DRAFT REVISION OF ISPM 6: SURVEILLANCE (2009-004)

Status box

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Adoption

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INTRODUCTION

Scope

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

References

[2] The present standard refers to ISPMs. ISPMs are available on the International Phytosanitary Portal (IPP) at https://www.ippc.int/core-activities/standards-setting/ispms.

Definitions

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

Outline of Requirements

[4] 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, and pest status in an area.

[5] National surveillance systems relate to both general surveillance and specific surveillance. A national surveillance system comprises surveillance programmes and the infrastructure required to implement them. Surveillance protocols describe the methodology of surveillance, whether general or specific. Supporting elements to consider for a national surveillance system include phytosanitary legislation and policies, prioritization, planning, resources, documentation, training, auditing, communication and stakeholder engagement, pest diagnostics, information management systems and pest reporting.

BACKGROUND

[6] Surveillance is essential in plant protection. Article IV of the IPPC prescribes general provisions for the organizational arrangements for national plant protection and specifically states that the responsibilities of an official national plant protection organization shall include "the surveillance of growing plants, including both areas under cultivation (*inter alia* fields, plantations, nurseries, gardens, greenhouses and laboratories) and wild flora, and of plants and plant products in storage or in transportation, particularly with the object of reporting the occurrence, outbreak and spread of pests, and of controlling those pests, including the reporting referred to under Article VIII paragraph 1(a)". According to the same article the "designation, maintenance and surveillance of pest free areas and areas of low pest prevalence" are a responsibility of NPPOs. In addition, Article VII.2(j) specifies that "contracting parties shall, to the best of their ability, conduct surveillance for pests and develop and maintain adequate information on pest status".

[7] Surveillance underpins several activities, including:

- the early detection of pests new to an area
- the compilation of host pest lists, commodity pest lists and pest distribution records (e.g. to support pest risk analysis and phytosanitary certification)
- the establishment and maintenance of pest free areas, pest free places of production, pest free production sites or areas of low pest prevalence
- the determination of pest status in an area
- pest reporting to other countries

- measuring changes in the characteristics of a pest population or pest incidence (e.g. for areas of low pest prevalence or for research)
- delimiting a pest population in an area
- eradication and pest management.

IMPACTS ON BIODIVERSITY AND THE ENVIRONMENT

[8] 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, absence or distribution of pests in an area and information about hosts or commodities as pathways. These pests could include organisms relevant to biodiversity (e.g. invasive alien species).

REQUIREMENTS

1. Components of a National Surveillance System

[9] A national surveillance system should be an integral part of a country's plant health system.

[10] A national surveillance system may be structured into programmes (e.g. for specific pest species or groups of pests) and should include the supporting infrastructure required to implement them (Figure 1 and section 3).

[11] Surveillance programmes may include the following types of surveillance:

- General surveillance: a process whereby information on pests of concern in an area is gathered from various sources. Sources may include national or local government bodies, research institutions, universities, museums, scientific societies (including those of independent specialists), producers, consultants, 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).
- Specific surveillance: a process whereby information on pests of concern in an area is obtained by the NPPO over a defined period. NPPOs actively gather specific pest-related data. Specific surveillance includes surveys that are conducted to determine the characteristics of a pest population or to determine which species are present or absent in an area.

[12] NPPOs should develop surveillance protocols describing how to conduct general and specific surveillance.

[13] Elements to be considered when an NPPO develops a national surveillance system are illustrated in Figure 1.

