[1] # INTEGRATED MEASURES FOR THE PRODUCTION OF PLANTS FOR PLANTING IN INTERNATIONAL TRADE

[2]

Date of this document	2012-01-09
Document category	Draft ISPM
Current document stage	2012-01 output from OSC, formatted for CPM-7 2012
Origin	ICPM-7 (2005) added topic 2005-002: Plants for planting (including movement, post-entry quarantine and certification programmes).
Major stages	SC 2006-05 approved specification 34 EWG 2006-09 drafted ISPM EWG 2007-02 revised draft ISPM SC-7 2008-05 revised draft ISPM via e-mail consultation based on SC-7 recommendation EWG 2008-12 revised draft ISPM SC 2010-04 approved draft ISPM to go for MC 2010-06 member consultation SC-7 2011-05 revised draft ISPM 2011-11 SC revised in meeting 2012-01
Notes	File template: IPPCStyles_2011-08-11. Formatted for SC 2011-11 (OCS formatting). 2011-11 Edited. 2012-01 formatted for CPM7 based on OCS report.

[3] ## INTRODUCTION

[4] ### Scope

[5] This standard outlines the main criteria for the identification and application of integrated measures at the place of production for the production of plants for planting (excluding seeds) for international trade. It provides guidance to help identify and manage pest risks associated with plants for planting as a pathway.

[6] ### References

[7] **ISPM 2.** 2007. *Framework for pest risk analysis*. Rome, IPPC, FAO.

ISPM 5. *Glossary of phytosanitary terms*. Rome, IPPC, FAO.

ISPM 11. 2004. *Pest risk analysis for quarantine pests including analysis of environmental risks and living modified organisms*. Rome, IPPC, FAO.

ISPM 12. 2001. *Guidelines for phytosanitary certificates*. Rome, IPPC, FAO.

ISPM 13. 2001. *Guidelines for the notification of non-compliance and emergency action*. Rome, IPPC, FAO.

ISPM 17. 2002. *Pest reporting.* Rome, IPPC, FAO.

ISPM 20. 2004. *Guidelines for a phytosanitary import regulatory system*. Rome, IPPC, FAO.

ISPM 21. 2004. *Pest risk analysis for regulated non-quarantine pests*. Rome, IPPC, FAO.

ISPM 24. 2005. *Guidelines for the determination and recognition of equivalence of phytosanitary measures*. Rome, IPPC, FAO.

ISPM 32. 2009. *Categorization of commodities according to their pest risk*. Rome, IPPC, FAO.

[8] ### Definitions

[9] Definitions of phytosanitary terms used in the present standard can be found in ISPM 5 (*Glossary of phytosanitary terms*).

[10] ### Outline of requirements

[11] Plants for plantings are generally considered to pose a higher pest risk than other regulated articles. For many plants for planting integrated measures may be necessary to manage pest risks. Integrated measures may be used to manage

the pest risks that plants for planting pose as a pathway for regulated pests and to ensure they meet phytosanitary import requirements. The use of integrated measures involves national plant protection organizations (NPPOs) as well as producers[1], and relies on pest risk management measures applied throughout the production and distribution processes.

[12] Integrated measures may be developed and implemented where specifically required by the NPPO of an importing country, or where the NPPO of the exporting country deems such measures to be effective to meet phytosanitary import requirements. General integrated measures may include requirements such as keeping a plan of the place of production, examination of plants, keeping records, treating pests and sanitation. Where the risk identified justifies the use of additional integrated measures, additional elements such as a place of production manual including a pest management programme, appropriate training for personnel, specific packing and transportation requirements, and internal and external audits may be required.

[13] The NPPO of the exporting country should provide adequate information to the NPPO of the importing country to support the pest risk assessment, approve and oversee places of production using integrated measures, and inspect plants and issue phytosanitary certificates that attest to the consignment as meeting the phytosanitary requirements of the importing country. The NPPO of the importing country should clearly communicate its phytosanitary import requirements.

[14] **BACKGROUND**

[15] Several ISPMs provide general guidance on pest risk management (e.g. ISPM 2:2007, ISPM 11:2004, ISPM 21:2004, ISPM 32:2009). The conclusions from pest risk analyses (PRAs) should be used to decide the appropriate measures to reduce the pest risk to an acceptable level for the importing country.

[16] Plants for planting are generally considered to pose a higher pest risk than other regulated articles and therefore additional specific guidance on pest risk management is needed to meet this higher pest risk.

