

EPPO Secretariat's approach for commodity studies (developed in 2015/2016)

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Scope

This document describes the process followed to date by the EPPO Secretariat to conduct commodity studies and screen a large number of pests to prepare pest lists.

Introduction

In 2012, EPPO started developing a new commodity-based framework, called a commodity study, to identify potential emerging pest risks (in which a specific commodity is selected and pests associated with the commodity from all possible origins in the world are identified).

When preparing a commodity study the first step of the process is to prepare a list of pests that:

- may be transported on the commodity
- may come from one or more origins (hereafter 'the origins').

This document describes the process and criteria established so far to harmonize the preparation of pest lists, including the establishment of priorities between pests in the EPPO framework. One of the objectives of the process is to screen pests that may present a risk to an area, through a preliminary assessment based on identified criteria.

A commodity study may be performed in order to identify pests to be added to alert lists, to be considered in a pathway-based PRA or to be prioritised for a pest-based PRA. The purpose of the lists should be specified before initiating the process, and this will also influence the complexity of the process.

This document was prepared based on the experience gained during the preparation of the EPPO Study on Pest Risks associated with the Import of Tomato Fruit (EPPO, 2015; hereafter EPPO Tomato study) and in the framework of the EU FP7 project Dropsa. The methodology may be improved in the future.

It is important to stress that, during the screening process, pests can only be selected if some information is already available. Pests for which there is a limited amount of information, with many unknowns, may become important if introduced to new places (such as was the case for *Drosophila suzukii* or *Tuta absoluta*), but there is no way of identifying these pests amongst the large number of those for which little information is available many of which will never become important. These risks have to be addressed through other mechanisms, e.g. the minimal requirement of a phytosanitary certificate for the commodity concerned.

Finally, it should be noted that this process was applied to EPPO Studies. Depending on the purpose, establishing pest lists and performing commodity PRAs would necessitate some modifications. A draft EPPO Standard on Preparation pest lists in the framework of commodity PRAs is under preparation (September 2016); it will describe a process for a specific commodity and specific origin(s).

1. Initiation

1.1. Scope

The following elements need to be defined:

Area for which the pest list is made (called hereafter area at risk)	<ul style="list-style-type: none"> - EPPO, regional entity (e.g.; EU or EEC), country. - Whether specific territories (e.g. overseas territories, islands) are part of the study
Commodity studied	The commodity and the plant species that it may comprise (e.g. fruit of <i>Solanum lycopersicon</i> , cut flowers of <i>Rosa</i> spp., plants for planting of <i>Castanea</i> spp.).
Origins	<ul style="list-style-type: none"> - Worldwide, one or several continents, one or several countries. - Whether the study should focus on specific origins due to a higher level of concern (e.g. a specific continent in a worldwide study).
Expected output	- Purpose for which a commodity study is conducted and how it will be used (e.g. to assemble a broad list of pests on a commodity, to select pests for an alert list or to help

	target inspections at import, or to select pests for pest-specific PRAs or for pathway-initiated PRAs. - The level of detail expected for each pest in the list should be specified (expectations may have to be adjusted during the study to account for larger numbers of pests than expected, etc.). The final use of the list will also influence the level of detail needed.
Categories excluding an organism from further consideration (called hereafter exclusion categories)	- Categories that, throughout the study, will exclude an organism from further consideration. A basic list of possible exclusion categories is given in Appendix 1, but additional categories may be needed depending on the expected output. - Exclusion categories should be given a short name, that can be used throughout the study (e.g. 'NO' for all categories, or 'NO1', 'NO2' etc.)

1.2. Characteristics of the pathway

Prior to starting the compilation of lists, the characteristics of the pathway should be described. This serves the purpose of adjusting the process and the criteria used for screening pests, applying them consistently, and targeting searches. Consideration should also be given to the:

- *Plant species that may make up the commodity:*
 - If the commodity includes several species (e.g. the commodity is a genus such as *Rosa*), the different plant species that may be present in the commodity should be listed.
 - Taxonomy of each plant species: preferred scientific name and common synonyms; e.g. *Solanum lycopersicon/Lycopersicon esculentum*, common names in English. It is useful to record common names in languages relevant to the origins.
 - Whether some pests may have gained their name from the plant host, e.g. *vaccinii* for *Vaccinium* spp. This may help general database searches such as CABI Crop Protection Compendium (CABI CPC) or EPPO Global Database, where the plant may not be included in the given host list or there is no host list, but the plant is likely to be a host.
- *Parts of plant that may be in the commodity:* this is critical to adjusting the criteria. Each commodity can be composed of several principal elements: those that are always present in the commodity and secondary elements that are not always present in the commodity. For example: for tomato fruit, only the fruit itself or also green parts (such as the calyx, stems, but also leaf material); for *Vaccinium* fruit: only the fruit (no secondary elements); for apples and pears (stems); for grapes (rachis); for cut flowers of *Rosa* spp., flowers, buds, leaves and stems in all cases (no secondary elements); for wood chips, wood or both wood and bark, possibly originating from the above-ground part of the tree or also from root systems. If the study covers the commodity only for an intended use, this should be considered. For example 'plant parts' of *Picea* may include both branches for decoration, that are likely to be small, or Christmas trees that include the trunk.
- *Origin of the commodity.* For global and continental studies, it is important for the assessors to provide an overview of possible origins in order to help focus searches if the commodity is likely to originate from a specific area only (i.e. the list should contain pests relevant to producing and exporting countries).
- *Other characteristics of the commodity that may influence the screening.* For example, if the commodity studied is a fruit, whether only fresh fruits are covered or whether dried and frozen fruits are also included.
- *Any other elements that could help the subsequent screening process* (in particular for limited pathway-initiated PRAs for which the origin and commodity are well-defined), such as the method of travel (air, sea), foreseeable consignment frequencies, volumes, seasons, existing legislation for the pathway.

2. Process

The process described is a stepwise approach potentially composed of a maximum of four steps.

- **Step 1.** Creating a list of pests focusing on the origins considered, including basic preliminary information especially on the regulatory status of the pests, geographical distribution and whether they could be associated with the commodity in trade. Step 1 is intended to quickly eliminate organisms that are not pests and pests that should not be considered further because they fall under exclusion categories.
→ *Output:* 'Step 1 List', a general list of pests, which identifies those that need further consideration.
- **Step 2.** Examining in more detail the list of relevant pests identified in Step 1, screening them against a number of criteria (detailed in section 2.2.2) and allocating an overall rating to each pest.
→ *Output:* 'Step 2 List', with information, ratings for individual criteria and an overall rating, as well as identifying those pests not needing further consideration.
- **Step 3.** Screening the 'Step 2 List' according to their overall rating, and other factors, in order to retain only the pests that are appropriate for the expected output, e.g. an Alert List, a list for a pathway-based PRA or for further prioritization at Step 4.
→ *Output:* 'Step 3 List', a shorter and more detailed list of pests, with a format and level of detail adapted to the expected output.
- **Step 4.** Evaluating pests through a scoring system to identify priority pests for individual PRAs. It is theoretically possible to apply Step 4 to all the pests selected for further study in Step 2. However, the scoring system at Step 4 needs more detailed information, and it may be appropriate to reduce the list of pests for which such information needs to be collected, by applying Step 3 prior to applying Step 4.
→ *Output:* 'Step 4 List' a list of pests in order of priority.

The process always includes Step 1 and Step 2, leading to a list of pests for the commodity. Whether Step 3 and Step 4 are conducted and the methods employed depends on the expected output, including the number of pests to be eventually retained (the list of pests to be considered further according to Step 2 may include several hundred pests) and whether the pests should be screened against more refined criteria than at Step 2). The process may stop at the end of Step 2, or continue to Step 3 or Step 4, or both (a few examples are given Figure 1).

When the list of pests to be considered further according to Step 2 is sufficiently short, it may be possible to combine Steps 2 and 3, or to go directly from Step 2 to Step 4. When the list is long, and the expected output requires a shorter list focusing on refined criteria (e.g. detailed features of the pests, origins, etc.), it is likely that the process will need to continue to both Step 3 and Step 4.

While it is preferable to plan from the start which steps are expected, readjustments may be needed once Step 2 has been completed.

The expected output and expected steps should be taken into account when planning information collection at Steps 1, 2 and 3, as they influence the type of information needed and details that should be recorded (in particular, if the study is expected to continue at Step 4, there may be specific information that may usefully be collected at an earlier stages).

The assessor may decide at which stage information should be collected for each pest, depending on whether the pest is considered likely to be retained at the next step. For example if at Step 1 a pest seems likely to be retained to the end of the process, more information may be collected and recorded at Step 1. In other cases, a stepwise approach may be followed, in order to avoid recording unnecessary information for pests that will not be retained.

Finally, the future intended use of the lists obtained at each step should be considered (e.g. only as an internal working tool, or intended to be published etc.), as well as the level of details to be recorded at each stage. This will influence the format and style, and the amount of information recorded, as well as whether all sources used will be archived.

2.1. Step 1: Listing pests for the origins considered

In Step 1, pests of the plant species considered are listed (for a worldwide study, pests already known to be present in the area at risk above the defined threshold do not need to be added to the list). Vectors of pests are also included.

Searches may identify organisms that are not pests, however these should be screened out, and only 'pests' should remain at the end of this step. ISPM 2 section 1.2 provides guidance on the determination of an organism as a pest.

2.1.1. Categories of information

The basic information required is listed in Appendix 2 Table 1 is filled in and used to determine whether the pests should be considered further in Step 2. A conclusion is given for each organism.

The information gathered constitutes the Step 1 List. This step does not aim to assemble complete information on each organism, but to quickly eliminate those species that fall into one of the exclusion categories. More in-depth data are only collected in Step 2 and Step 3 for the pests retained following Step 1.

2.1.2. Information to be collected

Table 1 in Appendix 2 presents the information to be collected with possible adjustments depending on the specific study. The information can be collected as an Excel spreadsheet or in another compatible data format. The information needed at further steps should be taken into account when structuring data at Step 1 (e.g. rows and columns in xls spreadsheet), so that the Step 1 List can be used directly to build the Step 2 List, etc. (without needing to recombine information). For some information, an extraction tool (EPPO web services) is now available for EPPO Global Database with: EPPO codes, taxonomic information and host plants.

Information should be collected in sequence (as outlined in 2.1.3) in order to avoid recording superfluous data.

2.1.3. Process for collating information

A stepwise approach using various sources is recommended:

- A first list of organisms should be prepared based on large datasets such as EPPO Global Database, the CABI Crop Protection Compendium (and any other sources that are readily available for the commodity), extracting pests for which the plant species considered are listed as hosts, with species names that may indicate the host species (e.g. *vaccinii* for *Vaccinium*).
 - Groups of organisms (e.g. orders, families) that are always unlikely to be associated with the commodity considered (even when they are pests of the plant species) may be omitted from the list. For transparency a list of the groups excluded from further consideration should be indicated. This may include broad categories such as plants or birds, but also some families. For example, Scolytidae are very unlikely to be associated with fruit.
 - Basic data are searched, focusing first on elements that would exclude the organism from further consideration. As soon as an organism can be allocated to an exclusion category, no further information needs to be included.
- The list should be completed progressively with additional pests extracted from various sources. Table 3 provides a non-exhaustive list of the types of publications that are found useful at this stage. In parallel, any useful information relating to pests already on the list should also be recorded (i.e. in addition to EPPO Global Database and CABI CPC).
- When consulting other sources, a stepwise approach is useful, i.e. adding pests from a few sources at a time, and searching for basic information, to make sure that no time is spent unnecessarily on pests that could easily be shown not to meet basic criteria and fall in the exclusion categories.
- The amount of details recorded on the list should normally be limited to what is necessary to justify retaining the pest to Step 2. However, for pests that, it is already clear from the data available, will be retained at least to Step 2, more details may be recorded at this stage to avoid re-reading the same publications.

Searches should first focus on elements that exclude the organism from further consideration, as decided at the start of the study (exclusion categories). The order that allows a conclusion to be reached more effectively should be decided upon. A possible order is:

- Whether the pest is regulated in the area at risk (this would exclude the pest from further consideration in the case of EPPO Study, but not in the context of pest lists established by a country in the context of a commodity PRA). This is the most readily available information for the area at risk.
- Whether the pest is present in the area at risk, if appropriate, above a defined threshold (i.e. a number of countries above which a pest is excluded from further consideration).

- Whether the organism is not a pest of the plants concerned or whether the pest is not associated with the commodity, depending on which information is found first in the searches made.

Attention should be paid to:

- The need to list pests using preferred names (to avoid multiple inclusions of the same pest in the List under its preferred name and synonyms).
- The level of detail should correspond to decisions made at the start of the process (see section 2).
- Carefully recording sources of information (including name, URL) and, especially for pests that are likely to be retained at further steps, ensuring that this information can be retrieved where necessary and depending whether it is decided that all sources should be archived (see section 2) (for example, by saving the references used as files or PDF copies of internet pages, with file names such as 'Author year pest').
- **It is not necessary to complete all fields, as long as the information collected allows a conclusion to be reached.**
- **The level of detail necessary for pests that will be allocated to NO categories should be decided (e.g. what is considered a reliable source).**

2.1.4. Suggested format of Step 1 List

The Step 1 List should contain all organisms considered. A number of additional pests will generally be identified only in Step 2, but they do not need to be added retrospectively to the Step 1 List.

The format should be decided in advance. A suggested format for the Step 1 List in a simple xls file is given in Appendix 3. Not all information is collected at Step 1.

Furthermore, for pests that fall in an exclusion category, no complete information is necessary, and the search for information may stop as soon as an excluding element is confirmed.

2.1.5. Conclusion of Step 1: determination of pests to be considered in Step 2

At the end of Step 1, all listed pests should have been allocated to a category. Only pests that were not allocated to an exclusion category should be considered further in Step 2. The number of organisms in the Step 1 List should be indicated, as well as the number of pests in the different categories.

Although difficult, it is useful to give an idea of how the information found allowed to cover the range of origins considered (apart from the CABI CPC and EPPO Global Database which cover the world). In particular, one may list origins (relevant countries or regions) with a good coverage (i.e. sufficient information was found), or those for which very little information was found.

2.2. Step 2: Prioritizing pests that may require further consideration

The aim of Step 2 is to establish priorities for further consideration amongst the pests retained in Step 1, leading to a more targeted list of pests for the commodity. The original list from Step 1 may be expanded in Step 2 as additional pests are identified, or some entries may be merged if some pests are found to be synonyms. If pests are added, they should first be evaluated against the exclusion factors of Step 1 before searching for further information.

At Step 2, criteria are used to identify consistently those that require further consideration. For each pest, further information is sought (2.2.1) in order to rate it against a number of criteria (2.2.2), and individual ratings are then combined in an overall category rating (2.2.3). It is likely that a number of pests from Step 1 will be allocated to excluding categories at Step 2, because of additional information found at Step 2, and some others will be excluded from further consideration. The remaining pests may constitute the final output (if the study stops at Step 2), or be considered further in additional steps.

The 'Step 2 List' shows, the information collected for each pest, its ratings for each criterion, and the overall rating with a conclusion where relevant.

2.2.1. Further information gathered

Step 2 first requires confirmation that the pest does not fall in excluding categories (especially that it may be transported on the commodity, completing the distribution to ascertain that the pest is not present in the area at risk (above the defined threshold) and verification that the plant species that comprise the commodity are hosts). Prior to

conducting Step 2, one may consider whether other elements than excluding categories will exclude the pest from further consideration at Step 2. For example, if the Step 2 List is very long, one may wish only to focus on pests that are associated with certain elements of the commodity (e.g. fruit itself versus fruit with peduncles; botanical wood itself versus wood with bark). If this is the case, criterion A will be rated first, and other criteria do not need to be rated if the pest does not receive high A ratings.

Data gathering in Step 2 aims only to find information related to the exclusion criteria and other criteria in 2.2.2 related to prioritisation. It does not aim to make an extensive bibliographic study for each pest (further study may still be necessary at a later stage for the pests selected). However, it is important that ratings in Step 2 are based on sufficient reliable information (i.e. relying on several publications to confirm the information as necessary), to make sure the pests are correctly rated compared to each other. Interesting additional information is nevertheless recorded where available (especially for pests that will definitely be retained for further steps). The information gathered in Step 2 should allow the pest to be allocated to an overall category, even if this is still preliminary.