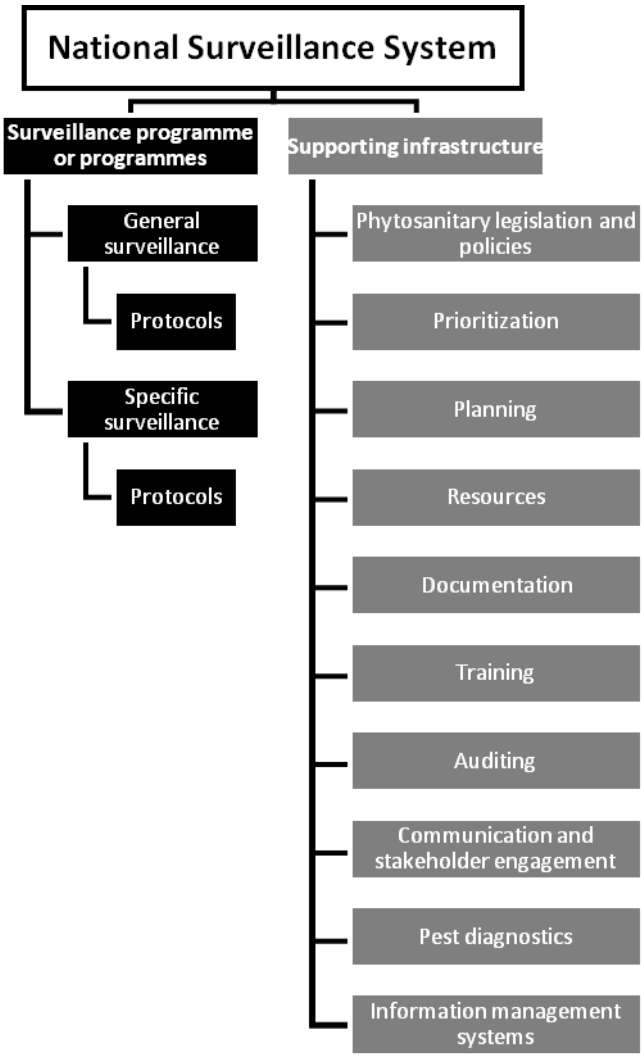

Figure 1.A model national surveillance system, comprising surveillance programmes (general and specific) and supporting infrastructure.

2. Designing Surveillance Programmes

[14] Surveillance programmes should, as appropriate, be long term and regular with well-developed methodology, so that results may be compared and analysed. Surveillance programmes may include elements of general and specific surveillance (Figure 1). The methodology of surveillance should be described in surveillance protocols. The protocols developed by NPPOs should aim to achieve the purpose of the surveillance programme.

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

[16] Surveillance methods should be based on international or regional guidelines where they exist or be developed by the NPPO. 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 surveillance outcomes.

[17] NPPOs may need to develop or adopt new methods for new or emerging pests. In all cases, surveillance methods should be based on relevant scientific, geographical and statistical information, and be operationally feasible.

2.1 General surveillance

2.1.1 Approaches to general surveillance

[18] NPPOs may use a range of approaches to general surveillance with varying degrees of involvement by the NPPO – from reports received by the NPPO to increasingly structured and targeted programmes run entirely by the NPPO. Examples of general surveillance approaches are listed below:

- receipt of reports from the general public (i.e. initiated by the public)
- scanning of sources of pest information
- general encouragement of public reporting through official channels (e.g. via a free call phone number in response to publicity about plant health or educating on the advantages of reporting pests)
- encouragement of public reporting on specific pests – this is useful where the target species is known and public awareness is already high (e.g. through the use of public awareness materials) and during known periods of high pest incidence (e.g. breeding seasons)
- encouragement of reporting by groups involved with specific crops(e.g. producers, community groups)
- involvement of specific groups in plant health activities organized by the NPPO to obtain surveillance data (e.g. scientific societies, plant health clinics and agricultural extension services)
- cooperation with other governmental services (e.g. forestry or environmental services)
- cooperation with institutions that carry out research
- general surveillance carried out by NPPO staff.

[19] NPPOs should take into account the following factors when developing approaches to general surveillance:

- costs and resource requirements are usually lower with less involvement of the NPPO
- good results are more readily achieved for easily noticed and recognizable pests (e.g. beetles and caterpillars) or symptoms
- detection of hidden pests (e.g. wood-boring beetles, or pathogens that are symptomless in some hosts) is usually less effective
- surveillance may not need to be restricted to a defined period
- the proportion of useful reports received is usually lower for less-structured or less-targeted programmes
- the usefulness of the information (e.g. pest diagnosis, monitoring methodologies) may depend on how current it is
- systems may be needed to manage large numbers of reports from general surveillance, in order to identify those which are relevant
- the validity of the data may need to be verified
- increasing the sensitivity and specificity of a general surveillance programme may result in higher costs.

