COMMISSION ON PHYTOSANITARY MEASURES

TWENTIETH SESSION

DIAGNOSTIC LABORATORY NETWORKING

AGENDA ITEM 13.8

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1. Background

[1] The Commission on Phytosanitary Measures (CPM) Focus Group on Diagnostic Laboratory Networking was established by CPM-17 (2023) with its Terms of Reference adopted the following year by CPM-18 (2024). The focus group was further extended by CPM-19 (2025) until CPM-22 (2028). The work was commenced by an in-kind consultant from South Africa who conducted an extensive literature review and organized interviews with relevant stakeholders to evaluate conditions and expectations for an IPPC diagnostic network arrangement. The report[1] resulting from this exercise was presented to the IPPC Strategic Planning Group[2] in October 2025 and its main findings are compiled in this paper.

[2] The IPPC Secretariat opened a call for focus group members from 3 June to 15 August 2025, yielding eighteen (18) nominations in total. Nine (9) of the nominees were subsequently selected by the CPM Bureau with representation from Africa, the Near East and North Africa, Europe, Asia, the Pacific, Latin America and the Caribbean, North America, and a regional plant protection organization. The membership list is available here.[3]

[3] With the focus group now established and the initial assessment of the state of diagnostic laboratory networks completed, work is progressing successfully. An in-person meeting is tentatively scheduled for June 2026.

2. Introduction

[4] Countries rely on the trade of agricultural goods to promote economic growth and ensure food security. With the increase in international trade of plants and plant products, the movement of people across continents and the impact of climate change, many countries are at risk of plant pest incursions and establishment. Countries increasingly rely on support systems that incoporate strong diagnostic skills and up-to-date expertise and resources to detect pests of economic importance.

[5] To address these biosecurity challenges, many countries have created plant-health diagnostic networks (PHDNs). Many successful PHDNs exist at a national or regional scale. These networks at different levels illustrate how networking, standard operating procedures, accreditation and coordinated training

[1] *Building and strengthening plant health diagnostic networks: a global approach*: https://www.ippc.int/en/publications/95061/

[2] IPPC Strategic Planning Group: https://www.ippc.int/en/commission/strategic-planning-group/

[3] CPM Focus Group on Diagnostic Laboratory Networking web page: https://www.ippc.int/en/commission/cpm-focus-group-reports/cpm-focus-group-on-diagnostic-laboratory-networking/

can improve detection, surveillance and response capacity. Other existing successful networks offer important lessons and this can be leveraged to implement and strengthen PHDNs.

3. Establishment and evolution of plant-health diagnostic networks

[6] Since 1998, The European and Mediterranean Plant Protection Organization (EPPO) has developed a comprehensive diagnostic programme to harmonize testing methods across its member states. In addition, EPPO maintains a database of diagnostic expertise to map laboratory capacities and conducts regular interlaboratory comparisons to enhance quality management and accreditation under ISO/IEC 17025. Furthermore, in the EPPO region there has been the development of National Reference Laboratories, as well as European Union Reference Laboratories, that support national plant protection organizations (NPPOs).

[7] In the United States of America, the National Plant Diagnostic Network was established in 2002 following concerns about agricultural biosecurity. The network links land-grant universities, state departments of agriculture, and federal agencies into a coordinated diagnostic and reporting system for plant health. It provides standardized protocols, quality assurance, training, and secure data-sharing across five regional hubs.

[8] In Africa, the International Plant Diagnostic Networks was established in 2006 to bolster plant-health diagnostics. The focus was to address challenges experienced regarding diagnostics, assessing diagnostic capacity as well as developing a diagnostic system for plant-health experts in East and West Africa.

[9] In Australia, the National Plant Biosecurity Diagnostic Network was formally founded in 2011 as a platform to link diagnosticians across government, universities and industry. The network coordinates diagnostic protocols, runs national proficiency-testing schemes, and provides professional development. In terms of governance, it operates under the Subcommittee on Plant Health Diagnostics, which oversees technical standards and facilitates the diagnostic capacity needed during pest outbreaks.

[10] In Asia, the ASEAN (Association of Southeast Asian Nations) Regional Diagnostic Network was developed to enhance regional diagnostic capability across ASEAN member states. The network provides a collaborative mechanism for sharing protocols, conducting regional training, and strengthening pest-identification capacity. It also supports harmonization of diagnostic methods to facilitate safe trade in plant products under ASEAN agreements.

4. Global examples of other types of successfully implemented networks

[11] Euphresco, a European phytosanitary research coordination network, though not solely diagnostic, plays a critical role in supporting diagnostic networks by funding and coordinating collaborative research on diagnostic methods. Its projects link European national reference laboratories and NPPOs, fostering alignment of methodologies and the sharing of resources across borders.

[12] The PlantwisePlus programme, led by CABI, complements formal plant-health diagnostic networks by strengthening frontline surveillance and advisory systems. This initiative provide farmers with free, science-based crop health advice, thereby increasing early detection of pests. By partnering with NPPOs, extension services and universities, PlantwisePlus enhances diagnostic capacity, supports pest surveillance and contributes to climate-smart, sustainable crop production and food-security outcomes.

