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Coconut Risk Management and Mitigation Manual for the Pacific Region

Compiled by R. Bourdeix, J. M. Sourisseau and J. Lin

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

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Compiled by R. Bourdeix [1, 2], J. M. Sourisseau [3, 4], and J. Lin [5]

(1) CIRAD[1], UMR AGAP[2], F-34398 Montpellier, France.
(2) AGAP, Univ Montpellier, CIRAD, INRA[3], Montpellier SupAgro, Montpellier, France.

(3) CIRAD, UMR ART-DEV, F-34398 Montpellier, France.
(4) ART-DEV[4], CIRAD, Univ Montpellier, CNRS[5], 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.

12. EFFICIENT AND DIVERSIFIED PLANTING MATERIAL

By R. Bourdeix, V. Johnson, V. Kumar and L. Heimuli

Description

The risk is that state services, private companies and NGOs do not invest in the production of coconut material, and advise all farmers to use the same variety, or the same kind of varieties. Farmers will find themselves unduly influenced and constrained to use planting material that is genetically limited or not adapted to local conditions. A uniform variety can harbour a pathogen, if disease-susceptible, or even disease-tolerant, and thus can accelerate epidemics in the case of new or existing diseases. Yields and harvest uses may also be limited using a single varietal type that is either unproductive or not suitable for all uses.

Occurrence and severity

As explained in the risk sections related to loss of traditional varieties and agricultural knowledge, coconut landraces (mainly Tall-types) that were created over millennia by the Pacific islanders were progressively diluted in the mass of coconut palms selected only to produce copra. We estimate that at least 50% of the coconut varieties created by Pacific Islanders over centuries are already lost, and the extent of loss for traditional agricultural knowledge is certainly much higher.

Nowadays, traditional coconut plantations in the Pacific region show a high level of variability, especially for fruit shape, weight, kernel and water contents. In the middle of a copra coconut plantation, a few palms of traditional Polynesian varieties survive, or a mix of these varieties. Some palms produce long coconuts with a thick husk that were used for making ropes, some produce large shells with flat bottoms that were used as containers, some have soft and/or sweet kernels or husks, some produce sweet and tasty coconut milk. At least half of the Polynesian coconut varieties conserved in *ex situ* gene banks were collected from such mixed populations.

A recent trend is to promote ‘local Tall varieties’. But in many cases, what is called ‘local variety’ by farmers and agricultural officers is no longer a variety, but an uncontrolled mixture of various traditional varieties and sometimes modern hybrids. The ‘best palms’ harvested for seednuts are often natural hybrids between traditional varieties or progenies of these hybrids. Seednuts are harvested on palms close to Dwarf x Tall Hybrids, and sometimes directly on the Dwarf x Tall hybrids considered as traditional varieties. Such a situation was encountered in Avatoru village, Rangiroa Atoll, Tuamotu, French Polynesia. Here grew a mix of some local Tall varieties, Malayan Yellow and Red Dwarfs, a dwarf called ‘Tahitian Red Dwarf’ (but originating from Papua New Guinea), Compact Dwarfs from the Cook Islands, the Brazilian Green Dwarf, the hybrid Brazilian Green Dwarf x Rangiroa Tall, the Hybrid Malayan Yellow Dwarf x West African Tall, and progenies F2 and F3 from these hybrids. This mixture of varieties, many of which being imported less than 50 years ago, was already called ‘the variety of our ancestors’ by many villagers.

Mitigation and adaptation

Do you want to plant Tall-type coconut? Sometimes seednuts are harvested by agricultural officers on Dwarf x Tall hybrids instead of Tall-type palms. It is not always easy to make the distinction. Hybrids may be confused with very productive Tall types. Most Tall populations are only brown or green coloured. When, in a nursery, or in the progeny of a parent palm, more than 10% of yellow or red sprout is observed, part of the seedlings is probably harvested on a hybrid instead of a Tall-type.

Because of their rapid vertical growth, Tall-types are associated with more risks than other coconut varieties. From 6 to 12 years, their vertical growth generally ranges from 60 to 120 cm per year. Even if their growth strongly reduces with age, they generally reach a stem length of about 15 m at 25 years old. Fruits and leaves fall on people, house-roofs and cars and cause damage. People, and especially children, fall when climbing palms and are often severely injured. When planted closed to houses and when a cyclone occurs, uprooted stems damage roofs and cars. A study was conducted at the hospital of Kirakira, a small community in Solomon Islands. Within a 3-year period, 142 of the trauma admissions involved children. Among them, 49 (34%) were coconut palm trauma including 35 from falls, 12 from falling branches and two from falling coconuts. Coconut palm trauma involved mainly males (80%) and the median age of those injured was 13.

Hybrids need to be demystified and promoted at all levels: Farmers, agricultural officers, processors and policy makers. A coconut hybrid is just the cross between two coconut varieties, be they local or not local. Farmers can produce hybrids by themselves as long they understand the reproductive biology of the palm. For instance, in Fiji, farmers can create a hybrid by crossing the Fijian Tall and the Rotuman Tall (bigger fruits). They are systems based on the recognition of the colour of the sprouts at nursery stage that allows to produce hybrids quite simply. For selecting the best hybrids, field genetic experiments occupying about 8-10 hectares for 12 years are needed in the framework of a regular breeding program. Such experiments can be conceived as a profitable plantation in collaboration with private partners.

Actions to undertake

Agronomists who select varieties, determine optimum fertilizer rates or compare the effects of cropping techniques should not consider only agronomic characteristics: the criterion of yield of raw product per hectare should be replaced by yield efficiency. The selected varieties and the proposed cultivation techniques should result in products whose characteristics are compatible with traditional technologies; or, in collaboration with food scientists, new technologies adapted to the products should be developed and widely diffused.

Because of the lack of sustainable and efficient coconut breeding programs in the Pacific region, the few hybrids presently diffused were created and dates back at least 35 years. For instance, the hybrid Malayan Red Dwarf x Rennell Island Tall was first planted in 1979. It would be good to act now and to start to prepare for the future. It would be better to avoid that, in fifteen years, the hybrids planted in the Pacific region will date back 50 years.

A short movie (5- 10 minutes) is needed to explain Pacific farmers how they can produce hybrids by themselves. This will be more efficient than written guidelines. Such movie could be also useful for mother palm selection, nursery techniques and seedlings selection. Applications accessible by smartphones and paper brochure are also to be considered.

To date only two countries have started to improve hybrids: Côte d'Ivoire and Vanuatu. No Seednuts can be exported from Vanuatu because of the Coconut Foliar Decay Disease. The Lethal Yellowing Disease in Côte d'Ivoire remains quite far from the place where the parent palms are located. Pollen from the best Rennell Tall or Polynesian Tall parents would need to be imported. Such pollen will allow production of local hybrids yielding about 20% more. Further studies are needed to check disease transmission by pollen.

In vitro cultured coconut clones may be available in the near future, but still planting materials developed by *in vitro* technique would be expensive. In the long run, it may be cost effective. The cost of *in vitro* cultured coconut planting materials is yet to be determined and depends on the multiplication rate. Clones are far from being a panacea, as their value depends on the value of the palm that is cloned, and on the value of the fertilizing pollen, if clones are obtained from embryo plumules. Field evaluation trials are also needed to select the best clones, if not produced from known and recommended cultivars. It may become possible to import advanced clones from Vanuatu, because the cloning technique, together with molecular tests, will give the certainty of not transmitting the Coconut Foliar Decay disease.

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