A Global Strategy for the conservation and use of Coconut Genetic Resources 2018-2028

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cirad
LA RECHERCHE AGRONOMIQUE POUR LE DÉVELOPPEMENT
COGENT
Coconut genetic resources for enhanced livelihoods
Bioversity International

implemented in 35 communities of 15 coconut-producing countries[10]. Working in poor coconut growing communities, this project assessed the technical feasibility, financial viability, social acceptability and environmental safety of coconut-based technologies and production systems, namely: (1) producing and marketing high-value products from all parts of the coconut – kernel, husk, shell, wood, water, leaves; (2) intercropping cash and food security crops/integrating livestock; and (3) propagating important local and introduced high-value coconut varieties in community-managed nurseries and conserving them *in situ* and on farm.

This project had a consistent impact on poverty alleviation in the targeted communities and on *ex situ* coconut conservation. Eighty-nine (89) farmers' coconut varieties were identified and a total of over 62,000 seedlings from these varieties were planted on community farms. Results of this project also outlined issues for optimizing the *in situ* conservation approach:

- The project was conducted in too many communities and countries with regards to the limited funds available. Not enough research time was devoted to specific genetic resources aspects, and especially the characterization of traditional varieties.
- From a communications and awareness perspective, farmers' involvement in conservation of genetic resources was insufficiently promoted, valued and secured for the long term. The publication of a "Catalogue of farmer's varieties", although initially planned, was cancelled. This was due to a lack of reliable data; the poor web visibility of these communities and supplies of their coconut products not being sufficiently assured for promoting community involvement, helping them to market their products, and serve as example and success story.
- In some communities, palms from traditional varieties chosen by farmers as seednut providers were located at less than 20 meters from Dwarf x Tall coconut hybrids. The cross/open pollinating habit of these Tall-types has certainly led to unwanted varietal mixing.

The results contributed to the formulation of an international recommendation[11] during the 2012 COGENT SC meeting. This recommendation invites researchers to develop alternative concepts of conservation.

2.2.3 Revisiting the classical delineation between *in situ* and *ex situ* conservation

Many different locations could integrate the conservation of coconut genetic resources and even seed production by using a multifunctional land management policy.

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[10] Bangladesh, India, Sri Lanka, China, Indonesia, Malaysia, the Philippines, Thailand, Vietnam, Fiji, Papua New Guinea, Ghana, Tanzania, Mexico and Jamaica. Report available at: http://www.cogentnetwork.org/images/publications/PRCGC_Vol1.pdf

[11] Assessment and improvement of farmers' technical and traditional knowledge regarding coconut biology, in order to increase farmers' autonomy for production of good planting material. Available at the URL: http://www.cogentnetwork.org/images/2012_sc_meeting/cogent_recommendation_3.pdf

The *Polymotu* concept (*poly*=many, *motu*=island), a concept derived from previous initiatives in conservation by ancient Polynesians, uses the geographical isolation of dedicated sites or designs for conservation and reproduction of individual varieties of plants, trees and even animals.

For instance, when a small isolated island is planted with a single Tall-type variety certified for its true-to-type integrity, breeding occurs only within this variety and "naturally certified" seednuts are produced. In this case, both the geographical isolation and the availability of certified seednuts secure conservation. Various kinds of inland sites can also be used for this purpose as long as they are protected from pollen contamination. More than one variety per crop species can be conserved in each location, if genetic markers are available to differentiate progenies at the nursery stage (Figure 2.1).

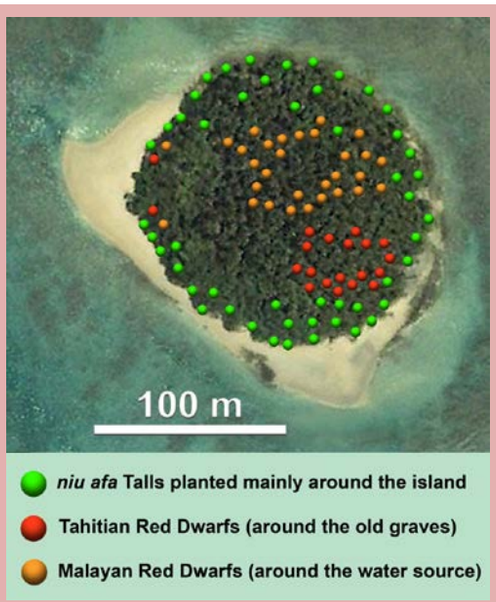

Figure 2.1. Schematic representation of the plantation of Nuusafe'e Island in Samoa using the *Polymotu* concept. (R. Bourdeix 2012)

The *Polymotu* conservation concept fits into a multifunctional land management policy. Many different locations can be used for conservation of genetic resources and even seed production so long as they meet the criteria required for biological and reproductive isolation. These dedicated sites can be small islands owned by communities or private individuals, public gardens, university campuses, golf courses, the backyards of resorts or research centres, or the bottom of small valleys. Even an entire small village may become an established place for conserving genetic resources and seed production, if all villagers agree to cultivate only a well-defined set of cultivars or populations. This kind of multifunctional land management strengthens the links between people, landscape and bio-diversity. It gives a special cachet to the sites, generates income and may enable related activities such as eco-tourism.

