



Coconut Risk Management and Mitigation Manual for the Pacific Region



Compiled by R. Bourdeix, J. M. Sourisseau and J. Lin Suva, December, 2021



© Pacific Community (SPC) 2021

All rights for commercial/for profit reproduction or translation, in any form, reserved. SPC authorises the partial reproduction or translation of this material for scientific, educational or research purposes, provided that SPC and the source document are properly acknowledged. Permission to reproduce the document and/or translate in whole, in any form, whether for commercial/for profit or non-profit purposes, must be requested in writing. Original SPC artwork may not be altered or separately published without permission.

Original text: English

Pacific Community Cataloguing-in-publication data

Bourdeix, R. (Roland)

Coconut risk management and mitigation manual for the Pacific region / compiled by R. Bourdeix, J. M. Sourisseau and J. Lin

- 1. Coconut Oceania.
- 2. Coconut Oceania Handbooks, manuals, etc.
- 3. Coconut Management Oceania.
- 4. Coconut industry Oceania.
- 5. Coconut products Oceania.

I. Bourdeix, R. (Roland) II. Sourisseau, J. M. III. Lin, J. IV. Title V. Pacific Community

634.6170995

AACR2

ISBN: 978-982-00-1429-9

Disclaimer

© Pacific Community (SPC) 2021. All rights for commercial/for profit reproduction or translation, in any form, reserved. SPC authorises the partial reproduction or translation of this material for scientific, educational or research purposes, provided that SPC and the source document are properly acknowledged. Permission to reproduce the document and/ or translate in whole, in any form, whether for commercial/for profit or non-profit purposes, must be requested in writing. Original SPC artwork may not be altered or separately published without permission.

While efforts have been made to ensure the accuracy and reliability of the material contained in this manual, the Pacific Community (SPC) cannot guarantee that the information is free from errors or omissions. SPC does not accept any form of liability, contractual or otherwise, for the content of this manual or for any consequences arising from its use

Prepared for publication by SPC Land Resources Division (LRD), Narere, Suva - Fiji. www.spc.int | +679 33 0733 | <u>Irdhelpdesk@spc.int</u>, and Diversiflora expertise, Montpellier, France | +33 0782824307 | roland.bourdeix@yahoo.fr.

To cite this manual:

Bourdeix, R., Sourisseau, J. M., & Lin, J. (Eds.). (2021). Coconut Risk Management and Mitigation Manual for the Pacific Region. Land Resources Division, SPC.

To cite a chapter of this manual:

Lin, J., Alasia, J. P., & Helsen, J. (2021). Risks linked to organizational and policy issues. In R. Bourdeix, J. M. Sourisseau & J. Lin, J. (Eds.). *Coconut Risk Management and Mitigation Manual for the Pacific Region* (pp 99-100). Land Resources Division, SPC.

Coconut Risk Management and Mitigation Manual for the Pacific Region

Compiled by R. Bourdeix ^(1, 2), J. M. Sourisseau ^{(3, 4),} and J. Lin ⁽⁵⁾

(1) CIRAD¹, UMR AGAP², F-34398 Montpellier, France.

(2) AGAP, Univ Montpellier, CIRAD, INRA³, Montpellier SupAgro, Montpellier, France.

(3) CIRAD, UMR ART-DEV, F-34398 Montpellier, France.

(4) ART-DEV⁴, CIRAD, Univ Montpellier, CNRS⁵, Université de Perpignan via Domitia.

(5) Doctoral Researcher in Research Training Group 1666 'Global Food: Transformation of Global Agri-Food Systems" University of Göttingen, Göttingen, Germany.

¹ The French Agricultural Centre for Research and International Cooperation.

² Joint Research Unit on Genetic Improvement and Adaptation of Tropical and Mediterranean Plants.

³ The French National Research Institute for Agriculture, Food and the Environment.

⁴ Joint Research Unit on Actors, Resources and Territories in Development

⁵ The French National Research Institute for Scientific Research.

