



Food and Agriculture
Organization of the
United Nations



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➔ Policy brief

Improving implementation of the systems approach for pest risk management in Southern Africa

Trade of plants and plant products is key to the economic development of developing countries, especially those that rely on agricultural production. However, international trade of these products presents several risks in terms of the introduction of invasive plant pests, which pose a threat to natural plant resources and managed crops, biodiversity and forest production, human and environmental health, and general rural livelihoods e.g. in Africa (Eschen *et al.*, 2021). Plant pests may be introduced not only through agricultural trade, but also through the trade of non-agricultural products if the materials are susceptible to pest infestations (e.g. dunnage [FAO, 2007, 2017b] such as pallets, handicrafts, household effects, etc.) or simply container hitch-hiking or contaminating pests e.g. on military equipment, used cars and other goods (CEPM, 1996, 1999). While agricultural trade is believed to be the primary pathway for pest introduction in an



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the European Union



area (Baskin, 2002; International Plant Protection Convention [IPPC], 2010), regulation of trade has a significant impact on the risk from the spread of new pests. The national plant protection organizations (NPPOs) in respective countries operating effective plant health systems play a critical role in the management of these risks while permitting the smooth flow of trade. NPPOs use pest-risk analysis (PRA) to estimate the risk from a specific trade and to find the management options that allow “safe” trade as detailed in ISPM 2 (framework for pest-risk analysis), ISPM 11 (pest-risk analysis for quarantine pests) and ISPM 21 (pest-risk analysis for regulated non-quarantine pests).

What is the systems approach?

The systems approach is a pest risk management option that integrates different measures, at least two of which act independently, with cumulative effect (ISPM 14 - FAO, 2017d). Each of these measures reinforces the effectiveness of the system and because they act independently if one fails, the system can continue. Adjustments can be made until the appropriate level of protection of the importing country is achieved. In a systems approach, considerations are made relating to expert knowledge of the biology and ecology of the pest, host susceptibility or status as a factor in risk (see ISPM 37 for fruit fly hosts - (Aluja & Mangan, 2007; 2020; FAO, 2012); building a system around sequential mortal of a pest acknowledging cumulative effects on the pest population (Jang, 1996); rely on pest-free areas or places of production for trade from a country not free from the pest in question or use of areas of low pest prevalence combined with other factors (see ISPM 22 - [FAO, 2016a]). Understanding these dynamics allows NPPOs to design effective management systems to reduce the likelihood of harmful pests infesting plants, plant products or other objects such as packaging and containers used in trade. Tools and training materials developed by IPPC, the World Trade Organization (WTO) and other organizations including National plant protection organizations (NPPOs) and Regional plant protection

organizations (RPPOs) help in the support and implementation of a systems approach. Of note, beyond compliance excel - based tools guide NPPOs around the world - enabling them to select which measure to include, determine the purpose of each measure and choose ways to improve the effectiveness of the system. Correct application of the systems approach helps countries prevent the introduction of invasive species and protect crops and biodiversity while keeping trade safe. **Box 1** illustrates components of a systems approach. Systems approaches provide an alternative to single measures to meet the appropriate level of phytosanitary protection of an importing country. They can also be developed in situations where no single measure is available.

► BOX 1: SYSTEMS APPROACH

Components of the systems approach

- Field and production measures;
- Pre-harvest measures;
- Post-harvest measures;
- Inspection and certification measures;
- Shipping and distribution measures.

Why use the systems approach?

- The appropriate level of phytosanitary protection cannot be achieved by a single available measure;
- Measurable - There is the possibility to assess the effectiveness of individual measures either qualitatively or quantitatively;
- Sustainability - Addressing more than one pest or hazard, and it is cost effective;
- Less restrictive - especially for a challenging pest or pathway situation that requires a more robust approach;
- Less detrimental - Single treatment option may reduce the quality of the product e.g. commodity treatment;
- Market access - The cumulative effect of the different integrated measures at the three levels along the production chain are sufficient to negotiate with trading partners in search for acceptable levels of protection.



