations in the **independent variable** will cause variations in the **dependent variable.**

As mentioned above, variables are characteristics of actual conditions that can be determined by observation and, most importantly, can have different values or characteristics. Thus, we can say we use concepts to think, observe, and explain, while variables are in the real world and are what we observe and explain.

Concepts are located in a theoretical plane while variables are located in a concrete plane and are perceptible by the senses.

As mentioned in the previous section, easily observable variables were selected for the hazard profiles for use by border post inspectors. Nonetheless, in practice, certain characteristics affect the importance that must be assigned to variables in developing the phytosanitary hazard profiles.

For example, with regard to processing level, if a plant product has been processed to the point that it is not capable of hosting or spreading regulated pests, it would not be necessary to evaluate, for phytosanitary reasons, the plant host. In some cases, it would be impossible to recognize the plant host given the degree of processing. Intended use, which would likely be consumption and other uses without further processing, including decorative and functional uses, would also be irrelevant. The country of origin also loses importance vis-à-vis the assessment and regulatory status of the product. Even though it is not regulated, it is unnecessary to make a decision on whether to authorize entry. Such a product, then, would not require an analysis or the application of phytosanitary measures.

In a danger profile, a characteristic that cancels the importance of all others is an independent variable.

For example: a violin is made of different types of wood: **piceous** (Picea spp.) for the cover and **maple** (Acer spp.) for the base and the scroll. The fingerboard is **ebony** (Diospyros spp), a very strong wood. The pins and chordal are made primarily of **ebony** or **jacaranda** (Jacaranda spp.) since they are used for tuning the violin. The finest maple wood comes from **Bosnia** and the best piceous wood for this purpose comes from **Central European countries**. Ebony comes from **Africa**. A violin is a product that is not mass made: the wood is dried in thin and molded sheets. Violins are not listed in any phytosanitary regulation and circulate freely across borders, regardless of what wood they are made of and the origin of the wood.

4.3 Parametrizing and assigning value to parameters within the hazard factors

A hazard can be graded by assigning arbitrary quantitative values to the different parameters used in drawing up the profile. With this procedure, numerical values are assigned to ordinal qualities in order to apply parametric methods.

Ordinal qualitative data are those which have categories that can be ordered in a logical ascending fashion, in this case: Low, medium, high.

A parametric concept is one that can be defined with variables using arithmetical and logical tables and expressions keyed to parameters. In assigning value to the parameters, the expressions become constants and define a concept as we normally know it. The possible values of a given parameter are called the argument of that parameter.

We thus assign arbitrary quantitative or numerical values to the basic parameters of a phytosanitary hazard profile, which can be grouped into ranges:

	Assigned numerical value
Low	0-2
Medium	3-4
High	5-6

Note that it is the parameter that is rated, not the product itself. The hazard of the product is the sum of all the identified, rated, and weighted parameters.

4.3.1. Hazard factors, parameters, and risks

Hazard factors are related to the condition of certain variables regarded as basic for defining the profiles. Parameters are dimensions of the factors to which arithmetical expressions can be assigned. From these parameters, the probability of assigning a correct argument to the parameter can be determined, that is, identify the risk that the profile may or may not be valid.

Hazard factor	Parameter	Associated risks (The probability of ...)
Plant host	The plant host is identifiable	Incorrect identification of a plant species.
	The plant host is unknown	Not making the effort to identify the plant host
Intended use	Plants for propagation or planting (includes seeds and other plant parts for propagation or multiplication)	Assigning the intended use of propagation to a plant part that does not have that purpose (e.g., ginger rhizomes)

(Continues)

(Continuation)

Hazard factor	Parameter	Associated risks (The probability of …)
(Cont.) **Intended use**	Consumption	Assigning the intended use of consumption to a plant part which may be used for propagation (e.g., potato tubers)
	Processing	Assigning the intended use of processing to a plant part that can be used for propagation (e.g., bean grains, potato tubers)
Processing level	The plant product has been processed to a degree where it is not capable of hosting or spreading regulated pests (category 1)	Inspector does not have the capacity to evaluate the degree of processing and incorrectly identifies it as category 1
	The product has been processed but remain capable of hosting or spreading some regulated pests (category 2)	Inspector does not have the capacity to evaluate the degree of processing and incorrectly identifies it as category 2
	The product has not been processed (categories 3 and 4)	Inspector does not have the capacity to evaluate the degree of processing
Country of origin	Country of origin is known	Incorrect assignment of country of origin
	• The country of origin has a known presence of quarantine pests associated with the plant or plant product	Incorrect assignment of quarantine pests to the country of origin
	• The phytosanitary status of the country is unknown for the pests in the given commodity or plant	Effort not made to obtain information on the phytosanitary status
	• The country of origin has a comparable phytosanitary status with regard to the given product or plant. The presence of associated quarantine pests has not been determined	Asignar erróneamente estatus fitosanitario comparable al país de origen.
	The country of origin is uncertain or unknown	Effort not made to identify the country

(Continues)

(Continuation)

Hazard factor	Parameter	Associated risks (The probability of …)
Regulatory status	The plant, plant product, or regulated article has generic regulations for any origin, without specific phytosanitary measures	Inspector is unfamiliar with the regulations
	The plant, plant product, or regulated article has established phytosanitary measures for certain origins	Incorrect assignment of origin, leading to incorrect phytosanitary measure
		Not having the knowledge needed to determine phytosanitary measures
Potential pest presence	The plant or plant product is not regulated or is prohibited	Inspector unaware that it is not regulated or prohibited
	The plant, plant product, or regulated article does not show symptoms or signs of the presence of pests	Inspector did not inspect diligently and did not notice symptoms that can be attributed to pests
	The plant, plant product, or regulated article shows symptoms indicating the presence of pests.	Inspector incorrectly identifies normal reactions of a plant or plant product as symptoms
Pest interception		
• Pest identification	The intercepted organism is in a developmental stage that cannot be specifically identified	The persons responsible for identification do not have the guides necessary for identifying certain developmental stages
	No laboratory is available to identify the intercepted organism	Loss of information
	The organism is identified partially to the genus level	Persons responsible for identification do not have the experience or guides necessary to enable identification at the species level
		Incorrect identification of genus
	The species of the organism is identified	The species is incorrectly identified

(Continues)

(Continuation)

Hazard factor	Parameter	Associated risks (The probability of …)
• Regulatory status of the organism	If the organism is partially identified at the genus level, which is a genus that includes pests considered quarantine pests	Incorrect identification of genus leads to incorrect assignment of regulatory status
	The organism is identified at the species level and is a quarantine pest	Incorrect identification of species leads to incorrect assignment of quarantine status.
		Correct identification of species but incorrect assignment of status
	In plants for planting the organism is identified at the species level, and is a regulated non-quarantine pest	Incorrect identification of species leads to incorrect assignment of regulated non-quarantine pest status
		Correct identification of species and incorrect assignment of status
	The organism is identified at the species level and is a present pest without official control	Incorrect identification of species leads to assignment of present pest without official control status
		Correct identification of species but not assigned present pest status without official control
	The organism is identified at the species level and is a beneficial organism (antagonist, predator, parasite)	The species is identified incorrectly and is assigned the status of beneficial organism
		The species is identified correctly and is not assigned the status of beneficial organism
		Since it is beneficial, because it controls pests of interest, it poses a risk for biodiversity

4.3.2. Assigning value to the parameters

The assignment of values is arbitrary and requires expert judgment.