9. OTHER PESTS (LARGE ANIMALS)

By R. Bourdeix, T. McKenzie, M. A. M. Gruber, O. Smus and S. Ratu

Description

The risk is that large animals (bigger than insects) destroy the harvest and/or compromise replanting by destroying seedlings.

Rats, crabs, squirrels and more rarely bats, are known to destroy coconuts when still on bunches, and sometimes also when fallen on the soil (crabs). The old coconut pierced by the animals remain on the ground. Some of them fill with rainwater and provide perfect breeding places for mosquitoes that can transmit diseases to animals and humans.

Rats are a major mammalian pest that damage coconut and other important crops. Three species are found in the Pacific: Pacific or Polynesian rat (kimoa, kiore), Black rat or ship rat, Brown rat or Norwegian rat. They are mainly nocturnal, but overpopulation may drive them to be active during the daytime also. Gnawing damage by rats can often be seen on young nuts but sometimes also on the trunks and on inflorescences, opening ways for disease or insect attacks. Mature nuts are fed on when they have fallen to the ground.

Wild or semi-wild pigs and goats often eat coconut seedlings planted by farmers, and sometimes ruin almost all replanting efforts. Cattle sometimes feed on the young coconut leaves, causing damage as long as the leaves remain within their reach.

In two places it has been observed by Dr R. Bourdeix that overgrowth of birds (seen in Motu One, Tetiaroa Atoll, French Polynesia) and bats (seen near Madang in Papua New Guinea) may induce an infestation by PHYTOPHTHORA. This water mold causes immature nuts to fall and sometimes the death of the coconut tree by bud rotting. One hypothesis is that the droppings of these animals constitute natural culture media for the fungus. This needs to be verified by scientific studies and more farmers observations.

The coconut crab (*Birgus latro*) is a species of terrestrial crab, also known as the robber crab or palm thief. It is the largest land-living arthropod in the world, with a weight up to 4.1 kg (9.0 lb). Coconut crabs cannot open fresh coconuts when still on the palm. In 1981, the crab was listed on the IUCN Red List as a vulnerable species, but a lack of biological data caused its assessment to be amended in 1996. Conservation management strategies have been put in place in some regions. So, it is better to keep crabs and let them eat some of the coconuts.

Occurrence and severity

Damage by rats and other mammals is difficult to quantify, but rats can affect production of coconut and other crops, with the most damage being done by the black rat.

In the 2010's in Marquesas Islands, most young coconut palms were destroyed by semi-wild pigs that circulate freely in plantations without being supervised or circumscribed by their owners. All attempts to replant coconut palms have failed. The village mayor has published local edicts threatening the owners of these pigs with fines, but this measure has remained mostly ineffective. Goats also eat young seedlings. Wild pigs sometimes eat mature coconut fallen on the ground.

Mitigation and adaptation

In case of damage by animals, the first step is to identify which animal caused the destruction of the nuts. This can often be identified by the way the fibres of the husk have been cut. Once identified, some specific actions can help control these pests.



© R. Bourdeix, 2018.

Plate 10. Damage caused by squirrels on Green Dwarf coconuts in Thailand. It is rare to observe such significant damage.

Preventing rats from invading new areas is very important as it can be difficult to eradicate them later. Rats are frequently found on boats, ships and aircraft as stowaways. Rats can also swim considerable distances. Therefore, biosecurity at possible entrances must be managed. The import of rats is prohibited into and out of most Pacific island countries, including New Zealand and Australia. Some countries, such as New Zealand, use dogs specifically trained to detect rats.

Rats are commonly introduced by and found around human populations. Therefore, keeping environments clean and tidy and storing food resources securely can help reduce rat populations. Rat-proofing storage places can help reduce products being destroyed. Putting metal trunk banding or plastic sheets around the coconut palm trunk can help deter rats and stop them from reaching the crown. When using such bands, be careful: if the leaves from one palm touch another, and if rats can climb neighbouring trees, then they will reach all the coconut trees and continue to damage fruits. Electric fences (lethal and non-lethal) and other enclosures have been successful, but are expensive.