The information should be collected following a certain order in order to avoid recording superfluous data. In particular, once a pest is allocated to a relevant exclusion category, no further information should be sought.

- Parts of plants attacked according to the biology of the pest

Where needed, an additional search of information is made on the parts of plant that are likely to carry the pest. This is to confirm that the pest may be transported with the commodity (depending on the plant parts with which it can be associated). This information is used for the criterion A 'whether the pest may be carried with the commodity'. Where the commodity is determined as not being a possible pathway, the assessment of the pest stops, it is allocated to the relevant excluding category, and no other information is sought.

In many cases, the assessment that the pest may be carried on a commodity is preliminary and the extent to which a pest is likely to be associated with a commodity normally requires detailed analysis in the framework of a PRA. At this stage, a conservative approach is still recommended. For example, for a fruit commodity that may contain leaves, if a life stage of an insect is mainly found on leaves, but may in some cases be found on fruit or wander onto fruit, it is reasonable to consider that the pest can be associated with the fruit. In-depth analysis will then be needed in a PRA.

- Relevant geographical distribution and presence in the area at risk

The second collection of distribution data does not aim to achieve a complete study of the distribution (which may be further completed in Step 3 based on new sources of information), but to refine the distribution as defined in Step 1, which generally relies only on one source of information. No additional search is needed for pests for which distribution data in Step 1 is considered to be sufficient (e.g. recent information in EPPO Global Database, recent EPPO Alert List entry, recent and full data sheet in CABI CPC, etc.). When an additional search is made, it may become clear in Step 2 that the pest already occurs in the area at risk above the defined threshold. In this case, the pest is not considered further and allocated to the relevant exclusion category. It is recommended that the search for information stops as soon as this threshold is reached (provided the information is considered reliable). The information on distribution is used for criterion B 'present (or not) in the area at risk above the defined threshold'.

- Host range

In Step 1, the information generally relies on one or a small number of sources, which are sometimes contradictory. Complementary information may be needed in some cases to verify that the plant species concerned is a host. This is not done for pests for which information in Step 1 is sufficient to confirm the host status of the plant. If there is good evidence that the plant species is not a host, and there are no other reasons to keep the pest (such as interception records), the pest is not considered further and allocated to the relevant exclusion category. In some cases, a more complete list of hosts may be needed, especially if it has not been obtained at Step 1 and criterion C 'level of polyphagy' is going to be used. It is also useful to document other possible pathways.

- Consideration of other excluding categories

Information that allows pests to be allocated to other exclusion categories should be sought.

- Additional information

Other information that is useful at this stage to rate criteria, such as the spread of the pest, quarantine status, interceptions etc. is also recorded. Any information needed for further steps may also be recorded if the pest is very likely to be retained, to avoid having to return several times to the same information source.

- References

All references used should be given in the list (EPPO Global Database, CABI CPC or 'Author (year)'). Depending on prior decisions made on the intended use and level of detail in the Step 2 List, it may be necessary to maintain a list of all references separately for use at a later stage.

The level of detail of the information recorded in the list depends on the expected output. For example, applying Step 4 to prioritize pests for PRA requires specific data to be recorded in the lists at Step 2 (or Step 3).

2.2.2. Criteria used to prioritize pests

The criteria used to prioritize the pests should be decided upon, as well as their ratings and sub-ratings as necessary for the purpose of the screening. In choosing criteria, and their ratings and sub-ratings, one should keep in mind that there should be a sufficient number of criteria and ratings/sub-ratings to discriminate between the possibly large number of pests at Step 2, but the system should be kept simple. Ratings should be decided in advance, but sub-ratings may be defined later if there is a need to better discriminate between pests. When defining sub-ratings, one should keep in mind that they need to be rated with limited amounts of information (i.e. they should be general, and detailed evaluations that may be undertaken in pest PRAs should not be made).

The criteria presented below are considered appropriate, but need to be adapted to the specific study:

- criteria A and B are essential
- criteria C and D may not always be considered necessary or not be discriminative.
- criteria E, F and G help discriminate further between pests

These criteria, as well as proposed ratings, are presented in Appendix 4. Criteria that are not expected to be discriminatory or are not considered to be important do not need to be used. No general guidance can be given on whether sub-ratings are necessary, but some that were found useful in the framework of Dropsa are suggested in Appendix 4.

It is expected that at least some of the criteria below will always need to be adjusted to the pathway considered. Only general elements are presented below, and examples of ratings and sub-ratings are included in Appendix 4.

The criteria retained should be used and documented for each pest. Where it has been decided that pests that correspond to a defined criterion rating are eventually not going to be retained (e.g. pests associated with the part of the commodity leading to a rating A3; or pests present in part of the area at risk, rated B1b), other criteria do not need to be rated for such pests.

The answers cannot always be precise and there are many unknown factors at this stage, but the ratings should nevertheless allow priority pests for further consideration to be selected and the allocation of pests to overall categories. A rating 'unknown' is given whenever the information is insufficient to rate the criterion. In addition, a sub-rating 'uncertainty' ('u') may be used in association with relevant ratings (e.g. A1u) when some information is known, but U (e.g. AU) is used if it is totally unknown.

The criteria, their ratings and possible sub-ratings need to be adjusted taking into account:

- The characteristics of the commodity and pathway
- The expected output and the ability of the criteria to help select an appropriate number of higher risk pests as priority for further work.
- Elements that are important to the expected output (e.g. other important plant species that may be threatened, etc.)

Essential criteria (a proposed rating for the criteria is presented in Appendix 4)

A. Whether the pest may be carried on the pathway

Depending on the commodity, this may not be an easy criterion to rate based on the basic information available at this stage. Multiple rating is suggested (a simple yes/no is not considered sufficient). This is because the likelihood of association of the pest with the pathway depends on the association of life stages with the different plant parts in the consignment. The criterion needs to be adjusted to the specific pathway.

B. Present (or not) in the area at risk

This can be a yes/no/unknown criterion. But it may need to be adjusted depending on whether more detailed categories are necessary (e.g. recording presence in a specific area of a country, or recording presence in a specific territory subject to different conditions and different plant health regulations, e.g. overseas territories).

When the area is composed of several countries, a threshold corresponding to the maximum number of countries where the pest is present may be defined.

The ratings may record for example: absence, presence below the threshold (if used), presence above the threshold (if used) and unknown.

Other criteria (a proposed rating for the criteria is presented in Appendix 4)

C. Polyphagous or not

This criterion may be useful where the Step 1 List contains a mixture of polyphagous pests and more oligophagous pests, if this is an element that will be taken into account in the final selection. The levels of polyphagy to be considered should be defined (e.g. one species, a genus, family of the species considered, several families). This criterion was not discriminatory at all or only slightly discriminatory in studies conducted so far, and its use should be considered carefully.

D. Climatic similarity

This rating aims to compare the level of climatic similarity outdoors between the area at risk and the known distribution of the pest. It can only be a rough estimate (a detailed study of climatic similarity would also need to take into account the precise distribution of the pest in the country of origin, and under which climates the crop is grown). The assessment of climatic similarity proposed in this Standard is adapted from the rating guidance for 'Climatic Suitability' developed in the framework of the PRATIQUE project. This guidance is based on the classification of Köppen-Geiger based on Rubel and Kottek (2010). Climates that are similar between the area at risk and the countries where the pest is present are identified. Some limitations are highlighted in Appendix 4. However, this criterion is intended primarily to identify those pests whose distribution have a very low similarity with the area at risk, for the purpose of screening (recognizing that pests that occur in a certain climatic conditions may adapt to other climatic conditions). Pests with a medium climatic similarity should not be excluded. This criterion is mainly useful for plant species that are grown in different climates at origin than in the area at risk (for example, where the area at risk is the EPPO region, tropical fruit species are widely grown in equatorial climates that are not present in the EPPO region). For others, it is likely that only few pests can be allocated to a very low climatic similarity. This criterion is also not intended to be used on its own, and it has a limited use for crops grown indoors.

E. Recorded economic, environmental and social impacts

This should be based on the information given in the literature consulted and will often be qualitative. This criterion is difficult to apply consistently, and decisions should be taken prior to starting the rating, as to the different factors used (for example, if only one record of a high level of damage in any country qualifies as giving an overall high rating for impact). This should always take account of direct impact, and it should be decided how indirect impacts should be taken into account (e.g. impact on export markets). For EPPO Studies, this criterion was based mostly on direct impact.

F. Intercepted

This criterion is intended to identify pests that are already known to have moved with the trade in the selected commodity or others. Ratings can be based on the EPPO Reporting Service, national or regional databases or other sources. Records of interceptions in publications, PRAs, etc. should also be taken into account. Only limited data on interception are available publically worldwide, and the absence of interception records does not mean that a pest has

not moved with the commodity. Searches for interception records may be intensive; it should be decided how much time will be spent on that task, and which sources of information are readily available.

G. Pest has spread/emerging pests

This is based only on the sources consulted to find other data. Ratings should record whether there is evidence that the pest has spread or is becoming significantly more damaging or has moved to other crops.

2.2.3. Overall category rating in Step 2

The ratings and sub-ratings of the different criteria should be combined to allocate each pest to different overall categories.

- Certain ratings exclude a pest from further consideration and allocate it to an exclusion category, e.g. no evidence of association with the commodity or the plant species are not hosts (Criterion A) present in the area at risk above the threshold defined (Criterion B).
- Other pests are allocated to an overall priority category by taking into account the ratings and sub-ratings for individual criteria.

The need and complexity of overall categories depend on the length of the Step 2 List and the expected output. It may be that simple overall categories combined with a manual selection by an expert are sufficient. However, the system proposed here and at further steps is considered useful to ensure consistency in the selection process, especially when the Step 2 Lists are long.

The overall categories should be defined by combining the different ratings for all criteria. It should also take account of the ratings that lead to exclusion. The overall categories are highly dependent on the expected output (including the desired number of pests to be selected; ratings previously decided to exclude a pest from further consideration). It is not possible to give overall guidance on this point, or specify the categories that should be used. However, the following may be taken into account:

- *Whether all criteria used are important for the selection.* For example, it may be decided that criterion C (polyphagy), although rated, will not be used to discriminate between pests (e.g. oligophagous pests are also considered as important). Although this decision should preferably be made before starting Step 2, in order to avoid unnecessary work, there may be situations where such a decision can only be taken after the extent to which a criterion is suitable for screening pests has already been tested.
- *Within a criterion, are there ratings that should exclude the pest or that give more importance to the pest.* For example if one wishes to focus on the association of the pest with the main common form of the commodity (e.g. a fruit itself versus a fruit with leaves and stems), pests rated A1 or A2 and pests rated A3 should end up in different overall categories. If one wishes to retain E1 pests (and not E2 and E3), then E2/E3 can be in the same category, and E1 in a separate one.
- *How to use sub-ratings.* For example, if one wishes to retain A1/A2 pests, but there are too many, one may wish to focus on those that have a better possibility of transfer once at destination ('t'). Pests rated A1t/A2t should end up in different overall categories than those rated A1/A2.
- *How criteria and individual ratings should be combined with each other.* For example, if economic impact at origin is considered important, different E ratings should fall into different overall categories, and one should then decide if further distinction is needed. For example, is there a need to make a difference between pests rated with high impact (E1) that were intercepted (F1) or for which this is not known (FU).
- *How to deal with unknown or uncertainties.* For ratings and sub-ratings that are marked with unknown (e.g. if one cannot even determine from the literature if the pest could become associated with the commodity) or with an uncertainty, should the pests with these ratings be included in the final output? Potential unknown risks may be found among these pests, but some indication (e.g. have moved in trade) is still needed to whether they should be considered to be more important than the minor pests. Pests with many unknowns but still some indication of importance can be allocated to different categories than others.
- *Whether additional considerations need to be used to discriminate between pests.* For example if there is a requirement to focus on particular regions of origin. If the original aim was to build a list of pests for the purpose of inspection, but it is realized that after applying the principal overall categories in Step 2, there will still be too many pests, separate lists can be made for different groups of origins.

If a large number of pests are retained following Step 2, and the expected output is a much shorter list at Step 3, it is advisable to have a sufficient number of overall categories, in order to then be able to decide which ones should be retained for the expected output (for example A1t/A2t + E1 + (F1 or G1), A1t/A2t + E1 + any other, A1/A2 + E1 + (F1 or G1) etc.). If there are too few overall categories, one may end up with many pests in each, and not be able to use them for the expected output. For consistency purposes and to avoid random selection, the overall categories should be detailed and robust enough so that all pests in one category can be retained (or not) at Step 3, without the need for too much 'handpicking'.

The pests allocated to the overall categories may be reviewed again, and the category adjusted as needed, although the system should be robust to allow for minimal changes at this stage. Reasons for such changes should be specified in the conclusion. However, this may reveal that the rating of individual criteria has not been consistent for all pests, and this needs to be adjusted. The conclusion should mention all elements of interest (to facilitate further screening).

2.2.4. Suggest format of Step 2 List

The Step 2 List should contain all the pests considered, as well as the information obtained from the sources used. The format should be decided in advance, as well as the level of detail (see section 2). An example of a Step 2 List in a simple xls file is given in Appendix 5.

Columns may be added depending on other elements needed to make the selection in the next Step (for example, for the EPPO Tomato study, whether the pest is present in different regions of the world).

An explanation of the content of the spreadsheet and the limitations may be included.

2.2.5. Conclusion of Step 2

A conclusion should be given and should:

- indicate the number of pests in Step 2 (including those retained from Step 1 and those deleted or added in Step 2), as well as the number of pests in the different overall priority categories.
- describe the system for combining ratings, overall priority categories and other elements considered.

2.3. Step 3. Reducing the list of pests for further consideration

At Step 3, a shorter list of pests is prepared from the pests selected at Step 2. Whether and how Step 3 should be conducted depends on the expected output, and no general guidance can be given. As mentioned in 2.2, it may be that simple overall categories combined with a manual selection by an expert are sufficient. However, for longer lists, a more organized system can be developed.

2.3.1. Selecting pests among those retained for further considerations at Step 2

Consideration should be given to:

- the expected output (how it will be used, number of pests)
- which categories of overall ratings at Step 2 are relevant for the expected output
- whether further selection criteria should be applied to reach the expected output, including pest features, origins etc. For example for tomato, the focus was given to insects. For Dropsa the focus was on apple and some pests associated to peduncles were retained, but not to other green parts. When the aim is to prepare a list of pests for inspection purposes, the selection using the overall criteria may be considered as too long, and one may wish to focus only on pests from origins (this may also be done at Step 2).

At one extreme, all pests retained for further consideration at Step 2 may be retained (possibly simply complementing information as needed (see next section). However, too many pests will often be retained for further consideration at the end of Step 2, and the objective of Step 3 is to reduce the list to those pests that are important for the expected output.

Even when a selection system is applied, it should also be possible to handpick pests from the Step 2 List (i.e. those that would be allocated to an overall category which is not retained, but which are interesting for the expected output). This should be limited to specific cases (for example a pest with many unknowns, if the assessor thinks it has a potential to become important if introduced). If too many pests in a category are handpicked, it may mean that the overall categories were not clearly defined. Redefining them can be considered, to avoid inconsistencies and random selection.

The overall categories retained for the Dropsa Alert Lists are presented as Appendix 6.

2.3.2. Finalizing the Step 3 List

The content and level of detail should be appropriate to the expected output.

Consideration should be given to:

- the format of the expected output (e.g. table format versus more detailed text)
- which information in Step 2 Lists should be retained in the expected output (e.g. are criteria ratings part of the output)
- how it will be used (influencing for example the level of editing)
- whether the level of detail from Step 2 List is sufficient, or the text should be further expanded (e.g. better documenting other possible pathways)
- whether additional information is needed that was not collected for the purpose of screening pests.

For example if the expected output is alert list records in the EPPO format, it is likely that the text should be expanded and additional information be sought.

