SAMAC
Macadamias South Africa NPC

SAMAC Biosecurity Risk Framework

May 2025

Revision History

Version	Date	Author	Description of changes
1	15/11/2024	K Noeth	First draft
2	29/05/2025	K Noeh	Major revisions to species lists (Tables 2 – 5), content revisions to section 2 and all subsections, section 6 and section 7, general polishing.

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1. Introduction

Biosecurity refers to the measures and actions implemented to protect against the introduction, emergence, spread and release of biological agents such as viruses, bacteria, fungal pathogens, and insect pests which pose a risk to human, plant, or animal health. Biosecurity measures also indirectly protect livelihoods, lifestyles, and the natural environment which could be harmed by the introduction of new pests and diseases. Biosecurity is primarily a statutory function, but secondarily it is the responsibility of every citizen of a country.

With increased trans-continental travel of persons and goods, concomitant movement of various pests and diseases is also observed. South Africa has 71 ports of entry for goods arriving from international trading partners. Pests and diseases enter South Africa through one of these ports via plants, soil, seeds, wood packaging and products made from plants or animals crossing borders. Additionally, they can be transported by hitchhiking on people or in luggage, through courier systems, or via air or sea freight. Not all of these ports, however, are a risk for the introduction of pests and diseases of macadamias. The major international airports at Johannesburg, Lanseria, Cape Town, Durban, Gqeberha, and Mbombela, along with the seaport at Durban and the land-border crossings at Lebombo (Mozambique), Beitbridge (Zimbabwe), and Oshoek (eSwatini), pose the highest biosecurity risk for macadamias in South Africa (Table 1). This is because seedlings, graft wood, nut-in-shell for processing, and travelling growers or service providers frequently move through these ports. The seaports at Cape Town, Richards Bay, Gqerberha and the land-border crossings at Maseru (Lesotho) and Ficksburg (Lesotho) pose a much lower risk for macadamias in South Africa.

Table 1. International ports of entry into South Africa and associated risk for the macadamia industry.

Airports	Macadamia industry risk (High, medium, low)
OR Tambo International Airport (Johannesburg)	High (seedlings/and or graft wood)
Cape Town International Airport (Cape Town)	High (seedlings/and or graft wood)
King Shaka International Airport (Durban)	High (seedlings/and or graft wood)
Lanseria International Airport (Johannesburg)	High (seedlings/and or graft wood)
Chief Dawid Stuurman International Airport (Gqeberha)	High (seedlings/and or graft wood)
Kruger International Airport (Mbombela)	High (growers/service providers travelling to Mozambique)
Seaports	**Macadamia industry risk (High, medium, low)**
Port of Durban (Durban)	High (nut in shell from Africa for cracking in South Africa, graft wood)
Port of Cape Town (Cape Town)	Low
Port of Richards Bay (Richards Bay)	Low
Port of Gqeberha (Gqeberha)	Low
Land Border Crossings	**Macadamia industry risk (High, medium, low)**
Beitbridge Border Post (border with Zimbabwe)	High (nut in shell from Africa for cracking in South Africa, service providers)
Lebombo Border Post (border with Mozambique)	High (nut in shell for cracking in South Africa, travelling growers & service providers)
Oshoek Border Post (border with Eswatini)	High (nut in shell for cracking in South Africa, service providers)
Maseru Bridge Border Post (border with Lesotho)	Low
Ficksburg Bridge Border Post (border with Lesotho)	Low

2. SAMAC Biosecurity Risk Framework

The South African macadamia industry has no alternative but to implement biosecurity measures. The aim of the SAMAC Biosecurity Risk Framework is to identify, assess and mitigate risks to macadamia production and the profitability of growers due to the introduction of pests and diseases into production areas. This framework also outlines the response and sequence of events if a new biosecurity threat is identified. An overview of the framework is shown in Figure 1.