[20] When conducting general surveillance, NPPOs should evaluate the reliability of the information, which depends on the source of the information (e.g. reports from the general public versus entomologists). Guidance on evaluating the reliability of a pest record is provided in ISPM 8 (*Determination of pest status in an area*).

2.1.2 Elements of general surveillance

[21] NPPOs should recognize that general surveillance can be an effective supplement to specific surveillance. For example, general surveillance can provide the context for undertaking specific surveillance to accurately determine the pest status in an area or site. The NPPO may also decide that the result of general surveillance is sufficient to determine the pest status.

[22] The elements of general surveillance may include:

- mechanisms to facilitate reporting:
  - legislative obligations (for the general public, growers or specific agencies)
  - cooperative agreements (between NPPOs and, for example, stakeholders or scientific societies)
  - the use of contact personnel to enhance communication channels to and from NPPOs
  - public education and awareness raising initiatives
- tools for collecting reports from the public:
  - publicly accessible free call phone numbers
  - systems for free delivery of samples
  - smartphone and mobile device applications (apps)
  - social media channels and e-mail
- systems or processes to enhance the quality of reporting:
  - a filtering process at the point of initial contact
  - the ability to send and receive images for initial identification
  - publicity material to allow submitters to self-filter (e.g. leaflets and websites with pest information and photos)
  - training for submitters
- means to consolidate, analyse and communicate the information gathered:
  - integrated national, regional or global databases and alert systems for emerging pests
  - spatial modelling tools embedded in web-based systems (e.g. geographical information systems)
  - mathematical and simulation models of data collected (e.g. Bayesian networks).

[23] NPPOs may encourage reporting by ensuring timely feedback (e.g. identification of specimens submitted) to those providing reports.

2.2 Specific surveillance

[24] Three types of surveys may be utilized by NPPOs depending on the objectives of the specific surveillance programme:

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

[25] These surveys may be developed for pests in relation to one or more areas, sites, hosts, pathways or commodities and should include the collection of pest presence and absence records.

[26] The result of every observation or sample taken should be recorded, including when the pest was not found. Data on pest absence collected during 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.

[27] The most important factor for the validity of pest absence data is the design of the specific surveillance programme. Elements that should be considered in the design of specific surveillance programmes are presented in sections 2.2.1 to 2.2.9.

2.2.1 Purpose

[28] The purpose of the surveillance should include background on the phytosanitary objectives and the reasons why the information is required (e.g. early detection, assurance for a pest free area, pest free production site or area of low pest prevalence, commodity pest list).

2.2.2 Scope

[29] 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) or uncultivated area.

2.2.3 Target

[30] The target of the surveillance should be described. The target may be a single or multiple pests, hosts, pathways or commodities, or a combination of any of these.

2.2.4 Timing

[31] Timing may include the start and end of the survey and the frequency of visits by field personnel. 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.

2.2.5 Area or site selection

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

- any previously reported presence, distribution and resulting pest status of the pest
- the previously reported absence of a pest
- the undetermined pest status of an area
- the biology of the pest
- the suitability of the climate and other ecological conditions in the area for the pest
- the geographical distribution of host plants and production areas
- the degree of isolation of an area
- pest management programmes (at commercial and non-commercial sites)
- the points of consolidation, handling or storage of the harvested commodity
- proximity to:
  - points of entry (for pathways, including people)
  - sites where imported commodities are marketed, stored, processed or used as planting material
  - tourist activities.

[33] To achieve effective use of resources, surveillance for absent or recently intercepted pests (e.g. in a consignment) may best be concentrated on those places that are at higher risk of the primary spread of the pest.