a) Plant host

Parameter	Hazard rating	Observation or assumption
The plant host can be identified	0-2	It is assumed that if the host can be identified, the hazard and risk can be known and assessed
The plant host is unknown	5-6	There is no probability of knowing the hazard and assessing the risk

b) Intended use

Parameter	Hazard rating	Observation or assumption
Plants for propagation (includes seeds and other plant parts for propagation or multiplication)	5-6	Some uses pose higher risk than others; for example, planting vs. consumption or processing
Plants for planting (includes seeds and other plant parts)	5-6	
Consumption	3-4	
Processing	0-2	
Consumer product that can be diverted to propagation	0-2	

c) Level of processing

Parameter	Hazard rating	Observation or assumption
The plant product has been processed to a degree where it is not capable of hosting or spreading regulated pests (category 1)	0	The processing level affects the capacity of the commodity to host pests; it also affects pest viability
The product has been processed but can still host or spread some regulated pests (category 2)	1-2	
The product has not been processed (categories 3 and 4)	5-6	

d) Country of origin

Parameter	Hazard rating	Observation or assumption
The country of origin is known	3-4	It is possible to determine what pests are associated with the product in that country
The country of origin is uncertain or unknown	5-6	It is not possible to determine with certainty the phytosanitary status of the plant or plant product

If the country of origin is known:

Parameter	Hazard rating	Observation or assumption
There is a known presence of quarantine pests associated with the plant or plant product in the country of origin	5-6	If quarantine pests are present in the country of origin, there is an increased risk that they will be associated with the product
The phytosanitary status of the country is unknown vis-à-vis the pests in the given commodity or plant	5-6	Absence of information increases uncertainty and therefore risk
The country of origin has a comparable phytosanitary status with regard to the given commodity or plant. The presence of associated quarantine pests has not been determined	1-2	Self-explanatory

e) Regulatory status of the plant product

Parameter	Hazard rating	Observation or assumption
The plant, plant product or regulated article has generic regulations for any origin, without specific phytosanitary measures	2-3	The PRA has not determined associated quarantine pests
The plant, plant product or regulated article has established phytosanitary measures for certain origins	5-6	The PRA has determined associated quarantine pests

(Continues)

(Continuation)

Parameter	Hazard rating	Observation or assumption
The plant or plant product is not regulated or is prohibited	5-6	The phytosanitary status of the plant or plant product is unknown
Plants for propagation purposes are regulated with post-entry quarantine	6	This measure is requested because some pests are latent and others are difficult to detect
Consumption products capable of being diverted for use in propagation require the application of phytosanitary measures to inactivate their capacity for propagation	6	It is necessary to prevent the propagation of consumption products for cultivation reasons; moreover, the phytosanitary measures are different

f) Potential presence of pest

Determined by the observation of pest symptoms, such as those in Annex 1.

Parameter	Hazard rating	Observation or assumption
The plant, plant product or regulated article does not show symptoms or signs of pest presence	2-3	Latent, asymptomatic pests or pests that are difficult to detect could be present
The plant, plant product or regulated article shows symptoms of pest presence	5-6	Symptoms are observed but not the presence of an agent

g) Interception of pests

This can be evaluated using the following parameters:

- Pest identity
- Regulatory status of the pest

(Continúa)

i) Pest identity

Parameter	Hazard rating	Observation or assumption
The intercepted organism is in a developmental stage that makes specific identification impossible	6	If the organism cannot be identified, the worst case scenario should always be assumed, i.e., that it is a pest
No laboratory is available for identifying the intercepted organism	6	If the organism cannot be identified, the worst case scenario should always be assumed, i.e., that it is a pest
The organism is partially identified to the genus level	5	If the organism cannot be identified, the worst case scenario should always be assumed, i.e., that it is a pest. At the genus level, however, it is possible to determine if that level includes pests
The organism is identified to the species level	3-4	Its risk can be determined

ii) Regulatory status of the organism

Parameters	Hazard rating	Observation or assumption
The inability to identify the organism makes it impossible to determine its status	6	The worst case scenario should be assumed: that it is a possible quarantine species
The organism is identified partially to the genus level and this genus includes quarantine pests.	6	The worst case scenario should be assumed: that it is a possible quarantine species
The organism is identified to the species level and it is a quarantine pest	6	Self-explanatory
The organism is identified to the species level in plants for planting and is a regulated non-quarantine pest	4	The risk is lower because it is a non-quarantine present pest in the country
The organism is identified to the species level and is a present pest without official control	1	Self-explanatory

(Continues)

(Continuation)

Parameters	Hazard rating	Observation or assumption
The organism is identified to the species level and is a beneficial organism (antagonist, predator, parasite or hyperparasite of pests)	6	Exotic beneficial organisms can have an indirect impact on cultivated or wild plant resources and fauna, which means they should be assessed in advance
The organism is identified to the species level and is a beneficial organism (antagonist, predator, parasite or hyperparasite of pests) present in the country	1	Se explica por si solo

4.3.3 Weighting of hazard factors

Weighting is the emphasis given to each variable within a set intended to be measured or expressed in an index.[3]

Not all factors selected for assessing the hazard have the same weight in a final decision. Weighting coefficients are used to assign and reflect the differing importance of hazard factors in the final rating.

As in the case of the assignment of numerical values, the weighting of factors is also arbitrary and requires expert judgment to select which factors have the greatest incidence in determining the final hazard.

The following scenarios are offered for illustrative purposes:

i) Category 1 products

- The plant product has been processed to a degree where it is not capable of hosting or spreading regulated pests (category 1). That is, no danger is identified. At this point, the assessment concludes and authorization is given for the product to enter.
- The product has been processed but remains capable of hosting or spreading some regulated pests (category 2). The intended use

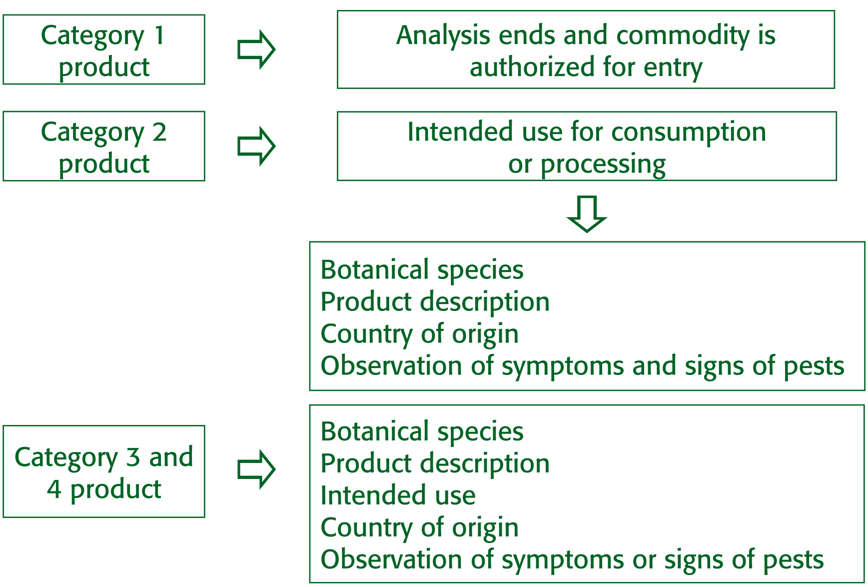
3 http://www.bolsamadrid.es/esp/bolsamadrid/cursos/dicc/p.asp

is consumption or processing. Examples: chipped wood, chopped fruits, naturally dried fruits and vegetables, painted objects including lacquers and varnishes, polished grains (rice) or hulled grains. Here the following is relevant: identification of the host and its country of origin, observation of the presence of symptoms or signs of pests, the commodity's regulatory status, and the possible pests intercepted.

- For unprocessed products (categories 3 and 4) all factors are important, especially observation of symptoms or signs of pests. This observation can yield the following:
  – No pests or symptoms are detected (apparently healthy).
  – Pests are not detected and only symptoms attributable to pests are detected.
  – Pests are detected (mycelia, rust pustules, developmental stages of insects, etc).

