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

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

2.6.2. Safe movement of germplasm

Although essential to the utilization of coconut genetic resources, movement of coconut germplasm may also transfer pests and diseases. The *FAO/IBPGR Technical Guidelines for the Safe Movement of Coconut Germplasm*[54] provides country-based information about the risks associated with each particular pest or disease and recommendations on appropriate quarantine measures. It recommends that coconut germplasm be preferably distributed as *in-vitro*-cultivated embryos to reduce chances of introducing diseased material into disease-free areas.

COGENT is following these guidelines. At present, recommendations are to transfer germplasm only from reportedly healthy zones, and using preferably the technique of cultivating coconut embryos. *In vitro* techniques should be used for exchanging coconut germplasm in the form of excised embryos or plantlets grown from these embryos. However, even if these techniques are working well in the labs, they need further refinement to be adapted to a wide range of situations and germplasm. Funded by the Trust and CRP-FTA, a project was conducted from 2009 onwards to optimize, validate and apply a standard embryo culture protocol. This project applied existing techniques to a wide variety of genotypes and conditions, and led to the 2012 publication of improved guidelines (Cueto et al. 2012) available on the COGENT website. However, all the COGENT member countries need to upgrade their capacity and resources in order to successfully implement the embryo transfer protocol and thus to benefit from them.

Diseases caused by viruses, viroids and phytoplasmas are particularly serious threats to the safe movement of germplasm, since some of them cannot easily be eliminated and, moreover, virus and viroids can remain latent (symptomless) in some genotypes. In 2004, COGENT and Bioversity International published its *Manual on Germplasm Health Management for the International Coconut Genebank* (Ikin and Batugal 2004) which also serves as a guide for international and national genebank managers and any quarantine services.

Only a few of the genebanks carry out virus, viroids and phytoplasma indexing or have this indexing done by a partner institute. Indeed, effective differentiation, detection and diagnosis are still unavailable. Phytoplasma were detected on excised embryos taken from diseased palms, but transmission of the disease to plantlets has yet to be observed. No phytoplasma was detected in seedlings harvested from both symptomatic and non-symptomatic palms. Seedlings tested after two years did not develop LYD symptoms (Oropeza et al. 2011). On the other hand, phytoplasma transmission by seedlings was recently demonstrated in other species such as winter oilseed rape, tomato and corn (Calari et al. 2011). The Cadang-Cadang viroid was also detected on embryos, seedlings germinated *in vitro* and pollen taken from diseased palms. Transmission of the viroid through pollen, seeds and harvesting tools has been demonstrated (Pacumbaba et al. 1994).

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[54] See URL: http://www.cogentnetwork.org/images/publications/TG_safe_movement%20_germplasm.pdf

Pesticide and disinfection treatments are systematically applied to seednuts and seedlings internationally moved, following the rules and methodologies described in international guidelines. For endosperm plugs and embryos, disinfection treatments prior to *in vitro* culture should always be applied before they are moved from one laboratory to another. Plant health authorities of both the importing and exporting countries are involved in the process, by providing and checking the requested phytosanitary certificates which should accompany any coconut material being transferred internationally. Post-entry quarantine stations are present in a few coconut-producing countries, such as Brazil, and some material has been lost due to the delay for managing the imported seednuts, and because phytopathologists in charge of country-level quarantine were not trained to manage coconut seednuts or coconut embryos cultivated *in vitro*.

The risk linked to pests and diseases preventing distribution of germplasm has strongly restricted the development of all the coconut collections. Within this period, the International genebank for Africa and the Indian Ocean, located in Côte d'Ivoire and free from major diseases, has provided about 45% of the germplasm distributed internationally. The recent detection of lethal diseases caused by phytoplasmas in Côte d'Ivoire and also in Papua New Guinea will probably restrict germplasm exchange, especially if research does not provide solutions. At time of press, the PNG ICG is being transferred to a safer location, to avoid the threat of the Bogia phytoplasma. It is also being upgraded, with UK Darwin Initiative support, to protect Pacific coconut diversity threatened by climate change, embracing also Fiji and Samoa. These islands will host satellite genebanks for the PNG ICG.

Currently there is no Coconut Quarantine Centre offering quarantine for regional and international transfers. Laboratories able to index coconut material for Cadang Cadang viroid and/or for phytoplasmas are available in India, Sri Lanka, the Philippines, Australia, UK and France.

2.6.3 International germplasm transfers

CGRD records show that during the past 30 years, among the 145 accessions transferred from 1 genebank to another, 17 have been moved within the same country and 128 have been transferred internationally[55]. These international transfers have been conducted using either seednuts or embryos cultivated *in vitro*. The use of the embryo technique generated a decrease of at least 42% in accessions sizes, when compared to transfers conducted by using seednuts.

Figure 2.9 illustrates the international germplasm transfers facilitated between *ex situ* collections from 1983 to 2017. International genebanks have been involved in 57% of these transfers, but in a very unequal manner. The international genebank of Côte d'Ivoire has contributed 45% of the internationally transferred germplasm (57 accessions). During the same period, the international genebank of Papua New

[55] The International Coconut Genetic Resources Database (CGRD) does not take in account germplasm transfers conducted during the recent embryo project funded by the Trust (it is necessary for the accessions to be planted in the field), nor the material recently taken by Mexico and Brazil from Côte d'Ivoire (no data transmitted by countries).