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[26]CONTENTS [to be inserted]

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[29]INTRODUCTION

[30]Scope

[31]This standard describes the requirements for surveillance, including the components of a national surveillance system.

[32]References

[33]The present standard refers to International Standards for Phytosanitary Measures (ISPMs). ISPMs are available on the International Phytosanitary Portal (IPP) at <https://www.ippc.int/core-activities/standards-setting/ispm>.

[34]WTO (World Trade Organization). 1994. *Agreement on the application of sanitary and phytosanitary measures*. Geneva, WTO. Available at https://www.wto.org/english/tratop_e/sps_e/spsagr_e.htm.

[35]Definitions

[36]Definitions of phytosanitary terms used in this standard can be found in ISPM 5 (*Glossary of phytosanitary terms*).

[37]Outline of Requirements

[38]Surveillance is one of the core activities of national plant protection organizations (NPPOs). It provides NPPOs with a technical basis for many phytosanitary measures; for example, phytosanitary import requirements, pest free areas, pest reporting and eradication.

[39]National surveillance systems should comprise surveillance programmes and the capacity and infrastructure required to implement them. The methodology of surveillance should be described in surveillance protocols. When designing national surveillance systems, NPPOs should consider options relating to phytosanitary legislation and policies, prioritization, planning, resources, documentation, training, auditing, communication and stakeholder engagement, and pest diagnostics.

[40]In this standard, the components of national surveillance systems, relating to both general surveillance and specific surveillance, are described. Elements of specific surveillance are also described. The standard also provides guidance for information management systems as they are essential for the future use of the information collected within surveillance programmes.

[41]BACKGROUND

[42]Under ISPM 1 (*Phytosanitary principles for the protection of plants and the application of phytosanitary measures in international trade*) countries are required to justify their phytosanitary measures on the basis of pest risk analysis. The principles referred to in ISPM 1 endorse the concept of “pest free area”, a description of which is provided in ISPM 4 (*Requirements for the establishment of pest free areas*). This concept is also referred to in the World Trade Organization’s agreement on the application of sanitary and phytosanitary measures (WTO, 1994). Surveillance is an integral component in the establishment and maintenance of pest free areas, and is linked to many ISPMs; for example, ISPM 2 (*Framework for pest risk analysis*), ISPM 4 (*Requirements for the establishment of pest free areas*), ISPM 7 (*Phytosanitary certification system*), ISPM 8 (*Determination of pest status in an area*), ISPM 9 (*Guidelines for pest eradication programmes*), ISPM 10 (*Requirements for the establishment of pest free places of production and pest free production sites*), ISPM 11 (*Pest risk analysis for quarantine pests*), ISPM 14 (*The use of integrated measures in a systems approach for pest risk management*), ISPM 17 (*Pest reporting*), ISPM 19 (*Guidelines on lists of regulated pests*), ISPM 20 (*Guidelines for a phytosanitary import regulatory system*), ISPM 21 (*Pest risk analysis for regulated non-quarantine pests*), ISPM 22 (*Requirements for the establishment of areas of low pest prevalence*), ISPM 26 (*Establishment of pest free areas for fruit flies (Tephritidae)*), ISPM 29 (*Recognition of pest free areas and areas of low pest prevalence*), ISPM 30 (*Establishment of areas of low pest prevalence for fruit flies (Tephritidae)*) and ISPM 35 (*Systems approach for pest risk management of fruit flies (Tephritidae)*).

[43]Surveillance underpins the following activities:

- [44]the early detection of new pests
- [45]the compilation of host pest lists, commodity pest lists and pest distribution records (e.g. to support pest risk analysis and phytosanitary certification)
- [46]the declaration of pest free areas or areas of low pest prevalence
- [47]the determination of pest status
- [48]reporting to other countries
- [49]measuring changes in pest population size or pest prevalence (e.g. for research)
- [50]eradication and management
- [51]biodiversity research, management and reporting.