Using the *Polymotu* concept, some of the most important constraints encountered in *ex situ* collections are shifted. There would be no need

for palm climbing and any accession's lifetime would be extended. Instead of climbing the palms for making controlled hand-pollination, people only have to wait for the fruits to fall naturally to the ground. Open-pollination provides true-to-type and cheap seednuts. Thus, the same accession can be kept as long as a sufficient number of palms remain alive in the field. In most cases, the duration of a coconut accession would then be extended from 25 – 30 years (current useful lifespan in *ex situ* collections) to 75 - 100 years. Even if some of the palms die, there is no need to remove the remainder, as is done presently in classical genebanks. Dead palms can be replaced by new ones, without removing the old palms still alive. Such lifespan extension represents a huge saving of resources.

Three possible applications of the *Polymotu* concept are currently being studied: "Ecotourism on Islands" (French Polynesia, Samoa), Inland (to be applied in Côte d'Ivoire) and "Urban" in Fiji and possibly in Brazil.

Case study 1: the *Polymotu* approach versus "ecotourism on islands"

Projects testing the *Polymotu* approach versus "ecotourism on islands" were recently implemented in Samoa and, to a lesser extent, in French Polynesia. In Samoa, a project funded by the Trust and leaded by SPC was implemented with collaboration of CIRAD and the COGENT Secretariat. Six small islands surrounding Upolu were surveyed, and two of them, namely Namu'a and Nuusafe'e were planted in 2012 with 50 seedlings of Niu afa, 20 seedlings of Malayan Red Dwarf (MRD) and 10 seedlings of Tahitian Red Dwarf (TRD). The aim of planting three coconut varieties is to produce both pure breeds of Niu afa, dwarf seedlings and natural hybrids between Dwarfs and Niu afa. As shown in Figure 2.2, the size of the fruits and the colour of coconut sprouts allows visually differentiating between pure strains of Niu afa (green sprouts), the Dwarfs (orange) and new hybrids produced (brown).

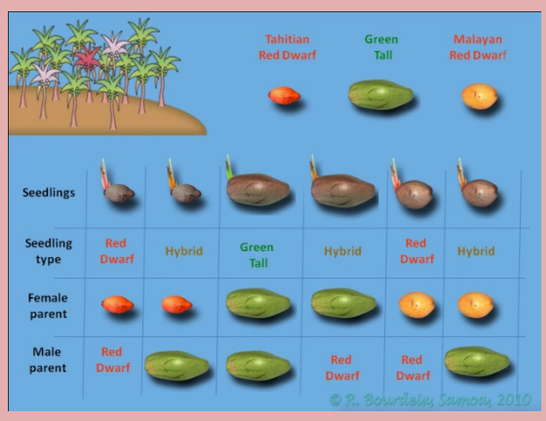

Figure 2.2. The three varieties planted in Nuusafe'e and Namu'a Islands, Samoa: Tahiti Red Dwarf, Niu Kafa Tall, Malayan Red Dwarf, and the way to identify progenies in the nursery by using the shapes of the fruit and the colors of the germinating sprouts. (Bourdeix et al. 2005b, 2014)

Thirty other tropical fruit trees (including rambutan, avocado, soursop, and mandarin) were also planted in each island. In French Polynesia, a *motu* from the Tetiaroa Atoll is little by little replanted with progenies of a few rare palms producing "horned coconut".

Case study 2: the *Polymotu* approach versus "inland"

A project testing the *Polymotu* approach versus "inland" has been launched in Africa. In Côte d'Ivoire, the Marc Delorme Research Centre houses the International Coconut Genebank for Africa and Indian Ocean. The collection is currently threatened by a Lethal Yellowing Disease (LYD) which is now at less than 150 km from the centre, on both sides of the coast (in Ghana and in Grand Lahou region). It is also threatened by intense land pressure due to the expansion of Abidjan (the capital city) and by a chronic budget deficit that could ultimately jeopardize the existence of the genebank. In order to address the two first constraints, the COGENT secretariat encouraged CNRA to duplicate about 50 coconut accessions on 5 of the 13 other experimental sites belonging to the institute and scattered across the country. Each accession of Tall varieties will be planted in geographical and reproductive isolation, in the middle of other tree crop plantations (Rubber, oil-palm, forest trees, coffee and cocoa). CNRA is presently slowly implementing this project with limited funding.

Plate 2.1.

Tall-type coconut varieties from the Pacific region

Coconut is much more than coconut!

1 & 2. One of the most famous coconut palms in the Pacific region, called "Seven in one" in Rarotonga, Cook Islands. The seven palms were grown from a single coconut planted in 1907. The second picture dates when the palms were young, probably around 1918.

3. Tall-type coconut varieties include palms with the thicker stems, here in a garden of Rarotonga, Cook Islands.

4. The famous "niu afa" in Samoa, Internationally known as Niu Kafa Tall, has the longest coconuts of any variety.

5. Harvesting a variety called "lady coconut" in Tuvalu. During weddings, when the guests are too numerous, and large fruits not available for all, such small elongated coconuts are distributed for drinking.

6 & 7. Vanuatu Tall and Rennell Island Tall

8. A rare Tongan Tall with striped fruits.

9. Karkar Tall from Papua New Guinea.

10. A variety from Tubuai Island, French Polynesia, with elongated fruits and very long bunch peduncles.

11. The variety "makire" with numerous small round fruits in Tahiti, French Polynesia.

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