

**Submissions for topics for Standards and Implementation****1. General information**

Submission number	2023-030
Title of Proposal	Sampling Calculator Tool for Surveillance (ISPM 6) and Inspection of Consignments (ISPM 31)
Submitted by (Country or Organization)	IPPC Contracting Party
IPPC Official Contact Point or RPPO	Canada
Supported by	USDA-APHIS- United States NPPO

2. Contact information

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3. Summary of proposal

Summary of justification for the proposal	<p>ISPM 6 discusses the use of statistical design for surveillance, and ISPM 31 provides equations and sampling tables for determining sample sizes required for consignments. The tables in ISPM 31 assume a relatively high effectiveness of sampling methods for smaller lot sizes, which is not always the case. Standard tools supporting the development of statistical designs for surveys and for calculating sample sizes under conditions of varied sampling effectiveness will support the enhancement of pest surveillance worldwide, and add confidence in the effectiveness of plant biosecurity programs.</p> <p>RPPOs and NPPOs have their own sample size calculators, and these calculators, as well as the relevant literature, are primarily written in English. Examples of existing sample size calculator tools are NAPPO's Sample Size</p>
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	<p>Calculator and EFSA's RiBESS+ tool. Both of these tools are listed as Contributed Resources on the IPPC website, however there is no official IPPC Implementation Resource for these calculations. We therefore would like to propose the creation of a standardized toolkit, such as a spreadsheet tool or computer code, in all FAO languages to standardize the calculation of sample sizes for contracting parties and eliminate duplicated efforts across NPPOs in developing approaches to calculate sample sizes. This tool would also be able to operate "in reverse" to calculate the effectiveness of a given survey design or sampling protocol, and compare it to a statistically sound design, supporting the evaluation and assessment of plant health surveillance activities. This resource will support Strategic Objectives B - Protect forests and the environment from the impacts of plant pests and C - Facilitate safe trade development and economic growth by supporting the statistical design of pest surveillance methods for NPPOs that may lack in-house statistical expertise or resources to setup their own calculation tool.</p>
Expected outcome of standard / implementation resource	Analytical toolkit, such as spreadsheet based calculations or computer code, that simplifies and standardizes sample size calculations.
Contribution to filling gaps in the Framework for Standards and Implementation	Key Result Areas A1/B1: All NPPOs have effective pest surveillance systems in place for timely detection of new pest arrival and monitoring spread, C3: Detections of pests in trade pathways are declining as exporting countries take more responsibility for managing the pest risk associated with exports, and importing countries report detections more quickly and more consistently.

4. Type of proposed material

Proposed material	Implementation resources
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5. Standard/ Implementation

Type of implementation resource	New implementation resource
New implementation resource	Analytical tool
Convention articles, ISPMs or CPM	Convention articles: Article IV – General Provisions relating to the organizational arrangements for national plant protection 2(b, c, h), Article VII – Requirements in relation to imports 2(j), Article XX – Technical assistance) ISPM: ISPM 6: Surveillance and ISPM 31: Methodologies for sampling of consignments

6. Literature review

Literature review	<p>ISPM 31 has the tables for sample size numbers for statistically based sampling of consignments that provide sample numbers for consignments of different sizes, at different confidence levels. For the most part, these tables assume a relatively high effectiveness of the inspection method to detect pests. ISPM 31 does contain equations for sample size calculations, however there is no IPPC tool available to apply these equations. Both NAPPO and EFSA have sample size calculators that apply the ISPM 31 equations. The FAO has a comprehensive document for risk-based disease surveillance that applies the same sample size equations in a surveillance context. The sample size equations can be rearranged to operate 'in reverse', such that a contracting party could take the number of samples they are taking from inspection of consignments, or for their surveillance program, and calculate the level of confidence that they could have for a given pest detection threshold. A sample size calculator tool that has both the regular and 'reversed' equations, available in all FAO languages, would support IPPC contracting parties in more precise calculation of sample sizes for consignments and surveillance programs, as well as evaluating the statistical confidence that the parties can have in their programs.</p> <p>* ISPM 6. 2018. Surveillance. Rome, IPPC, FAO</p>
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	<p>* ISPM 31. 2008. Methodologies for sampling of consignments. Rome, IPPC, FAO</p> <p>* FAO. 2014. Risk-based disease surveillance – A manual for veterinarians on the design and analysis of surveillance for demonstration of freedom from disease. FAO Animal Production and Health Manual No. 17. Rome, Italy</p> <p>* IPPC Secretariat. 2021. Surveillance guide – A guide to understand the principal requirements of surveillance programmes for national plant protection organizations. Second edition. Rome, FAO on behalf of the Secretariat of the International Plant Protection Convention</p> <p>*NAPPO. 2018. Sample Size Calculator. https://www.nappo.org/english/learning-tools/Resources-and-Learning-Tools-for-Risk-Based-Sampling/Sample-Size-Calculator</p> <p>*EFSA. 2016. Risk based estimate of system sensitivity update tool (RiBESS+). https://zenodo.org/record/2541541#.YT9gNp0zbIU</p>
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7.Criteria for justification and prioritization of proposed topics

