



Coconut Risk Management and Mitigation Manual for the Pacific Region



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



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# **1. CYCLONES, TROPICAL STORMS AND TSUNAMIS**

By R. Bourdeix, T. Sileye, U. Remudu and O. Smus

## Description

The risk is for coconut palms to be destroyed, uprooted or broken at the level of the stem by winds or tsunami waters. Cyclones and similar events may cause sharp drops in production even if the damaged coconut trees survive. New diseases or outbreaks of insect pests may follow, brought by the winds or resulting from the poor sanitary conditions induced by a cyclone.

## **Occurrence and severity**

Cyclones are occurring, more or less frequently, in most coconut producing Pacific countries. For instance, in the 1990s, extreme weather cost the Pacific region more than 1 billion USD (Asian Development Bank, 2013). Nevertheless, we do not know the real risk for a particular coconut palm to be destroyed by a cyclone (probability per time unit according to countries). From an economic and agricultural point of view, it seems that the damages and loss of production induced by cyclones are more important than the killing of palms, often occurring only close to the cyclone eye.

On Taveuni Island (Fiji) farmers estimate that a category five cyclone hitting their farms cause the loss of about 1.5 to 2 years of production. Such a cyclone is said to occur once every five years, but it generally does not affect all farms in the same way. In the past, the famines resulting from the destruction of harvests could be deadlier than the cyclone itself, because of the island's isolation. Islanders resorted to food of famine.

The way coconut palms are destroyed seems to depend on the nature of the soil: broken stems in rocky and compact soils, uprooting in sandy and soft soils. A new coconut disease seems to have been recently introduced in Fiji following a cyclone (V. Kumar, personal communication, 2018).

Such climate disasters can threaten human and animal lives. One of the worst coconut-related stories was recorded in 1878 on the Kaukura atoll in the Tuamotus, French Polynesia. Copra harvesters were surprised by the storm during the seasonal occupation of a motu. The cyclone killed 117 people.

## Mitigation and adaptation

- Be aware of and stay continuously informed by the national weather services launching cyclonic and tsunami alerts. Take precautions so that people, animals, vehicles and equipment are as safe as possible when a storm comes. Plans must be already thought out and fully prepared before disruptions. It is safer not to plan to harvest coconut on unpopulated remote islands during cyclone season.
- Manage the plantation so that all the palms are not the same age and be from different varieties. Plant other crops between the palms. If something occurs, such diversity may protect farmers. All palms and crops will not be affected in the same way. Share observations with other farmers and scientists.

- Use coconut varieties tolerant to cyclones. This includes some Tall types, but also Compact Dwarfs and probably their hybrids. There is a need to develop public and/or private coconut breeding programs integrating Compact Dwarf types in crosses and field experiments. Farmers can also produce such varieties and hybrids by themselves. Do not plant Tall-types coconut palms near houses in places where they can damage roofs and vehicles; instead plant slow-growing Dwarfs or Compact Dwarfs.
- Test new planting arrangements where coconut trees are planted in groups of three or four, with greater distances between groups allowing more intercropping. The roots of the coconut trees planted in groups mix and give the whole a greater resilience on soft soils where the risks of uprooting are higher.
- When feasible, cut the largest green leaves off the coconut palms before a cyclone occurs. This can be done with a coconut hook or sickle. It will reduce the leverage effect of the wind force and prevent the coconut tree from being broken, uprooted and damaged. This technique is not easily applicable in large plantations; it can be very useful for palms located close to houses and where vehicles are parked.
- In India, different planting depths were tested, from surface to 90 cm depth. Under cyclone conditions, in the surface, and 30 cm treatments, the percentage of palms uprooted and tilted were 10% and 5% respectively, whereas none of the palms under deeper planting treatments were affected. These results were in accordance with those reported in 1974; planting at 60 cm deep seems the best, it registered significant increase in boll size and number of roots putting forth firm anchorage, thereby enabling the palms to withstand the cyclonic storm. According to Dr Chowdalpa (personal communication), deep planting is mainly practiced on the sandy soils of the west coast of India, not on the East coast where soils are more compact.
- For economic reasons, in the event of serious damage to cash crops, the government may plan official assistance. Farmers need to find out in advance about the agricultural allowances provided in case of a cyclone in their country and try to satisfy the technical and administrative requirements for this aid. *A posteriori* analysis shows that, in the absence of these precautions, only a small percentage of farmers generally benefit from aid following a cyclone.
- Dead trunks remaining after a cyclone can induce proliferation of the *Oryctes* beetle, which can kill many other palms. These trunks need to be cut and removed. In the Philippines, the government distributed chainsaws to farmers after a giant cyclone. Palms affected by the hurricane may need special care, such as organic or chemical fertilization, to help them recover.

## Actions to undertake

- Study the real risk of coconut palms being destroyed by cyclones and how this risk will evolve with climate change. In each country at risk, farmers must be informed about the real probability of a coconut palm being destroyed by a cyclone within a 20 year period. The experts believe that effects of cyclones are generally localized, and that this probability is less than one in a thousand. The risk of production loss is much higher and should also be more accurately evaluated.
- Field experiments of new planting designs based on palm grouping. In expert opinion, farmers should not wait for the results of the scientific studies (in at least 12 years) before starting to test and use these new designs. Some farmers have already done this in the Dominican Republic.

- In high-risk areas, set up a team to assess the effects of cyclones on agricultural production, early detection, monitoring, and mitigating the development of new pests and diseases. Satellite and aerial remote sensing can help establish a semi-automatic procedure for mapping land instability both in its static aspects (cartography of degraded zones and morpho-dynamic combinations), and its evolution (slope, river and atoll dynamics). Such methods usefully contribute to natural risk assessment.
- It should be acknowledged that the coconut palm remains the most cyclone-tolerant crop, much so that scientists recently created strong synthetic composite material, directly inspired by the molecular structure of the coconut stem.

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