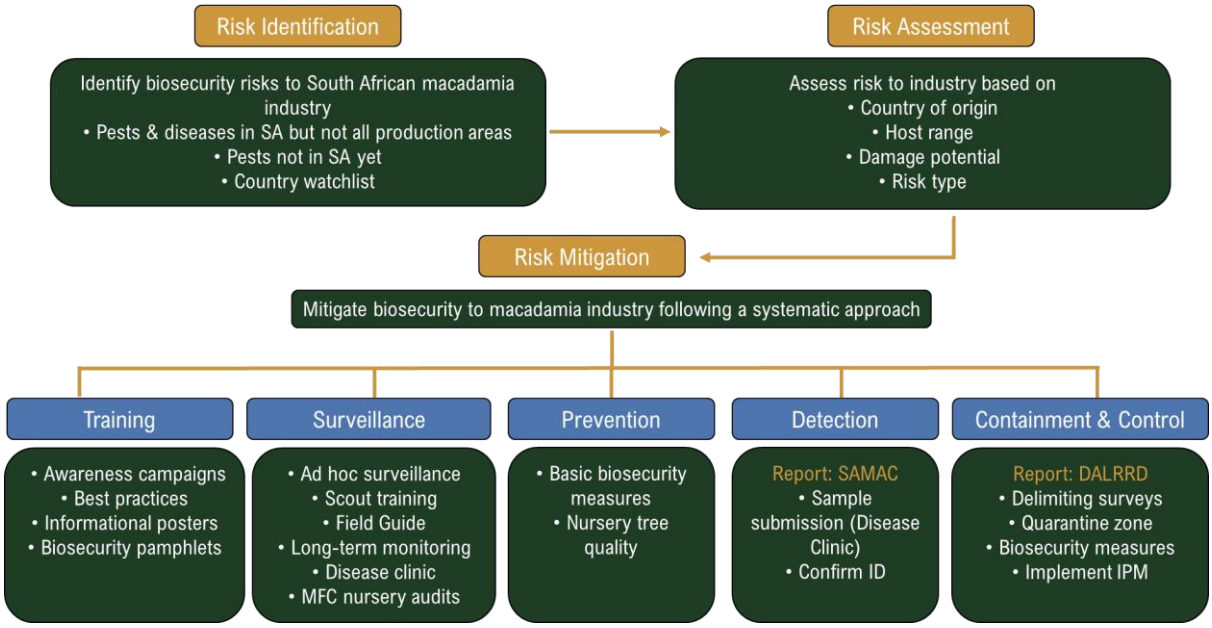

Figure 1. Overview of the SAMAC Biosecurity Risk Framework.

2.1 Risk Identification

Risks to the South African macadamia industry include pests and diseases that are present in some, but not all, macadamia production regions in South Africa (listed in Table 2). Risks to the industry also include pests and diseases which do not occur in South Africa yet (listed in Table 3). The lists of potential high risk biosecurity threats should continually be updated by the SAMAC Risk Mitigation Sub-Committee.

The Risk Mitigation Sub-Committee should be continually aware of potential pests and diseases in other macadamia producing countries. Countries exporting macadamia graft wood to South Africa should be placed on a watchlist, as pests and diseases from these countries can enter South African ports through this manner. Known pests and diseases of macadamias from these countries should be included in the lists of potential biosecurity threats. Current countries on the watchlist include Australia, China, eSwatini, Malawi, Mozambique, New Zealand, Tanzania, USA (esp. Hawaii), Zambia, and Zimbabwe.

2.2. Risk Assessment

Risk assessments involve niche modelling and the determination of host ranges, generation time, available control measures and damage potential of identified pest and diseases risks. Risk assessments of pest and disease risks within South Africa and internationally is available in the appendix in Tables 2 to 5.