[17] Integrated measures may be used at places of production to manage the risk of regulated pests, especially those that are difficult to detect based on import or export inspections because:

[18]

- some pests do not have distinct visual symptoms, particularly at low pest incidence
- symptoms of infestation may be latent or masked at the time of inspection (e.g. as a result of pesticide use, nutrient imbalances, dormancy of plants at time of dispatch, presence of other non-regulated pests or by removal of symptomatic leaves)
- the type of packaging, size and physical state of the consignment can influence the effectiveness of inspection
- alternative or supplementary detection methods for many plant pests, particularly pathogens, may not be available.

[19] Using integrated measures for pest risk management may provide an alternative to import prohibition or post-entry quarantine to meet the phytosanitary import requirements. The application of integrated measures for pest risk management requires not only the participation of the NPPO of the exporting country but also the participation of producers throughout all the stages of production of the plants for planting.

[20] Integrated measures are designed to manage pest risks from regulated pests, and also have the advantage of managing other pests at the place of production.

[21] It is expected that the standard will contribute to the protection of biodiversity and the environment by setting up integrated measures that will contribute to minimizing international spreading of pests.

[22] **REQUIREMENTS**

[23] **1. Basis for regulation**

[24] The importing country may establish and shall communicate its technically justified phytosanitary import requirements for plants for planting (refer to ISPM 2:2007, ISPM 11:2004 and ISPM 21:2004). Annex 1 outlines factors to be taken into account when the NPPO of the importing country conducts a PRA for plants for planting.

[25] The NPPO of the exporting country should develop and set up measures that meet the phytosanitary import requirements. Integrated measures may be developed and set up in two different cases as follows:

[26]

- The importing country, in its phytosanitary import requirements, specifies integrated measures to be used in

the exporting country.

- The importing country does not explicitly require integrated measures to be used, but the NPPO of the exporting country deems that using integrated measures would be a suitable and effective means of achieving the importing country's phytosanitary import requirements and, therefore, decides to specify integrated measures to be applied by producers wishing to export plants for planting to that particular importing country.

[27] If in the latter case the NPPO of the exporting country deems that "integrated measures" that they have put in place are equivalent to phytosanitary import requirements of an importing country, the exporting country should seek formal approval of equivalence of these measures with the importing country (ISPM 24:2005).

[28] A producer wishing to participate in using integrated measures, in order to qualify to export plants for planting to particular countries, should seek approval from its NPPO. Subsequently, the NPPO of the exporting country may approve producers conforming to requirements for integrated measures set up by that NPPO.

[29] **2. Integrated Measures**

[30] This standard describes two main levels of integrated measures. Section 2.1 (General integrated measures) describes a set of integrated measures that are widely applicable to all plants for planting. Section 2.2 (Additional integrated measures in higher pest risk situations) describes additional elements designed to manage pest risks in higher pest risk situations. It may not be necessary to require all these elements. Furthermore, for certain production systems not all elements may be applicable (e.g. physical barriers for field grown plants). Therefore, only some of the elements described in section 2.2 may be appropriate. NPPOs may consider these options in addition to pre-export or port of entry inspections in order to manage pest risks.

[31] **2.1 General integrated measures**

[32] The NPPO of the exporting country may approve a place of production that complies with requirements on general integrated measures that are applicable to all types of plants for planting and types of pests.

[33] **2.1.1 Approval of places of production**

[34] The following conditions should form part of the approval process for producers seeking to use the general integrated measures:

[35]

- maintaining an updated plan of the place of production as well as records of when, where and how plants for planting were produced, treated, stored or prepared for movement from the place of production (including information on all plant species at the place of production and the type of plant material such as cuttings, *in vitro* cultures, bare root plants)
- keeping records for three years (or longer, if justified) that verify where and how plants for planting were purchased, stored, produced, distributed and any other relevant information on their plant health status
- access to a plant protection specialist with a well-established working knowledge of pest identification and control
- designating a person as a contact person for the NPPO of the exporting country.

[36] **2.1.2 Requirements for the place of production**

[37] The following may be adequate to meet the phytosanitary import requirements:

[38]

- conducting visual examinations of plants and places of production by designated personnel as necessary, at appropriate times and according to information and protocols provided by the NPPO of the exporting country
- keeping records of all examinations, including a description of pests found and corrective actions taken
- taking specific measures where necessary (e.g. to keep the plants free from pests regulated in the country of destination) and documenting these measures
- notifying the NPPO of the exporting country if any pests regulated in the country of destination are observed
- establishing and documenting a system of sanitation and hygiene.