All of the above is illustrated in the following danger assessment flowchart:

Figure 5: Categorization of commodities



ii) Category 2 products

Product has been processed but can still host or spread some regulated pests. The intended use can be, for example, consumption or subsequent processing. Here, the processing level and intended use are independent variables that affect the other variables.

Scenario a: apparently healthy products

HAZARD FACTOR		Weighting coefficient (WC) (%)
F1	Plant host	25
F2	Country of origin	25
F3	Phytosanitary status of the country of origin	25
F4	Regulatory status of the commodity	25
		Total 100

In this case the variables have the same weight in the final determination of danger.

Multiplying the absolute value of risk (AVR) and the weighting coefficient (WC) yields the weighted value of the hazard (WVH).

HAZARD FACTOR		(WC) (%)	Parameter	AVR	WVH
F1	Plant host	25	Identifiable	0-2	0- 0.5
			Unknown	5- 6	1.25- 1.5
F2	Country of origin	25	Known	3-4	0.75- 1.0
			Unknown	5- 6	1.25- 1.5
F3	Phytosanitary status of the country of origin	25	Known with associated pests of quarantine importance	5-6	1.25- 1.5
			Known without associated pests of quarantine importance, or status comparable to destination country	1-2	0.25- 0.5
			Unknown	5-6	1.25- 1.5

(Continues)

(Continuation)

HAZARD FACTOR		(WC) (%)	Parameter	AVR	WVH
F4	Regulatory status of the commodity	25	Generic, without specific phytosanitary measures	2-3	0.5- 0.75
			Specific for certain origins, with mention of specific pests	5-6	1.25- 1.5
			Not regulated	5-6	1.25- 1.5

Different combinations of the parameters of each hazard factor can yield different situations representing real conditions. Some possibilities are:

An identifiable plant host is intercepted; it is from a known country of origin where there are present pests of quarantine importance that can be transmitted by the product, and the phytosanitary regulations include specific regulations for these pests.

$\sum$ 0.5 + 1.0+ 1.5+ 1.5 = 4.5 (medium-high hazard)

An identifiable plant host is intercepted; it is from a known country of origin where present pests of quarantine importance are not found, and the phytosanitary regulations are generic.

$\sum$ 0.5 + 1.0+ 0.5+ 0.75 = 2.75 (low hazard)

An identifiable plant host is intercepted, of uncertain or unknown origin, so the phytosanitary status of the possible country of origin is unknown and it is not regulated.

$\sum$ 0.5 + 1.5+ 1.5+ 1.5 = 5 (high hazard)

Scenario b: Products show signs or symptoms of pests

HAZARD FACTOR		Weighting coefficient (WC) (%)
F1	Plant host	20
F2	Country of origin	20
F3	Phytosanitary status of country of origin	15
F4	Regulatory status of the product	10
F5 (a)	Presence of symptoms without causal agent	35
F5 (b)	Identification of the pest	15
F6	Regulatory status of the intercepted organism	20

The same operation above is performed below.

HAZARD FACTOR		(CDP) (%)	Parámetros	VAP	VPP
F1	Plant host	20	Identifiable	0-2	0- 0.4
			Unknown	5- 6	1.0-1.2
F2	Country of origin	20	Known	3-4	0.6-0.8
			Unknown	5- 6	1.0-1,2
F3	Phytosanitary status of the country of origin	15	Known, with associated pests of quarantine importance	5-6	0.75-0.9
			Known, without associated pests of quarantine importance, or status comparable to destination country	1-2	0.15-0.3
			Unknown	5-6	0.75-0.9
F4	Regulatory status of the commodity	10	Generic, without specific phytosanitary measures	2-3	0.2-0.3
			Specific for certain origins, with mention of specific pests	5-6	0.5-0.6
			Not regulated	5-6	0.5-0.6

(Continues)

(Continuation)

HAZARD FACTOR		(CDP) (%)	Parámetros	VAP	VPP
F5 (a)	Presence of symptoms without the presence of a causal agent	35		5-6	1.75 -2.1
F5 (b)	Identification of intercepted pest	15	The intercepted organism is at a developmental stage that cannot be identified to the species level	6	0.9
			No laboratory is available for identifying the intercepted organism	6	0.9
			The organism is partially identified to the genus level	5	0.75
			The organism is identified to the species level	3-4	0.45-0.8
F6	Regulatory status of the intercepted organism	20	Because the organism cannot be identified, the status of the organism is unknown	6	1.2
			The organism is partially identified to the genus level and its genus includes quarantine pests	6	1.2
			The organism is identified to the species level and is a quarantine pest	6	1.2
			The organism is identified to the species level in plants for planting and is a regulated non-quarantine pest	4	0.8
			The organism is identified to the species level and is a present pest without official control	1	0.2

(Continues)

(Continuation)

			The organism is identified to the species level and is a beneficial organism (antagonist, predator, parasite or hyperparasite of pests)	6	1.2
			The organism is identified to the species level and is a beneficial organism (antagonist, predator, parasite or hyperparasite of pests)	1	0.2

In this scenario, some possible options are:

A clearly identified plant host is intercepted, coming from a known country of origin where it is known that there are quarantine pests associated with the species as well as specific regulations; symptoms of a pest are detected but the causal agent is not intercepted.

$$\sum 0.4 + 0.8 + 0.90 + 0.6 + 2.1 = 4.8 \quad \text{(medium-high hazard)}$$

An unknown plant host is intercepted, coming from a known country of origin; because the host is unknown it cannot be determined if the (known) country has associated quarantine pests. Because the commodity is unknown it is unregulated, and symptoms of a pest are detected but the causal agent is not intercepted.

$$\sum 1.2 + 0.8 + 0.9 + 0.6 + 2.1 = 5.6 \quad \text{(high hazard)}$$

A clearly identified plant host is intercepted, from a known country of origin where it is not known if there are quarantine pests associated with the species; there are generic regulations; a pest is detected and a specialist determines that it is in a developmental stage that makes identification impossible.

$$\sum 0.4 + 0.8 + 0.3 + 0.9 + 1.2 = 3.6 \quad \text{(medium hazard)}$$

iii) Category 3 and 4 products

Category 3 products have not been processed and their intended use is consumption or processing; for example. fruits and fresh vegetables for consumption and cut flowers. One of the important factors to consider in this category is the diversion of the intended use from consumption to planting.

Category 4 products have not been processed and are for planting.

Scenario a: No pests are detected and no pest symptoms are observed (apparently healthy)

HAZARD FACTOR		Weighting coefficient (WC) (%)
F1	Plant host	25
F2	Intended use	25
F3	Country of origin	15
F4	Country of origin and phytosanitary status	15
F5	Regulatory status	20
		Total 100

HAZARD FACTOR		(WC) (%)	Parameter	AVR	WVH
F1	Plant host	25	Identifiable	0-2	0-0.5
			Unknown	5- 6	1.25- 1.5
F2	Intended use	25	Plants for propagation (includes seeds and other plant parts for propagation or multiplication)	5-6	1.25- 1.5
			Plants for planting (includes seeds and other plant parts)	5-6	1.25- 1.5
			Consumption	3-4	0.75 - 1

(Continues)

(Continuation)

HAZARD FACTOR		(WC) (%)	Parameter	AVR	WVH
F2			Processing	0-2	0-0.5
			Product for consumption that can be diverted to planting	5-6	1.25- 1.5
F3	Country of origin	15	Known	3-4	0,45- 0.6
			Unknown	5- 6	0.75- 0.9
F4	Phytosanitary status of the country of origin	15	Known, with associated pests of quarantine importance	5-6	0.75- 0.9
			Known, without associated pests of quarantine importance, or status comparable to destination country	1-2	0.15-0.3
			Unknown	5-6	0.75- 0.9
F5	Regulatory status of the commodity	20	Generic, without specific phytosanitary measures	2-3	0.4- 0.6
			Specific for certain origins, with mention of specific pests	5-6	1.0- 1.2
			Not regulated or prohibited	5-6	1.0- 1.2
			Plants for propagation are regulated with post-entry quarantine	6	1.2
			Commodities for consumption that can be diverted to planting require application of phytosanitary measures to inactivate their capacity for propagation	6	1.2

Some examples are:

A clearly identified plant host is intercepted whose intended use is consumption but whose characteristics make it possible for it to be diverted to propagation and for which historical evidence of same exists. It comes from a known country of origin, where it is known that quarantine pests are associated with the product; when it is for propagation, the product must comply with post-entry quarantine.