2.3. Risk Mitigation

The mitigation of biosecurity risks follows a systematic approach. Awareness of biosecurity risks are addressed by training and education initiatives. The knowledge gained from training feeds into surveillance efforts to detect biosecurity risks. Surveillance can be conducted through several means that involves everyone, from farmers and growers to government institutions. If a biosecurity risk is detected, its identify and potential risk needs to be verified. Once verified, the biosecurity risk needs to be contained if possible. Finally, control efforts can be implemented, along with continual monitoring of the pest to determine its spread. Each step outlined in more detail below.

2.3.1 Training and education

Since biosecurity is a national priority, training and awareness campaigns across the South African macadamia industry, government agencies and ports of entry should be the first step in addressing biosecurity risks. Training and education can take the form of awareness campaigns, study groups and training roadshows to production areas, government agencies and research institutions.

a. Biosecurity pamphlets

Photographic identification guides of the key biosecurity threats (see Appendix: Tables 2 – 5) should be updated and circulated in industry annually, as well as distributed to officials at ports of entry.

b. Best Practices

Best practice guidelines should form the core of biosecurity training material, providing growers, nursery operators, consultants, and transporters with standardised, practical instructions. These guidelines must be updated regularly to reflect new pest incursions, updated legislation, or technological advances in pest detection and control. They should include:

- Planting material protocols: Guidance on sourcing disease-free and certified planting material. Nursery hygiene and traceability systems must be emphasised to prevent pathogen spread via propagation.
- On-farm biosecurity checklists: Protocols for managing staff and visitor movement, equipment sanitation, clothing changes, and vehicle entry. Clear signage and designated entry/exit points should be included.
- Monitoring and surveillance: Standardised monitoring schedules for high-risk pests and diseases and sampling procedures for early detection. Templates for recording data should be provided.
- Pest and disease response plans: Step-by-step instructions on containment, reporting, and initial treatment actions if a new biosecurity threat is suspected. This includes whom to notify (e.g. DALRRD, industry bodies).
- Port of entry best practices: For inspectors, freight handlers and customs officials—guidance on handling macadamia plant material imports, visual inspection protocols, and identifying red flags.

Best practices documents should be made available in multiple formats (print, PDF, mobile-friendly apps) and languages relevant to the workforce (e.g., English, Afrikaans, isiZulu, isiXhosa).

c. Awareness campaigns

Awareness campaigns should be designed to build a proactive, informed culture of vigilance around biosecurity threats. These campaigns can take the form of short WhatsApp alerts communicated via the SAMAC phone, online webinars, emails, best practices and informational pamphlets for offices, packhouses and nurseries. Topics to include are key biosecurity threats, basic on-farm biosecurity measures, nursery tree quality, introduction pathways (especially travelling growers, consultants and technical advisors), regulated pests and regulatory updates.

2.3.2 Surveillance

Surveillance can be conducted broadly through standard scouting activities by farmers. Surveillance can also be conducted more specifically through targeted surveillance programs, such as for the bark borers

and macadamia felted coccid surveys. Activities that should form part of surveillance programs are outlined below.

a. Scout training

Insect scouts spend most of their time monitoring insects. Considering the currently confirmed hectarage of macadamia orchards in South Africa (80 000 ha), capacitating these people will be the first and logical departure point of a biosecurity awareness campaign and continued training is therefore not negotiable. Scouts should be encouraged to follow the SAMAC scouting standard operating procedures.

b. Field guide

The SAMAC field guide should be updated to include a section on biosecurity threats, or a separate document should be drafted. This document should be continually updated to include the latest biosecurity threats in Tables 2 and 3.

c. Disease Clinic

SAMAC currently supports a diagnostic clinic at FABI and industry should continuously be encouraged to send samples to the disease diagnostic clinic. The Disease Diagnostic Clinic serves as the "first line of defence" in industry for detecting new pests and diseases.

d. Ad hoc surveillance

Ad hoc surveillance plays a critical role in the early detection of new or emerging pest threats, particularly in response to grower reports or informal detections. It serves as a flexible, rapid-response layer of the biosecurity system, enabling containment before broader establishment.