[52]IMPACTS ON BIODIVERSITY AND THE ENVIRONMENT

[53]This standard may contribute to the protection of biodiversity and the environment by helping countries develop systems to provide reliable and well-structured information on the presence or absence of pests in an area. These could include organisms relevant to biodiversity (invasive alien species), human health and animal health.

[54]REQUIREMENTS

[55]1. Components of National Surveillance Systems

[56]A national surveillance system is an integral part of a country's plant health strategy and may contribute to the facilitation of trade.

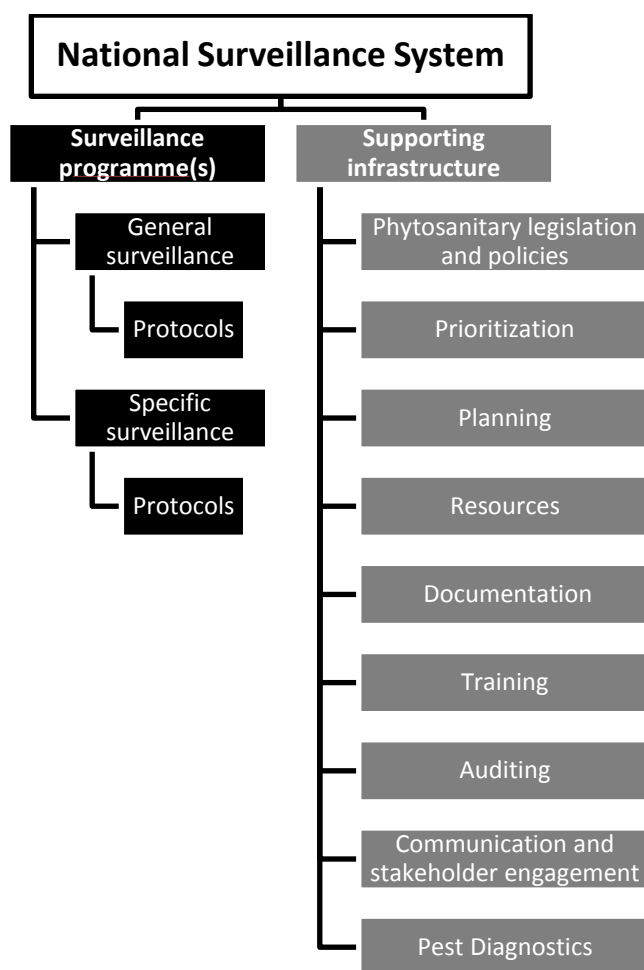
[57]A national surveillance system should comprise surveillance programmes (e.g. for fruit flies, wood-boring insects or fungi) and the capacity and infrastructure required to implement them (Figure 1).

[58]Each of the programmes may contain a number of elements such as:

- [59]general surveillance
- [60]specific surveillance (one or more)

[61]Surveillance protocols describe how to conduct general and specific surveillance.

[62]Sections 1.1 to 1.9 describe the elements of supporting infrastructure to be considered when NPPOs design national surveillance systems.



[63]

[64]**Figure 1.** National surveillance systems comprise surveillance programmes (general or specific) and supporting infrastructure.

[65]1.1 Phytosanitary legislation and policies

[66]National surveillance systems should be supported by phytosanitary legislation and policies that ensure authority, responsibilities and financial resources are assigned to the appropriate administrative level – national (e.g. NPPO), state, provincial or regional. Legislation may include third party authorization by the NPPO.

[67]Phytosanitary legislation should include appropriate provisions for:

- [68]entering premises and inspecting or collecting samples of plants, plant products or other articles that may be capable of harbouring pests
- [69]the continuous training of diagnostics personnel and the establishment and maintenance of facilities to ensure that pests are properly identified
- [70]the legal protection of NPPO officers or persons authorized by the NPPO who perform surveillance activities
- [71]mandatory domestic reporting (e.g. by research institutions, diagnostic laboratories, non-governmental organizations, industry, local government or scientific groups) to the NPPO on potential pests new or exotic to an area.

[72]Surveillance policies should cover responsibilities related to administration, finance and governance within the NPPO, including funding for surveillance activities, internal procedures for surveillance deliverables and the identification of milestones, and training and qualification of personnel.