$\sum$ 0.5 + 1.0 + 0.6 + 1.2 + 1.2 = 4.5 (medium-high hazard)

An unknown plant host is intercepted whose intended use is planting in an indoors flowerpot; it comes from a known country of origin where it is not known that quarantine pests are associated with the product, and the product is not regulated.

$\sum$ 1.5 + 1.5 + 0.6 + 0.9 + 1.2 = 5.7 (high hazard)

Scenario b: Only symptoms are detected, not the causal agent

HAZARD FACTOR		Weighting coefficient (WC) (%)
F1	Plant host	20
F2	Intended use	20
F3	Country of origin	10
F4	Phytosanitary status of the country of origin	10
F5	Regulatory status of the product	15
F6	Presence of symptoms but not the presence of a causal agent	25
		Total 100

HAZARD FACTOR		(WC) (%)	Parameter	AVR	WVH
F1	Plant host	20	Identifiable	0-2	0-0.4
			Unknown	5- 6	1.0-1.2
F2	Intended use	20	Plants for propagation (includes seeds and other plant parts for propagation or multiplication)	5-6	1.0-1.2
			Plants for planting (includes seeds and other plant parts for propagation)	5-6	1.0-1.2
			Consumption	3-4	0.6-0.8
			Processing	0-2	0-0.4
			Product for consumption that can be diverted to propagation	5-6	1.0-1.2
F3	Country of origin	10	Known	3-4	0.3-0.4
			Unknown	5- 6	0.5-0.6
F4	Phytosanitary status of the country of origin	10	Known, <u>with</u> associated pests of quarantine importance	5-6	0.5-0.6
			Known, <u>without</u> associated pests of quarantine importance, or status comparable to destination country	1-2	0.1-0.2
			Unknown	5-6	0.5-0.6
F5	Regulatory status of the product	15	Generic, without specific phytosanitary measures	2-3	0.3-0.45
			Specific for certain origins, with mention of specific pests	5-6	0.75-0.9
			Not regulated or prohibited	5-6	0.75-0.9

(Continues)

(Continuation)

HAZARD FACTOR		(WC) (%)	Parameter	AVR	WVH
F5			Plants for planting are regulated with post-entry quarantine	6	0.9
			Products for consumption that can be diverted to propagation require the application of phytosanitary measures to inactivate their capacity for propagation	6	0.9
F6	Presence of symptoms but not of a causal agent	25		5-6	1.25-1.5

Some possible options:

A clearly identified plant host is intercepted whose intended use is plants for planting; from a known country of origin where it is known that quarantine pests are associated with the product; the product must fulfill post-entry quarantine; at the moment of detection, leaf symptoms were detected but the causal agent was not determined.

$$\sum 0.4 + 1.2 + 0.4 + 0.6 + 0.9 + 1.5 = 5 \text{ (high hazard)}$$

A known plant host is intercepted whose intended use is consumption; it offers no possibilities for diversion of use, it comes from a known country of origin for which the phytosanitary status is unknown; the product is regulated with specific phytosanitary measures.

$$\sum 0.4 + 0.8 + 0.4 + 0.6 + 0.9 = 3.1 \text{ (medium hazard)}$$

Scenario c: Pests are detected (i.e., mycelia, rust pustules, developmental stages of insects, others).

HAZARD FACTOR		Weighting coefficient (WC) (%)
F1	Plant host	20
F2	Intended use	20
F3	Country of origin	10
F4	Phytosanitary status of the country of origin	10
F5	Regulatory status of the product	15
F6	Identification of the intercepted pest	15
F7	Regulatory status of the intercepted organism	10
		Total 100

HAZARD FACTOR		(WC) (%)	Parameter	AVR	WVH
F1	Plant host	20	Identifiable	0-2	0-0.4
			Unknown	5- 6	1.0-1.2
F2	Intended use	20	Plants for propagation (includes seeds and other plant parts for propagation or multiplication)	5-6	1.0-1.2
			Plants for planting (includes seeds and other plant parts)	5-6	1.0-1.2
			Consumption	3-4	0.6-0.8
			Processing	0-2	0-0.4
			Commodity for consumption that can be diverted to propagation	5-6	1.0-1.2
F3	Country of origin	10	Known	3-4	0.3-0.4
			Unknown	5- 6	0.5-0.6
F4	Phytosanitary status of country of origin	10	Known, with associated pests of quarantine importance	5-6	0.5-0.6

(Continues)

(Continuation)

HAZARD FACTOR		(WC) (%)	Parameter	AVR	WVH
(Cont.) F4			Known, without associated pests of quarantine importance, or status comparable to destination country	1-2	0.1-0.2
			Unknown	5-6	0.5-0.6
F5	Regulatory status of the commodity	15	Generic, without specific phytosanitary measures	2-3	0.3-0.45
			Specific for certain origins, with mention of specific pests	5-6	0.75-0.9
			Not regulated or prohibited	5-6	0.75-0.9
			Plants for propagation are regulated with post-entry quarantine	6	0.9
			Commodities for consumption that can be diverted to propagation require the application of phytosanitary measures to inactivate their capacity for propagation	6	0.9
F-6	Identification of intercepted pest	15	The intercepted organism is in a developmental stage that cannot be identified at the species level	6	0.9
			No laboratory is available for identifying the intercepted organism	6	0.9
			The organism is partially identified, to the genus level	5	0.75
			The organism is identified to the species level	3-4	0.45-0.6

(Continues)

(Continuation)

HAZARD FACTOR		(WC) (%)	Parameter	AVR	WVH
F 7	Regulatory status of intercepted organism	10	Because of lack of identification, the status of the organism is unknown	6	0.6
			The organism is partially identified to the genus level, and this genus includes quarantine pests	6	0.6
			The organism is identified to the species level and is a quarantine pest	6	0.6
			The organism is identified to the species level in plants for planting, and is a regulated non-quarantine pest	4	0.4
			The organism is identified to the species level and is a present pest without official control	1	0.1
			The organism is identified to the species level and is a beneficial organism (antagonist, predator, parasite or hyperparasite of pests)	6	0.6

Possible options:

A clearly identified plant host whose intended use is plants for propagation is intercepted; it comes from a known country of origin where it is known that quarantine pests are associated with the commodity; the commodity must fulfill post-entry quarantine. At the time of detection a basidiomycete fungus is detected but not identified, and as a result, its regulatory status is unknown.

$\sum$ 0.4 + 1.2 + 0.4 + 0.6 + 0.9 + 0.9 + 0.6 = 5 (high hazard)

A known plant host is intercepted whose intended use is consumption, and there are no options for diversion of its use; it comes from a known country of origin with a phytosanitary status comparable to that of the receiving country; the commodity is regulated with general phytosanitary measures; a pest is intercepted that is identified to the species level by the official analyst and the pest is a non-quarantine pest.