[39] Table 1 in Appendix 1 provides specific options for pest management measures related to pest group characteristics that are applicable for most types of plants for planting at places of production.

[40] Table 2 in Appendix 1 provides examples of possible pest management measures that NPPOs may require for

different types of plants for planting and different types or groups of pests associated with them. The examples describe frequently used measures for important pest types of the relevant type of plants for planting.

[41] **2.2 Additional integrated measures in higher pest risk situations**

[42] Where general integrated measures alone are not sufficient to manage the pest risk, the NPPO of the exporting country may approve a place of production that complies with the requirements for additional integrated measures in higher pest risk situations.

[43] **2.2.1 Requirements for the place of production in higher pest risk situations**

[44] Producers applying for approval to use additional integrated measures for higher pest risk situations should develop a place of production manual that includes a pest management programme and relevant information on production practices and operational systems. The NPPO of the exporting country may approve the place of production to export plants to a particular destination when it has determined the integrated measures used meet the phytosanitary import requirements of that country of destination.

[45] The following sections provide the elements to be documented and implemented by the producer and audited by the NPPO of the exporting country.

[46] **2.2.1.1 Place of production manual**

[47] The place of production manual should describe all of the requirements, elements, processes and operational systems that make up the integrated measures for pest risk management of the plants for planting. The manual should be developed, implemented and maintained by the producer and approved by the NPPO of the exporting country[2]. The manual or parts thereof should be specific to particular plant species or destinations. If the manual is amended, it should be approved by the NPPO of the exporting country.

[48] The place of production manual may include the following elements:

[49]

- a description of the organizational structure and of the responsibilities of the relevant personnel, including names of the person designated as responsible for the technical performance of the place of production and the plant protection specialist (see section 2.2.1.3) (either of these personnel may serve as the contact point between the NPPO and the producer, and should notify the NPPO of the exporting country upon detection of pests regulated in the country of destination)
- a plan and description of the place of production, which is kept up to date and which records when, where and how the various species and types of plants for planting are produced, treated, stored or prepared for movement from the place of production (including information on plant species, source of plant material and type of plant material such as cuttings, *in vitro* cultures, bare root plants)
- a pest management programme (see section 2.2.1.2)
- a description of dispatch and receiving locations within the place of production
- handling procedures for incoming plant material, including procedures to ensure segregation of incoming plant material from material already on site
- a description of subcontracted activities and the process for approval
- a description of documentation procedures to maintain evidence of the source and origin of propagation material
- a description of how internal audits will be conducted, including the frequency and who is responsible
- procedures for recall of plants when non-conformity is detected, if appropriate
- procedures for visitors.

[50] **2.2.1.2 Pest management programme**

[51] The pest management programme, included in the place of production manual, should describe procedures or processes approved by the NPPO of the exporting country and designed to either prevent infestations or control pests. It should include a description of the phytosanitary import requirements of the importing countries for each plant species and type of plant material. Table 2 in Appendix 1 provides examples of possible measures that NPPOs may require for different types of plants for planting and different types or groups of pests associated with them.

[52] The pest management programme should include the following elements:

[53]

- sanitation and hygiene – contributing to preventing the introduction of pests to the place of production and minimizing spread within a place of production, for example:
    - regular removal of infested plants and plant debris

- disinfection of tools and equipment
- removal of weeds and non-crop plant material
- treatment of water
- management of surface water
- personal hygiene (e.g. hand washing, foot baths, coveralls or aprons)
- limited access
- routines for use of packaging material and packaging facilities

- pest control – products, procedures and measures (see Appendix 1) to prevent or treat pests such as:
  - physical barriers (e.g. screens, double doors)
  - disinfection of growing media and containers used to grow plants
  - crop protection product applications (e.g. chemical, biological)
  - disposal of infested plants
  - mass trapping of both pests of concern and possible vectors
  - climate control
  - hot water or heat treatment

- handling of incoming plant material – methods and documentation for managing pest risks associated with incoming plant material, with descriptions of:
  - measures to ensure that all plants for planting entering the place of production are free of pests regulated by the importing countries, possible pest vectors and practically free of other pests, and that the risk of introducing and transmitting plant pests is mitigated
  - procedures to be followed if pests are detected
  - records to be kept, including the date, the name of the person carrying out the examination, any pests, damage or symptoms found, and any corrective actions taken