While systems approaches range in complexity, the application of critical control points system in a systems approach may be useful to identify and evaluate points in a pathway where specified pest risks can be reduced and monitored (see [Figure 1](#)). The decision regarding the acceptability of a systems approach lies with the importing country, subject to consideration of technical justification, minimal impact, transparency, non-discrimination, equivalence, and operational feasibility. A systems approach is usually designed as an option that is equivalent to but less restrictive than other measures such as prohibition of imports. [Box 2](#) provides information on resources that support the systems approaches.

Situation in the Southern African Development Community (SADC)

With growth in international trade and tourism, and changes in climate in the region, comes increase in pest introduction and associated risks. The implementation of effective systems approaches are important in mitigating these risks. In some regions, systems approaches have been used for decades. However, it is not actually known how much trade is occurring using systems approach as there is no requirement to register such systems with the IPPC and bilateral trade agreements, and specific pest-commodity protocols for trade often are not shared. Therefore, while there are examples of their use in SADC, there are significant conceptual, technical and institutional issues that must be resolved to take full advantage of opportunities from systems approaches to move beyond compliance with plans imposed by trade partners, to a position of strength for negotiation. Save for South Africa (for fruit fly, false codling moth, citrus etc.) ([Box 1](#)), most of the SADC Member States have not implemented systems approaches. The United Republic of Tanzania has also embraced aspects of the systems approach to manage pests of avocado in order to meet requirements of export



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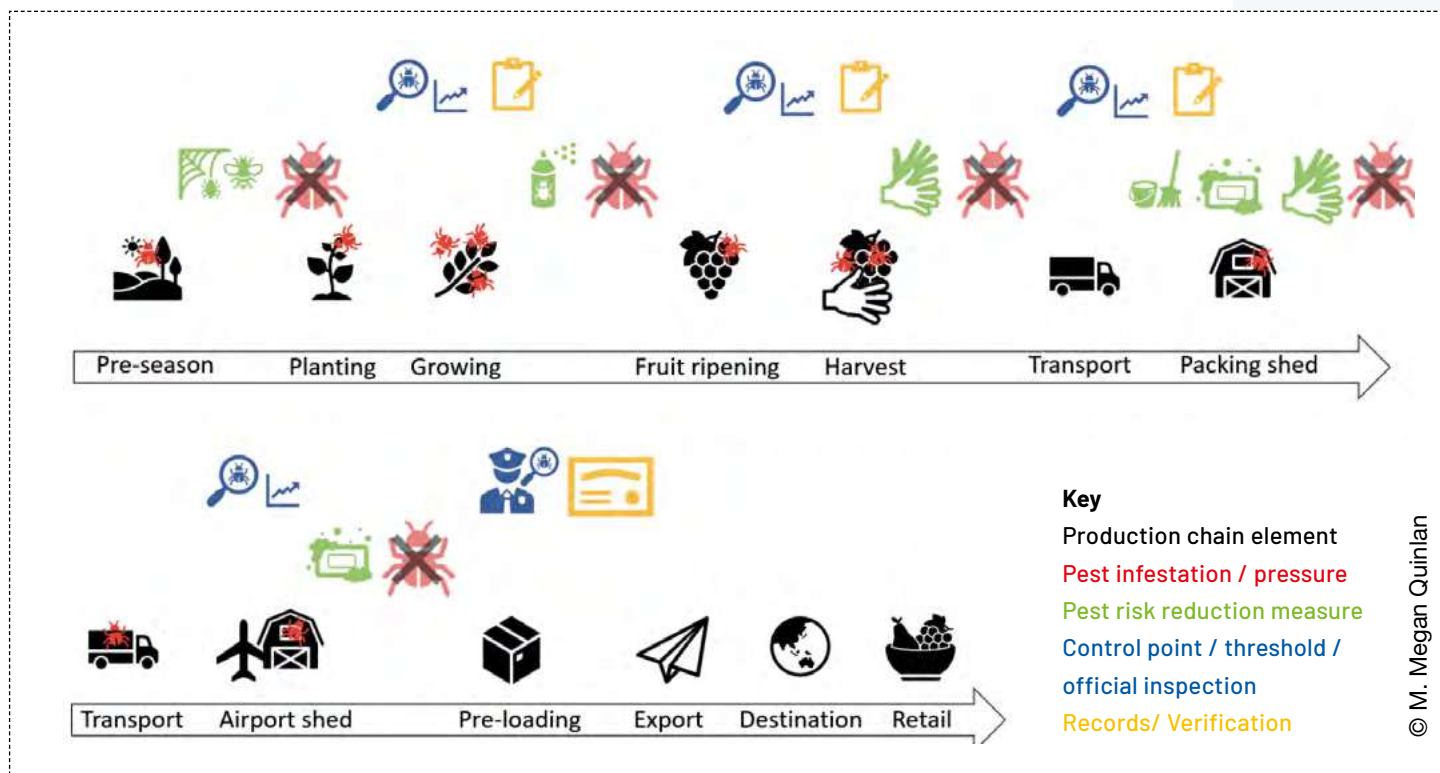
markets. From an online survey conducted in 2021 (in the first phase of STOSAR) on the Sanitary and Phytosanitary (SPS) topics to be covered, over 50 percent of the SADC Member States who responded reported the need for support in understanding and implementing ISPM 14. Even with the low response from the survey, issues of capacity, technical skills and participation especially in the implementation of ISPM 14 by actors came up top. The low adoption and implementation of systems approaches limit the benefits and opportunities ([Box 1](#)) that Member States would get especially in accessing international markets (e.g. The European Union regulations on false codling moth). Communication and awareness creation of systems approaches including protocols to all stakeholders in the pest-risk management chain