$\sum$ 0.4 + 0.8 + 0.4 + 0.2 + 0.45+ 0.6+ 0.1 = 2.95 ~ 3
(low-medium hazard)

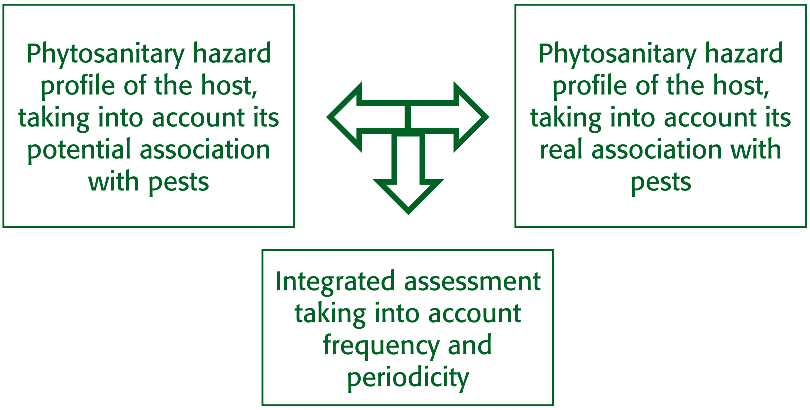
In short, the hazard level of a host is the summation of weighted hazard values:

$$HL = \sum (ADV \times WC)$$
$$HL = \sum WDV$$

DL: Hazard level
ADV: Absolute hazard value
WC: Weighted coefficient
WDV: Weighted hazard value

4.3.4. Integrated assessment of phytosanitary hazard

Figure 6: Integrated assessment of hazard



An integrated assessment can be performed after a certain amount of time (i.e., one year) for a place of entry or all places of entry of given plants, plant products or regulated articles.

To that end, the following is necessary:

- A permanent and systematic information-recording system on host and pest interception. It will only be possible to measure biological pressure if information on pest and host interception is recorded systematically, fully and in timely and consistent fashion at all points of entry and in all established inspection activities.

- The plant protection organization must have fulfilled the IPPC requirement of having a public list and extensive knowledge of quarantine pests for its territory. ISPM 19 *Guidelines on Lists of Regulated Pests* refers to the creation, maintenance and updating of these lists: *"Lists of regulated pests are established by an importing contracting party to specify all currently regulated pests for which phytosanitary measures may be taken."* … *"Specific* *lists are provided on request to the NPPOs of exporting contracting parties as a means to specify the regulated pests for the certification of particular commodities."… "Quarantine pests, including those subject to provisional or emergency measures, and regulated non-quarantine pests should be listed." … "Updating of the lists is required when pests are added or deleted or when required information or supplementary information changes."* Listed pests have already been submitted to pest risk analysis and meet the definition of quarantine pest. Ideally, these lists should also link the pests to their pathways. If the pests intercepted are not on the list and are also not present in the national territory, emergency measures need to be taken and a risk assessment subsequently conducted for it to be categorized as a quarantine pest.

- Given the above, it is also important to have a list of the pests present in the territory that are not regulated.

- Finally, the hazard rating and subsequent risk assessment should be grounded in and backed by a reliable diagnostic system either of the plant protection organization itself, or of an agency accredited to identify pests or the plants and plant products that carry them.

a) Factors and parameters of an integrated hazard assessment

The following factors enter into an integrated hazard assessment:

- Frequency of interception of the host and/or its pests
- Periodicity of interception of the pests and/or their hosts
- Cumulative level of taxonomic identification
- Percentage of quarantine pests intercepted as compared to total pests intercepted on a given host
- Difficulty of detection and recognition

- Diversity of hosts for a single pest
- Diversity of origins for a single pest
- Amounts intercepted

i) Frequency

Frequency of interception of a plant, plant product, or pest is the **absolute number** of interceptions in each identified administrative place (authorized place of entry, internal quarantine post, or other activity) per unit of time (month, year).

The higher the absolute number (i.e., the more often the commodity is intercepted) the greater the hazard and the possible risk.

It is practically impossible to have reference figures for this parameter. Therefore, the lowest frequency on the information record will be set, arbitrarily, as the low rating; the highest frequency will be set as the high rating; and the average or median value of the two will be the medium rating.

Parameter	Hazard rating	Observation or assumption
Lowest frequency in the commodity category	1-2	The higher the frequency, i.e., the more often the commodity is intercepted, the greater the danger of entry
Intermediate frequency	3-4	
Highest frequency	5-6	

ii) Periodicity

This refers to the distribution of interceptions of plants and plant products and/or their pests over time. For example, X absolute number daily, or weekly or monthly, or concentrated in certain months, etc.

Parameter	Hazard rating	Observation or assumption
Interceptions are distributed consistently throughout the year	5-6	The danger of entry is greater when there is steady pressure
Interceptions are irregular during the year	5-6	If events are irregular, there is a greater degree of uncertainty regarding the danger of entry
Sporadic or occasional interceptions	2-3	The danger of entry will be lower

iii) Cumulative level of taxonomic identification

Parameter	Hazard rating	Observation or assumption
Over 25% of pests detected can only be identified at the family level	6	These levels of identification introduce very high factors of uncertainty and thus represent greater risk
Over 25% of pests detected can only be identified at the genus level, which includes quarantine species	6	

iv) Percentage of quarantine pests intercepted as compared to total pests intercepted on a given host

Here too the figures are entirely arbitrary. They can be revised to take into account evaluations of the interception records and a comparison with information provided by surveillance teams or official control over outbreaks, or recent introductions of pests into the area.

Parameter	Hazard rating	Observation or assumption
Over 5% of pests intercepted in the commodity are absent quarantine pests	6	The percentage is completely arbitrary and can be modified by each plant protection agency to take into account what is considered an acceptable level of risk

(Continues)

(Continuation)

Parameter	Hazard rating	Observation or assumption
Over 5% of pests detected are present quarantine pests under official control	6	
Over 10% of pests detected on plants are regulated non-quarantine pests	4	

v) Difficulty of detection and recognition

Pests that are difficult to detect include very small or microscopic arthropods protected in plant structures such as buds, stalks, seeds, or latent or asymptomatic microorganisms. This rating requires expert judgment combined with information from the inspectors that made the interceptions. Sometimes an inspector will send samples to the laboratory without realizing that they contain an organism, and it is the laboratory analyst who detects the presence.

Parameter	Hazard rating	Observation or assumption
Pest that is difficult to detect	6	The rating will be determined by expert judgment and in conversation with inspectors
Pest that is easy to detect	4	

vi) Diversity of hosts for a single pest

Parameter	Hazard rating	Observation or assumption
Interceptions in only one host	2	The greater the diversity of hosts, the greater the opportunity for entry and thus the higher the risk
Interception in at least 2 hosts	4	
Interceptions in more than 2 hosts	6	

vii) Diversity of origins for a single pest

Parameter	Hazard rating	Observation or assumption
Interceptions from a single country of origin	2	The greater the diversity of places of origin, the greater the opportunity for entry and thus the higher the risk
Interceptions from at least 2 countries of origin	4	
Interceptions from more than 2 origins	6	

viii) Amount intercepted, in volume or units of entry

As in the procedure used for the above factors, the highest hazard rating is given to the greatest intercepted amount; the lowest hazard rating in the same commodity category is given to the lowest intercepted amount; and the intermediate value is the average or median between the two.

Parameter	Hazard rating	Observation or assumption
Lowest amount in the commodity category	1-2	The greater amount implies greater danger
Intermediate amount	3-4	
Greatest intercepted amount	5-6	

b) Weighting of integrated danger factors

INTEGRATED HAZARD FACTOR		Weighting coefficient (WC) (%)
F1	Frequency	15
F2	Periodicity	15
F3	Cumulative level of taxonomic identification	10
F4	Percentage of quarantine pests intercepted as compared to total pests intercepted on a given host	15

(Continues)

(Continuation)

INTEGRATED HAZARD FACTOR		Weighting coefficient (WC) (%)
F5	Difficulty of detection and recognition	10
F6	Diversity of hosts for a single pest	15
F7	Diversity of origins for a single pest	15
F8	Amount intercepted, in volume or units of entry	5
		100

In this process, the greatest weight was given to diversity of hosts and diversity of origins, frequency and periodicity of interceptions, and percentage of quarantine pests detected. The next highest was difficulties of detection and recognition (related to the level of taxonomic identification achieved), and finally, amount intercepted.