- examination of plant material (see section 2.2.1.5) and production sites – methods, frequency and intensity used to examine all plant material in the place of production (e.g. by visual examination, sampling, testing and trapping), including details of any laboratories used to identify pests found and methods used

- examination of plants for planting prior to export – methods, frequency and intensity used to examine plants when exports are being prepared

- identification and management of infested product, with descriptions of:
  - how an infested plant will be identified and treated
  - measures to ensure that non-compliant plants are not exported
  - disposal of removed plant material in a manner that prevents buildup and spread of pests

- keeping records of the application of crop protection products and other pest management measures.

[54] **2.2.1.3 Plant protection specialist**

[55] Producers implementing additional integrated measures in higher pest risk situations should have access to a specialist with a well-established working knowledge of pest identification and control in order to ensure that sanitation, pest monitoring and pest control measures are implemented, as described in the place of production manual. The plant protection specialist may serve as the contact person with diagnosticians who may be needed for pest identification.

[56] **2.2.1.4 Training of personnel**

[57] Personnel should be trained to detect pests, especially those regulated by the importing country, and to follow a formal reporting system to communicate information on pest findings. Training should also include methods to handle material to reduce pest risk.

[58] **2.2.1.5 Examination of plant material**

[59] All plant material produced in a place of production (including plants destined for domestic markets and other production sites) should be examined for the presence of pests on a regular schedule by designated personnel according to established methods and corrective action applied as necessary.

[60] **2.2.1.6 Packaging and transportation**

[61] The following considerations apply to packaging and transport operations:

[62]

- Plant material should be packed in a manner to prevent infestation by regulated pests.
- Packaging material should be clean, free of pests and meet the phytosanitary import requirements.
- Conveyances used to move plant material from the place of production should be examined and cleaned as necessary prior to loading.
- Each lot of a consignment should be identified in a way that can be traced back to the place of production.

[63] **2.2.1.7 Internal audits**

[64] Internal audits should be conducted to ensure that the producer is in compliance with its place of production manual. Internal audits should focus on whether the manual and its implementation meet the requirements of the NPPOs of the exporting and importing countries. For example, the internal audit may evaluate the competency of place of production personnel in identifying and controlling pests, carrying out duties and responsibilities and whether the record keeping of the producer is adequate to keep track of the origin of plant material, labels, etc.

[65] Internal audits should be carried out by personnel who are independent of the people directly responsible for the audited activity. The results of the audits and any non-conformities (see section 2.3 and Appendix 2) should be recorded and presented to the producer for review. Corrective action regarding any non-conformities discovered should be implemented promptly and effectively and documented.

[66] If the audit identifies any critical non-conformities (see section 2.3), the producer should immediately notify the NPPO of the exporting country in writing and ensure that non-conforming plants for planting are not exported. Immediate corrective actions should be taken under the supervision of the NPPO of the exporting country.

[67] **2.2.1.8 Records**

[68] Up-to-date records should be maintained and made available to the NPPO. The place of production manual should clearly identify individuals responsible for maintaining various records, and the location and manner in which such records are maintained. Records should be maintained for three years (or longer, if justified). Records should include date, name and signature of the person who carried out the task or prepared the document. Examples of records that may be required include:

[69]

- invoices, phytosanitary certificates and other information that substantiate the origin and the phytosanitary status of incoming plant material
- results of the inspection of incoming plant material
- results of audits
- records of examination during production including any pests, damage or symptoms detected and corrective actions taken
- records of pest management measures taken to prevent or control pests (including method of application, product applied, dosage and date of application)
- records of examination of outgoing plant material, including type, quantity of material exported and country exported to
- copies of phytosanitary certificates for plant material exported by the producer
- records of non-conformities identified and the corrective or preventative actions taken
- records of personnel responsible for applying pest management measures
- records of personnel training and their qualifications
- copies of the forms used for internal audit reports and checklists
- records necessary to maintain forward and backward traceability of plants for planting from the place of production.

[70] **2.3 Non-conformity with requirements for the place of production**

[71] A non-conformity is any failure of products or procedures to adhere to the integrated measures set up by the NPPO of the exporting country.