2.4 Step 4: establishment of a priority list of pests

At Step 4, a scoring system for the selection of pests at the end of a commodity study is applied in order to prioritize pests. The scoring system should be adapted to the output. Step 4 does not include information collection, since all the information necessary to apply the system should have been collected at the previous stages. The information required is quite detailed, in particular on the biology of the pest. Such a system should be used in a group with specialists from the different disciplines as required.

The scoring system described below was used in a meeting with experts in order to select pests for PRA following the EPPO Tomato study. The system was discussed during the Panel on Phytosanitary Measures, which considered that it should be simplified. However this has not been done so far.

Scoring system developed to select pests for PRA following the EPPO Tomato study.

The rating system proposed is based on the elements of PM 5/3. It only uses elements of PRA that:

- can be rated based on the information available in a commodity study (i.e. basic record based on a limited number of publications), without the need for further extensive searches.
- are expected to allow discrimination between pests.

Points are allocated to factors that increase the likelihood of entry and establishment of the pest, and the magnitude of impacts.

In some cases, the rating of a specific element needs to be adjusted to each commodity. This is indicated, where relevant, in the column basic ratings of the table below, and a specific rating given for the commodity considered. The rating system should be adapted to each commodity in order to obtain the necessary discrimination between pests, depending on specific constraints (e.g. number and type of pests retained at the last stage of the commodity study). Throughout the assessment, individual ratings may be reduced by assessors to take account of uncertainties in the information available.

An illustration of the rating is given in Appendix 7 for tomato fruits and plants for planting of *Quercus* spp.

Elements in PM 5/3 and general comment	Basic ratings (all commodities)
ENTRY	
Association with the pathway at origin	
Taking into account the biology of the pest (2.03)	
<i>Occurrence of suitable life stages.</i> All pests at this stage of a commodity study should have one or several life stages potentially associated to the commodity at origin. This influences several elements, linked to association (2.03), detection (2.09) and intended use (2.10). They are all grouped here as they all relate to the biology of the pest.	

Elements in PM 5/3 and general comment	Basic ratings (all commodities)
<p>If the commodity is not homogenous, i.e. the plant parts composing the commodity may vary (e.g. green parts or not for some 'fruit' commodities, bark or not for the commodity 'roundwood'), the different components of the commodity should be noted.</p> <p>The rating table can usefully summarize, for each pest, the different life stages present on different components of the commodity.</p> <p>For mobile life stages, the likelihood that they may be associated to the commodity should be considered. For example, a less mobile adult or flying adult feeding on fruit may be considered associated to fruit, whereas adults likely to fly when disturbed (e.g. fruit flies) are not.</p> <p>The elements below should be rated.</p>	
<p><u>- life stages associated to the commodity</u></p> <p>If all life stages for which information is available are associated to the commodity, this may favour the pest. This covers all the possible components of the commodity (e.g. for tomato fruit, fruit itself and green parts).</p> <p>For insects, the location of pupae may often not be known from basic information available, and the rating may be based only on egg, larvae (or nymphs for Hemiptera) and adults.</p>	<p>[0 or 1]</p> <p>+1: All life stages for which information is available associated to the commodity (i.e. for insects, late life stages, but also others)</p>
<p><u>- association to part of plants that are always present in the commodity</u></p> <p>If the commodity is not homogenous, i.e. the plant parts may vary, a rating may give more importance to pests associated to the part that is always present in the commodity (e.g. fruit itself, wood itself). also taking account of the life stages that more likely to eventually complete their development and transfer to suitable hosts. These life stages should be determined in advance.</p> <p>This is not relevant for commodities that are likely to be homogenous for all origins, e.g. grain of wheat.</p>	<p>[0, 1 or 3]</p> <p>The different parts of the commodity should have been identified above.</p> <p><u>Rating:</u></p> <p>+ 3 life stages more likely to eventually complete their development and transfer to suitable hosts are associated to the plant parts that are always present in the commodity (e.g. fruit itself, wood itself)</p> <p>OR</p> <p>+ 1 such life stages are associated only to other parts</p>
<p><u>- life stages inside/outside components of the commodity.</u></p> <p>The relevant life stages should be rated depending on whether they are present inside/on the various components of the commodity. The presence inside components of the commodity favours survival in transport (2.07) and complicates detection (2.09), while the different life stages influence the ease for the pest to complete its life cycle and transfer to a host (i.e. late stages > eggs). The components of the commodity to be considered when rating are those defined above.</p> <p>The ratings should be adjusted to each group of pests and, for each group, consider whether a different rating is needed for late life stages and early life stages.</p>	<p>[0 to 5]</p> <p>Relevant early and late stages (if appropriate) are rated separately and then added:</p> <p><u>For insects:</u></p> <p><i>Rating for late life stages</i></p> <p>+3 late life stages inside the main components of the commodity</p> <p>OR</p> <p>+ 2 late life stages inside other components of the commodity</p> <p><i>Rating for early life stages</i></p> <p>+2 early life stages inside the main components of the commodity</p> <p>OR</p> <p>+ 1 early life stages inside other components of the commodity</p> <p>(all others: 0)</p> <p>This needs to be adapted to other pest groups.</p>

Elements in PM 5/3 and general comment	Basic ratings (all commodities)
<p>- <u>ease of detection of the life stages</u>. This relates to detection (2.09). The more difficult it is to detect the pest, the higher the rating. However, a rating based on the size of life stages would go beyond the data available for most pests. A rating by family would work only for some (as size is variable in others). The simple rating here aims to discriminate pests whose more mature stages are 'very small' (e.g. in the order of below 3 mm) or 'very big' (e.g. in the order of above 3 cm). For insects, eggs are generally small, so considering eggs would not discriminate between pests (even if egg groups may be detectable in some cases). What is considered 'big', 'small' and in-between is left to the discretion of assessors, as well as other important elements for individual pests (e.g. colour, presence of large/conspicuous symptoms) (for example, a pest that has small life stages but produces large leaf mines may be rated lower). It could generally be considered that fungi, bacteria, viruses, nematodes, acari, Aleyrodidae, Thripidae, Tephritidae, Cecidomyiidae are small, while certain Coleoptera or Noctuidae are very big (several centimeters)</p>	<p>[+1, 0 or -1] +1 stages are very small (e.g. below 3 mm); - 1 several big (e.g. over 3 cm) conspicuous life stages 0 all other cases</p>
<p>- <u>consideration of biology in relation to the intended use (details are under 2.10)</u> This considers life stages that associated with parts of the commodity that will be discarded before use, and that are most likely to leave the discarded material, or complete their development and leave (i.e. for insects, mobile nymphs or adults, larvae).</p>	<p>No general rating. To be adapted to the commodity. Consider in particular: +1 Life stages as described associated with parts of the commodity that will be discarded before use</p>
<p><i>Volume of movement (2.05), frequency of movement (2.06)</i> These were not used as such (also they proved to not be discriminative between pests in the tomato study). However, pests that occur in several broad geographical regions (in particular continents) may multiply opportunities that trade occurs with the EPPO region, also as different EPPO countries may have favoured trade relationships with different continents. The relevant regions should be defined. For a worldwide study, the relevant regions could be: Asia, Africa, Oceania, North America, and the group South America/Central America/Caribbean.</p>	<p>[0 to 1] +1: Several broad geographical regions</p>
Survival during transport, storage	
<p><i>Indicators of survival in transport and storage (2.07)</i> - detection of viable organism on the pathway (interceptions) indicates that survival is possible- known introductions to new areas also indicate survival. Pest with special mobility (even if they have not spread through trade) may also be rated (e.g. long-distance migration)</p>	<p>[0 to 2] +2 known interceptions or known introduction to new areas OR +1 known long-distance natural spread (e.g. migration)</p>
Surviving existing management procedures	
<p><i>Detection during current inspection procedures (2.09)</i>. The location of the pest (i.e. whether the life stages are hidden or not) and ease of detection of life stages (size) are covered under 2.03.</p>	-
Transfer to a suitable host or habitat (2.10)	
<p><u>Innate dispersal mechanisms, need for vector.</u> Pests that can more easily than others leave the commodity on their own may be rated higher. This may be useful for commodity studies retaining other pests than flying insects (i.e. unlike for tomato fruit). The following may be considered as helping the pest leave the commodity on its own:</p>	<p>[0 to 2] +2 pest able to move on its own (fly, run, airborne spores)</p>

Elements in PM 5/3 and general comment	Basic ratings (all commodities)
<p>- if it is able to move on its own (fly, run, airborne spores/life stages, versus crawling, sessile, etc.).</p> <p>- if it needs a vector, and a vector is present in the EPPO region or there is a possibility that it is imported at the same time. If the commodity is plants for planting (including seeds), a vector is more likely to come into contact with the pest, and rating should be higher. The usefulness of this element should be considered on a commodity basis, considering the pests retained, the nature of the commodity, storage period etc. (e.g. 'crawling' pests may be mobile enough to leave a commodity which is stored for a long time).</p> <p><u>Arriving at suitable time of the year for establishment</u></p> <p>This could apply to commodities that may be imported at a specific season not favouring establishment of pests if its hosts are not at a suitable stage (e.g. winter). Pests that have other hosts (at a suitable stage throughout the year) may however be able to find a suitable host</p>	<p>OR</p> <p>+1 if the pest needs a vector, and this vector is present in the EPPO region or can be imported at the same time (+2 for plants for planting)</p> <p>In addition, depending on the commodity, consider modifying the 'mobility' rating above as follows:</p> <ul style="list-style-type: none"> - suitable hosts always present: maintain full rating - suitable hosts sometimes present: modify to half rating
<p><u>Intended use of the commodity (processing, consumption, disposal of waste, by-products)</u></p> <p>Some intended uses are associated with a higher probability of introduction (e.g. planting) than others (e.g. processing). However this may not be discriminative between pests (e.g. for plants for planting, commodity imported for immediate processing without storage). In some cases, the intended use allows to discriminate between pests located on different parts of the commodity if part of the commodity will be discarded. For example:</p> <ul style="list-style-type: none"> - for processing, but part is known to be discarded before use (e.g. green parts of fruits, shell of nuts, peel of tubers or vegetables: mobile pests associated to this part may be favoured). - specific use of the whole commodity (e.g. Christmas trees, possibly stored outdoors before decoration and later discarded in gardens/nature: needle pests may be exposed to dessication while wood borers may have a better possibility to survive and complete their life cycle) <p>This relates to the biology of the pest and is considered under 2.03</p>	<p>No general rating. To be adapted to the commodity. Details to be added to 2.03</p>
<p><u>Other pathways of interest</u></p> <p>This focuses on the possibility that the pest may be associated to other commodities in trade, which are not heavily regulated (e.g., for the EPPO region, not plants for planting, soil, potato tubers). This has to be decided for each commodity individually. In order to obtain a discriminatory effect between pests, several commodities/groups of commodities may need to be rated separately.</p>	<p>[suggest 3 maximum]</p> <p>To be adjusted to the commodity</p> <ul style="list-style-type: none"> +1 for other pathways for other species in the same family +0,5 or 1 for each type of interesting other "less regulated" pathways
ESTABLISHMENT	
<p><i>Distribution of hosts plants and suitable habitats (3.09).</i> One important element related to hosts is whether the pest has important host plants in the area considered. This is covered under "impact".</p>	<p>-</p>
<p><i>Distribution of alternate hosts or other species critical to the pest's life cycle (3.09).</i> Pests that need a vector are covered under 2.10</p>	<p>-</p>

Elements in PM 5/3 and general comment	Basic ratings (all commodities)
<p><i>Climatic similarity</i> (3.03). All pests selected in commodity studies are expected to have some climatic similarity to some part of the area considered, although some will have higher climatic similarity than others. This element may be useful for some commodities. It is not considered relevant for crops that are cultivated both outdoors and indoors throughout the region (as suitable conditions would occur throughout the region for most pests).</p>	<p>[0 to 1] To be considered on a commodity basis. Proposal for outdoors crops: +2 high +1 medium</p>
<p><i>Pest highly adaptable</i> (3.18) (to environmental fluctuations, adapt to wider range of hosts, resistance to plant protection products /overcome host resistance). Pests for which there is evidence of such may receive a higher rating, as well as those presenting other important factors favouring establishment</p>	<p>[0 to 2] +2 has adapted to new hosts, has shown resistance to plant protection product, has overcome host resistance, or any other factors favouring establishment.</p>
<p><i>Pest established in new areas outside its original area of distribution</i> (3.19). Covered under 2.07</p>	<p>-</p>
<p><i>Knowledge about eradication.</i> Pests for which eradication was attempted and failed receive a higher rating.</p>	<p>[0 to 2] +2: eradication failed.</p>
SPREAD	
<p>These cannot be rated at this stage based on the information available. Not used.</p>	
IMPACT	
<p><i>Impact at origin and potential.</i> The potential impact is not easy to use as the impact at destination is mostly not known. However, three elements can be taken into account: - Pests for which a higher impact is reported at origin on the plant considered (based on the few sources consulted). Care should be taken with general statements of impact. - Pests which are known vectors or potential vectors. If there is no specific data on whether the pest is or is not a vector, the group to which the pest belongs should be considered. Different ratings are given to known vectors of important pests and others. - Pests that have other important hosts in the area considered may have potential higher impact. Rating to be decided for each commodity study, depending on the hosts considered important. Hosts may be divided into several groups. For example, for the commodity “tamarillo fruit” (minor Solanaceae), it may be important to rate pests that attack other Solanaceae, and other major plants.</p>	<p>[for all together, 0 to 3or4] +2 if strong evidence of higher impact or known vector of important pests OR +1 pest is a potential vector No general rating, to be developed for each commodity, suggest 0-2 maximum (this is in addition to the previous rating)</p>

General considerations/ precaution for use

- As is the case for all screening processes, this process does not aim to establish an exhaustive list of pests with complete information on each of them but rather to prioritize pests that should be considered further.
- Even if a pest is not retained as a priority pest for further consideration this does not mean that it is not an important pest, or that it may not be transported on the commodity.
- Data in the compiled lists at early stages need to be used with caution. Only relevant information is sought, in a limited number of publications that are sometimes contradictory, and there may be uncertainties on whether the pest meets the basic criteria for the study. This is resolved at later stages.
- At all steps, the ability to read publications in the languages relevant to the origins considered is likely to allow a better coverage.

