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Coconut Risk Management and Mitigation Manual for the Pacific Region

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11. INTERNATIONAL TRANSMISSION OF PESTS AND DISEASES

By V. Johnson and R. Bourdeix

Description

The key risk is that even traces of insects or pathogens such as viruses, bacteria or fungi, when accidentally introduced into a country, may trigger epidemics and cause economic or social disasters, linked to sectors in agriculture, food, and animal and human health.

The term 'biosecurity' was first used by the agricultural and environmental communities. It related first to a set of preventive measures designed to reduce the risk of transmission of infectious diseases and pests in crops and livestock, invasive alien species, and even living modified organisms.

The National Agricultural Quarantine Services, Biosecurity teams (or equivalent organizations) play a critical role in protecting agriculture and the environment from invasive plant and animal species, pests and diseases. The Services' tasks include pest risk assessment and analysis, pest identification, pest treatment and mitigation protocols development, invasive pest management policy development, and administration. They also include routine inspections of international passengers, commercial vessels, trucks, aircraft and railcars. They work to ensure reciprocal market access – export and import of biological products - and to maintain high efficiency in any emergency response.

Pest risk analysis (PRA) and import risk analysis (IRA) are the processes that are used to technically establish phytosanitary measures regulating plants and plant products imports and exports. Although these processes are primarily used to determine import and export requirements for commercial quantities of traded commodities, they apply also to importing small quantities of germplasm that are internationally transferred as planting material or for breeding purposes. Rules for commercial products and germplasm introduction may slightly differ, where those for germplasm movements are more stringent.

Occurrence and severity

This is an extremely important risk. Several scenarios can be quoted as illustrations: 1) imports of plants other than coconut palms but which have transmitted coconut pests; 2) introductions of coconut plant material that have transmitted coconut diseases and 3) Introduction via machinery and equipment unrelated to agriculture, such as brightly lit warships on which *Oryctes* beetles have been found attracted to light. Another case is coconut products transmitting pests and diseases to organisms other than coconut, but this will not be described here.

Two examples of such introductions are: 1) the coconut rhinoceros beetle (*Oryctes rhinoceros*) was introduced into Samoa by a large boat transporting hundreds of thousands of rubber seedlings in the early nineteenth century, and introduced elsewhere in the Pacific Islands over subsequent decades. Some Dwarf seednuts transferred in 2018 from Costa Rica to Dominican Republic were infested with nematodes (*Bursaphelenchus cocophilus*- causing red ring disease) and they were destroyed. When species are transmitted to areas beyond their natural range, there is also a risk that they will spread rapidly in the absence of natural predators which normally co-evolve in the natural habitats. Insect and other vectors are often

responsible for transmitting pathogens, so these also need to be considered in any quarantine and pest mitigation strategy.

Mitigation and adaptation

The first step is to identify the range of pests that are likely to be infesting commodity flows, carried by coconut food and non-food products, seednuts, seedlings, pollen or embryos (cultivated *in vitro*). For each of these pests, technical data are compiled in a datasheet that include information on pest biology and transmission, and when available, their economic importance.

Coconut should be internationally moved only as processed products (including copra), seednuts, cultured embryos/ plantlets and pollen. Importing coconut seedlings is banned in most countries. Whole mature coconut and green coconut for drinking, when exported from Pacific countries are very often fumigated with methyl bromide, to destroy all insects and arthropod pests that may have casually moved with the fruits. This treatment is incompatible with organic certification. Alternatives are available, but as of 2019 these are also pesticides, and jeopardize the development of an organic market for mature and drinking coconuts in these countries.

In the case of coconut germplasm transfer, the material destined for export should be collected in a zone free of disease, and especially free from phytoplasma, viruses and viroids. A manual (Cueto et al., 2012) provides information and guidance on movement and duplication of coconut (*Cocos nucifera L.*) germplasm using embryo culture transfer protocols. Coconut embryos are extracted from the coconut and cultivated *in vitro*. Plantlets are then obtained that can be transferred to the field and grown on to become adult coconut palms. This is feasible only by well-trained scientific teams. Embryo transfer was considered as the safest technique for moving germplasm, until a team from Mexico found the lethal yellowing disease (LYD) can be transmitted through the embryo onto plantlets. Cadang-cadang has been detected in the embryo and pollen but is not proven to be seed- and pollen-transmitted. Phytosanitary measures to ensure effective hygiene must be implemented according to national and international standards when sharing material.

Actions needed

- **Biosecurity services** assist millions of travellers, goods, vessels and aircraft to move in and out of Pacific states and other countries at the same time, minimising adverse effects on environment, and human, animal and plant health. Public awareness and inspection programs are a crucial component of this task, and some of them should target specifically farmers. Coconut products should not be moved abroad without quarantine inspection. Developing and implementing national **by-laws** and **border controls** can also assist in successful biosecurity.
- As mentioned above, ensuring compliance with effective **phytosanitary protocols**, or introducing these where they are not currently implemented, are critical to preventing international transmissions of pests and diseases. Pacific island countries, including Australia and New Zealand, should strengthen their collaborations to have more harmonized quarantine and biosecurity policies.
- To supplement biosecurity services, countries should develop and enforce policies based on sound **epidemiological knowledge** and contingency plans to anticipate threats from key invasive species (see also separate sections on pests and diseases risks). Once a pest

invasion has been recorded, governments should be prepared to control spread and eradicate, using measures already developed in national disease management plans. This will include forecasting, surveillance, vector control and using new pest diagnostic protocols, all based on sound epidemiological knowledge. In many cases, governments may need to embark on capacity building programs.

- **Pollen** is sometimes exchanged for breeding purposes. Treatment of coconut pollen is not possible, other than sieving out the larger contaminating pests, so all consignments should be carefully, visually inspected using a low power microscope, before dispatch and again at point of entry. Use preferably pollen from bagged inflorescences where insecticide and nematicide have been added before the natural opening of the spathe.
- Using **seednuts** can reduce risks of introduction. In this case, the bracts protecting the perianth should be systematically removed, as mites breed there, and the seednuts must be treated with appropriate insecticide and fungicide. Sometimes seednuts can be partially de-husked to increase the efficiency of chemical treatment.
- **Coconut variety diversity** on farms provides some protection against epidemics. If several varieties are present in the agricultural landscape, this increases the chances that some will be more tolerant, and pest or disease spread may be constrained.

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