[72] The NPPO of the exporting country should distinguish between two types of non-conformities as follows, taking into account the severity of the non-conformity:

[73]
- Critical non-conformities are incidents that compromise the efficacy of the integrated measures utilized at the place of production or increase the risk of infestation of the plants for planting.
- Non-critical non-conformities are incidents that do not immediately compromise the integrated measures or increase the risk of infestation of the plants for planting at the place of production.

[74] Non-conformities can be detected during internal audits, external audits conducted or administered by the NPPO of the exporting country, or as a result of examinations of plant material.

[75] The place of production (or relevant parts thereof) should have its approval withdrawn and exports should be immediately suspended if the NPPO of the exporting country:

[76]
- finds a critical non-conformity
- repeatedly identifies non-critical non-conformities
- identifies multiple non-critical non-conformities
- finds that the producer fails to carry out the required corrective actions within the specified time period.

[77] Reinstatement should occur only once corrective action has been put into place and an audit by the NPPO of the exporting country has confirmed that the non-conformities have been corrected.

[78] The corrective actions may require a change to the integrated measures and should include measures to prevent recurrence of the failures identified.

[79] The NPPO of the exporting country should inform the NPPO of the importing country of any suspension and reinstatement.

[80] A list of examples of non-conformities can be found in Appendix 2.

[81] **3. Responsibilities of the NPPO of the Exporting Country**

[82] The NPPO of the exporting country is responsible for:

[83]
- communicating import country requirements to producers
- developing and setting up the integrated measures
- approving places of production seeking participation in using integrated measures
- overseeing approved places of production
- ensuring that all plants for planting exported by approved places of production meet the phytosanitary import requirements
- carrying out export inspections and issuing phytosanitary certificates for consignments from approved places of production
- providing information on integrated measures developed to the NPPO of the importing country upon request
- granting and facilitating, where justified, visits and audits carried out by the NPPO of the importing country in accordance with section 4.1
- providing adequate information on relevant pest outbreaks to the NPPO of the importing country in accordance with ISPM 17:2002.

[84] **3.1 Setting up integrated measures**

[85] In developing and setting up its integrated measures, the NPPO of the exporting country should specify the requirements to be met by a producer based on the pest risk factors described in Annex 1 and the requirements of the importing country or countries. Furthermore, the documentation and communication requirements for the producer should be specified.

[86] **3.2 Approval of places of production**

[87] Requirements for the approval of places of production that comply with the general integrated measures are described in section 2.1.1.

[88] The requirements for approval of places of production seeking to use additional integrated measures for higher pest risk situations are described in section 2.2.1 and should be based upon:

[89]

- a review of the place of production manual and an initial documentation audit at the place of production to verify that it is complying with the requirements established according to the pest risk factors of its production
- an implementation audit to verify that:
  - the producer complies with the protocols, procedures and standards specified in their place of production manual
  - the required supporting documentation is sufficient, current and readily available to personnel
  - adequate records and documents are maintained
  - internal audits are performed and corrective actions completed
  - procedures in place are adequate to ensure that any pest problems are quickly identified and appropriate actions are taken to ensure that only plants that meet the phytosanitary import requirements of the importing country are exported
  - either plant material within the place of production has remained free of all quarantine pests or the NPPO was duly informed about infestations of quarantine pests and appropriate measures were taken to ensure that the pest has been eradicated
- the establishment of procedures to meet tolerance levels for regulated non-quarantine pests as required.

[90] Upon successful completion of the documentation and implementation audit, the place of production may be approved by the NPPO of the exporting country to export specific plants for planting to specific countries.

[91] **3.3 Oversight of approved places of production**

[92] After authorization, the NPPO of the exporting country should oversee the place of production, in particular through monitoring or auditing of the production and operational system. The frequency and timing of monitoring or auditing should be determined according to the pest risks, phytosanitary import requirements and on the producer's record of conformity. Monitoring or auditing should include inspection and where applicable, testing of plants for planting, and verification of the documentation and management practices as they relate to the relevant integrated measures.

[93] **3.4 Export inspections and issuance of phytosanitary certificates**

[94] The integrated pest risk management measures may reduce the need for growing season inspections and, may also reduce the frequency or intensity of export inspections of consignments of plants for planting. A phytosanitary certificate should be issued, and an additional declaration may be added that refers to the application of this ISPM. This additional declaration should be in compliance with ISPM 12:2011.