[13] Animal diagnostic systems are well established by the World Organisation for Animal Health (WOAH). The WOAH model assigns identified reference laboratories and experts for specific diseases, links their responsibilities to official manuals and expects high technical leadership, external assistance to countries, and participation in proficiency testing and method harmonization. This system produces rapid, authoritative technical advice and a durable mechanism for global coordination of diagnostics and standards. The approach of WOAH shows that a nominated-lab model backed by international standards and formal reporting pathways builds trust among countries and supports harmonized diagnostics and rapid responses to animal diseases.

[14] The Convention on Biological Diversity's Global Taxonomy Initiative highlights complementary lessons for laboratory networks that depend on taxonomy and identification capacity. The initative emphasizes capacity building, standardized workflows (including DNA barcoding guidance), and regional training to close taxonomic gaps. The programme materials and training guides produced as part of the initiative illustrate how targeted investments in taxonomic infrastructure increase the accuracy and utility of diagnostic outputs for biodiversity and biosecurity purposes.

[15] FAO's Global Soil Laboratory Network demonstrates important best practices for harmonizing laboratory chemistry and methods across countries. The network was established to harmonize soil analysis methods, units and metadata, and it produces standard operating procedure libraries and best-practice manuals. This network also shows the value of linking laboratories to a central data-management agenda so outputs can feed global monitoring and policymaking.

[16] Disease-specific consortia such as the Borlaug Global Rust Initiative and the broader global work on *Puccinia graminis* (wheat stem rust) give a clear success story for rapid global coordination focused on a single, high-impact pathogen. The Borlaug Global Rust Initiative combined surveillance, shared germplasm evaluation, coordinated breeding programmes and rapid data-sharing to mitigate the threat of Ug99 and other virulent races. This coordinated system links surveillance, diagnostics, centralized genotyping, resistance screening and breeding delivery to produce tangible successes. It is an example of how pathogen-focused networks that integrate diagnostics with breeding and deployment pathways can turn surveillance data quickly into on-farm impact.

[17] The plant-health programmes of CGIAR emphasize integrated pest management, coordinated research and policy engagement to protect key crops across regions.

5. Fundamental resources required for plant-health diagnostic laboratory networks

[18] The effectiveness of PHDNs depends on the integration of fundamental requirements with solid administrative structures to provide a comprehensive framework for early detection, accurate diagnostics, and timely phytosanitary interventions. The following requirements are needed:

- **Institutional capacity.** This includes strong governance structures, NPPOs with clear mandates, and mechanisms for stakeholder engagement and coordination. This institutional strength must be supported by an enabling legal framework that facilitates pest reporting, quarantine enforcement, and eradication efforts.
- **Human resource capacity.** Skilled diagnosticians with expertise in taxonomy and molecular biology are needed to identify pests of economic and regulatory concern. Continuous training and professional development programmess help maintain diagnostic competency and ensure preparedness for emerging threats.
- **Infrastructure and laboratory capacity.** The facility must include capacity for classical and molecular diagnostics, including polymerase chain reaction platforms, sequencing capabilities, and microscopy facilities, as well as systems for sample handling, storage and disposal.
- **Standardized diagnostic protocols and quality assurance systems.** Harmonized standard operating procedures, reference materials, and participation in proficiency-testing schemes are essential.
- **Sustained funding and resource mobilization.** These are vital for the continuity of PHDN operations.
- **Information management and communication systems.** These are also critical, as PHDNs require secure digital platforms for data collection, storage and sharing, enabling real-time reporting of pest detections and facilitating coordinated responses.
- **Training and continuous professional development.** These form a core requirement. Beyond initial capacity building, ongoing skill enhancement in emerging diagnostic technologies, data interpretation, and risk communication ensures that the workforce remains competent and adaptive to new challenges.
- **Governance and coordination mechanisms.** These must be operationalized.

6. Strengths, weaknesses, opportunities and threats (SWOT) analysis of plant-health diagnostic networks

[19] In terms of strengths, PHDNs can enhance diagnostic capacity and standardize procedures across laboratories. Networks foster resource- and knowledge-sharing, and coordinated communication and harmonized data collection within PHDNs improves surveillance and supports evidence-based decision-making.

[20] Despite the identified strengths, several weaknesses challenge the operational effectiveness of PHDNs. High initial investment and ongoing operational costs can constrain network expansion, particularly in low-resource diagnostic infrastructures. Differences in laboratory capacity, technical expertise, and accreditation standards may lead to inconsistencies in diagnostic quality.

[21] Plant-health diagnostic networks also present significant opportunities, which include the integration of advanced technologies, such as high-throughput sequencing, digital diagnostic platforms and AI-assisted analysis, that improve diagnostic accuracy and turnaround times.

[22] In terms of threats to PHDNs, a lack of support from governments with emphasis on funding or donor support, can negatively affect a network's sustainability. Cross-border data-sharing and material transfer present biosecurity and intellectual-property challenges. Rapid technological advancement may render existing laboratory infrastructure obsolete if continual upgrades are not implemented.