5. Phytosanitary hazard profiling for handicrafts

Handicrafts[4] are artistic objects of cultural significance made by hand or using tools powered for the most part by human energy, individually by an artisan or collectively by a handicraft production unit. These objects project an authenticity that strengthens cultural pride and identity while preserving traditional means of making goods and the native designs of a given region.

The characteristics of a handicraft include:

- Originality of design: each piece is the artisan's own and identifies him/her.
- Artisans are skilled, that is, they are capable of manipulating the tools and materials of their particular craft.
- Handicrafts are not mass-produced; output is small-scale and personal.
- Artisans transform the materials they work with into something of their own creation, using natural raw materials or industrial products.
- Each piece should be functional and be useful for the purpose and/or function for which it was created.

4 www.sololinksugeridos.com.ar/arte/artesanías_definición.htm

Handicrafts can be classified into the following types:

a) **Traditional handicrafts:** These use raw materials from the region and rudimentary tools, conserve the cultural roots transmitted from generation to generation, and are created for utilitarian and decorative purposes.

b) **Native indigenous handicrafts:** These keep the craft production of indigenous people and communities alive, making use of tools, techniques and other elements taken from their environment.

c) **Market-oriented indigenous handicrafts:** As indicated in the name, these artisans extend their reach by adapting original designs to market requirements.

d) **Distinctive folkloric handicrafts:** These differentiate one people from other peoples of the world and have solid folkloric roots that maintain their identity.

e) **Urban handicrafts:** For these, urban inputs and techniques are used to meet consumer demand; they emerge from people's imagination and talent and are inspired by the universality of culture.

f) **Luxury handicrafts:** As indicated by the name, these are luxury items created with high-value raw materials from nature.

Since handicrafts are made from raw materials and other elements taken from the environment, it is important to consider their components and degree of processing for the purpose of phytosanitary hazard rating.

Plant products commonly used in handicrafts include: wood, bark, branches, seeds, canes/bamboo, fiber, dried flowers, vines, dried leaves, dried fruits.

The following is one example of a proposed hazard rating. The diversity of materials and origins in handicrafts makes it impossible to illustrate all alternatives. In this category, inspectors' capacity to assess the degree of transformation or processing of the plant materials used in the handicraft is an important factor.

Woods

a) All-wood handicrafts

Parameter	Hazard rating
The wood is raw, and includes small bits of bark	6
The wood is raw and shows some insect damage	6
The wood is brushed and varnished and shows insect damage for decorative effects. Wood parts are thin	2- 4
The wood is brushed and varnished and shows insect damage for decorative effects. Wood parts are thick	5
The wood is dried, brushed, varnished and shows no insect damage	0

b) Handicrafts with wooden parts

Parameter	Hazard rating
Less than half the handicraft is made of wood.	3-4

The wood in these handicrafts should be evaluated as in section (a) above.

Bark

Parameter	Hazard rating
The bark is raw and adhered to the wood	5-6
The bark is separate from the wood	4
The bark is separated from the wood and is dyed or varnished	0-2

Branches

Parameter	Hazard rating
The branches are dried, thick, and leafless	6
The branches are very dry, thin, and leafless	4
The branches are fresh and have leaves	6
The branches show insect damage	6

Seeds

Parameter	Hazard rating
The seeds are perforated and varnished	2-3
The seeds are inside glass containers (pyramids, bottles)	2-3
The seeds are glued to a surface and painted	2-3

Canes/bamboo

Parameter	Hazard rating
The canes are fresh	6
The canes are dried, but unpainted and untreated	5

Fibers

Parameter	Hazard rating
Due to the extraction process, fibers have undergone a high degree of treatment	0

Dried flowers

Parameter	Hazard rating
Flowers with seeds	6
Seedless flowers	3-4
Seedless painted flowers	0

Vines

Parameter	Hazard rating
Due to the extraction process, vines have undergone a high degree of treatment	0

Dried leaves

Parameter	Hazard rating
The leaves are dried naturally	3-4
The leaves are cut and painted	0

Dried fruits

Parameter	Hazard rating
Only the shell (smooth) is used (nuts)	0
Only the shell (fibrous) is used (coconut)	1

By way of example, some of the species used in the San Andrés valley of Cuba, as well as some of the objects made from them, are listed below.

Plants and plant parts most commonly used in local handicrafts in San Andrés valley, Cuba. [5]

Plant	Part
Hoopvine *(Trichostigma octandrum).*	Stalks
Palma de sierra *(Gaussia princeps).*	Leaves
Common bamboo *(Bambusa vulgaris).*	Stalks
Monkey step vine *(Bauhinia cumanensis).*	Vine
Palma tarrigona *(Pritchardia wrightii).*	Leaves

(Continues)

5 Source: Pimentel Pimentel C. O. and V. Castañeta Valdez. 2007. Estado de conservación de las especies vegetales utilizadas para la artesanía en el valle de San Andrés, Pinar del Río, Cuba. *Revista de Ciencias Forestales – Quebracho N° 14 – December 2007.*

(Continuation)

Plant	Part
Mexican cedar *(Cedrela odorata).*	Wood
Mahogany *(Swietenia mahogani).*	Seeds
Knotted spikerush *(Eleocharis interstincta).*	Stalks
Uva grass *(Gynerium sacharoides)*	Stalks
Coconut *(Cocci nucifera).*	Fruit
Oxeye bean *(Mucuna urens).*	Seeds
Mate *(Canavalia ekmanii).*	Seeds
Almex *(Celtis trinervia).*	Stalk
Jamaican rain tree *(Brya ebenus).*	Stalk
Bell mimosa *(Dichrostachys cinereal).*	Stalk
Geno geno *(Lonchocarpus dominguensis).*	Bark
Rose *(Rosa indica).*	Stems
Calabash tree *(Crescentia cujete).*	Fruit
Baria *(Gerascanthus gerascanthoides).*	Wood
Sandbox tree *(Hura crepitans).*	Seeds
Mahoe tree *(Hibiscus elatus).*	Wood, bark

5.1. Objects

Hats, carvings, pyro-engravings, baskets, brushes, horse-riding gear, toys, lamps, carpets, pencil holders, outlets, vessels, maracas, cane rattles, furniture made with vines, güiros (percussion instrument), flowers, ropes, other souvenirs.

6. Decision making[6]

Decision making is a process by which a choice is made between alternatives or ways to address different situations that, in this case, may arise with regard to the adoption of phytosanitary actions.

In order to make a decision, the problem must be known, understood, and analyzed with a view to solving it. Sometimes problems are simple and daily, and the decision-making process is routine. In other cases, the outcome of a poor or good choice related to the phytosanitary status of a country can have significant consequences so a more structured process is required to provide maximum security and information in solving the problem. Decisions affect us all, since it is through decision making that critical opinions are developed.

Non-programmed or unstructured decisions are those taken to deal with unique problems or situations, or those that require a specific model or process to solve them. In this context, phytosanitary hazard profiles can serve as a model or process that helps in the adoption of correct phytosanitary measures. Programmed decisions are made in repetitive and routine situations. A person who makes this type of decision does not need a "custom-made" solution but simply decides on the basis of habit or prior action. With regard to phytosanitary matters, however, an important occupational hazard affecting phytosanitary inspectors is over-routinization, that is, not analyzing or thinking about the grounds for their decision-making. Programmed decisions are based on policies, procedures, or rules (written or unwritten) to facilitate decision-making in repetitive situations. Routinization, however, can limit or rule out alternatives if procedures are not periodically reviewed. Nonetheless, this type of decision in some ways liberates decision makers from responsibility and from taking the time to think about a solution every time.