[95] **3.5 Providing information**

[96] The NPPO of the exporting country should provide information on the integrated measures being used to the NPPO of the importing country if required.

[97] **4. Responsibilities of the NPPO of the Importing Country**

[98] The NPPO of the importing country is responsible for setting and communicating technically justified phytosanitary import requirements. In doing so, the NPPO of the importing country should, before import, consider the factors that affect pest risks specifically associated with plants for planting (refer to Annex 1). The phytosanitary import requirements should be consistent with the identified pest risks.

[99] Plants for planting produced using integrated measures may not require intensive import inspection of every consignment. The NPPO of the importing country may decide to only monitor imported plants for planting produced using integrated measures, including testing samples for the presence of regulated pests and verifying that agreed procedures are followed.

[100] The NPPO of the importing country should notify the NPPO of the exporting country of any non-compliances (see ISPM 13:2001).

[101] The NPPO of the importing country may also review the system of approval of places of production presented by the NPPO of the exporting country and, where appropriate, conduct audits. The NPPO of the importing country should provide feedback on the results of the reviews, monitoring and audits to the NPPO of the exporting country, as well as any findings of non-compliance that are found upon import or at a later date in the country of destination.

[102] **4.1 Auditing**

[103] The NPPO of the importing country may request the NPPO of the exporting country to provide reports on audits undertaken by the producer and by the NPPO of the exporting country. It may also request to audit the integrated measures as developed and set up by the exporting country. This audit may consist of documentation review, inspection and testing of plants produced using integrated measures, and, where appropriate, site visits as a demonstration of the integrated measures used (see ISPM 20:2004) or provided that there is specific justification, for example in cases of non-compliance (ISPM 13:2001).

[104] This annex is a prescriptive part of this standard.

[105] ANNEX 1: Factors that affect the pest risk of plants for planting

[106] **Pest-related factors that affect pest risk**

[107] Pest-related factors that should be taken into consideration include:

[108]
1. whether the pest occurs in the exporting country
2. type of pest (arthropod, fungus, virus, bacterium etc.)
3. potential for establishment and spread
4. potential economic impact
5. capacity of the pest to survive and multiply during transport and storage
6. reproduction rate and number of generations per year
7. mode of transmission (e.g. vector, graft transmission, mechanical transmission)
8. ability to detect the pest or, where relevant, its vector, even at low pest incidence
9. conditions required for symptom expression
10. host range of the pest
11. presence of host plants in the country of import
12. pest seasonality
13. latency of infection
14. availability of control measures
15. feasibility of eradication or containment.

[109] **Plant-related factors that affect risk**

[110] The initial plant-related pest risk factors to be considered are plant species, cultivar and area of origin. Within any given plant species, there is a range of pest risk associated with the type of plant material moved including, as broadly ranked below from lowest to highest pest risk (recognizing that these rankings may vary depending on specific circumstances):

[111]
1. meristem tissue culture
2. *in vitro* culture
3. budwood/graftwood
4. unrooted cuttings
5. rooted cuttings
6. root fragments, root cuttings, rootlets or rhizomes
7. bulbs and tubers
8. bare root plants
9. rooted plants in pots.

[112] In addition, pest risk usually increases with plant age, as older plants have had longer exposure to potential pests. Pest risk also increases with size because larger plants have a larger surface area exposed to pests and may also be more difficult to inspect and treat. However, age and size are not always correlated (e.g. artificial dwarfing or pests associated with specific plant growth stages).

[113] **Production-related factors that affect pest risk**

[114] How plants for planting are produced can influence the level of pest risk. These factors may include:

[115]
1. growing media
2. irrigation method and water source
3. growing conditions.

[116] In general, use of soil as a growing medium is likely to pose a greater pest risk than a soil-free medium because soil is more likely to carry soil-borne pests (such as micro-organisms, arthropods, nematodes). Sterilization, pasteurization or other effective methods for treating of the growing medium prior to planting may manage some pest risk.

[117] The source and quality of irrigation water can affect pest risk. For certain pests spread by water, surface water may pose a greater pest risk than treated water. Likewise the method of irrigation may produce microclimates or

conditions favourable for pest development and spread (e.g. overhead rather than drip irrigation).

[118] Examples of growing conditions that may affect pest risk are listed below, broadly ranked from lowest to highest pest risk:

[119]
1. growth chamber
2. glasshouse
3. screen house
4. field grown in containers (pots, tubs etc.)
5. field grown
6. plants collected from the wild.