[73]1.2 Prioritization

[74]Priorities for surveillance may vary from country to country depending on the needs for surveillance information.

[75]Elements to consider in prioritizing surveillance programmes may include:

- [76]existing bilateral, regional or international arrangements
- [77]implementation of pest management programmes where surveillance is used as an instrument (e.g. eradication)
- [78]emerging pests at the local, regional or international level
- [79]whether other more cost-effective alternatives to surveillance will achieve the phytosanitary objectives
- [80]the availability of the tools and methodologies required to implement a surveillance programme
- [81]the quality and reliability of the expected surveillance results, given the required resource expenditure
- [82]national lists of priority pests prepared using pest risk analysis ranking methods or similar analytical techniques
- [83]whether the pests affect biodiversity
- [84]trade and market access considerations.

[85]1.3 Planning

[86]Once priorities for surveillance have been established, NPPOs should develop plans for the implementation of surveillance programmes, taking into account phytosanitary legislation and policies.

[87]1.4 Resources

[88]Surveillance should be adequately resourced with appropriate human, financial and physical resources.

[89]Human resources may include staff in administration, operations, technical functions, management and logistics. Human resources management by NPPOs should consider staff qualification requirements, technical capabilities and training needs, as well as overall capacity development and succession planning.

[90]Financial resources may be required for surveillance logistics and staff travel, equipment purchase and maintenance, staff training, specimen processing and diagnosis, maintenance of an information management system, facility maintenance and emergency response expenses for unplanned surveillance activities.

[91]Physical resources may include field equipment, vehicles and consumables used for carrying out surveys, reference materials and other documentation, computers and other equipment for data input and storage, software for information management systems, staff uniforms, and materials for raising public awareness.

[92]Resources for diagnostics services are essential to a national surveillance system.

[93]1.5 Documentation

[94]NPPOs should develop administrative procedures (e.g. standard operating procedures for, among other things, engaging stakeholders and financial management) for maintaining official documentation, surveillance protocols (e.g. technical instructions) and reference materials. This documentation is essential for promoting consistency, improving reliability, and facilitating audit and verification of activities under a national surveillance system.

[95]1.6 Training

[96]Training, assessment and regular review of staff are integral components of a national surveillance system. NPPOs should develop and implement procedures to ensure the competencies of staff are maintained at appropriate levels.

[97]Personnel involved in surveillance should be adequately trained in plant protection and related fields (including relevant pest species, their biology and hosts, and their symptoms of infestation) and data management. Field staff should also be trained in sampling methods, preservation and transportation of samples for identification, and record keeping associated with samples.

[98]Training materials should be developed and updated in accordance with current surveillance practices to help ensure staff competencies are developed and maintained. Training materials, along with reference materials, should be readily available to all personnel of the NPPO.

[99]Training procedures and records may be used by NPPOs to demonstrate good governance practices to external stakeholders and promote system transparency.

[100]1.7 Auditing

[101]NPPOs should conduct regular audits of their general and specific surveillance to ensure that activities are carried out in accordance with relevant surveillance protocols. The scope and timing of audits should be included in the design of each surveillance programme.

[102]Aspects of the activity or the surveillance system that are identified during an audit as being deficient should be subjected to corrective actions in a timely manner.

[103]1.8 Communication and stakeholder engagement

[104]NPPOs are encouraged to engage with stakeholders on the design, planning, implementation and review of national surveillance systems, as well as on priorities for surveillance and on outcomes, using effective and timely communication. Arrangements may include:

- [105]communication internal to the NPPO (e.g. meetings, briefings, newsletters)
- [106]communication external to the NPPO (e.g. official reporting, industry notices)
- [107]formal stakeholder engagement (e.g. forums, newsletters, awareness raising and training initiatives)
- [108]formal and informal national surveillance networks that develop and implement surveillance programmes, and their channels to communicate information to and from the NPPO.

[109]1.9 Pest diagnostics

[110]Diagnostics services are fundamental to the success of a national surveillance system. NPPOs should ensure appropriate diagnostic services are available. Diagnostics references are available in ISPM 27 (*Diagnostic protocols for regulated pests*).