3. References (all URLs accessed in October 2015)

CABI CPC. Internet database. Crop Protection Compendium. CAB International. <http://www.cabi.org/cpc>

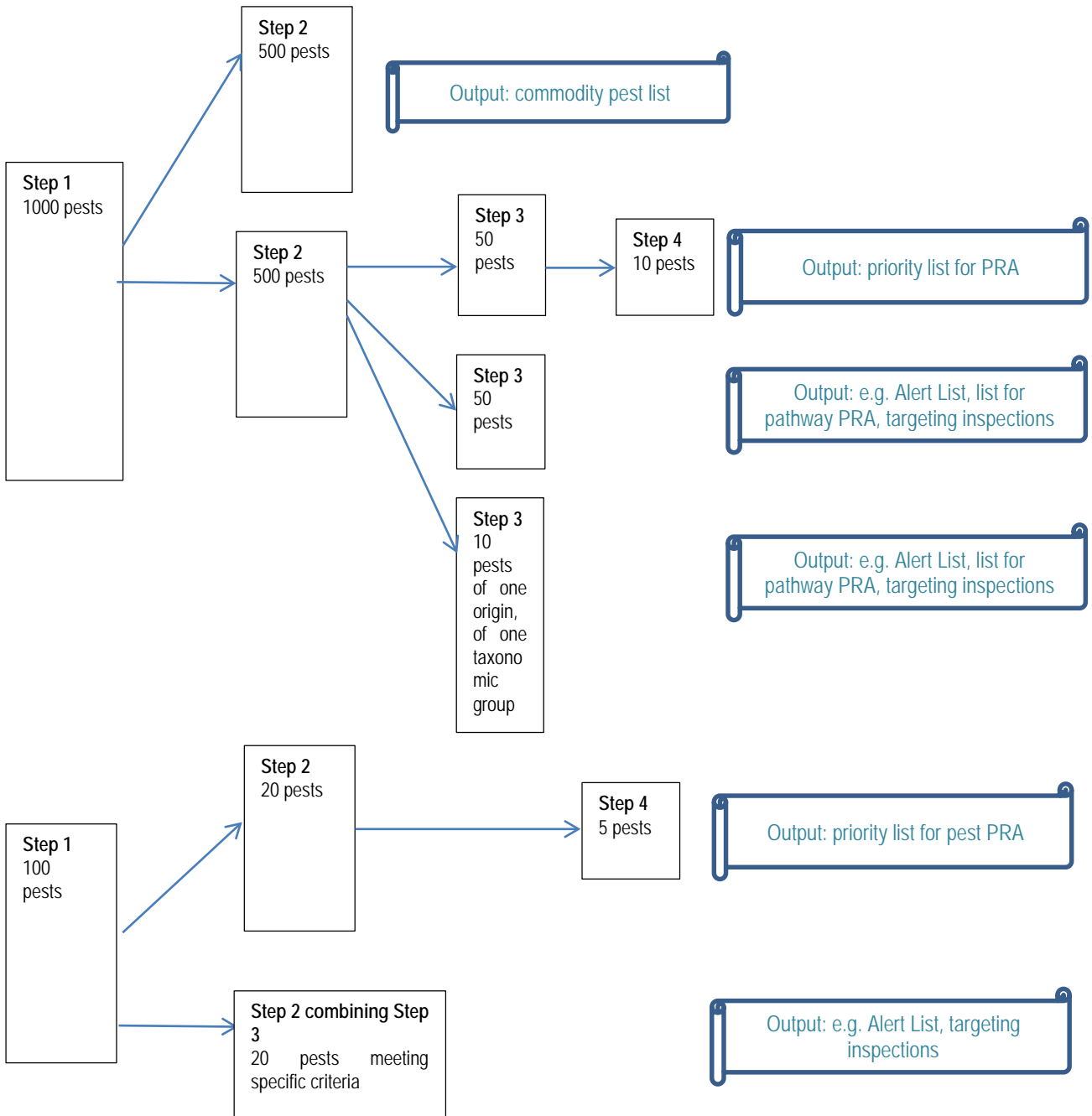
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EPPO. 2011. EPPO Standard PM 5/3. Decision-support scheme for quarantine pests. Available at <http://archives.eppo.int/EPPOStandards/pr.htm>

EPPO. 2015. EPPO Technical Document No. 1068, EPPO Study on Pest Risks Associated with the Import of Tomato Fruit. EPPO Paris. Available at <http://www.eppo.int>

FAO. 2007. ISPM 2. Framework for pest risk analysis. Rome, IPPC, FAO.

Figure 1. Steps (examples and output)



Appendix 1 : Basic exclusion categories for which no further assessment is needed

	Main reason	Decisions on pests <u>NOT</u> covered in this category for the specific commodity study
N O 1	Pest present in the area at risk. At Step 1, this is the element that allows organisms to be excluded very quickly, and should be considered first.	<ul style="list-style-type: none"> - If the area at risk is several countries (e.g. EPPO, regional entity), decide whether a threshold should be applied, i.e. number of countries above which a pest is excluded from further consideration. A threshold may take account of the number of countries and diversity in the area at risk, the number of pests expected to be found (and screened), and whether growing the host plant species is relatively new/limited in the area at risk (in order to protect new producing countries). For example, where a threshold was applied in previous studies (EPPO Tomato study, some fruit in Dropsa, EU), the threshold of 3 countries was found to be convenient. - In addition, decide how specific territories are considered, e.g. which overseas territories do not constitute a record of presence in the area at risk. - in some circumstances, it may also be decided that presence only in glasshouse does not constitute a record of presence in the area of risk.
N O 2	Pest already regulated in the area at risk	<p>The level of regulation excluding a pest from further consideration, e.g.:</p> <ul style="list-style-type: none"> - any listing, including EPPO A1/A2 lists, EPPO Alert List - regulated pest for the endangered area - regulated pests for the endangered area, but only if regulated on the commodity (e.g. one may decide to not exclude pests that are regulated only on other commodities, for example, for a study on Rubus fruit, a pest regulated only on plants for planting of Citrus).
N O 3	No possibility for transport on the pathway. A conservative approach should be taken. Whether a pest can be carried by a pathway generally requires a more in depth analysis, except for specific cases, where this can already be excluded (e.g. soil pests or plants as pests for fruit commodities). It is not recommended to spend much time on this at this stage. Detailed factors such as the conditions of transport (e.g. cold), which also vary considerably depending on origins cannot be considered at this stage.	<p>The conditions excluding a pest from further consideration, and how conservative assessors should be. It is recommended that the following pests be retained at this stage as whether the consignment may be a pathway normally requires in-depth analysis, not possible from only the few sources available in Step 1.</p> <ul style="list-style-type: none"> - pests that may be associated (any life stage) to any plant parts that may be in the commodity, e.g. larvae on leaves of a fruit species, where leaves may be associated with consignments of fruit, even if this is not a common case (e.g. tomato, not <i>Vaccinium</i>). e.g. pests on or in stems, where stems may be associate with consignments of fruit (apples, cherries). - pests with life stages that may incidentally be associated with the commodity, e.g., for fruit, flying adults or larvae normally associated with leaves but likely to wander onto fruit and end up in consignments - pests intercepted on the commodity, even if they are not a pest of the plant species (e.g. wheat pest in consignments of apple fruit) have the possibility to be transported on the pathway. Decision may be needed on whether to exclude pests intercepted only one or a small number of times on the commodity.
N O 4	Plant species is not a host. This should be used conservatively.	<ul style="list-style-type: none"> - It is recommended that any pest for which there is a doubt on whether the plant species is a host or for which there are conflicting records is maintained. In particular, any pest for which a specific publication relating to the plant species was found does not fall into this category, even if some broad sources (e.g. CABI CPC or EPPO Global Database) do not mention the plant as host. - Pests intercepted on the commodity that are not pests of the plant species, should not be automatically excluded. A judgement needs to be made, for example very few interception records, and other sources provide convincing evidence that the plant species is a host. However, as Step 1 uses few sources, one should keep in mind that the number of interceptions has limited relevance.
N O 5	Other reasons. For example if the organism is a natural enemy, not a pest of any crop, or pests mentioned at genus level in interceptions. This also covers cases where analysis is not possible. For example where an organism is listed in a publication, but it is impossible to find any reference	<p>Decide how to deal with interceptions at the genus level. It is useful to make a brief Internet search for the genus and name of the plants, and add to the list any individual pest species for which an association with the plant exists (if not already listed based on other sources). Genera should in any case be allocated to this category following the search for species.</p> <p>Cases that cannot be analyse relates mostly to serious cases of misspelling. Decide how much effort should be spent to guess spelling mistakes, or whether the name given is a (rare) synonym. This case was rare in the EPPO tomato study and Dropsa</p>

Appendix 2 - Category of information to be collected.

This table indicate the fields that should be included in the Step 1 List.

Those marked with * should normally be completed for every pest on the list; however, some simple or shortened answers may be given when necessary (to avoid assembling unnecessary information for pests that will not be retained at further stages – especially for hosts and distribution).

Field name	Content	Adjustments depending on commodity, origins, area
Species*	Scientific name, i.e. species or genus as identified during the search. If the name in the publication is now a synonym, the preferred name should be indicated here and the synonym in the relevant column (to avoid duplications). Uncertainties on synonymy can sometimes not be resolved easily and can be recorded under 'other information' (to not spend time on organisms that will not be considered in Step 2).	As described
Type*	As a code. See Table 3	The taxonomic groups and levels should be adjusted depending on the study. Additional groups should be created as needed. For example mammals are not mentioned in Table 3.
Taxonomy*	See Table 3. Taxonomic levels proposed are not consistent across all groups of pests, in order to be more informative. For pests in EPPO Global Database, this data can be extracted automatically (but necessitates some combination/formatting)	The taxonomic groups and levels should be adjusted depending on the study. For example, the tomato study recorded 'plants' generally in this column, as none would be associated with the fruit pathway. For seeds, taxonomic details may be useful. Codes for different types/phylum of plants may be needed in some cases. Additional groups should be created as needed (e.g. rodents are not mentioned in Table 3). It does not need to cover groups that are not listed at Step 1 (e.g. birds or nematodes for fruit pathways).
Source*	EPPO Global Database, CABI CPC, or Author (date or ND). As described. It may be useful that references are saved in parallel (and Internet pages as PDF) for the purpose of future access when links change or disappear from the Internet.	The need for saving references depends on the intended use of the Lists.
URL or citing	URL (e.g. web pages, articles posted on the web, databases etc.) or original publication if the source was cited in another publication). Possibly date of access for URL.	Decide whether an attempt should be made to record this.
Location of life stages on plant part	Indicate here information on the presence of different life stages on the different parts of the plant and elements of the commodity (e.g. eggs on leaves, larvae feed on leaves, peduncles and on the fruit itself, pupae in the soil, adults fly and feed on nectar). At Step 1, this does not need to be filled for all pests, but mostly for those that are not associated with the plant parts in the commodity (e.g. 'all stages on roots', for a fruit commodity), or those that are clearly associated with the commodity	This should especially address the plant parts that are relevant for the commodity studied.
Pathway considered*	Indicate if the commodity could be a pathway. This is based on information recorded in the previous field. It should be conservative because based on one or a small number of sources. It can allow the identification of a number of pests that cannot be transported on the pathway for obvious reasons. Assessing whether a pest may be transported on the commodity is not straightforward and requires detailed consideration of the biology of the pest (and is a detailed process within PRA). There is also often conflicting information about this in various publications. It is therefore often not possible at this stage to provide a definitive answer or any answer. Uncertainties can be recorded. A certain No here excludes a pest from further consideration	For each commodity, adjust to the different parts of plants composing the commodity. Details can be added if the pest can be found on part of the commodity only (e.g. leaves, not fruit; bark, not wood). Indicate if the pest may be associated with the commodity as contaminant or incidentally (e.g. flying adults on a plant part they do not feed on)
Other pathways	Preliminary assessment of other pathways the pest could be associated with. This is also based on the field 'parts of plant on which the pest is present'. The usefulness of this may depend on the expected output. It may provide useful information for further analysis. It is generally not needed at Step 1 and can be added, where needed at late stages (except if readily available, and the pest is likely to be retained). For pests in EPPO Global Database or CABI CPC, some details on pathways may be given.	Decide whether this should be recorded, and how systematically.

Field name	Content	Adjustments depending on commodity, origins, area
Hosts*	<p>All listed pests have an association with one or several of the plant species covered by the commodity study. Complete host lists are not needed here until one is sure that the pest will be retained at the next stage (i.e. only the species of interest may be listed).</p> <p>Some organisms are listed because they are mentioned in a database recording all plant species on which any life stage was found (hosts or not), or because they were intercepted on the commodity, or for data obtained through data mining. The host status for the plants species considered is sometimes difficult to determine. In some cases, it is possible to exclude the pest. Alternatively the pest can be retained to the next step, if more extensive searches are required.</p> <p>Where the plant species considered is not included as a host in CABI CPC or EPP0 Global Database, a general search can be made to determine if other sources associate the pest with the plant species. For pests in EPP0 Global Database, some data can be extracted automatically (but needs some combination/formatting).</p> <p>Interceptions records are a special case. The intercepted organisms may have been hitchhikers on the commodity, and may not be a pest at all, or not a pest of that plant. A decision needs to be made on which pests to keep (see section NO2, NO4)</p> <p>Latin names are recommended for the purpose of future searches in spreadsheets. If there is any ambiguity as to the species concerned, a phrasing such as ‘Malus (as apple)’ may be used.</p> <p>A certain answer that the plant is not a host always excludes a pest from further consideration (interception data is a special case)</p>	<p>This is work-intensive, so decide on the level of detail necessary at which stage (i.e. full lists as found, hosts that are important for the area at risk, only recording that the plant species considered are hosts).</p> <p>This should also take account of the stage at which assessors prefer to assemble data. In any case, detailed searches should focus on pests that are likely to be retained to the next step.</p> <p>Decide how strictly Latin names should be used, i.e. common names may be recorded if given in publications, and later transformed to Latin names if the pests are retained for the expected outcome.</p>
Other information	<p>This relates in particular to information allowing the assessment of the possible association to the pathway. Other elements of biology may be recorded as well as records of interception, any element excluding the organism from further study. Such information should be noted when available in the publications reviewed, but not systematically searched for.</p> <p>The assessor needs to look out for any essential information that may also be needed at subsequent steps.</p>	As described.
Distribution*	<p>Complete distribution data is not needed here until one is sure that the pest will be retained at the next stage (i.e. one may choose at Step 1 to only ascertain absence from the area at risk).</p> <p>Based on CABI CPC or EPP0 Global Database, when available. Either of those can be used at this stage. It is the case that one of them may contain more up-to-date information, but it is not necessary to compare them at this stage, and the other can be consulted at the next stage.</p> <p>When CABI CPC or EPP0 Database do not indicate a distribution, a general search can be made of other sources, and the distribution found in each of them listed. Records found in other references should be listed for that reference. If a source only relates to one country, this can be indicated in this field.</p> <p>A general decision is needed on whether to record individual countries, or only broad regions where there is no doubt that the pest is present in a number of countries. The following broad regions are recommended: Africa, Asia, Europe (also non-EPP0 countries), Oceania, Caribbean, Central America (Guatemala to Panama), South America, North America (incl. Mexico). Because of the diversity of the Americas, it is recommended to have separate categories for South America, Central America, Caribbean and North America.</p> <p>When listing regions, it is considered useful for the further use of data to list them in the same order, and to keep all American regions close to each other. However it is difficult to be consistent depending on how they are mentioned in the original sources. For pests in CABI CPC or EPP0 Global Database, it is easy to scroll quickly down distribution lists and assess whether regions or countries should be listed.</p> <p>If there is a doubt on the distribution, and this will need to be clarified at a later stage, it may be preferable to list countries.</p> <p>In any case, it is also preferable to list here the countries/region for which the study is made (i.e. Europe, etc.).</p> <p>If the pest is present above the threshold (next field), this column may be left blank and only the next one documented.</p>	<p>Decide whether to list countries or broad regions.</p> <p>If broad regions, decide which regions to be listed, and the number of countries under which individual countries should be listed. The threshold of 5 countries was used in Dropsa for all regions, except for North America (3, USA, Canada, Mexico).</p> <p>Decide whether this should be limited to records for the origins under consideration and the area at risk, e.g. for fruit from South America to EPP0, to South American countries and EPP0 countries.</p> <p>Decide whether to record infranational distribution, e.g. if a pest has a very limited distribution in a large country.</p> <p>Decide whether this field should be field for pests that are present above the defined threshold, without uncertainty (next field). (Because assembling distribution lists is work intensive, not filling this in this case will save a lot of work)</p>

Field name	Content	Adjustments depending on commodity, origins, area
	Because detailed country information is necessary in Step 2 for rating the climatic similarity of pests, a double approach can be followed, where detailed distribution is indicated for pests retained for Step 2 (to remove the need to have to search for those in Step 2). Where countries are listed, a systematic approach is recommended, where countries are still listed by broad region.	
Present in the area at risk*	The answers are: - Yes: if above the threshold defined – a conservative approach should be used, depending on the sources and the threshold. If only one reference of unknown status indicates presence in 1 country, then this should be verified, or the pest kept for verification at a later stage. This is especially true for taxonomic groups in which have undergone many taxonomic changes, which may confuse the distribution. - No: if present in no country - country names: if present in a number of countries below the threshold A certain Yes here excludes a pest from further consideration	The threshold and specific territories should be consistent with those defined in categories (see 3.1) Decide whether 'no' should be used, or left blank. Where the answer is 'yes' at Step 1, decide if any distribution data needs to be recorded (see above).
Regulation in the area at risk	This records whether the pest is already regulated in the area at risk. In the case of EPPO, if the pest is already recommended for regulation, or under consideration, or on the EPPO Alert List; in the case of Dropsa, whether the pest is regulated in the EU. The type of list should be indicated (e.g. A1, A2, Alert List). For pests in EPPO Global Database, the categorization status for EPPO and the EU can be extracted automatically. This field should always be filled if this is a criteria excluding a pest from further consideration, in which case this will exclude pests	If the area at risk is a regional entity, it may be useful to have two columns, one to register the status in that entity, and one for EPPO. The level of detail needed should be decided in advance. For example, in addition to the list number, the name under which the pest is regulated (if different), whether it is regulated for the commodity or another pathway.
Conclusion*	Rating of the conclusion of Step 1, as per 3.1	Relevant categories for pests retained or excluded should be defined as per 3.1. One may define to leave the field empty for the pest retained to the next Step.
Synonyms	This does <u>not</u> record systematically all known synonyms, but <u>only</u> names under which a pest was mentioned in the reference concerned, if not under its preferred name (to facilitate retrieval of information), or a synonym that is especially important for the further use of the information (i.e. where useful data may be found by searching for the synonym)	As described
Kind of damage	If it is available in a publication used to record other data, information on damage (type, importance, potential) is useful for further steps. Do not perform specific searches at Step 1 to find this information.	As described
EPPO code	This is useful to group organisms and identify possible synonymy between listed pests. EPPO codes are given in EPPO Global Database for a large number of pests (incl. many for which no detailed data is available), and can be extracted automatically based on preferred names or synonyms.	Decide if this is needed for the specific study. This should be recorded for future EPPO studies.