When a potential biosecurity threat is reported by a grower, consultant, or extension officer, a trained surveillance team led by Biosyntrix should be dispatched within a defined response window. Surveillance teams must follow standardised pest scouting procedures (SAMAC Standard Operating Procedure for Monitoring) to ensure consistency across sites. All field detections should be logged using GPS-enabled tools or mobile apps to build a spatial understanding of potential spread, especially in clustered production regions.

Suspected detections of regulated or high-priority pests must trigger immediate reporting to DALRRD's Plant Health unit and follow official pest notification procedures under the South African Emergency Plant Pest Response Plane framework.

Findings from ad hoc surveillance should be communicated to industry to raise alertness and implement precautionary measures if necessary.

e. Long term monitoring

Long-term pest and disease monitoring is vital for understanding seasonal dynamics, emerging trends, and the long-term impact of climate, landscape, or varietal shifts. These efforts contribute to evidence-based forecasting and proactive management.

The FABI Disease Clinic, in collaboration with select growers, coordinates structured monitoring on dedicated farms strategically distributed across key macadamia-growing regions.
Core elements include:

Long term monitoring also offers research opportunities, including pest phenology studies, resistance development tracking, and host-pathogen interaction analyses.

f. MFC Nursery audits

The annual auditing of nurseries for the presence of Macadamia Felted Coccid (MFC, Acanthococcus ironsidei) is a high-priority regulatory and industry quality assurance activity. Nurseries represent a key risk pathway for pest spread through the distribution of infested planting material.

Biosyntrix conducts structured audits of registered macadamia nurseries at least once per year, with additional surprise visits to discourage poor practices and improve compliance.

2.3.3 Prevention

Basic biosecurity measures should be implemented at the farm level, with heightened vigilance in designated quarantine zones and areas identified as high-risk, such as farms located near confirmed macadamia felted coccid (MFC) infestations. Proactive on-farm surveillance is essential to detect potential threats early and prevent the establishment and spread of key pests and diseases. This must be supported by the use of healthy, pest-free planting material sourced from accredited nurseries. Ensuring the health and quality of nursery trees is critical to planting success, reducing vulnerability in the field, and protecting the broader industry from avoidable biosecurity incursions

Best Practices for basic on-farm biosecurity measures, as well as nursery tree health and quality should be circulated to growers annually. Translating these into isiZulu, isiXhosa and Venda is recommended, for ease of access to non-English speaking growers.

2.3.4 Detection and verification

Should any new insect or disease be found, the grower or technical advisor should report the incident to SAMAC immediately. Samples should be submitted to the Disease Diagnostic Clinic at the University of Pretoria to confirm the identity. Based on the identity of the insect or pathogen and its status as a phytosanitary or regulated pest, a decision will be made by the SAMAC R&D Committee on the steps that should be followed- e.g. delimiting surveys, establishing quarantine zones, implementing IPM protocols etc. Growers and industry stakeholders should be notified of any biosecurity incursions, the outcomes of investigations and the recommend actions going forward, if applicable. Diagnostic tools for the main biosecurity risks should be developed proactively.