[111]Verification of diagnoses by recognized authorities other than the NPPO may be needed.

[112]2. Surveillance Design

[113]The methodology of surveillance should be described in surveillance protocols. The protocols should aim to achieve the purpose of the surveillance programme, which may include elements of general and specific surveillance.

[114]Surveillance protocols should provide clear instructions for carrying out a surveillance activity in a consistent manner that can be used by various operational staff at different locations and with different skill sets. Methods used in the surveillance protocol may be distinguished by, for example, the means in which data are collected, where the surveillance is carried out, or whether the methods are focused on the pest, host or pathway.

[115]Surveillance methods may be based on recognized guidelines or agreed by NPPOs. Surveillance managers and officers should be aware of current methodologies associated with specific groups of pests and should ensure that the methods are used appropriately to deliver reliable and defensible surveillance outcomes.

[116]NPPOs may need to develop new methods when faced with new or emerging pests. In all cases, surveillance methods should be based on relevant scientific and statistical information, and be operationally feasible.

[117]2.1 General surveillance

[118]Through general surveillance, NPPOs utilize various sources of pest information and pest distribution. These sources may include, among others, national or local government agencies, research institutions, universities, scientific societies (including those of amateur specialists), producers, consultants, museums, the general public, scientific and trade journals, unpublished data, and the websites of other NPPOs or international organizations (e.g. the IPPC, regional plant protection organizations, the Convention on Biological Diversity).

[119]2.1.1 Approaches to general surveillance

[120]NPPOs may use a range of approaches to general surveillance with varying degrees of involvement by the NPPO – from passive data acceptance to increasingly structured and targeted programmes run entirely by the NPPO. Examples of general surveillance approaches are listed below, starting with the most passive:

- [121]receipt of reports from the general public (i.e. initiated by the public)
- [122]scanning of sources of pest information
- [123]general encouragement of public reporting through official channels (e.g. via a free call phone number in response to publicity about plant health or the advantages of reporting pests)
- [124]targeted encouragement of public reporting on specific pests – this is useful where the target species is known and public awareness is already high (mobilization can be further increased through the use of public awareness materials) and during known periods of high propagule pressure (e.g. breeding seasons)
- [125]targeted encouragement of reporting by specific groups (e.g. producers, community groups) – this works well in situations where the crop is known but the pest of concern is unknown
- [126]targeted involvement of specific groups in plant health activities organized by the NPPO to obtain surveillance data (e.g. plant health clinics and agricultural extension activities).

[127]When developing approaches to general surveillance, NPPOs should take into account that at the passive end of the range:

- [128]costs and resource requirements are usually lowest
- [129]good results are more readily achieved for easily noticed pests (e.g. beetles and caterpillars with recognizable characteristics) or disease symptoms
- [130]detection of hidden pests (e.g. wood-boring beetles) is usually less effective

- [131]surveillance need not be restricted to a defined period of time, it can continue throughout the year
- [132]there is a higher likelihood than for more targeted approaches of unexpected species being reported
- [133]the percentage of reports of a significant pest is usually small.

[134]In general, moving through the range of approaches from passive to substantial involvement means increasing sensitivity and specificity, but this usually comes with increasing costs.

[135]2.1.2 Components of general surveillance

[136]The components of general surveillance are:

- (1) [137]incentives for reporting, which may include:
 - [138]legislative obligations (for the general public or specific agencies)
 - [139]cooperative agreements (between NPPOs and stakeholders)
 - [140]the use of contact personnel to enhance communication channels to and from NPPOs
 - [141]public education and awareness raising initiatives
- (2) [142]mechanisms for reporting, which may include:
 - [143]publicly accessible free call phone numbers
 - [144]free post systems for delivery of samples
 - [145]smartphone apps
 - [146]social media channels
- (3) [147]systems or processes to enhance the quality of reporting, which may include:
 - [148]a filtering process at the point of initial contact
 - [149]the ability to send and receive images for initial identification
 - [150]publicity material to allow submitters to self-filter (e.g. leaflets and websites with pest information and photos)
 - [151]training for submitters
- (4) [152]means to consolidate, analyse and report the information gathered, which may include:
 - [153]spatial modelling tools embedded in web-based systems (e.g. geographical information systems)
 - [154]mathematical and simulation models of data collected (e.g. Bayesian networks)
 - [155]integrated national, regional or global databases.