Table 2. Codes and taxonomic details

Code	For type of pest	Taxonomic details given	Upper taxonomic levels (for reference)
Animals			
I	Insecta (Class)	Order: Family	Animalia (Kingdom), Arthropoda (Phylum), Hexapoda (Sub-Phylum)
E	Entognatha (Class)	Order: Family	Animalia (Kingdom), Arthropoda (Phylum), Hexapoda (Sub-Phylum)
A	Arachnida (Class)	Order: Family	Animalia (Kingdom), Arthropoda (Phylum), Chelicerata (Sub-Phylum)
N	Nematoda (Phylum)	Order: Family	Animalia (Kingdom)
M	Myriapoda (Sub-Phylum)	Class: Order: Family	Animalia (Kingdom), Arthropoda (Phylum)
G	Gastropoda (Class)	Order: Family	Animalia (Kingdom), Mollusca (Phylum)
Bird	Aves (Class)	Order : Family*	Animalia (Kingdom), Chordata (Phylum), Vertebrata (Sub-phylum)
Pathogens			
V	Viruses and viroids (Kingdom)	Family: genus	
B	Bacteria (Kingdom)	Order: Family	Note: this includes phytoplasma
F	Fungi (Kingdom)	Phylum	-
C	Chromista (Kingdom)	Phylum: Class	-
Plants			
P	Plantae (Kingdom)	Class: Family*	Plantae (Kingdom), 14 Phylum (according to EPPO Global Database)

*These may not be relevant for many commodity studies and may be recorded as 'plants' and 'birds' or not included on the lists.

Table 3. Types of sources of information that may be used

To start the list
EPPO Global Database
CABI CPC
To complete the list
Lists from similar studies, e.g. to date EPPO Tomato study (EPPO, 2015), Dropsa studies, and Dropsa Review list
Interception data, from EPPO countries or other sources
PRAs (EPPO, EPPO countries, other regions)
Books and compendiums relating to pests of the crop or to specific regions
Publications on groups of pests, in printed form, databases or internet sites
Sources on pests of the crop in a country or region, e.g. leaflets, cropping advice, lists of pests present in a country, official lists of pests on the IPP (www.ippc.int)
Targeted searches for certain countries, for example important countries not covered in the general publications above
Regulations from countries regarding imports
EPPO Reporting Service articles and notifications of non-compliance
Pest lists provided by NPPOs for some origins [note: the EPPO Secretariat does not have access to such information]

Appendix 3
Example of spreadsheet/database format at Step 1 (example from Drosophila, Vaccinium)

At Step 1, all information for one pest can be given in one row, especially if the pest is likely to be retained to Step 2. If it is clearly going to be excluded, it does not matter if there are several rows per pest. If the former approach is chosen, the relevant reference for the information given needs to be recorded in every column.

Species	Synonyms	Type	Taxonomy	Source	Citation or weblink	Location of life stages on plant parts	fruit pathway	Other pathways	Hosts	Other information	Distribution (preliminary)	Present in 3 EU countries	Status for EU/EEC..	EPPO Lists	Conc.	Kind of damage	EPPO code
Chrysoteuchia topiaria		I	Lepidoptera : Crambidae	CABI CPC, AgricultureCanada, 2013; AgriReseauQuebec, 2015; IPM Centers, 1998		larvae feed on bark and wood of roots and stolons. Overwinter in the litter, pupae and eggs in the litter (Agriculture Canada, 2013) Feeds on roots. (AgriReseauQuebec, 2015)	?incidental, adults only		Vaccinium macrocarpon (both Canada references); Poa, Pseudotsuga, Vaccinium (datamining), Vaccinium macrocarpon (CPC)	Major pest (AgriReseauQuebec, 2015)	Canada, USA (CPC) Throughout Canada, USA and Europe (Roberts and Mahr, nd)	?need further search, no detailed record found, and no other mention of Europe found				death of vines, loss of leaves; important, sometimes sporadic pest (IPM Centers, 1998)	CRAMHO

Appendix 4. Rating criteria at Step 2 (based on Dropsa with an attempt to make it generic)

The rating and sub-ratings of the criteria proposed below have been developed based on the EPP0 Tomato study and the commodity studies performed in the framework of the EU FP 7 project DROPSA (in the methods as in October 2015 – still under development).

Essential criteria

A. Whether the pest may be carried with the commodity

This is not an easy criterion to rate based on basic information. Multiple rating can be used here as a simple yes/no is often not considered sufficient. The likelihood of association of the pest with the pathway depends on whether some life stages are associated directly with the main elements of the commodity or secondary elements (e.g. for fruits the fruit itself or other plant parts such as peduncles leaves etc.). Five rating level are proposed, but the ratings could be refined depending on which pests are interesting for the expected outcome (for example, if one wishes to discriminate between pests associated to fruit peduncles, or only other green parts).

A1	Yes, in or on the main elements of the commodity, in a non-highly mobile life stage (including crawling but not running/flying), whether or not some stages may also be associated to the secondary elements. A1* indicates where the pest needs a transmission means for transfer (i.e. for viruses and viroids, vector or other mechanism)
A2	Yes, on the main elements of the commodity (whether or not some stages may also be associated to secondary elements), but in a highly mobile form (running/flying), i.e. it is difficult to judge if the life stages remain associated with the main elements of the commodity at and after harvest.
A3	Yes, in a non-mobile life stage (non-running/flying, e.g. egg, larvae, pupae), only on secondary elements of the commodity, with no life stage associated to the main elements.
A4	No evidence of possible association.
AU	Unknown (insufficient information found to assess this)

Possible sub-ratings (e.g. a pest with the rating A2 and the sub-rating c is noted A2c):

Sub-rating	Description	Reason and use
c (contaminant)	Pests recognized as major contaminants of consignments of the fruit studied (i.e. not pests of the crop studied, but often associated to consignments).	Such pests are associated with the commodity in a way, but may not be interesting for the expected output, as they are not pests of the species considered.
t (transfer possibilities through own mobility)	The pest has mobile life stages and is more likely to transfer at destination. This covers pests that have flying, running (but not crawling) life stages, and pathogens transferred by contact or vectors. Pests in some groups were always rated as 't' (e.g. Diptera, Coleoptera). Pests in others were rated as 't' only if there was specific information (e.g. airborne fungi, virus transmitted by a vector).	To allow to discriminate pests with a higher likelihood of transfer due to their mobility, estimated very broadly.
w (wild)	The pest is associated with the fruit genus considered in nature, and there is no evidence that it is the pest of this genus in cultivated or managed conditions. It is less likely to become associated to the consignments.	To identify pests that are less likely to become associated to consignments moving in trade. This sub-rating was used for <i>Vaccinium</i> , especially for a number of North American pests.

B. Present (or not) in the area at risk

	Distribution in the area at risk
B1	B1a. Absent from the area at risk B1b. Present in the area at risk below the defined threshold (number of countries) decided for the category NO1 (Table 2). [Where the threshold is 0, 'B1' can be used (absent from the area at risk)]
B2	Present in the area at risk above the defined threshold (number of countries) decided for the category NO1 (Table 2)

BU	Unknown. There is no good information on the distribution of the pest, and whether or how widely it occurs in the area at risk. This covers in particular pests that seem to be more widespread than indicated in the few references found, without evidence that this is the case.
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Note: Other ratings may be added. For example if one wants to rate separately (and therefore easily identify) pests that are present in some territories that are not part of the area at risk but are part of countries of the area at risk (e.g. recording presence in a specific area of a country, or recording presence in a specific territory subject to different conditions and different plant health regulations, e.g. overseas territories).

Other criteria

C. Polyphagous or not

	Polyphagy level
C1	Hosts in several families (without consideration of the number of hosts, which is reflected in the host list)
C2	Several hosts, but only in the family of the species/genus considered
C3	Only the species/genus considered
CU	Unknown. Information on hosts does not seem sufficient to answer this question (in particular, there is a presumption (but no evidence) that the pest may have more hosts than found).

D. Climatic similarity

This rating aims at screening the level of climatic similarity outdoors between the area at risk and the known distribution of the pest. This can only be a rough estimate as a detailed study of climatic similarity would also take account the precise distribution of the pest in a specific country, and under which climates the crop is grown.

The types of climate present in the area at risk according to the classification of Köppen-Geiger based on Rubel and Kottek (2010) should be identified. The number of common climate types between countries where the pest is present and the area at risk is determined. Areas where the crop concerned is known not to be grown should be identified to avoid overestimating the number of common climate types. In such cases, very extreme climate types are excluded for the rating (therefore reducing the possible maximum number of climate types).

An overview map and table of percentages can be used to summarize the climate types present in the area at risk. The climatic similarity is then rated by counting the number of climates that are common to the known pest distribution and the area at risk. This can be done using either the map or the tables of percentages, identifying countries of the known pest distribution and counting the number of climates common with the area at risk. The rating generally takes account of countries in their entirety, except if data on the distribution within a country (especially individual states or similar entities within large countries) is available.

The Köppen-Geiger climate classification map showing all climates, as well as the map and percentages used for Dropsa (i.e. with the EU as area at risk) are given as examples at the end of this Appendix. The modified map and percentages were based on the outcome of the EU FP7 project PRATIQUE (“Rating Guidance for Climatic Suitability », deliverable 3.3, Annex 4) as adjusted in September 2014 (R. Baker, personal communication, 2014).

The limits of the rating categories need to be determined on a case by case basis depending on the size of the area at risk considered.

rating	Common climates between the countries where the pest is present and the area at risk
X-XX	High – X-XX common climates
1-X	Medium 1-X common climates
0	Low: 0

It is recognized that this approach has limitations:

- This criterion probably overestimates the climatic similarity in many cases, as climatic conditions may be considered as more similar as what they are in reality. For example, if a pest occurs in a country with many climatic types, the rating can be high while the pest may be present under only a few of these climates.
- Climatic similarity may not reflect precisely where the pest will establish as a pest may establish in a different climate type from the one it is present in.
- The plant species considered may not be grown in all climate types present in the area at risk, and the resulting similarity would be lowered by climates where the crop is not grown at all.
- When the rating is done visually, it may not be precise in some cases, for example where a climate occurs in a limited area of a country or at borders.
- It cannot always take account of the detailed distribution of the pest within a country.

E. Recorded impact

	Recorded Impact
E1	High (Some references refer to a major or serious pest, even if only at local level)
E2	Medium (Only occasional damage mentioned; no mention of serious damage)
E3	Low (mentioned as a minor pest, and no reference pointing to the above categories)
EU	Unknown

Records such as “one of the most serious pest of the species considered in country/province Z” could be rated as F1, as well as records of serious damage on other hosts. The rating is not very precise, and it is hard to decide the appropriate rating in some cases, but it gives an indication especially for major or minor pests.

Possible sub-ratings (e.g. a pest with high impact on a different plant species in the past is rated A1dh):

Sub-rating	Description	Reason and use
h ('historical', impact in the past)	Pests whose impact was higher in the past. The rating is given for the highest impact, i.e. in the past or currently. A 'h' is added only if the impact was higher in the past.	To not necessarily discard pests that are currently minor, but had a higher importance in the past.
v (vector)	Known vector. The direct damage is rated as above, and 'v' is added if the pest is a vector. A vector that causes damage only by vectoring a pathogen is rated as E3v. A pest in a group containing many vectors (e.g. Cicadellidae), but with no evidence of being a vector is not rated 'v'	To allow to take account of vectors, even if their direct damage is minor.
d (on a different plant species)	Impact rated for a different plant species/genus than the one studied. The highest rating is given. For example, a pest that would be E3 for the species studied, but E1 for another is rated E1d. A pest that would be E2 for the species studied and E3 for others would be rated E2.	To show where the rating was given for other plant species than the one studied.

F. Intercepted

	Known to have been intercepted
F1	Yes, there are one or several interception records
FU	Not known to have been intercepted (no interception record for this pest in the sources considered)

G. Pest has spread/emerging pests

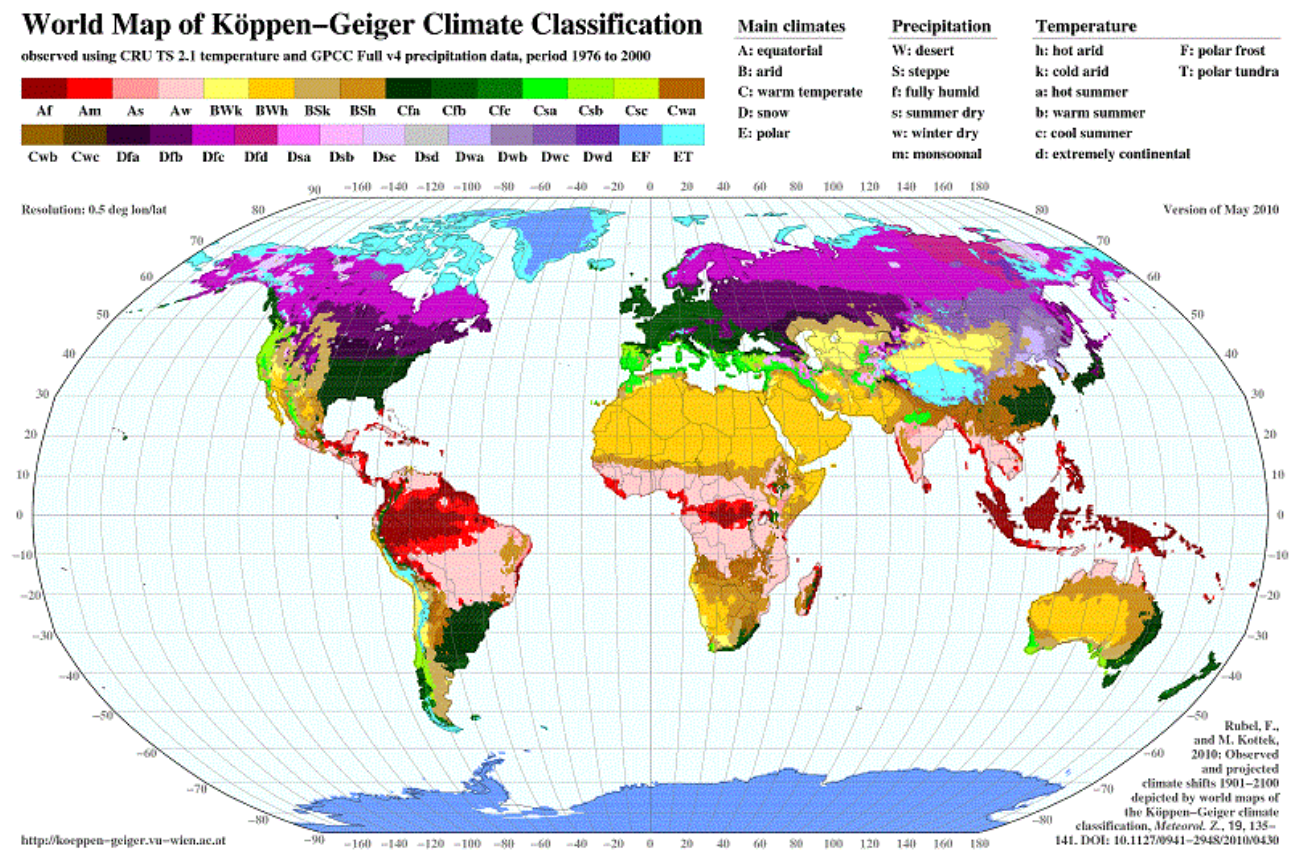
	Is there evidence that the pest has spread or is emerging?
G1	Yes (this takes account of spread/emergence of the pest between countries or inside a country, whether the pest is becoming significantly more damaging or has moved to other crops)
G2	No
GU	Not known from the information available

G1 can be used when this is specifically indicated in the literature, or when the current distribution data points to spread (e.g. a new record in Africa for a pest of presumed American origin otherwise distributed only in the Americas). G2 is little used, but applies in particular where a pest is recorded in only 1 country, without specific indication of spread within that country.