► IMPLEMENTATION OF SYSTEMS APPROACH FOR CITRUS SPP IN SOUTH AFRICA

- **Orchard:** Orchard registration, trap monitoring, orchard sanitation, fruit infestation monitoring, biological control measures, in-orchard culling.
- **Pack house:** Packhouse delivery inspection, fruit grading, packaging, phytosanitary inspection.
- **Shipping and certification:** Safeguarding of consignment, shipping regime, phytosanitary certification.



Figure 1. A systems approach



The figure shows a systems approach for a hypothetical pest/crop combination in which the risk of pest infestation in the final exported commodity is reduced by a series of pest management measures along the production/export chain. The black icons represent different points in the chain. The pest presence in the environment or as infestation in the crop or produce is indicated by red insects. Throughout the production, packing and export of each consignment, pest management measures (green) may be required to reduce losses for the grower and reduce the risk of possible introduction to an acceptable level for the importing country. The measures specified in the systems approach are biocontrol/natural enemy augmentation, insecticide application, postharvest hand sorting, warehouse hygiene, fruit washing, hand sorting at the packing shed and a further wash pre-loading. The real-time results shown by monitoring (blue icons) inform the

pest manager if additional measures are needed, acting as control points to remedy any issues in the systems approach up until that point. In a systems approach some measures may be stipulated as mandatory by the importing country while others may only be required if thresholds are exceeded. Records of the pest population/infestation levels and any measures used (orange clipboards) provide important information and verification to exporting and importing stakeholders and increase confidence to support new or continued trade (Quinlan et al., 2020).



(especially NPPO involvement) is critical to achieving of its objectives. Addressing the gaps identified

► BOX 2: RESOURCES THAT SUPPORT A SYSTEMS APPROACH

1. Information

- a. Data on biology, area of distribution, pathways, factors affecting introduction and spread, and impact, and risk-reducing measures;
- b. Pest status for the country (data from national pest surveys and interception records are crucial, sharing information is an obligation under the IPPC);
- c. Host status and association of pests with crops.
 - Well-established procedures for searching the literature and databases of existing trade.
- d. Efficacy of treatments.
 - The IPPC endorsed treatments require data on the predicted effect and required conditions.

2. Expert Knowledge

- a. Decisions can be constrained by data availability and need to use what information is available to inform expert judgements:
 - Extrapolating from historical data from where the pest occurs, to assess potential future events in a different geographical area;
 - Taking information about one pest and applying it to the related pest being assessed.

