A Global Strategy
for the conservation and use of Coconut Genetic Resources
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LA RECHERCHE AGRONOMIQUE POUR LE DÉVELOPPEMENT

COGENT
Coconut genetic resources for enhanced livelihoods

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The term "improved hybrid" also refers to a cross between two structures belonging to different varieties but at least one of these structures being improved by progeny tests for combining ability. One more generation of experiments is needed to evolve from hybrids to improved hybrids.

2.5.2 Involvement of farmers in breeding and seednut production

Farmers seem to produce more than 85% of the planting material from the varieties they select and (perhaps sometimes unconsciously) conserve germplasm (Bourdeix et al. 2016). Scientists are quite well aware that the present capacity of their institutions for seednut production does not adequately meet farmers' needs, and/or that farmers are sometimes reluctant to plant the advanced genetic material produced by "scientific" coconut breeders. It has been demonstrated that the preferences of many farmers are not only linked with the agronomic value of the planting material, but also that farmers' choices take account of the qualities of planting material as a cultural entity within a human community (Bourdeix et al. 2008).

Many farmers hold some kind of "private collection", containing three to ten cultivars or populations, most of them conserved with a low number of palms, and planted together in the same fields. Indeed, for farmers, creating coconut varieties is not an easy task. It requires monitoring over several years. Tall coconut palms often flower after six years, which is long enough to risk forgetting where the seednut came from. In most situations, farmers cannot prevent coconut varieties from mixing. A coconut palm undergoes uncontrolled crossing with any of its neighbours, so mostly the sought-for characteristics are not found in the progeny. The more the coconut palm is productive, the more it will reproduce by selfing (pollination between successive inflorescences), so the best palms may not give systematically the best progenies because of strong inbreeding depression.

Woman farmer next to a Dwarf palm
(R. Bourdeix, CIRAD)

Farmers' knowledge regarding the coconut reproductive system and the use of genetic markers such as germinating sprout colour are key factors for breeding purposes. Both traditional and technical knowledge of farmers and other stakeholders regarding coconut breeding and its reproductive system are insufficiently assessed. For instance, in French Polynesia, at least 80% of farmers do not know that each coconut palm has both female and male flowers. Many farmers' communities are also losing the traditional knowledge to cultivate and select coconut varieties and devote less time than in the past to the management of their palms. A quite frequent trend is to promote "local Tall varieties". In some cases, what is now called a "local variety" is an

uncontrolled mixture of various traditional varieties and sometimes modern hybrids. The "best palms" harvested for seednuts are often natural crosses between traditional varieties, or crossed between traditional varieties and modern hybrids. Seednuts are sometimes harvested on Tall-type palms planted very close to Dwarf x Tall hybrids, or even directly on such hybrids.

Governments in many countries are promoting farmers' organizations. Some countries have tried to engage with such organizations and to strengthen their role and efficiency in seednut production. The idea is for researchers to interact with farmers' organizations using participatory approaches, and then to use both breeders' and farmers' knowledge to educate trainers to help women and men farmers to improve their breeding and seednut production, also in gender-responsive ways. Finally, such interactions increase the knowledge of breeders about the real needs (including gendered trait-preferences) of the farmers or private sector stakeholders and thus lead to better breeding scheme's programing, and more relevant outputs.

2.5.3 Past and contemporary coconut breeding

Coconut breeding programmes aim to improve yield, to develop varieties tolerant to biotic and abiotic stress and well adapted to the main uses of the coconut palm (Arunachalam and Rajesh 2008). As with most perennial crops, coconut breeding is complex and takes a long time, yet despite this, important achievements have been recorded.

Scientific research on coconut started in India in 1916 but many studies were interrupted by world wars and by the 1929 economic crisis. (Ratnambal and Nair 1998). The first coconut hybrids created by a scientist were produced in Fiji in 1926, by crossing the Malayan Red Dwarf (a classical Dwarf) with the Niu Leka Dwarf (a Compact Dwarf) (Marechal 1928).

Traditional coconut varieties are classified in four types: **Tall**; two kinds of **Dwarfs** (**autogamous Malayan** type and **allogamous Compact** type); and a few rare varieties intermediate between Tall and Dwarf and called **Semi-Tall**. Coconut breeders have tested crosses within and between most of these types.

The first "scientific" hybridizations between Dwarf and Tall coconut varieties were initiated by Indian researchers (Patel 1938). However, recent study shows that Indian farmers from Kerala have long been able to select natural hybrids within the progeny of the Chowgat Orange Dwarf. They choose and value the rare seedlings with brown sprouts in the progeny of the Orange Dwarf that otherwise has an orange sprouts due to selfing (Bourdeix et al. 2008). Indian scientists very probably observed what farmers did and then amplified their efforts with scientific research.

"Modern" coconut breeding only resumed after the Second World War, with the first scientific surveys studying coconut diversity. From 1945 to 1960, numerous hybridizations were produced thanks to the involvement of institutions like CPCRI and IRHO with generally a low number of palms per progeny. Even when hybrids displayed a high yield potential, the lack of reliable seednut production prevented their distribution to farmers.