[120] Enclosures such as growth chambers, glasshouses and screen houses usually provide better control over plant material and better opportunity for pest exclusion than field-grown plants. Plants grown in containers with sterilized growing medium or grown on a membrane may afford some protection from soil-borne pests. Field-grown crops are generally subject to cultural and chemical pest control. Plants collected in the wild are unprotected from pests and potentially are of higher pest risk. Also aquatic plants produced with or without any substrate may carry specific risk for the transmission of pests. Production systems may not fit into one of the above categories and may comprise a combination of several growing conditions (e.g. wild collected plants being transplanted into containers for further growing in the field before export). Certification schemes require specific combinations of these factors and may provide specific safeguards.

[121] **Intended uses that affect pest risk**

[122] Plants for planting are classified in ISPM 32:2009 as a high pest risk commodity category. Different intended uses that affect the pest risk may include whether plants are grown as annuals or perennials, whether they are grown indoors or outdoors, whether they are grown in urban areas, field or nursery etc.

[123] **Other risks to be considered**

[124] NPPOs should take particular note of the risks associated with plants for planting to biodiversity and the environment (e.g. CITES).

[125] This appendix is for reference purposes only and is not a prescriptive part of this standard.

[126] **APPENDIX 1: Examples of pest management measures to reduce the pest risk of plants for planting at a place of production**

[127] **Table 1.** Examples of measures to reduce the pest risk of plants for planting at a place of production categorized by pest group (Pest groups may be overlapping, e.g. groups 1 and 3, and a variety of available measures may be required to adequately address pest risk.)

[128]

	Pest group	Available measures
1	Pests causing latent infections and those that are likely to be transmitted by plants for planting without signs or symptoms	• Derivation from mother plants that have been tested and found free from the relevant pest • Isolation from sources of infestation (e.g. buffer zone or geographical distance from other host plants, physical isolation using a glasshouse or polytunnel, isolation in time (e.g. growing season) from a source of infestation (temporal isolation)) • Testing of samples of the plants for freedom from pests • Production within a specified certification scheme or clean stock programme that controls the relevant pests • Use of indicator plants • Production of tissue cultures (including meristem tip cultures) which may eliminate pathogens.

2	Pests having stages and symptoms that are visible during the growing season	• Growing season inspection for freedom from pests or symptoms (e.g. at timed intervals, for example monthly for the three months before export or at different growth stages) • Growing season inspection of the mother plants • Inspection after harvest to meet a specified tolerance level for a pest (e.g. tolerance for bulb rots by fungi/bacteria) • Pesticide applications • Ensuring appropriate conditions for symptom expression • Production within a specified certification scheme or clean stock programme that controls the relevant pests.
3	Pests spread by contact	• Prevention of contact with sources of infestation (e.g. other plants) • Hygiene measures for handling pruning tools and equipment between different batches/lots • Planning of activities in the place of production to work with plants of higher health first • Use of dedicated clothing and equipment in isolated places (e.g. screen houses) • Pesticide applications • Isolation from sources of infestation (e.g. buffer zone or geographical distance from other host plants, physical isolation using a glasshouse or polytunnel, temporal isolation).
4	Pests transmitted by vectors	• Isolation from sources of infestation (e.g. buffer zone or geographical distance from other host plants, physical isolation using a glasshouse or polytunnel, temporal isolation) • Pre-planting soil testing for freedom from or to meet a tolerance for soil-borne pests or their vectors • Pesticide treatments for control of insect vectors of pests (e.g. aphids).
5	Pests spread by wind	• Isolation from sources of infestation (e.g. buffer zone or geographical distance from other host plants, physical isolation using a glasshouse or polytunnel) • Pesticide applications.
6	Pests spread by water	• Use of uncontaminated water sources, free of pests • Irrigation water to be disinfected or sterilized before use or reuse • Isolation from sources of infestation (e.g. buffer zone or geographical distance from other host plants, physical isolation using a glasshouse or polytunnel, temporal isolation).