3. Beyond Compliance Tools

- a. Production or Pathway Chain (see Figure 1).
 - Graphic representation of activities to be used in a systems approach organized by stage (time and place), objective and type of measures;
 - This tool supports discussion of the objectives of measures so that the key modes of action against pest risk and means to verify their effectiveness are considered – even if not all are employed;
 - The completed tool provides an overview of options that is immediately grasped, thereby enhancing communication, and supporting analysis of combinations of measures that reduce the probability of introductions of regulated pests while remaining in proportion to the risk.
- b. Decision support for a systems approach (DSSA tool).
 - Allows users in importing or exporting countries to assemble and assess phytosanitary measures that contribute to pest risk reduction and the implementation of management plans;
 - A framework for ranking measures performance over a range of indicators, with the possibility of showing a range of opinions;
 - The DSSA aids constructive discussion amongst stakeholders within, and between, exporting and importing countries. The DSSA results can be the basis for proposals for new trade, equivalence or to supplement existing trade protocols that are failing to maintain the desired level of protection. The ratings may confirm areas of agreement regarding potential efficacy and point to the part of the system where data collection might address uncertainties and unknowns.



Developing a systems approach

This may be undertaken by the importing country, or by the exporting country, or bilaterally. The process may include consultation with industry, the scientific community, and NPPOs of importing and exporting countries. However, the NPPO of the importing country decides the suitability of the systems approach in meeting its requirements, subject to consideration of technical justification, minimal impact, transparency, non-discrimination, equivalence and operational feasibility. The systems approach has been implemented successfully around the world in pest management.

Gaps in a systems approach implementation

- a. The lack of awareness, acceptance and confidence in ISPM 14 and the systems approach is exacerbated by the fact that few trading partners share their operational or management plans, even though PRA are available. However, the lack of capacity to offer acceptable equivalent measures amongst trading partners could also be an issue.
- b. No current mechanism for sharing success stories about the implementation of ISPM 14 and the systems approach. This could be because of a greater emphasis on implementation of the system approach protocols, rather than how the measures contribute to risk reduction, either individually or in combination.
- c. The implementation of ISPM 14 is significantly slowed because NPPOs do not have wide access to all the details related to a specific tradable commodity even though combinations of measures have been the basis of substantial trade for decades. This could also be exacerbated by confidence and trust between trade partners.
- d. There is no requirement to register such a system with IPPC. In addition, although the IPPC is binding, ISPMs are not binding therefore country's are encouraged, but not obliged, to implement the system, and the principle of equivalence and IPPC Article VII 2a is considered sufficient.

- e. Limited active promotion and sharing of Beyond Compliance materials with other projects and training courses addressing risk management.
- f. Limited tracking of the impact of Beyond Compliance tools and general ISPM implementation.
- g. Fewer resources (infrastructure, personnel etc.) in most NPPOs especially in less-resourced countries that are obligated to meet import requirements, and face challenges satisfying these requirements set by the target market NPPOs, but who do not seek equivalence agreements (Quinlan *et al.*, 2020).
- h. A systems approach relies on stakeholder involvement. In some cultures, the NPPO retains a regulatory identity, rather than seeing itself as a trade facilitator, so that working closely with private industry can create unease. Even with a more collaborative culture, additional demands from stakeholder engagement and consultation require additional resources and possibly some competencies not generally employed in NPPOs (Quinlan *et al.*, 2016).

Role of NPPOs in implementing a systems approach

National plant protection organizations play a critical role in the plant health systems of any country, especially in the management of potential risks posed by the introductions of pests. With international trade uncertainties occasioned by the pests, NPPOs facilitate smooth and "safe" trade by operating an effective plant health system through implementation of International Standards for Phytosanitary Measures (ISPMs). Trade agreements are a function of the NPPOs of the importing and exporting countries and not the private sector for which the bilateral agreements are binding. Also, if a harmonised set of measures is used (i.e. trade based on an ISPM), the NPPO is the official representative of the country to ensure compliance. Other roles include:



- to recognize or approve of system approach as an alternative to consignment-based phytosanitary requirements;
- to certify facilities based on auditing by themselves or on basis of recommendations by approved entities;
- to maintain and publish a register of certified facilities;
- to decide on suspension, exclusion and re-acceptance (re-certification) of facilities of participants/ participants.