7. Successes and economic gains from plant-health diagnostic networks

[23] In terms of successes, PHDNs have demonstrated tangible impacts in various contexts. For example, the National Plant Diagnostic Network in the United States of America was key in the early detection of, and response to, *Phytophthora ramorum*, the pathogen responsible for sudden oak death, thereby preventing its uncontrolled spread. Similarly, EPPO has successfully developed and disseminated standardized diagnostic protocols, facilitating regional resilience and alignment with international frameworks. The ASEAN Regional Diagnostic Network has advanced pest diagnostic capacity in Southeast Asia, leading to more consistent identification and reporting of quarantine pests. In Africa, diagnostic initiatives supported by the African Union have strengthened monitoring of invasive pests such as fall armyworm (*Spodoptera frugiperda*) and cassava brown streak virus, directly contributing to food-security protection and adaptive capacity.

[24] The economic gains of PHDNs are equally significant. Early detection and coordinated responses reduce the costs of pest eradication and management, generating substantial savings compared to delayed action. For instance, preventing the spread of invasive pests safeguards agricultural productivity and minimizes trade disruptions, thus enabling economic growth and market access. Harmonized diagnostic capacity also supports a return on investment by reducing duplication in testing, ensuring compliance with phytosanitary standards, and maintaining market access. These economic benefits show that investments in PHDNs are both cost-effective and strategically vital for maintaining resilient agricultural systems.

8. Interviews with stakeholders on plant-health diagnostic networking

[25] A range of stakeholders were interviewed (see Appendix 1) on PHDNs. Standard questions were posed, including questions on areas such as institutional framework, human-resource capacity, technical capacity, financial resources, awareness, information management, and networking and partnerships.

[26] The consolidated outcomes from the interviews were as follows:

- National plant protection organizations must maintain primary regulatory authority. Networks should complement each other and not compete.
- Some countries have good laboratory infrastructure while others have insufficient resources.
- Existing networks must be mapped and must be aligned to IPPC guidelines. Existing resources should be leveraged.

- Financial sustainability is critical. There should be blended funding models as well as good regional support.
- There is a need for centralized systems for data management and information-sharing.
- Plant-health diagnostic networks are good to safeguard market access and reduce trade disruptions.

9. Conclusion and recommendations

[27] The establishment or strengthening of any PHDN is vital and beneficial to any country or region in safeguarding its agricultural and natural resources against harmful pests and should be considered a strategic priority. Countries and regions should move from developing policies and frameworks to being intentional in implementing actions to build PHDNs. A plant-health diagnostic network will strengthen a country's or region's diagnostic capabilities, enhance the credibility of systems through quality assurance and accreditation, and, with sustained funding, help build trust between trading partners in recognition of compliance systems that support the safe trade of agricultural commodities.

[28] From the reviewed literature, interviews conducted with various stakeholders, and consideration of successfully implemented models, the following recommendations are made:

- Encourage countries and regions to assess institutional capacities and create good governance structures that appropriately support the establishment and functioning of a PHDN.
- Assess legal frameworks of NPPOs, infrastructure requirements, data-management systems, capacities, competencies and expertise levels in a country or region.
- Develop training programmes for professional development, standardized diagnostic protocols on priority pests among regions, criteria for good data-management systems and communications, and funding models for PHDNs for establishment and sustainability.

[29] Note: The recommendations made are by no means exhaustive.

Recommendations

[30] The CPM is *invited* to:

(1) *note* this paper; and

(2) *discuss* and *provide* comments to the CPM Focus Group on Diagnostic Laboratory Networking.

Appendix 1: List of stakeholders participating in the plant-health diagnostic network interviews

Interviewee(s)	Organization(s)	Region
Shiroma Sathyapala	FAO	-
Fathiya Mbarak Khami	International Centre of Insect Physiology and Ecology (icipe)	Africa
Juliet Goldsmith	Caribbean Agricultural Health and Food Safety Agency (CAHFSA)	Caribbean
Fiona Constable	Subcommittee on Plant Health Diagnostics (SPHD)	Pacific
Beatriz Melchó	Comité de Sanidad Vegetal del Cono Sur (COSAVE)	Latin America
Rojas Quiroga Katty Guadalupe, Dunia Gutierrez, Jorge Evelio Angel Diaz, Wladimir Enriquez, Ana Garrido, Norma Gladys Nolazco Alvarado	Comunidad Andina (CAN), Servicio Nacional de Sanidad Agropecuaria e Inocuidad Alimentaria (SENASAG), Instituto Colombiano Agropecuario (ICA), Agencia de Regulación y Control Fito y Zoosanitario (AGROCALIDAD), Centro de Diagnóstico de Sanidad Vegetal (SENASA)	Latin America
Florence Munguti	Kenya Plant Health Inspectorate Service (KEPHIS)	Africa
IPPC Technical Panel on Diagnostic Protocols (TPDP)	-	-