In Dropsa, only spread/emergence of the pest between countries or inside a country was taken into account. However, the EPPO Secretariat proposes that it would be useful for future commodity studies to adapt criterion

G as above, to take account of whether the pest is becoming significantly more damaging or has moved to other crops.

World map of Köppen-Geiger climate classification (Rübel and Kottek, 2010)



Map of climates used in the framework of Dropsa (Dr. R. Baker, pers. comm., 2014)

Note : the climate ET (tundra/polar climate) is marked but was not used to assess the climatic similarity.

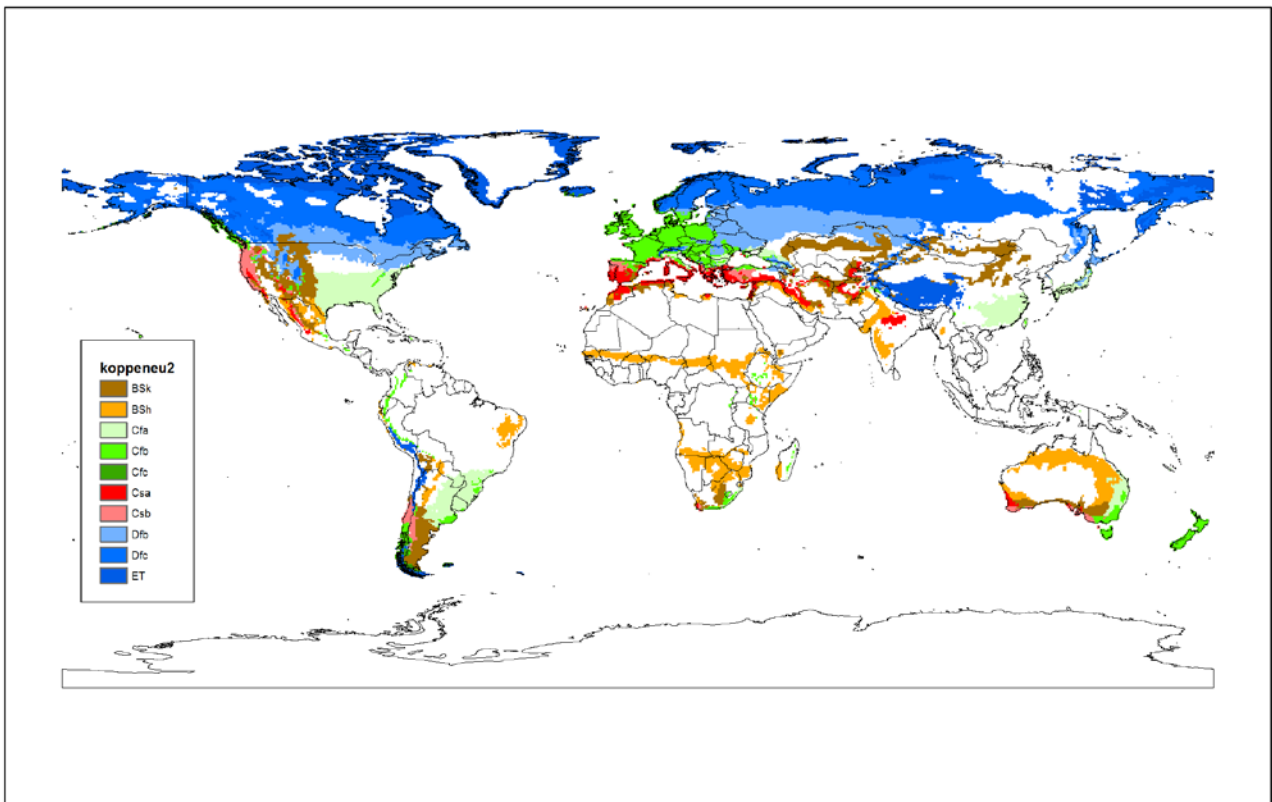


Table of climate percentages used in the framework of Dropsa (Dr. R. Baker, pers. comm., 2014)

CNTRY_NAME	BSk	BSh	Cfa	Cfb	Cfc	Csa	Csb	Dfb	Dfc
Afghanistan	25,9%	6,0%	0,0%	0,8%	0,0%	19,5%	0,8%	0,0%	0,0%
Albania	0,0%	0,0%	0,0%	8,3%	0,0%	41,7%	41,7%	8,3%	0,0%
Algeria	5,5%	0,6%	0,0%	0,0%	0,0%	4,1%	0,0%	0,0%	0,0%
Angola	0,0%	22,1%	0,0%	0,0%	0,0%	0,0%	0,0%	0,0%	0,0%
Antarctica	0,0%	0,0%	0,0%	0,0%	0,0%	0,0%	0,0%	0,0%	0,0%
Argentina	28,5%	5,5%	28,5%	4,7%	1,7%	0,0%	5,7%	0,0%	0,0%
Armenia	7,7%	0,0%	0,0%	0,0%	0,0%	0,0%	0,0%	76,9%	0,0%
Australia	7,4%	28,2%	6,3%	4,7%	0,0%	1,4%	2,1%	0,0%	0,0%
Austria	0,0%	0,0%	0,0%	48,7%	0,0%	0,0%	0,0%	28,2%	20,5%
Azerbaijan	44,4%	0,0%	24,4%	2,2%	0,0%	11,1%	0,0%	13,3%	0,0%
Bangladesh	0,0%	0,0%	0,0%	0,0%	0,0%	0,0%	0,0%	0,0%	0,0%
Belarus	0,0%	0,0%	0,0%	4,4%	0,0%	0,0%	0,0%	95,6%	0,0%
Belgium	0,0%	0,0%	0,0%	100,0%	0,0%	0,0%	0,0%	0,0%	0,0%
Belize	0,0%	0,0%	0,0%	0,0%	0,0%	0,0%	0,0%	0,0%	0,0%
Benin	0,0%	7,7%	0,0%	0,0%	0,0%	0,0%	0,0%	0,0%	0,0%
Bhutan	0,0%	0,0%	0,0%	0,0%	0,0%	0,0%	0,0%	0,0%	0,0%
Bolivia	13,1%	3,0%	0,3%	1,6%	0,0%	0,0%	0,0%	0,0%	0,0%
Bosnia & Herzegovina	0,0%	0,0%	4,5%	95,5%	0,0%	0,0%	0,0%	0,0%	0,0%
Botswana	0,0%	67,5%	0,0%	0,0%	0,0%	0,0%	0,0%	0,0%	0,0%
Brazil	0,0%	5,6%	8,4%	0,9%	0,0%	0,0%	0,0%	0,0%	0,0%
Brunei	0,0%	0,0%	0,0%	0,0%	0,0%	0,0%	0,0%	0,0%	0,0%
Bulgaria	0,0%	0,0%	51,1%	42,6%	0,0%	0,0%	0,0%	6,4%	0,0%
Burkina Faso	0,0%	60,5%	0,0%	0,0%	0,0%	0,0%	0,0%	0,0%	0,0%
Burundi	0,0%	0,0%	0,0%	0,0%	0,0%	0,0%	0,0%	0,0%	0,0%
Cambodia	0,0%	0,0%	0,0%	0,0%	0,0%	0,0%	0,0%	0,0%	0,0%
Cameroon	0,0%	6,8%	0,0%	0,0%	0,0%	0,0%	0,0%	0,0%	0,0%
Canada	0,8%	0,0%	0,0%	0,6%	0,1%	0,0%	0,1%	12,8%	43,9%
Central African Rep.	0,0%	7,4%	0,0%	0,0%	0,0%	0,0%	0,0%	0,0%	0,0%
Chad	0,0%	19,6%	0,0%	0,0%	0,0%	0,0%	0,0%	0,0%	0,0%
Chile	2,6%	0,0%	0,0%	11,8%	18,3%	0,0%	17,3%	0,0%	0,0%
China	10,1%	0,0%	11,9%	0,2%	0,0%	0,0%	0,0%	0,4%	0,6%
Colombia	0,0%	0,0%	0,0%	8,3%	0,0%	0,0%	0,3%	0,0%	0,0%
Comoros	0,0%	0,0%	0,0%	0,0%	0,0%	0,0%	0,0%	0,0%	0,0%
Congo	0,0%	0,0%	0,0%	0,0%	0,0%	0,0%	0,0%	0,0%	0,0%
Congo, DRC	0,0%	0,0%	0,0%	0,7%	0,0%	0,0%	0,0%	0,0%	0,0%
Costa Rica	0,0%	0,0%	0,0%	6,7%	0,0%	0,0%	0,0%	0,0%	0,0%
Cote d'Ivoire	0,0%	0,0%	0,0%	0,0%	0,0%	0,0%	0,0%	0,0%	0,0%
Croatia	0,0%	0,0%	3,6%	85,7%	0,0%	3,6%	7,1%	0,0%	0,0%
Cuba	0,0%	0,0%	0,0%	0,0%	0,0%	0,0%	0,0%	0,0%	0,0%

CNTRY_NAME	BSk	BSh	Cfa	Cfb	Cfc	Csa	Csb	Dfb	Dfc
Cyprus	0,0%	25,0%	0,0%	0,0%	0,0%	75,0%	0,0%	0,0%	0,0%
Czech Republic	0,0%	0,0%	0,0%	92,5%	0,0%	0,0%	0,0%	7,5%	0,0%
Denmark	0,0%	0,0%	0,0%	100,0%	0,0%	0,0%	0,0%	0,0%	0,0%
Djibouti	0,0%	0,0%	0,0%	0,0%	0,0%	0,0%	0,0%	0,0%	0,0%
Dominican Republic	0,0%	0,0%	0,0%	12,5%	0,0%	0,0%	0,0%	0,0%	0,0%
Ecuador	0,0%	3,6%	0,0%	26,5%	0,0%	0,0%	1,2%	0,0%	0,0%
Egypt	0,0%	0,3%	0,0%	0,0%	0,0%	0,0%	0,0%	0,0%	0,0%
El Salvador	0,0%	0,0%	0,0%	0,0%	0,0%	0,0%	0,0%	0,0%	0,0%
Equatorial Guinea	0,0%	0,0%	0,0%	0,0%	0,0%	0,0%	0,0%	0,0%	0,0%
Eritrea	0,0%	37,5%	0,0%	0,0%	0,0%	0,0%	0,0%	0,0%	0,0%
Estonia	0,0%	0,0%	0,0%	3,7%	0,0%	0,0%	0,0%	96,3%	0,0%
Ethiopia	0,0%	17,1%	0,0%	6,0%	0,0%	0,0%	0,3%	0,0%	0,0%
Falkland Is.	0,0%	0,0%	0,0%	0,0%	25,0%	0,0%	0,0%	0,0%	0,0%
Faroe Is.	0,0%	0,0%	0,0%	0,0%	100,0%	0,0%	0,0%	0,0%	0,0%
Fiji	0,0%	0,0%	0,0%	0,0%	0,0%	0,0%	0,0%	0,0%	0,0%
Finland	0,0%	0,0%	0,0%	0,0%	0,0%	0,0%	0,0%	6,8%	92,8%
France	0,0%	0,0%	0,4%	90,1%	0,8%	4,3%	3,2%	0,0%	1,2%
French Guiana	0,0%	0,0%	0,0%	0,0%	0,0%	0,0%	0,0%	0,0%	0,0%
Gabon	0,0%	0,0%	0,0%	0,0%	0,0%	0,0%	0,0%	0,0%	0,0%
Georgia	0,0%	0,0%	24,1%	13,8%	0,0%	0,0%	0,0%	55,2%	3,4%
Germany	0,0%	0,0%	0,0%	100,0%	0,0%	0,0%	0,0%	0,0%	0,0%
Ghana	0,0%	0,0%	0,0%	0,0%	0,0%	0,0%	0,0%	0,0%	0,0%
Greece	0,0%	0,0%	2,0%	3,9%	0,0%	72,5%	21,6%	0,0%	0,0%
Greenland	0,0%	0,0%	0,0%	0,0%	0,0%	0,0%	0,0%	0,0%	0,0%
Guadeloupe	0,0%	0,0%	0,0%	0,0%	0,0%	0,0%	0,0%	0,0%	0,0%
Guatemala	0,0%	0,0%	0,0%	12,8%	0,0%	0,0%	0,0%	0,0%	0,0%
Guinea	0,0%	0,0%	0,0%	0,0%	0,0%	0,0%	0,0%	0,0%	0,0%
Guinea-Bissau	0,0%	0,0%	0,0%	0,0%	0,0%	0,0%	0,0%	0,0%	0,0%
Guyana	0,0%	0,0%	0,0%	0,0%	0,0%	0,0%	0,0%	0,0%	0,0%
Haiti	0,0%	0,0%	0,0%	0,0%	0,0%	0,0%	0,0%	0,0%	0,0%
Honduras	0,0%	0,0%	2,8%	0,0%	0,0%	0,0%	0,0%	0,0%	0,0%
Hungary	0,0%	0,0%	0,0%	100,0%	0,0%	0,0%	0,0%	0,0%	0,0%
Iceland	0,0%	0,0%	0,0%	0,0%	8,3%	0,0%	0,0%	0,0%	0,0%
India	0,1%	22,0%	0,1%	0,6%	0,0%	6,9%	0,0%	0,4%	1,2%
Indonesia	0,0%	0,0%	0,0%	0,2%	0,0%	0,0%	0,0%	0,0%	0,0%
Iran	21,2%	8,9%	1,0%	0,0%	0,0%	17,2%	0,0%	0,0%	0,0%
Iraq	0,0%	19,9%	0,0%	0,0%	0,0%	9,9%	0,0%	0,0%	0,0%
Ireland	0,0%	0,0%	0,0%	100,0%	0,0%	0,0%	0,0%	0,0%	0,0%
Israel	0,0%	28,6%	0,0%	0,0%	0,0%	28,6%	0,0%	0,0%	0,0%