Role of public and private sector in the systems approach

Both public and private sectors form a critical stakeholder block in the implementation of a system approach and general plant health matters. While pest risk management has been seen as an NPPO function, the involvement of private and other relevant public players would determine/influence the success of the system. Different stakeholders are involved in a production chain including producers and processors; business inputs and service providers; traders and buyers; and regulators etc. and determine the measures to be taken at each critical point along the production chain. Among the roles played by the public and private sectors include:

- The application of good practices in relation to agricultural production, hygiene and safety along the value chain.
- SPS Compliance e.g. provision of information and inputs by business and service providers which affect what SPS measures are used (at critical control points).
- Accreditation and certification, as well as product differentiation or branding as a marketing strategy.
- Creation of awareness and recognition of SA and processes among suppliers and outgrowers.
- Investment in scientific facilities, equipment and methodologies for rapid analyses by national and private sector.
- Training and capacity building for personnel, organisation and systems involved in SA.

Role of importing country in the systems approach

Provide specific information regarding pests of concern, phytosanitary import requirements, types and level of assurance required (e.g. certification), points requiring verification. Importing countries, in consultation with the exporting country where appropriate should select least trade restrictive measures where there are options. The importing country could also propose improvements or alternative options, audit (evaluation and verification of the systems approach), specify actions for non-compliance and review and give feedback. Where importing countries agree to accept the implementation of certain measures in their territories, importing countries are responsible for the implementation of those measures and should be published (Article VII.2(b), IPPC).

Role of exporting country in the systems approach

Provide sufficient information to support evaluation and acceptance of the systems approach including; commodity, place of production and expected volume and frequency of shipments, relevant production, harvest, packing/handling, transport details, pest-host relationship, pest management measures proposed for a systems approach, and relevant efficacy data and relevant references. The exporting country could also monitor/audit and





report on system effectiveness, take appropriate corrective actions, maintain appropriate records and provide phytosanitary certification in accordance with requirements of the system.

Conclusion and recommendations

Commodity trade relies on reducing pest risk associated with respective pathways in an evidence-based manner, and the systems approach can be an important option to achieve this. However, the lack of publicly available examples to learn from by NPPOs in lesser resourced countries remains a barrier. The increasing repository of resources on the IPPC website (www.ippc.int) provides an opportunity for sharing such examples for learning lessons. In order to enjoy the advantages of the systems approach more fully, the SADC Member States will need to embrace the complexity and provide budgetary allocations to implement the approach. The following recommendations are proposed for NPPOs, public and private sector involved in the production, import and export chain.

- A global database detailing successful trade cases using the systems approach to address awareness, acceptance and confidence in ISPM 14.
- Harmonisation of basic concepts in any other initiatives in risk management to allow grouping of all useful tools for future access and use.
- Training of technical staff in NPPOs, RPPOs or other relevant organizations who will become experts and facilitators in each region.
- Implementation of a communication and tracking system for the Beyond Compliance tools e.g. through licensing that's two-way to allow for feedback in the future of implementations.
- Inclusion of relevant stakeholders both in the public and private sector to facilitate the systems approach implementation and financial support, and capacity building of different players along the production chain.
- Promotion of public and private sector linkages e.g. through crop or supply

chain-focused working groups, task forces, or authorities (Day, 2013).

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This policy brief was prepared by the Center for Agriculture and Bioscience International (CABI). Elma Zanamwe, Zibusiso Sibanda, Mathew Abang and Berhanu Bedane of the FAO SFS reviewed the policy brief. The contribution of the SADC Secretariat is acknowledged.

This policy brief is an output of the European Union-funded project: "Support towards the Operationalization of the SADC Regional Agricultural Policy" STOSAR, implemented by the Food and Agriculture Organization of the United Nations in collaboration with the SADC Secretariat.