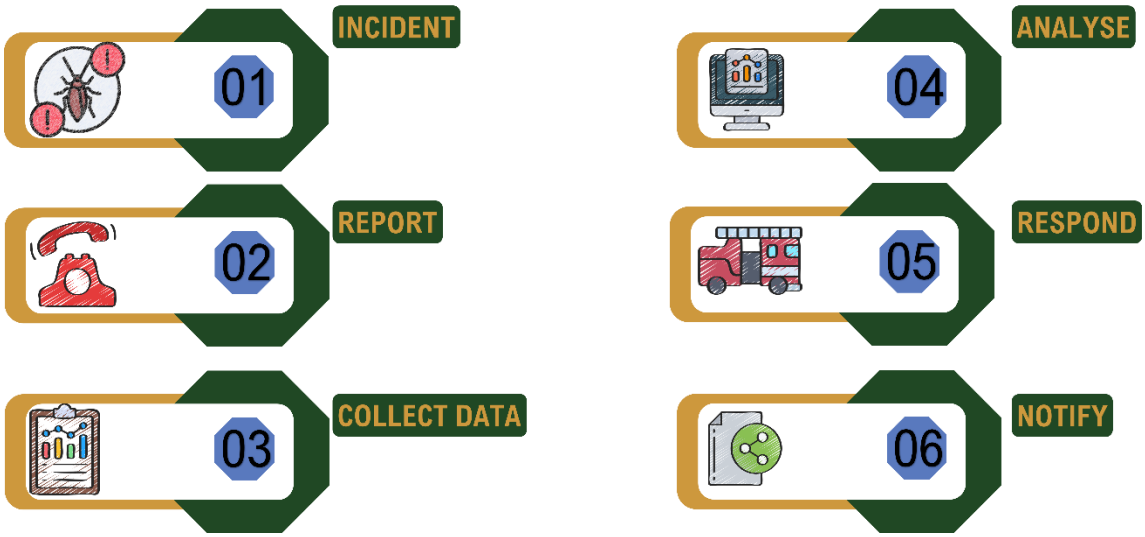

Figure 2. Overview of the procedure to be followed when reporting new biosecurity risk incidents

2.3.5 Containment and control

If a new pest or disease is confirmed as a key biosecurity threat or a regulated pest/ disease, the National Plant Protection Organisation of South Africa (NPPPOZA) must be notified immediately. Surveys will be conducted to assess whether the pest or disease can be contained, treated, or eradicated. The findings of these surveys and subsequent decisions should be communicated clearly to relevant stakeholders. While the Department of Agriculture has the authority to declare quarantine areas, SAMAC can request industry cooperation during this process. The detection site should be quarantined immediately to restrict the movement of host material, especially all listed host material, from the area. Initially, the quarantine zone will encompass a circular area with a 5 km radius around the detection point. A delimiting survey will also be conducted immediately to determine the extent of the infestation, which may lead to an adjustment of the quarantine zone.

In the event that a biosecurity threat is confirmed, integrated pest management (IPM) protocols should be implemented based on the results of delimiting surveys. These surveys help define the extent and distribution of the outbreak, guiding whether a targeted response at specific hotspots or broader area-wide measures are most appropriate. Tailoring IPM interventions in this way ensures that control efforts are proportionate, strategic, and resource-efficient, reducing the risk of further spread and

efforts are proportionate, strategic, and resource-efficient, reducing the risk of further spread and long-term establishment.

6. Conclusions

The South African macadamia industry operates within an increasingly complex biosecurity landscape, shaped by global trade, climate variability, and the emergence of novel pests and diseases. In this context, the establishment of a structured Biosecurity Risk Framework is not only prudent—it is essential. This framework sets out a coordinated, science-based approach to risk identification, assessment, and mitigation, aligned with national plant health priorities and international biosecurity obligations.

The success of this framework hinges on cross-sectoral cooperation. While statutory oversight remains the responsibility of the National Plant Protection Organisation of South Africa (NPPOZA), meaningful implementation requires active industry buy-in and alignment across government departments, research institutions, port authorities, and growers. Capacity building, information dissemination, and rapid response coordination must be adequately resourced and institutionally supported.

Strategic investment in surveillance, diagnostic capacity, regulatory enforcement, and communication channels is critical. Equally important is the continuous updating of pest threat lists, monitoring protocols, and best practice guidelines to ensure responsiveness to new and emerging risks.

In safeguarding the industry's phytosanitary integrity, this framework contributes not only to domestic agricultural resilience but also to maintaining South Africa's export competitiveness, protecting rural livelihoods, and fulfilling international market access requirements. Sustained commitment to biosecurity must therefore be viewed as a national agricultural imperative.

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