EPPO Secretariat's approach for commodity studies

CNTRY_NAME	Bsk	BSh	Cfa	Cfb	Cfc	Csa	Csb	Dfb	Dfc
Italy	0,0%	0,0%	24,8%	26,4%	0,0%	34,1%	4,7%	0,8%	4,7%
Jamaica	0,0%	0,0%	0,0%	0,0%	0,0%	0,0%	0,0%	0,0%	0,0%
Japan	0,0%	0,0%	57,9%	2,0%	0,0%	0,0%	0,0%	36,2%	2,0%
Jordan	8,6%	2,9%	0,0%	0,0%	0,0%	2,9%	0,0%	0,0%	0,0%
Kazakhstan	37,9%	0,0%	0,0%	0,0%	0,0%	0,8%	0,0%	25,5%	1,7%
Kenya	0,0%	37,4%	0,0%	9,6%	0,0%	0,0%	1,1%	0,0%	0,0%
Kuwait	0,0%	0,0%	0,0%	0,0%	0,0%	0,0%	0,0%	0,0%	0,0%
Kyrgyzstan	15,3%	0,0%	0,0%	0,0%	0,0%	0,0%	0,0%	11,8%	25,9%
Laos	0,0%	0,0%	0,0%	0,0%	0,0%	0,0%	0,0%	0,0%	0,0%
Latvia	0,0%	0,0%	0,0%	11,4%	0,0%	0,0%	0,0%	88,6%	0,0%
Lebanon	0,0%	0,0%	0,0%	0,0%	0,0%	75,0%	25,0%	0,0%	0,0%
Lesotho	0,0%	0,0%	0,0%	58,3%	0,0%	0,0%	0,0%	0,0%	0,0%
Liberia	0,0%	0,0%	0,0%	0,0%	0,0%	0,0%	0,0%	0,0%	0,0%
Libya	0,0%	4,9%	0,0%	0,0%	0,0%	1,2%	0,0%	0,0%	0,0%
Lithuania	0,0%	0,0%	0,0%	2,6%	0,0%	0,0%	0,0%	97,4%	0,0%
Luxembourg	0,0%	0,0%	0,0%	100,0%	0,0%	0,0%	0,0%	0,0%	0,0%
Macedonia	0,0%	0,0%	18,2%	63,6%	0,0%	0,0%	9,1%	9,1%	0,0%
Madagascar	0,0%	13,1%	8,0%	5,5%	0,0%	0,0%	0,0%	0,0%	0,0%
Malawi	0,0%	0,0%	0,0%	0,0%	0,0%	0,0%	0,0%	0,0%	0,0%
Malaysia	0,0%	0,0%	0,0%	0,0%	0,0%	0,0%	0,0%	0,0%	0,0%
Mali	0,0%	17,1%	0,0%	0,0%	0,0%	0,0%	0,0%	0,0%	0,0%
Malta	0,0%	0,0%	0,0%	0,0%	0,0%	100,0%	0,0%	0,0%	0,0%
Mauritania	0,0%	0,3%	0,0%	0,0%	0,0%	0,0%	0,0%	0,0%	0,0%
Mexico	12,8%	23,6%	1,7%	1,4%	0,0%	5,4%	3,3%	0,0%	0,0%
Moldova	0,0%	0,0%	0,0%	100,0%	0,0%	0,0%	0,0%	0,0%	0,0%
Mongolia	32,8%	0,0%	0,0%	0,0%	0,0%	0,0%	0,0%	0,0%	0,0%
Morocco	19,2%	9,0%	0,0%	0,0%	0,0%	34,6%	0,0%	0,0%	0,0%
Mozambique	0,0%	23,6%	0,0%	0,0%	0,0%	0,0%	0,0%	0,0%	0,0%
Myanmar	0,0%	5,6%	0,0%	0,4%	0,0%	0,0%	0,0%	0,0%	0,0%
Namibia	0,7%	33,1%	0,0%	0,0%	0,0%	0,0%	0,0%	0,0%	0,0%
Nepal	0,0%	0,0%	0,0%	0,0%	0,0%	0,0%	0,0%	0,0%	0,0%
Netherlands	0,0%	0,0%	0,0%	100,0%	0,0%	0,0%	0,0%	0,0%	0,0%
New Caledonia	0,0%	0,0%	0,0%	0,0%	0,0%	0,0%	0,0%	0,0%	0,0%
New Zealand	0,0%	0,0%	0,0%	86,7%	12,5%	0,0%	0,0%	0,0%	0,0%
Nicaragua	0,0%	0,0%	0,0%	0,0%	0,0%	0,0%	0,0%	0,0%	0,0%
Niger	0,0%	5,0%	0,0%	0,0%	0,0%	0,0%	0,0%	0,0%	0,0%
Nigeria	0,0%	21,1%	0,0%	0,0%	0,0%	0,0%	0,0%	0,0%	0,0%
North Korea	0,0%	0,0%	0,0%	0,0%	0,0%	0,0%	0,0%	4,2%	0,0%
Norway	0,0%	0,0%	0,0%	6,2%	6,2%	0,0%	0,0%	2,9%	72,0%
Oman	0,0%	0,0%	0,0%	0,0%	0,0%	0,0%	0,0%	0,0%	0,0%
Pakistan	7,4%	12,6%	3,1%	0,6%	0,0%	0,9%	0,6%	2,2%	3,4%

CNTRY_NAME	Bsk	BSh	Cfa	Cfb	Cfc	Csa	Csb	Dfb	Dfc
Panama	0,0%	0,0%	0,0%	0,0%	0,0%	0,0%	0,0%	0,0%	0,0%
Papua New Guinea	0,0%	0,0%	0,0%	0,0%	0,0%	0,0%	0,0%	0,0%	0,0%
Paraguay	0,0%	16,9%	38,7%	0,0%	0,0%	0,0%	0,0%	0,0%	0,0%
Peru	1,6%	1,9%	0,0%	7,7%	0,0%	0,0%	0,0%	0,0%	0,0%
Philippines	0,0%	0,0%	0,0%	0,0%	0,0%	0,0%	0,0%	0,0%	0,0%
Poland	0,0%	0,0%	0,0%	87,7%	0,0%	0,0%	0,0%	12,3%	0,0%
Portugal	0,0%	0,0%	0,0%	0,0%	0,0%	69,2%	30,8%	0,0%	0,0%
Puerto Rico	0,0%	0,0%	0,0%	0,0%	0,0%	0,0%	0,0%	0,0%	0,0%
Qatar	0,0%	0,0%	0,0%	0,0%	0,0%	0,0%	0,0%	0,0%	0,0%
Romania	0,0%	0,0%	23,2%	33,9%	0,0%	0,0%	0,0%	40,2%	2,7%
Russia	0,7%	0,0%	0,5%	0,1%	0,0%	0,0%	0,0%	14,3%	46,8%
Rwanda	0,0%	0,0%	0,0%	10,0%	0,0%	0,0%	0,0%	0,0%	0,0%
Sao Tome & Principe	0,0%	0,0%	0,0%	0,0%	0,0%	0,0%	0,0%	0,0%	0,0%
Saudi Arabia	0,0%	0,0%	0,0%	0,0%	0,0%	0,0%	0,0%	0,0%	0,0%
Senegal	0,0%	54,4%	0,0%	0,0%	0,0%	0,0%	0,0%	0,0%	0,0%
Serbia & Montenegro	0,0%	0,0%	16,3%	72,1%	0,0%	2,3%	0,0%	9,3%	0,0%
Sierra Leone	0,0%	0,0%	0,0%	0,0%	0,0%	0,0%	0,0%	0,0%	0,0%
Slovakia	0,0%	0,0%	0,0%	46,2%	0,0%	0,0%	0,0%	50,0%	3,8%
Slovenia	0,0%	0,0%	0,0%	88,9%	0,0%	0,0%	0,0%	0,0%	11,1%
Solomon Is.	0,0%	0,0%	0,0%	0,0%	0,0%	0,0%	0,0%	0,0%	0,0%
Somalia	0,0%	37,3%	0,0%	0,0%	0,0%	0,0%	0,0%	0,0%	0,0%
South Africa	22,0%	19,8%	4,2%	8,2%	0,0%	0,7%	1,8%	0,0%	0,0%
South Georgia & the South Sandwich Is.	0,0%	0,0%	0,0%	0,0%	0,0%	0,0%	0,0%	0,0%	0,0%
South Korea	0,0%	0,0%	14,3%	0,0%	0,0%	0,0%	0,0%	4,8%	0,0%
Spain	13,0%	0,0%	2,3%	22,7%	0,0%	41,7%	20,4%	0,0%	0,0%
Sri Lanka	0,0%	0,0%	0,0%	0,0%	0,0%	0,0%	0,0%	0,0%	0,0%
Sudan	0,0%	26,7%	0,0%	0,0%	0,0%	0,0%	0,0%	0,0%	0,0%
Suriname	0,0%	0,0%	0,0%	0,0%	0,0%	0,0%	0,0%	0,0%	0,0%
Svalbard	0,0%	0,0%	0,0%	0,0%	0,0%	0,0%	0,0%	0,0%	0,0%
Swaziland	0,0%	40,0%	0,0%	0,0%	0,0%	0,0%	0,0%	0,0%	0,0%
Sweden	0,0%	0,0%	0,0%	14,7%	0,0%	0,0%	0,0%	12,2%	67,9%
Switzerland	0,0%	0,0%	0,0%	50,0%	5,6%	0,0%	0,0%	0,0%	11,1%
Syria	17,8%	17,8%	0,0%	0,0%	0,0%	21,9%	1,4%	0,0%	0,0%
Tajikistan	15,3%	0,0%	0,0%	0,0%	0,0%	5,1%	0,0%	0,0%	0,0%
Tanzania	0,0%	10,3%	0,0%	1,0%	0,0%	0,0%	0,0%	0,0%	0,0%
Thailand	0,0%	0,0%	0,0%	0,0%	0,0%	0,0%	0,0%	0,0%	0,0%
The Bahamas	0,0%	0,0%	0,0%	0,0%	0,0%	0,0%	0,0%	0,0%	0,0%
The Gambia	0,0%	33,3%	0,0%	0,0%	0,0%	0,0%	0,0%	0,0%	0,0%
Timor Leste	0,0%	0,0%	0,0%	0,0%	0,0%	0,0%	0,0%	0,0%	0,0%
Togo	0,0%	0,0%	0,0%	0,0%	0,0%	0,0%	0,0%	0,0%	0,0%

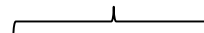
CNTRY_NAME	BSk	BSh	Cfa	Cfb	Cfc	Csa	Csb	Dfb	Dfc
Trinidad & Tobago	0,0%	0,0%	0,0%	0,0%	0,0%	0,0%	0,0%	0,0%	0,0%
Tunisia	15,3%	15,3%	0,0%	0,0%	0,0%	11,9%	0,0%	0,0%	0,0%
Turkey	3,7%	0,0%	0,9%	9,0%	0,0%	36,5%	24,5%	4,6%	0,0%
Turkmenistan	25,5%	0,0%	0,0%	0,0%	0,0%	1,5%	0,0%	0,0%	0,0%
Uganda	0,0%	3,8%	0,0%	2,6%	0,0%	0,0%	0,0%	0,0%	0,0%
Ukraine	0,0%	0,0%	7,4%	12,8%	0,0%	0,0%	0,0%	77,7%	0,3%
United Arab Emirates	0,0%	0,0%	0,0%	0,0%	0,0%	0,0%	0,0%	0,0%	0,0%
United Kingdom	0,0%	0,0%	0,0%	90,3%	9,7%	0,0%	0,0%	0,0%	0,0%
United States	15,4%	1,0%	21,7%	2,2%	0,5%	1,1%	4,6%	15,4%	12,6%
Uruguay	0,0%	0,0%	94,3%	5,7%	0,0%	0,0%	0,0%	0,0%	0,0%

CNTRY_NAME	BSk	BSh	Cfa	Cfb	Cfc	Csa	Csb	Dfb	Dfc
Uzbekistan	17,2%	0,0%	0,0%	0,0%	0,0%	14,0%	0,5%	0,0%	0,0%
Vanuatu	0,0%	0,0%	0,0%	0,0%	0,0%	0,0%	0,0%	0,0%	0,0%
Venezuela	0,0%	2,0%	0,0%	0,7%	0,0%	0,0%	0,0%	0,0%	0,0%
Vietnam	0,0%	0,0%	0,0%	0,0%	0,0%	0,0%	0,0%	0,0%	0,0%
West Bank	0,0%	0,0%	0,0%	0,0%	0,0%	100,0%	0,0%	0,0%	0,0%
Western Sahara	0,0%	0,0%	0,0%	0,0%	0,0%	0,0%	0,0%	0,0%	0,0%
Yemen	4,5%	5,8%	0,0%	0,0%	0,0%	0,0%	0,0%	0,0%	0,0%
Zambia	0,0%	12,0%	0,0%	0,0%	0,0%	0,0%	0,0%	0,0%	0,0%
Zimbabwe	0,0%	59,6%	0,0%	0,0%	0,0%	0,0%	0,0%	0,0%	0,0%

Appendix 5. Example of structure for Step 2 List (examples adapted from the EPPO Tomato study)

The Step 2 List is directly adapted from the Step 1 List, with a few added columns (including a conclusion and comments). The order of columns is changed depending on convenience.

Specific to the commodity and expected outcome



Species	Type	Taxonomy	Reference	Fruit pathway	Other pathways	Hosts	Location of the life stages	Other information	Distribution	Present in 3 EPPO countries	A	S	N	E	Af	N	C	A	C	A	S	A	E	O	Status for EU	EPPO Lists	Step 1	A	B	C	D	E	F	G	Conc.	Kind of damage	EPPO code	S	
Epilachna vigintioctopunctata	I	Coleoptera : Coccinellidae	Biosecurity NZ, 2000 and 1998; NBAII, 2013; Naz et al., 2012	Fruit if green parts attached	plants for planting, vegetables	CABI CPC (potato, tomato, eggplant, beans, loofah); eggplant, potato, tobacco, tomato, and other solanaceous plants (NBAII India); Solanum melongena, S. nigrum, S. surretanses, Datura, tomato Lycopersicum esculantum and Physalis sp. (Naz et al., 2012)	eggs, larvae, pupae on leaves, adults may be on fruit	regulated pest for tomatoes from Tonga and from Australia (Biosecurity NZ, 1998, 2000) Major pest of eggplant (NBAII, 2013) Serious pest (Naz et al., 2012)	Asia: Bangladesh, Bhutan, China, India, Indonesia, Japan, Korea, Rep., Laos, Malaysia, Myanmar, Nepal, Pakistan, Singapore, Sri Lanka, Taiwan, Thailand, Vietnam, Sth America: Brazil, Oceania: Australia, Fiji, Fr. Polynesia, New Caledonia, Niue, Samoa, Solomon Isl., Tonga, Vanuatu		1										1		1				Yes	A2	B1	C2	11	E1	FU	GU	1 Maybe more serious on eggplant than on tomato	Feeds on leaves	EPILVG	Hilvona	
Aspisoma ignitum	I	Coleoptera : Lampyridae	CABI CPC, Anon. 1996; Santiago-Blay & Medina-Gaud, 1986 citing others			okra, tomato (CABI CPC)	Possibly none.	Adults fly at night. It seems that all fireflies' larvae are predatory (Anon. 1996), and it is therefore not likely that the pest is associated with consignments of tomato. CABI CPC is the only reference found that refers to this species as a pest	Caribbean: Antigua & Barbuda, Montserrat, St Kitts & Nevis (CABI CPC); Cent. America, Cuba, Nth America: Mexico, Hispaniola, Lesser Antilles, Sth America: Venezuela, Colombia, Brazil, Porto Rico (Santiago-Blay & Medina-Gaud, 1986 citing others)							1	1	1	1							A4									NO2,4 Predatory. Not likely to be associated with tomato fruit				

**Appendix 6. Pests on Dropsa Alert Lists:
Combination of criteria ratings and sub-ratings**

on Alert List	Overall ratings retained
Top category	<ul style="list-style-type: none">• A1t/A2t + E1 + any other
Others	<ul style="list-style-type: none">• A1/A2 + E1 + any other• A1t/A2t + E2+ (F1 or G1 or Cn)• A1t + E2 + any other• A1t/A2t + E3v+ (F1 or G1 or Cn)• A1t/A2t + EU+ (F1 or G1 or Cn)• A1t/A2t + EUv+ (F1 or G1 or Cn)• Handpicked from any other overall categories

Appendix 7 - Scoring system developed to select pests for PRA in the framework of EPPO studies: illustration of ratings for tomato fruits and plants for planting of *Quercus* spp.