6 Adapted from: http://es.wikipedia.org/wiki/Toma_de_decisiones

In all organizations—and national plant protection organizations are no exception—a hierarchy determines the type of actions taken within it and, thus, the type of decisions that can and need to be made. Phytosanitary hazard profiles (PDP) support decision making in this context.

Organizations, regardless of their type, are often structured in three hierarchical levels:

1. Strategic level: Responsible for senior management and planning.

2. Tactical level: Responsible for subsystem planning.

3. Operating level: Responsible for day-to-day operations (daily/routine).

The situations or contexts in which decisions are made can be classified according to awareness of and control over the variables that affect or influence the problem, since the final decision or solution will be conditioned by the variables.

6.1. Environment of certainty

In this case, the problem is fully understood and known, and the proposed solution options will always yield known and consistent results. The only requirement is to decide which option offers the lowest risk to the phytosanitary heritage. The information available for solving the problem is complete, that is, the problem is identified, possible solutions are known, but the possible outcomes are not known with certainty. In this type of decision, the possible solution options have a certain known probability of producing a given outcome.

In phytosanitary matters, this can be the scenario of inspectors that check imported plants and plant products, especially consignments that enter the country on a routine basis and for which established regulations exist. Inspection and sampling procedures exist, laboratories are available to analyze intercepted pests, decisions are therefore easier to make for all expected outcomes, and previous records are also available.

6.2. Environment of risk

Decision makers are informed, understand the consequences of each scenario, but are uncertain as to which will occur. They are capable of weighting them by assigning a probability coefficient.

This can be the scenario facing border post inspectors vis-à-vis different plants and plant products for which they may have interception records or lists of the pests normally associated with them (identified by an authorized laboratory), but that are not behaving predictably with regard to frequency and periodicity of interception.

6.3. Environment of uncertainty

The information available is inadequate for making a decision; there is no control over the situation. It is not known how the problem may vary, or how the variables of the problem interact. Different solutions can be proposed, but it is impossible to assign probability to the outcomes. In this scenario, phytosanitary hazard profiles can support on-the-spot decision making by border post inspectors.

All decision-making processes can be divided into steps or stages:

- Identify and analyze the problem
- Identify the criteria for decision and weight them
- Design alternative solutions
- Evaluate options
- Select the best option
- Implement the decision
- Evaluate the results

Information is the raw material of the decision-making process. This is of paramount importance because without information it is impossible to evaluate existing options or develop new ones. In organizations that are faced with a constant need to make decisions, information plays a key role, and thus, has singular value.

With these general thoughts on decision making in mind, we can more clearly define the usefulness of hazard profiles for decision making at different levels.

At the strategic level (planning level) of a plant protection organization, the analysis of information gathered from the interception of plants, plant products, or pests can be used to take risk management actions that require the allocation of human or financial resources. For example, the following actions can be taken to address different biological pressures of pests at entry:

Biological pressure	**Risk management action**
High	• Perform a PRA to determine the risks of certain pests entering and becoming established • Design specific surveillance plans for early detection, to determine if pest entry led to introduction. This can include setting specific traps • Design specific emergency plans to prepare the official rapid response should introduction be determined • Review phytosanitary regulations to determine if they are in line with the pests being intercepted • Consult the country of origin regarding the presence of pests whose presence in their territory was not reported
Average	• General or specific surveillance focusing on hosts in the targeted territory
Low	• General, routine surveillance procedures, but with the addition of instructions for the given pest

When the level of taxonomic identification makes it impossible to suitably assess risk, the following should be determined: a) does the physical state of the interception make correct identification impossible, or b) should diagnostic procedures be introduced or enhanced?

Further, if the biological pressure of pests at entry is very high at a given point of entry, it may be advisable to install rapid detection laboratories and/or provide inspectors with additional training on same.

The volume, frequency and periodicity of interceptions will help determine whether it is necessary to strengthen inspection teams, that is to increase the number of inspectors at a given place or time. It may also determine the need to invest in an incinerator or an accredited secure system for the final disposal of remains.

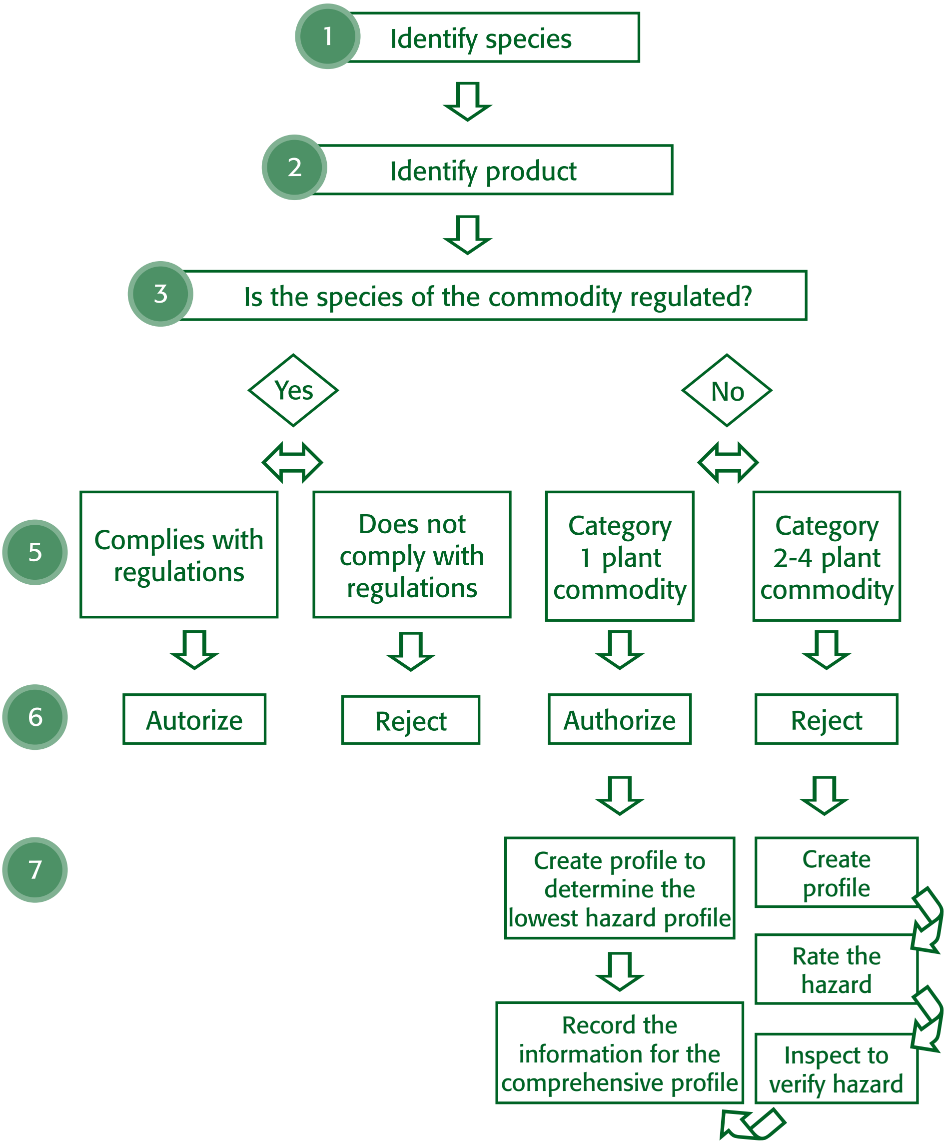
Finally, a well-performed assessment may lead to a decision to install technological support for interception work, such as X-ray machines, scanners, detector dogs, or to strengthen legal measures, etc.