[34] If the objective of surveillance is to delimit an outbreak, the area selection should be focused on the immediate surroundings of the known infested area and to sites of the same habitat type that, according to exercises of trace-forward and trace-back, may also have become infested. Surveillance that is focused on specific areas or sites within a larger area may be complemented by random sampling of sites in the whole area. For surveillance of pests that are widely distributed, a more systematic selection of sites over the whole area to be surveyed is more appropriate.

2.2.6 Statistical design

[35] NPPOs should define the population units (in the statistical sense) to be surveyed; that is, the population as a collection of similar units of concern. Defining the statistical population may be based on pest biology, a pathway or an entity upon which phytosanitary measures may be applied. The population unit may be of various types, for example:

- a geographical unit, comprising the area covered with a trapping grid
- a field planted with a host crop
- an individual host plant in an unmanaged or uncultivated area
- a storage facility.

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

- simple random sampling
- systematic sampling
- stratified sampling
- cluster sampling
- targeted sampling.

[37] Statistical sampling methods described in ISPM 31 (*Methodologies for sampling of consignments*) or other appropriate methods should be used as appropriate. They are often used when the data captured are of a binary nature (presence/absence). The statistical analysis of the data should be based on an appropriate method and may require expert advice.

[38] NPPOs are encouraged to state the level of confidence and the minimum level of detection of the pest survey.

2.2.7 Data collection

[39] NPPOs should determine the data elements to be captured during surveillance and how these data will be transferred to the information management system (e.g. by the use of forms and electronic devices).

2.2.8 Biosecurity and sanitation

[40] When developing surveillance protocols, NPPOs should consider procedures to ensure that spread of pests is not facilitated during a survey.

[41] NPPO officers, or other personnel authorized to undertake surveillance, should follow any biosecurity procedures that are in place at facilities, places of production or sites being surveyed.

2.2.9 Samples

[42] The surveillance protocol should include a description of when and how samples are to be taken, 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 code (e.g. label, number or bar code) to enable tracking and follow-up from the point of collection in the field, through the stages of processing and identification, to storage in a formal reference collection, if applicable.

3. Supporting Infrastructure

3.1 Phytosanitary legislation and policies

[43] A national surveillance system should be supported by phytosanitary legislation and policies that ensure that authority, responsibilities and financial resources are assigned to the appropriate administrative levels.

[44] Contracting parties should include the following provisions in their phytosanitary legislation or in official procedures:

- the legal power, process and protection for NPPO officers or other authorized personnel to undertake surveillance activities, including entering premises or land to inspect plants, plant products or other articles that may be capable of harbouring pests, or to collect samples for testing
- the establishment and maintenance of facilities for diagnostics or appropriate access to up-to-date diagnostic services to ensure that pests are properly identified
- mandatory domestic reporting (e.g. by research institutions, diagnostic laboratories, non-governmental organizations, industry, growers, local government or scientific groups) to the NPPO on detection or suspected presence of:
  - targeted pests
  - pests new to an area, host or pathway.

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

3.2 Prioritization

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

[47] Factors to consider when prioritizing surveillance programmes may include:

- impact of pests on crops and biodiversity
- existing national, bilateral, regional or international phytosanitary obligations and arrangements
- implementation of pest management programmes
- emerging pests at the local, national, regional or international level and potential benefits of their early detection
- whether surveillance is cost-effective
- the availability of the resources and methods required to implement a surveillance programme
- the quality and reliability of the expected surveillance results, given the required resource expenditure
- national lists of priority pests prepared using pest risk ranking methods or similar analytical techniques
- trade and market access
- foodsecurity
- findings of a pest in a consignment originating from an area where the pest was not known to be present (e.g. notification from trading partner or detection during export certification).

3.3 Planning

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

3.4 Resources

[49] Surveillance should be adequately resourced with appropriate human, financial and physical resources. Diagnostic services resources are an essential part of a national surveillance system.

[50] Human resources may include personnel in administration, operations, technical functions, management and logistics. NPPOs should ensure that personnel are appropriately trained and qualified.

[51] Financial resources may be required for surveillance logistics and staff travel (e.g. transport costs, accommodation and meals), 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.