7	Soil-borne pests able to colonize the plant	• Isolation from sources of infestation (e.g. buffer zone or geographical distance from other host plants, physical isolation using a glasshouse or polytunnel, growth of plants on raised benches, temporal isolation) • Derivation from mother plants that have been tested and found free from the relevant pest • Production within a specified certification scheme or clean stock programme • Testing of samples of the plants for freedom from pests • Pre-planting soil treatment or testing for freedom from pests such as fungi, nematodes, viruses transmissible by nematodes.
8	Soil-borne pests in growing medium attached to plants	• Growing medium to be sterilized before use • Use of inert growing media • Use of soil-less growing media • Isolation from sources of infestation, maintenance of plants in such a way that contact with soil is prevented (e.g. on raised benches) • Pesticide treatment (e.g. drench or fumigation) prior to export • Roots washed free from growing medium (and repotted in sterile growing medium in a sterile container).
9	Soil-borne pests in soil attached to plants	• Isolation from sources of infestation (e.g. buffer zone or geographical distance from other host plants, temporal isolation) • Pre-planting soil treatment or testing for freedom from pests (especially nematodes, fungi) • Pesticide treatment (fumigation) prior to export • Roots washed free from soil (and repotted in sterile growing medium).

[129] **Table 2**. Examples of measures to reduce the pest risk of plants for planting based on the type of plant material

[130]

Type of plant broadly ranked according to pests risk	**Examples of pest types**	**Available measures**
Meristem culture and *in vitro* culture	Viruses and virus-like diseases, bacteria, fungi, stem nematodes, mites and insects	• Derivation from mother plants that have been tested and found free from the relevant pest • Cultivation in sterile medium under sealed aseptic conditions • Testing of samples of the plants for freedom from pests.
Unrooted cuttings	Insects, viruses, bacteria, fungi and other pests	See groups 1 to 7 in Table 1 • Hot water treatment.
Budwood/graftwood	Bacteria and viruses, fungi, insects and other pests	See groups 1 to 7 in Table 1
Bulbs and tubers, root fragments, root cuttings, rootlets or rhizomes	Nematodes, viruses, bacteria, fungi, insects and other pests	See groups 1 to 7 Table 1 Hot water dipping to control nematodes.
Bare root plants	Nematodes and all other pests of the aerial plant part	See groups 1 to 7 in Table 1
Rooted cuttings	Nematodes, insects, viruses and bacteria and other pests	Measures depend *inter alia* on the pest risk of the growing medium used. See groups 1 to 7 in Table 1
Plants in growing media excluding soil	Nematodes and all other pests of the aerial plant part	See groups 1 to 9 in Table 1
Plants in soil	Nematodes and all other pests of the aerial plant part	See groups 1 to 9 in Table 1

[131] This appendix is for reference purposes only and is not a prescriptive part of this standard.

[132] **APPENDIX 2: Examples of non-conformity**

[133] Examples of non-conformity may include the following:

[134]

1. detection of quarantine pests or regulated non-quarantine pests (above set tolerance levels) of concern to the importing country on plants in or from the place of production
2. failure to undertake required laboratory tests or analyses or correctly follow procedures to identify pests
3. failure to carry out control measures at the place of production for regulated pests
4. failure to notify the NPPO of the exporting country of the presence of regulated pests at the place of production
5. export of ineligible plant taxa, plants from non-authorized origins, or plants not meeting phytosanitary import requirements
6. failure to correctly list the botanical names of all the plants on documents accompanying consignments
7. failure to keep consistent pest management records as required in the place of production manual and pest management programme
8. failure to keep consistent records of country of origin of plant material
9. failure to undertake ordered corrective actions within the specified time period
10. failure to perform internal audits as required
11. operating without adequately trained personnel, designated responsible person or plant protection specialist
12. significant modification of the place of production manual or pest management practices without prior approval from the NPPO of the exporting country
13. failure to examine incoming or outgoing plant material
14. failure to keep plants for planting that have been examined for export separate from other plant material that has not been examined
15. failure to maintain an effective pest management programme
16. failure to maintain sanitation management practices at the place of production
17. failure to periodically provide personnel with relevant training
18. failure to maintain an up-to-date list and training records of all personnel involved in implementing the place of production manual
19. failure to consistently sign and date reports or records
20. failure to record relevant changes to the lists of plant taxa produced, their location in the place of production and the plant material to be exported
21. failure to detect and record low-level populations of pests
22. failure to inform the NPPO of the exporting country of any changes to management practices outlined in the place of production manual.

[135] [1] Producer hereinafter refers to a producer of plants for planting at the place of production.

[136] [2] A documented quality management system, where available, may also be presented to the NPPO for consideration.