At the tactical level (subsystem planning), it could be necessary, for example, to determine the need to contact laboratories that have biosafety installations in order to breed certain pests that cannot be fully identified by the developmental stage in which they are detected, but that may be a quarantine pest. It may be necessary to train personnel to recognize certain groups of pests, or to provide inspection training to inspectors, or training to increase capacities to recognize symptoms and signs, among other things.

Decisions at the operating level are those made by inspectors in general, and, in this particular case, by border post inspectors.

When a border post inspector intercepts a plant, plant product or regulated article, a decision-making process begins that is illustrated in the flowchart below.

Figure 7. Flowchart of a decision



An intercepted plant or plant product can be:

- destroyed,
- returned to the origin, or
- submitted to authorized treatment

When border post inspectors intercept plants or plant products that do not comply with the established measures, they must take emergency measures, such as destroying them or returning them to the origin, when this is feasible.

The interception of plants or plant products that present high phytosanitary danger requires:

- a more diligent inspection,
- sending samples to a laboratory to determine possible pest presence,
- biosafety measures for final disposal (airtight containers, incineration, etc.) to avoid the undetected release of pests into the environment.

Records should be kept in all these cases for use as inputs in subsequent analyses.

7. Annexes

7.1 Guide to symptoms related to potential pest presence

A symptom is an alteration in the morphology and physiology of a plant caused by a pathogen.

Plant organ	Symptom	Possible agents
Roots	Color changes, such as outer black stain accompanied by wet or dry rot	Fungi
	Changes in internal texture and color (for example, reddish color observed inside the root when cut lengthwise).	Fungi
	Abnormal changes in shape (“rat-tail” appearance of the root, loss of secondary roots, excessive root mass)	Fungi
	Galls	Nematodes, insects
	Injuries and necrosis in the roots	Nematodes, insects
	Stubby roots	Nematodes
	Perforations	Perforations
Collar	Galls	Bacteria
	Perforations	Perforations
Stalks/stems	Perforations	Boring insects
	Galls	Insects, mites, bacteria
	Cankers and other injuries	Fungi or insect eggs.

(Continues)

(Continuation)

Plant organ	Symptom	Possible agents
Stalks/stems	Short internodes	Virus
	Deformations	Virus
	Exudations	Bacteria
	Phloem or xylem necrosis (observed in cross-sectional cut)	Fungi, bacteria, virus
	Exudations and vascular blockage (cross-sectional cut)	Bacteria
Buds	Rot	Fungi, bacteria
	Hypertrophies	Mites
Leaves	Serpentine mines	Insects
	Galls	Insects or mites
	Irregular spots or blotches	Virus, fungi, bacteria, nematodes
	Changes in color (mosaic, mottled, concentric spots)	Virus
	Leaf malformation	
	Localized tissue loss (holes)	Fungi, virus, insects.
	Vein clearing, vein banding	Virus
	Leaf roll-up	Insects, virus
	Leaf folding	Insects
Flowers	Rot	Fungi, bacteria
	Necrosis	Fungi, mites, bacteria, insects
Fruits	Insect mines in skin	Insects
	Perforations and galleries (visible when cut)	Insects
	Small, almost undetectable holes	Egg-laying of fruit flies
	Rot	Fungi
	Irregular spots, blotches	Fungi, bacteria, virus
	Surface scabs	Bacteria
	Russet	Fungi, bacteria, virus, insects

(Continues)

(Continuation)

Plant organ	Symptom	Possible agents
Seeds	Perforations	Insects
	Deformations	Nematodes
	External spots, blotches	Fungi, bacteria
	Cracks	Nematodes
	Galls (seed-like structures without embryos)	Nematodes
Other underground propagation structures[7]	Loose skin	
	External spots, blotches	Fungi, bacteria, nematodes
	Visible external rot (wet or dry)	Fungi, bacteria, nematodes
	Deformations	Nematodes
	Acidic rot	Fungi, bacteria
	Visible external perforations	Insects
	In cross-section:	
	Wet inner rot	Bacteria
	Dry rot and necrosis	Fungi, nematodes
	Discoloration, spots, blotches	Virus
	Exudations	Bacteria

7 Tubers, bulbs, corms, rhizomes, edible roots, etc.

7.2 Guide to signs related to real pest presence

Possible agent	Sign
Fungi	Pustules containing uredospores (in leaves)
	Aeciospores
	Pustules containing sporangiums (Albugo)
	Teliospores in grains (smut and rust) or in other structures
	Sclerotia
	Sporulating fruits
	Mycelium and sporulation on any plant organ
	Pycnidia (fungi) on cankers or on stalks/stems
	Rhizomorphs
Bacteria	Zooglea: Jelly-like in appearance, made of bacterial mass and plant remains
	Visualize
	- **Microflow:** Cut a small piece from the outer edge of a leaf spot and place it on a slide, add a drop of water, and observed under a microscope. Bacterial flow appears as a small cloud discharging from the plant tissue.
	- **Flow test:** Used with vascular bacteria. A piece of stem stalk apparently attacked by vascular bacteria is cut and suspended in a glass of water. The bacterium (zooglea) flows (is discharged) into the water; this is observable to the naked eye.
	- **Direct observation:** Slimy threads form when the stem is cut as zooglea fills the xylem.
Insects and mites	Eggs
	Pupas
	Immature (larvae and others similar to adults)
	Adults
Mollusks	Slugs
	Snails
Weeds or invasive plants	Seeds
	Undetermined small seedlings in growth substrata

7.3 Basic requirements for inspectors

1. Information

a) List of scientific and common names of plants and plant products
b) Associated photos
c) List of present pests in the country (considered non-quarantine)
d) List of regulated pests: Quarantine pests and regulated non-quarantine pests, ideally associated with their hosts
e) Phytosanitary regulations in effect (CD, website, manual, etc.)
f) Manual on specimen handling and conservation procedures

2. Basic tools for inspection (minimum)

a) Hand-held magnifying glasses
b) Penknife or handsaw for inspecting wood
c) Plastic bags to hold samples
d) Bottles of different sizes to contain samples
e) 70% alcohol
f) Ideally, a stereoscopic magnifying glass

8. Exercise

Rate the danger of the following plants, plant products, and regulated articles intercepted during the work of a border post inspector. In each case, explain your decision.

1) Banana plantlet carried by a woman who is bringing it from her native country and who wants to plant it in her garden. The small plant is of strong sentimental value to her.

___

___

2) Rootless chrysanthemum cuttings.

___

___

3) Very high-quality violin.

___

___

4) A small bag of poppy seeds, for pastry cooking.

___

___

5) Fresh bananas carried by a family traveling with many children. Scale insects *(Hemiptera: diaspididae)* detected on the banana.

___

___

6) Bouquet of white chrysanthemums for a wedding

___

___

7) Varnished necklaces made from unknown seeds

___

___

8) Fresh oranges

____

____

9) Small bag of banana chips (slices of fried banana).

____

____

10) Bolsita con tostones (rodajas de plátano frito).

____

____

11) Oil painting with a wooden frame showing galleries of *coleopteron scolytidae* (in the frame) as a decorative effect

____

____

12) A bunch of roses with leaves that have signs of having been eaten by chewing insects

____

____

13) Bag of *mate* tea

____

____

14) Garlic cloves

____

____

Notes

Agricultural Health and Food Safety
Technical Leadership and Knowledge Management Directorate

P.O. Box 55-2200 San Jose, Vazquez de Coronado,
San Isidro 11101 - Costa Rica
Phone: (506) 2216-0184
Fax: (506) 2216-0233
e-mail: saia@iica.int
Web Site: www.iica.int