[52] Physical resources may include field equipment (including personal protective equipment), vehicles, appropriate storage facilities and consumables used for carrying out surveys and monitoring, reference materials and other documentation, computers, georeferencing devices and other equipment for data input and storage, software for information management systems, staff uniforms (or valid identification) and materials for raising public awareness.

3.5 Documentation

[53] NPPOs should develop administrative procedures for maintaining official documentation, undertaking surveillance (including technical instructions in the form of surveillance protocols), and managing or having access to specimen collections. Documentation is essential for promoting consistency, improving interpretation and reliability of results, and facilitating audit and verification of activities under a national surveillance system.

3.6 Training

[54] Training, assessment and regular review of personnel involved in surveillance activities are integral components of a national surveillance system. NPPOs should develop and implement procedures to ensure that the competencies of staff are maintained.

[55] Personnel involved in surveillance activities should be adequately trained in plant health and related fields (including relevant pests, their biology, hosts and symptoms of infestation) and data management. Personnel should also be trained in biosecurity, sampling methods, handling of samples, preservation and transportation of samples for identification, and record keeping associated with samples.

[56] Training materials should be developed and updated regularly to ensure that the competencies of personnel are developed and maintained. Training and reference materials should be readily available to all personnel involved in surveillance activities.

3.7 Auditing

[57] NPPOs should conduct regular audits of their general and specific surveillance, including activities conducted by authorized entities, to ensure that activities are carried out in accordance with relevant surveillance protocols.

3.8 Communication and stakeholder engagement

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

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

3.9 Pest diagnostics

[59] Diagnostic services are fundamental to the success of a national surveillance system. NPPOs should ensure that appropriate diagnostic services are accessible. Some diagnostic protocols are available as annexes to ISPM 27 (*Diagnostic protocols for regulated pests*).

[60] Characteristics of the diagnostic services include:

- have expertise in disciplines relevant to pest (and host) identification

- have adequate facilities and equipment
- have access to specialists for verification where necessary
- have facilities for recordkeeping
- have facilities for processing and storing of reference specimens
- use standard operating procedures, where appropriate and available.

3.10 Information management systems

[61] Information management systems should be used as a repository or centralized database for all results obtained.

[62] Information management systems should be designed for the collection, consolidation, management, validation and reporting of surveillance data and information for analysis, including records of presence and absence of pests.

[63] It is critical that surveillance data and information are collected in a uniform manner to ensure their integrity from collection to reporting. NPPOs should develop and implement minimum data sets, for use across all surveillance programmes in accordance with section 4 of this standard. 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 should also be an integral element of information management systems.

[64] Information management systems should allow easy retrieval of data and information to meet national and international surveillance-related reporting requirements.

4. Pest Records

[65] NPPOs should determine how long pest records are required to be retained, taking into account that they may be needed to support declarations of pest status. For example, fruit fly absence pest records may be needed to support pest free areas for fruit flies in accordance with ISPM 26 (*Establishment of pest free areas for fruit flies (Tephritidae)*). Reference to the survey methodology used should be included in the pest records.

[66] Pest records from specific surveillance should include, as a minimum, the following information:

- scientific name and taxonomic position of the pest
- scientific name and taxonomic position of the host
- locality (e.g. location code, address, geographical coordinates)
- date of survey and name of surveyor
- identification date, method of identification and name of identifier.

When relevant and available, the above information should be included in pest records from general surveillance.

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

- codes for pest and host scientific names (e.g. EPPO codes)
- verification date, method of verification and name of verifier
- references (e.g. diagnostic protocol used)
- phytosanitary measures taken.

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

[69] The NPPO should act as the national repository for pest records.

5. Analysis and Reporting

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

[71] The information to be reported will depend 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, the statistical reliability.

[72] The means by which data are consolidated, analysed and reported may also be used to predict the probable behaviour of pests or vectors, including the probability of establishment and spread, in order to support decision-making on pest management and further surveillance.

6. Transparency

[73] NPPOs should, on request, provide information on methods used to conduct surveillance and on pest status and distribution.