7.1. Core criteria

Criteria	Information provided by Submitter
1. Contribution to the purpose of the IPPC as described in article I.1	Statistical sampling design is critical to ensuring the ability of surveillance and inspection efforts to detect pests of plants and plant products. This implementation resource will provide a tool that calculates the sampling numbers required for a statistically valid survey or inspection, as well as calculations for assessing a sampling design with a given number of samples. The tools will support the use of different sets of assumptions required for proper survey and sampling protocol design. By supporting the design of statistically valid sampling methods, this will support earlier detection of pests in plants and plant products for export and import, increasing the biosecurity across IPPC member countries.
2. Linkage to IPPC SOs and Organizational results demonstrated	Statistically valid sampling designs support confidence in surveys and inspections for pests. This work will thus support Strategic Objectives B – Protect forests and the environment from the impacts of plant pests, and C – Facilitate safe trade development and economic growth. By providing a standard toolkit for sample size calculations, IPPC member countries will be able to have greater confidence in the sampling designs of their

	trading partners, facilitating safe trade, and will support earlier detection of pests within member countries to protect forests and the environment.
3. Feasibility of implementation at the global level	Implementation should be straightforward. Both NAPPO and EFSA have sample size calculators available online and within the contributed resources section of the IPPC website, reducing the technical complexity of developing the tool. Equations for sample size calculations are found within ISPM 31 and related references. Sample size calculations are relevant for survey design, and consignment sampling design, which makes the tool relevant for all regions.
4. Clear identification of the problems that need to be resolved through the development of the standard or implementation resource	Identified need: a standard tool for calculating sample size requirements for surveys and consignment inspections. Most literature and tools on sampling methods are available only in English, this tool will increase the accessibility of sample size calculations by making a tool available in FAO languages. The tool will reduce duplication of effort among NPPOs with regard to developing procedures for sample size calculations.
5. Availability of, or possibility to collect, information in support of the proposed standard or implementation resource	Information for sampling design is broadly available, through the NAPPO Excel tool, the EFSA RShiny application, the FAO guidance on sampling, and ISPM 31.

7.2. Supporting criteria

Supporting Criteria	Information provided by Submitter
Practical	1) Yes. There is a sample size calculator tool available in Excel from NAPPO, an RShiny-based web application available from EFSA, and an in-house analytics pipeline in R for CFIA. 2) Since every member of IPPC must engage in sampling to detect pests, expertise should be widely available across IPPC members.
Economic	1) Up to \$1.1 trillion worth of agricultural products are traded each year, and plants contribute the majority of over \$100 trillion in ecosystem services annually. Consistent statistical design of sampling methods will support the protection of agricultural products and ecosystem services via enhanced detection of pests.

	2) See previous answer. A standard tool for developing sampling methods will increase trust among trading partners and help facilitate market access.
Environmental	<p>1) Enhanced surveillance design may reduce the need for some phytosanitary treatments, mitigating the environmental impact of those treatments.</p> <p>2) Statistical survey design is critical in detecting and managing pests. Enhance surveillance design will support earlier detection of these species.</p> <p>3) By supporting earlier detection of pests, enhanced statistical survey design will reduce their impact on wild flora, reduce habitat loss, and help to maintain biodiversity.</p>
Strategic	<p>1) As mentioned above, both NAPPO and EFSA already have a sampling design tool available, indicating broad support.</p> <p>2) Negotiations over sufficient and adequate sampling designs are common when negotiating or renegotiating market access.</p> <p>3) Most sampling design tools and literature are in English. This implementation resource will provide the tool in the FAO languages, increasing accessibility for developing countries. By having an IPPC-approved sample number calculator, resource intensity for calculating sampling numbers will be reduced for developing countries.</p> <p>4) This tool will apply to all countries, pests, and commodities.</p> <p>5) This tool represents the formalization of the equations found in ISPM 31.</p> <p>6) This resource addresses survey and inspection methodology, and provides a means to incorporate confidence, survey efficiency, and risk tolerance into sampling designs.</p> <p>7) There is currently no IPPC tool available for contracting parties.</p>

8. Financial/in-kind resources

Commitment for financial/in-kind resources to support the development of the proposed standards or implementation resource	In-kind time commitment on the part of the Canadian Food Inspection Agency to support the coding, writing, and development of the implementation resource.
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