[156]NPPOs should recognize that general surveillance can effectively supplement specific surveillance. For example, general surveillance can provide the context for specific surveillance to accurately determine the pest status in an area or site.

[157]2.2 Specific surveillance

[158]Through specific surveillance, NPPOs actively gather pest distribution information in structured programmes. Specific surveillance includes surveys that are conducted over a defined period of time to determine the characteristics of a pest population or to determine which species are present in an area. Three types of specific surveys may be utilized by NPPOs depending on the objectives of the surveillance programme:

- [159]detection survey: conducted in an area to determine if pests are present
- [160]delimiting survey: conducted to establish the boundaries of an area considered to be infested by or free from a pest
- [161]monitoring survey: ongoing survey to verify the characteristics of a pest population.

[162]These surveys may be developed for pests, hosts, pathways or commodities.

[163]Elements that should be considered in the design of specific surveillance are described in a surveillance protocol, and are presented in sections 2.2.1 to 2.2.9.

[164]2.2.1 Purpose

[165]The purpose of the surveillance should include background on the phytosanitary objectives and the reasons the information is required (e.g. early detection, assurance for a pest free area, a commodity pest list, a market access issue).

[166]2.2.2 Scope

[167]The scope describes the extent of the area to be covered by the surveillance, both geographically and in terms of the production system (whole or parts).

[168]2.2.3 Target

[169]Related to the scope of the surveillance, the target of the surveillance should be described. The target may be a single or multiple pest, host, pathway or commodity, or a combination of any of these.

[170]2.2.4 Timing

[171]Timing includes the start and end dates of the survey and the frequency of visits by field staff. These may be determined by, for example, the life cycle of the pest, the phenology of the pest's hosts or the scheduling of pest management programmes.

[172]The timing of audits should also be described, if appropriate.

[173]2.2.5 Area or site selection

[174]Area or site selection may be determined by:

- [175]the previously reported presence and distribution of the pest
- [176]pathways for introduction and spread of the pest
- [177]the biology of the pest
- [178]the climatic suitability of the area for the pest
- [179]the geographical distribution of host plants and production areas
- [180]pest management programmes (at commercial and non-commercial sites)
- [181]the points of consolidation of the harvested commodity.

[182]2.2.6 Statistical design

[183]NPPOs should describe the population to be surveyed. It is useful to consider the population as a collection of similar units of concern. The population may be based on pest biology, pathway or an entity upon which phytosanitary measures may be applied. The population may be of various types, for example:

- [184]a geographical unit with a trapping grid placed over an area
- [185]a field planted with a host crop
- [186]individual host plants in an unmanaged area
- [187]a storage facility.

[188]It is often not feasible to survey an entire population. Therefore, NPPOs may decide to perform the surveillance on a sample taken from the population. The four most common sampling methods, which may be applied alone or in combination, are:

- [189]random sampling
- [190]systematic sampling
- [191]stratified sampling
- [192]targeted sampling.

[193]Statistical sampling methods as described in ISPM 31 (*Methodologies for sampling of consignments*) or other appropriate methods can be used. They are often used when the data captured

are of a binary nature (presence/absence). The data collected in monitoring surveys require a different form of statistical analysis and therefore it is recommended that expert advice is sought.

[194]NPPOs are encouraged to state for the survey the level of confidence and the minimum level of detection of the pest, which are statistically related to each other and to the size of the sample (see ISPM 31 for further information). If no pests are detected in the sample, the prevalence of the pest in the area is below the level of detection at the stated level of confidence.