Trapping is a great option to catch all species of rats and help with identifying what species is present. Snap traps and live traps can be used. Rats may become 'trap-shy' (i.e., they avoid traps), and then are able to repopulate areas.

Baiting with pesticides is commonly used as a control or eradication tool. Commercial baits can be brought from most stores to eradicate rats within small areas (homes and storage). For wide ranges, bait stations (spaced at 50- 200 m) are used or spread along the ground. Aerial distribution is also used to dispense poisons in large and hard to reach areas. Rodenticides should be used with caution. Poisoning of non-target species may occur. Rats sometimes become 'bait-shy' to these poisons. Always follow guidelines and instructions on the use of pesticides. There may be **restrictions** on their use within your country.

Plant-derived pesticides are used within the Pacific and can be less toxic than commercial pesticides (more needs to be consumed). The young leaves of legume shade tree, *Gliricidia* are pounded and mixed with cooked rice, maize or other food as a lure. The bark can be used as well. Chemicals in the leaves, once converted with bacteria, are similar to the brodifacoum in commercial baits. In the Solomon Islands *Barringtonia asiatica* fruits' white inner flesh has been used as part of a rat poison. The scraped fruit is added to cooked rice or shredded coconut. However, this may be dangerous, as the concentration of the toxin is unknown. Be aware that some organic products can be as dangerous as modern chemicals for humans and other domesticated animals or wildlife.

Semi-wild and wild pigs can be controlled by trapping or shooting. A Marquesan farmer made the decision to install traps in his plantation, to catch, kill and eat all the pigs that roam. This type of solution may lead to conflicts with neighbours. In addition, it must be ensured that the traps used are absolutely safe for humans, and especially children. At the community level, there are often hunting campaigns that can help control wild pigs, which sometimes become dangerous for humans (seen in Atiu, Cook Island, motorcycles knocked out). In addition, the meat of these pigs is delicious and canned food well prepared according to traditional recipes could be sold at a premium price. Wild pigs should never be consumed if rat control has been undertaken in the area as the rat poison can accumulate in the tissues of pigs, particularly the liver. In Sri Lanka, protecting seedlings from pigs is carried out by enclosing the seedling with a large plastic or metal barrel having both sides open.

Actions to undertake

- Interactions can exist between pests. Some observations made in Thailand indicate that squirrels and/or rats, even if destroying some coconuts, may help to protect against other insect pests: it seems that they eat the *Oryctes* beetle, and could help to control it. This could indicate that we should not attempt to completely destroy these pest populations, but rather maintain them in a state of equilibrium that reduces damage to plantations. We strongly recommend an integrated pest management (IPM) approach to the control of all pests, where possible.
- Monitoring of rat populations is recommended. This can be done by rat traps, tracking tunnels or tiles and rodenticide bait blocks. They are a relatively cheap method for surveillance of populations in known areas and possible areas of concern.

References

Advani, R. (1985). Rodent pest management in the coconut plantations of India and its islands. *Indian Coconut Journal*. 15, 3–9.

Coconut crab. Wikipedia, the free encyclopaedia. <u>https://en.wikipedia.org/wiki/Coconut_crab</u>.

CPDT – Coconut pest and disease toolkit (2018). Rats. <u>http://coconutpests.org//pests-and-diseases-of-coconut/rats</u>.

Russell, Towns, Clout (DOC). (2008). Review of rat invasion biology: Implications for island biosecurity. *Science for Conservation* 286. Wellington, Department of Conservation, New Zealand.

Vinod, K. K. (2012). Stress in plantation crops: adaptation and management. In *Crop Stress and its Management: Perspectives and Strategies* (pp. 45-137). Dordrecht: Springer.



© R. Bourdeix, 2006.

Plate 11. Coconut crab (*Birgus latro*) on a coconut palm in Tuvalu.