Elements in PM 5/3 and general comment	Basic ratings (all commodities)	Illustration for tomato fruit	Illustration for plants for planting of <i>Quercus</i> [test]
ENTRY			
Association with the pathway at origin			
Taking into account the biology of the pest (2.03)			
<p><i>Occurrence of suitable life stages.</i> All pests at this stage of a commodity study should have one or several life stages potentially associated to the commodity at origin. This influences several elements, linked to association (2.03), detection (2.09) and intended use (2.10). They are all grouped here as they all relate to the biology of the pest.</p> <p>If the commodity is not homogenous, i.e. the plant parts composing the commodity may vary (e.g. green parts or not for some 'fruit' commodities, bark or not for the commodity 'roundwood'), the different components of the commodity should be noted.</p> <p>The rating table can usefully summarize, for each pest, the different life stages present on different components of the commodity.</p> <p>For mobile life stages, the likelihood that they may be associated to the commodity should be considered. For example, a less mobile adult or flying adult feeding on fruit may be considered associated to fruit, whereas adults likely to fly when disturbed (e.g. fruit flies) are not.</p> <p>The elements below should be rated.</p>		<p><u>Components of the commodity:</u> always the fruit itself. In some cases also green parts, intended here to cover calyx, stem and leaves.</p> <p><u>Codes in the rating table:</u> G = green parts; F = fruit itself; I = inside (life stages not marked with 'I' are outside/at the surface) E = egg; L = larvae (or nymph for Hemiptera); A = adult</p>	<p><u>Components of the commodity:</u> always the plant itself, i.e. stems, roots, branches, incl. wood and bark. In some cases leaves, soil.</p>
<p>- <u>life stages associated to the commodity</u></p> <p>If all life stages for which information is available are associated to the commodity, this may favour the pest. This covers all the possible components of the commodity (e.g. for tomato fruit, fruit itself and green parts).</p> <p>For insects, the location of pupae may often not be known from basic information available, and the rating may be</p>	<p>[0 or 1]</p> <p>+1: All life stages for which information is available associated to the commodity (i.e. for insects, late life stages, but also others)</p>	<p>[0 or 1] Score A in table 2</p> <p>+1: All life stages for which information is available associated to fruit (either fruit itself or green parts)</p>	<p>[0 or 1]</p> <p>+1: All life stages for which information is available associated to the pfp (either on its own, or if accompanied with leaves or soil)</p>

Elements in PM 5/3 and general comment	Basic ratings (all commodities)	Illustration for tomato fruit	Illustration for plants for planting of <i>Quercus</i> [test]
<p>based only on egg, larvae (or nymphs for Hemiptera) and adults.</p> <p>- <u>association to part of plants that are always present in the commodity</u> If the commodity is not homogenous, i.e. the plant parts may vary, a rating may give more importance to pests associated to the part that is always present in the commodity (e.g. fruit itself, wood itself). also taking account of the life stages that more likely to eventually complete their development and transfer to suitable hosts. These life stages should be determined in advance. This is not relevant for commodities that are likely to be homogenous for all origins, e.g. grain of wheat.</p>	<p>[0, 1 or 3] The different parts of the commodity should have been identified above. <u>Rating:</u> + 3 life stages more likely to eventually complete their development and transfer to suitable hosts are associated to the plant parts that are always present in the commodity (e.g. fruit itself, wood itself) OR + 1 such life stages are associated only to other parts</p>	<p>[0, 1 or 3] Score B in table 2 Plant parts identified above. Only insects. Larvae and nymphs (Hemiptera) are more likely to eventually complete their development and transfer to hosts. <u>Rating:</u> + 3 larvae/nymphs (Hemiptera) associated to the fruit itself OR +1 larvae/nymphs (Hemiptera) associated only to green parts</p>	<p>[0, 1 or 3] Plant parts identified above. May be insects, bacteria, fungi, nematodes <u>Rating:</u> +3 larvae/nymphs adults/nematode late stages/fungus/bacterium/virus associated to the wood, bark or roots OR + 1 same stages, associated only to leaves or soil.</p>
<p>- <u>life stages inside/outside components of the commodity.</u> The relevant life stages should be rated depending on whether they are present inside/on the various components of the commodity. The presence inside components of the commodity favours survival in transport (2.07) and complicates detection (2.09), while the different life stages influence the ease for the pest to complete its life cycle and transfer to a host (i.e. late stages > eggs). The components of the commodity to be considered when rating are those defined above. The ratings should be adjusted to each group of pests and, for each group, consider whether a different rating is needed for late life stages and early life stages.</p>	<p>[0 to 5] Relevant early and late stages (if appropriate) are rated separately and then added: <u>For insects:</u> <i>Rating for late life stages</i> +3 late life stages inside the main components of the commodity OR + 2 late life stages inside other components of the commodity <i>Rating for early life stages</i> +2 early life stages inside the main components of the commodity OR</p>	<p>[0 to 5] Score C in table 2 Components of the commodity as above. No other plant part to be distinguished in relation to difficulties of detection. Only insects were selected. <i>Rating for late life stages: larvae/nymphs/adults</i> + 3 inside fruit itself OR + 2 inside green parts <i>Rating for early life stages: eggs</i> +2 inside fruit itself OR + 1 inside green parts</p>	<p>[0 to 5] Components of the commodity as above. In addition, bark and rootballs are difficult to inspect, and it may be appropriate to give a rating to pests present on those. <u>For insects</u> <i>Rating of late life stages: larvae/nymphs/adults</i> + 3 inside wood (incl. bark) OR + 2 inside leaves or soil (possibly also if on bark or rootball) <i>Rating of early life stages: eggs</i></p>

Elements in PM 5/3 and general comment	Basic ratings (all commodities)	Illustration for tomato fruit	Illustration for plants for planting of <i>Quercus</i> [test]
	+ 1 early life stages inside other components of the commodity (all others: 0) This needs to be adapted to other pest groups.		+ 2 inside wood (incl. bark) OR + 1 inside leaves or soil (possibly also if on bark or rootball) Stages relevant to other pest groups need to be determined and ratings adapted
- <u>ease of detection of the life stages</u> . This relates to detection (2.09). The more difficult it is to detect the pest, the higher the rating. However, a rating based on the size of life stages would go beyond the data available for most pests. A rating by family would work only for some (as size is variable in others). The simple rating here aims to discriminate pests whose more mature stages are 'very small' (e.g. in the order of below 3 mm) or 'very big' (e.g. in the order of above 3 cm). For insects, eggs are generally small, so considering eggs would not discriminate between pests (even if egg groups may be detectable in some cases). What is considered 'big', 'small' and in-between is left to the discretion of assessors, as well as other important elements for individual pests (e.g. colour, presence of large/conspicuous symptoms) (for example, a pest that has small life stages but produces large leaf mines may be rated lower). It could generally be considered that fungi, bacteria, viruses, nematodes, acari, Aleyrodidae, Thripidae, Tephritidae, Cecidomyiidae are small, while certain Coleoptera or Noctuidae are very big (several centimeters)	[+1, 0 or -1] +1 stages are very small (e.g. below 3 mm); - 1 several big (e.g. over 3 cm) conspicuous life stages 0 all other cases	[+1, 0 or -1] Score D in table 2 Applicable as such +1, 0 or -1	[+1, 0 or -1] Applicable as such +1, 0 or -1
- <u>consideration of biology in relation to the intended use (details are under 2.10)</u> This considers life stages that associated with parts of the commodity that will be discarded before use, and that are most likely to leave the discarded material, or complete their	No general rating. To be adapted to the commodity. Consider in particular: +1 Life stages as described associated with parts of the	[0 to 1] Score E in table 2 Tomato fruits will be processed or consumed. Green parts will be discarded.	Not relevant, except if soil associated to plants for planting may be removed, replaced and discarded

Elements in PM 5/3 and general comment	Basic ratings (all commodities)	Illustration for tomato fruit	Illustration for plants for planting of <i>Quercus</i> [test]
development and leave (i.e. for insects, mobile nymphs or adults, larvae).	commodity that will be discarded before use	+1 larvae/nymphs/adults associated to green parts	
<p><i>Volume of movement (2.05), frequency of movement (2.06)</i></p> <p>These were not used as such (also they proved to not be discriminative between pests in the tomato study). However, pests that occur in several broad geographical regions (in particular continents) may multiply opportunities that trade occurs with the EPPO region, also as different EPPO countries may have favoured trade relationships with different continents.</p> <p>The relevant regions should be defined. For a worldwide study, the relevant regions could be: Asia, Africa, Oceania, North America, and the group South America/Central America/Caribbean.</p>	<p>[0 to 1]</p> <p>+1: Several broad geographical regions</p>	<p>[0 to 1] Score F in table 2</p> <p>Applicable as such (Asia, Africa, Oceania, North America, and the group South America/Central America/Caribbean).</p> <p>[Note: the PPM had previously proposed that presence in Asia could be criteria for tomato fruit. This is not part of the rating system, but could be considered in the final selection of pests.]</p>	<p>Applicable as such</p>
Survival during transport, storage			
<p><i>Indicators of survival in transport and storage (2.07)</i></p> <ul style="list-style-type: none"> - detection on the pathway (interceptions) indicates that survival is possible - known introductions to new areas also indicate survival. <p>Pest with special mobility (even if they have not spread through trade) may also be rated (e.g. long-distance migration)</p>	<p>[0 to 2]</p> <p>+2 known interceptions or known introduction to new areas</p> <p>OR</p> <p>+1 known long-distance natural spread (e.g. migration)</p>	<p>[0 to 2] Score G in table 2</p> <p>Applicable as such</p>	<p>Applicable as such</p>
Surviving existing management procedures			
<p><i>Detection during current inspection procedures (2.09).</i> The location of the pest (i.e. whether the life stages are hidden or not) and ease of detection of life stages (size) are covered under 2.03.</p>	-	-	-
Transfer to a suitable host or habitat (2.10)			
<p><u>Innate dispersal mechanisms, need for vector.</u></p> <p>Pests that can more easily than others leave the commodity on their own may be rated higher. This may be useful for commodity studies retaining other pests than flying insects (i.e. unlike for tomato fruit). The following may be</p>	[0 to 2]	Not relevant.	[0 to 2]

Elements in PM 5/3 and general comment	Basic ratings (all commodities)	Illustration for tomato fruit	Illustration for plants for planting of <i>Quercus</i> [test]
<p>considered as helping the pest leave the commodity on its own:</p> <ul style="list-style-type: none"> - if it is able to move on its own (fly, run, airborne spores/life stages, versus crawling, sessile, etc.). - if it needs a vector, and a vector is present in the EPPO region or there is a possibility that it is imported at the same time. If the commodity is plants for planting (including seeds), a vector is more likely to come into contact with the pest, and rating should be higher <p>The usefulness of this element should be considered on a commodity basis, considering the pests retained, the nature of the commodity, storage period etc. (e.g. 'crawling' pests may be mobile enough to leave a commodity which is stored for a long time).</p> <p><u>Arriving at suitable time of the year for establishment</u> This could apply to commodities that may be imported at a specific season not favouring establishment of pests if its hosts are not at a suitable stage (e.g. winter).. Pests that have other hosts (at a suitable stage throughout the year) may however be able to find a suitable host</p>	<p>+2 pest able to move on its own (fly, run, airborne spores) OR +1 if the pest needs a vector, and this vector is present in the EPPO region or can be imported at the same time (+2 for plants for planting)</p> <p>In addition, depending on the commodity, consider modifying the 'mobility' rating above as follows:</p> <ul style="list-style-type: none"> - suitable hosts always present: maintain full rating - suitable hosts sometimes present: modify to half rating 	<p>Not relevant. All the pests retained fly, all are assumed to be able to come close to a host, and none need a vector. This is not discriminative and was not used. However, pests with specific movement capacity (migratory) were given a point (see 2.07)</p> <p>Not applicable to tomato, which is assumed in the EPPO region to be available all year round and for which the mobility is not rated (see above).</p>	<p>May be useful</p> <p>Applicable as defined</p>
<p><u>Intended use of the commodity (processing, consumption, disposal of waste, by-products)</u> Some intended uses are associated with a higher probability of introduction (e.g. planting) than others (e.g. processing). However this may not be discriminative between pests (e.g. for plants for planting, commodity imported for immediate processing without storage). In some cases, the intended use allows to discriminate between pests located on different parts of the commodity if part of the commodity will be discarded. For example:</p> <ul style="list-style-type: none"> - for processing, but part is known to be discarded before use (e.g. green parts of fruits, shell of nuts, peel of tubers or 	<p>No general rating. To be adapted to the commodity. Details to be added to 2.03</p>	<p>-</p>	

Elements in PM 5/3 and general comment	Basic ratings (all commodities)	Illustration for tomato fruit	Illustration for plants for planting of <i>Quercus</i> [test]
vegetables: mobile pests associated to this part may be favoured). - specific use of the whole commodity (e.g. Christmas trees, possibly stored outdoors before decoration and later discarded in gardens/nature: needle pests may be exposed to dessication while wood borers may have a better possibility to survive and complete their life cycle) This relates to the biology of the pest and is considered under 2.03			
Other pathways of interest This focuses on the possibility that the pest may be associated to other commodities in trade, which are not heavily regulated (e.g., for the EPPO region, not plants for planting, soil, potato tubers). This has to be decided for each commodity individually. In order to obtain a discriminatory effect between pests, several commodities/groups of commodities may need to be rated separately.	[suggest 3 maximum] To be adjusted to the commodity +1 for other pathways for other species in the same family +0,5 or 1 for each type of interesting other “less regulated” pathways	[0 to 3] Score H in table 2 +1 for other Solanaceae pathways + 1 for other less regulated fruit (i.e. not Citrus) + 1 for cut flowers, leaf vegetables and herbs	[0 to 3] +1 for other Fagaceae pathways +1 other plants for planting of other trees, particle wood +1: wood logs of important tree species
ESTABLISHMENT			
<i>Distribution of hosts plants and suitable habitats (3.09).</i> One important element related to hosts is whether the pest has important host plants in the area considered. This is covered under “impact”.	-	-	-
<i>Distribution of alternate hosts or other species critical to the pest's life cycle (3.09).</i> Pests that need a vector are covered under 2.10	-	-	-
<i>Climatic similarity (3.03).</i> All pests selected in commodity studies are expected to have some climatic similarity to some part of the area considered, although some will have higher climatic similarity than others. This element may be useful for some commodities. It is not considered relevant for crops that are cultivated both outdoors and indoors throughout the region (as suitable	[0 to 1] To be considered on a commodity basis. Proposal for outdoors crops: +2 high +1 medium	Not relevant. Tomato is cultivated indoors and outdoors.	Relevant, i.e. would be fair to rate lower the pests that come from origins that have lower climatic similarity.

Elements in PM 5/3 and general comment	Basic ratings (all commodities)	Illustration for tomato fruit	Illustration for plants for planting of <i>Quercus</i> [test]
conditions would occur throughout the region for most pests).			
<i>Pest highly adaptable</i> (3.18) (to environmental fluctuations, adapt to wider range of hosts, resistance to plant protection products /overcome host resistance). Pests for which there is evidence of such may receive a higher rating, as well as those presenting other important factors favouring establishment	[0 to 2] +2 has adapted to new hosts, has shown resistance to plant protection product, has overcome host resistance, or any other factors favouring establishment.	[0 to 2] Score I in table 2 Applicable as such.	[0 to 2] Applicable as such
<i>Pest established in new areas outside its original area of distribution</i> (3.19). Covered under 2.07	-	-	-
<i>Knowledge about eradication.</i> Pests for which eradication was attempted and failed receive a higher rating.	[0 to 2] +2: eradication failed.	[0 to 2] Score J in table 2 Applicable as such	[0 to 2] Applicable as such
SPREAD			
These cannot be rated at this stage based on the information available. Not used.			
IMPACT			
<i>Impact at origin and potential.</i> The potential impact is not easy to use as the impact at destination is mostly not known. However, three elements can be taken into account: - Pests for which a higher impact is reported at origin on the plant considered (based on the few sources consulted). Care should be taken with general statements of impact. - Pests which are known or potential vectors. If there is no specific data on whether the pest is or is not a vector, the group to which the pest belongs should be considered. Different ratings are given to known vectors of important pests and others. - Pests that have other important hosts in the area considered may have potential higher impact. Rating to be decided for each commodity study, depending on the hosts considered important. Hosts may be divided into several groups.	[for all together, 0 to 3or4] +2 if strong evidence of higher impact or known vector of important pests OR +1 pest is a potential vector No general rating, to be developed for each commodity, suggest 0-2 maximum (this is in addition to the previous rating)	[0 to 4] Score K in table 2 Applicable as such +2 Score L in table 2 +1 several main Solanaceae (among tomato, potato, <i>Capsicum</i> , <i>Solanum melongena</i>). OR +2 several Solanaceae and other important hosts, or many other important hosts	[0 to 4] Applicable as such +2 +1 other deciduous trees OR + 2 deciduous and coniferous species or other important hosts

Elements in PM 5/3 and general comment	Basic ratings (all commodities)	Illustration for tomato fruit	Illustration for plants for planting of <i>Quercus</i> [test]
For example, for the commodity “tamarillo fruit” (minor Solanaceae), it may be important to rate pests that attack other Solanaceae, and other major plants.			