[195]**2.2.7 Data collection**

[196]NPPOs should determine the data elements to be captured in the surveillance records (see section 3 for requirements for surveillance records) and how these data will be transferred to the information management system (e.g. by the use of forms and electronic devices).

[197]**2.2.8 Biosecurity and sanitation**

[198]When developing surveillance protocols NPPOs should consider procedures to ensure that spread of pests is not facilitated during a survey. Field staff should consider biosecurity procedures in place at facilities or places of production being surveyed.

[199]**2.2.9 Sample handling**

[200]The surveillance protocol should include a description of how samples are to be collected, handled and prepared in order to ensure specimen integrity and preservation and timely delivery to the laboratory for diagnostic processing. Each sample should be given a unique identifier (label, number, etc.) to enable tracking and monitoring from the point of collection in the field, through the stages of processing and identification, to storage in a formal reference collection, if applicable.

[201]**3. Information Management Systems**

[202]National surveillance systems should be designed for the collection, consolidation, management, validation and reporting of surveillance data and information.

[203]It is critical that surveillance data and information are collected in a uniform manner to ensure their integrity from collection through to reporting. NPPOs should develop and implement minimum data sets for use across all surveillance programmes and these data sets should form the basis of a surveillance information management system. Information management systems should ensure traceability of samples taken during surveillance activities. Data verification procedures are also an integral component of information management systems.

[204]As well as being record keeping systems, information management systems should allow easy retrieval of data and information to meet national and international surveillance-related reporting requirements.

[205]Information management systems should be designed to allow for surveillance information to be appropriately included in them, while recognizing that such information may need to be aligned before incorporation.

[206]Information management systems should be a repository or centralized database for all results obtained. As such, they should be designed to record absence data. Valid absence data collected during detection, delimiting and monitoring surveys can be used by NPPOs to support a country's pest status and pest free areas as well as its trade and market access. The most important factor for the validity of absence data is the design of the surveillance.

[207]**3.1 Surveillance records**

[208]NPPOs should determine how long surveillance records are required to be retained, taking into account that they may be needed to support declarations of pest status.

[209]Surveillance records should include, as a minimum, the following information:

- [210]pest scientific name

- [211]pest family and order
- [212]host scientific name (as often as possible)
- [213]locality (e.g. location code, address, coordinates)
- [214]collection date and name of collector
- [215]identification date, method of identification and name of identifier.

[216]Surveillance records should also include, to the extent possible, the following information, especially if the presence of a quarantine pest is suspected:

- [217]European and Mediterranean Plant Protection Organization (EPPO) codes for pest or host scientific names
- [218]verification date, method of verification and name of verifier
- [219]references (e.g. diagnostics references)
- [220]sources of information and data.

[221]Additional information may be useful; for example, the nature of the pest and host relationship, infestation status, pest incidence, the growth stage of the host plant affected, whether the host plant is grown only in greenhouses, the plant part affected or the means of sample collection (e.g. attractant trap, soil sample, sweep net).

[222]The NPPO or an institution designated by the NPPO should act as the national repository for plant pest records, including surveillance records.

[223]3.2 Analysis and reporting

[224]Tools such as spatial mapping (geographical information system) and modelling and statistical analysis software can be used to manage surveillance data and to facilitate their presentation and reporting.

[225]The information contained in the reports produced from an information management system depends on the type of surveillance conducted. In all cases reports should provide data on the target (pest, host, pathway or commodity of concern), the area covered, the number of observations or samples taken, the results obtained and, if appropriate, statistical reliability.

[226]The means to consolidate, analyse and report data may be used to predict the probable behaviour of pests or vectors or the likelihood of invasions in order to support surveillance and response decision-making.

[227]While carrying out surveillance, pests that require obligatory reporting may be found; in such cases, ISPM 17 should be followed.

[228]4. Transparency

[229]NPPOs should, on request, provide information on pest presence, distribution or absence and methodologies used to conduct surveillance.

[230]Potential implementation issues

[231]This section is not part of the standard. The Standards Committee in May 2016 requested the secretariat to gather information on any potential implementation issues related to this draft, please provide details and proposals on how to address these potential implementation issues.