Taro pond field, Vêtuboso, Vanua Lava.

Taro in Vanuatu: towards a dynamic conservation strategy

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"Ordinary" or "true" taro (*Colocasia esculenta*) is a herbaceous plant with a swollen underground stem, the corm. It is one of the most ancient of crops and continues to be a key component of sustainable livelihoods in the relatively fertile and high-rainfall environments of the Pacific, Southeast Asia, West Africa and the Caribbean, where it has special cultural, dietary and economic importance. Worldwide, taro ranks fourteenth among staple crops, with 9 million tons produced globally on some 2 million hectares of land. In the Pacific, where it is particularly significant, it is considered an essential part of every meal. Both the corm - baked, roasted or boiled - and the leaves are eaten, and the latter is a significant source of vitamins, especially folic acid. In addition to its importance in the diet, the cultivation of taro is closely integrated into social and cultural life. It is used as a gift on formal occasions and contributes strongly to the identity of its grower.

Taro is a significant export commodity in such Pacific countries as Fiji and the Cook Islands. That this list of exporters would have been longer just a decade ago reflects the fact that taro is in difficulties. One of its problems is the *Taro Leaf Blight* (TLB) caused by *Phytophtora colocasiae* which devastated production in Samoa in 1993 and which still continues to threaten other Pacific island countries. However, the recent resurgence in Samoan taro cultivation shows that these problems can be overcome, particularly if genetic diversity is well managed and used. Unfortunately, this diversity is rapidly disappearing from many parts of the world as a result of factors such as changing diets, urban migration and the effects of pests and diseases.

To safeguard taro genetic resources, large *ex-situ,* or 'off-farm', collections have now been established in Southeast Asia and the Pacific by the *TaroGen* and *TANSAO* projects (see Networking, p. 35). However, collections are expensive to maintain and the risk of loss as a result of social unrest, financial constraints, pest

and disease problems and climatic disasters is high. *Ex-situ* conservation is, therefore, not enough. Communities which continue to depend on taro cultivation to meet their daily needs and where taro remains of social and cultural importance, are in practice managing the genetic diversity of taro. *In-situ*, or 'on-farm', conservation has, therefore, generated interest from taro genetic resources workers.

The challenges that faces taro production can be illustrated by the situation in the small Pacific island country of Vanuatu. In Vanuatu, the national *ex-situ* collection contain the best 125 varieties from most of the islands. However, local genetic diversity is rapidly eroding and taro is being replaced by other crops.

Living diversity

Vêtuboso is a relatively large village in the low mountains of Vanua Lava, an island in the northern part of the Vanuatu archipelago in the South Pacific. The island has 1900 inhabitants on about 330 km^2 of land. Vêtuboso is a remote village. A 20 km path links it to a local airport and a harbour where ships arrive between 4 and 12 times a year. Its inhabitants are subsistence farmers and grow taro as a main staple crop for local consumption. Taro is cultivated in abundance thanks to intensive irrigation practices in taro pond fields and surplus production allows the crop to be integrated into a complex local exchange network and thus into the social life of the village.

At present, 96 taro cultivars are grown in the village. A survey carried out among 12 farmers growing 51 of the cultivars and complemented by a DNA diversity study, revealed that each named cultivar corresponded to a separate genotype. Six cultivars were described as 'common' as they represent 83% of all planted taros, whereas 40 cultivars were classified as 'rare' (8% of all planted taro). As each farmer plants an average of about 20 cultivars, he or she usually grows six common taro and 14 intermediary and rare ones.

Photo: Author

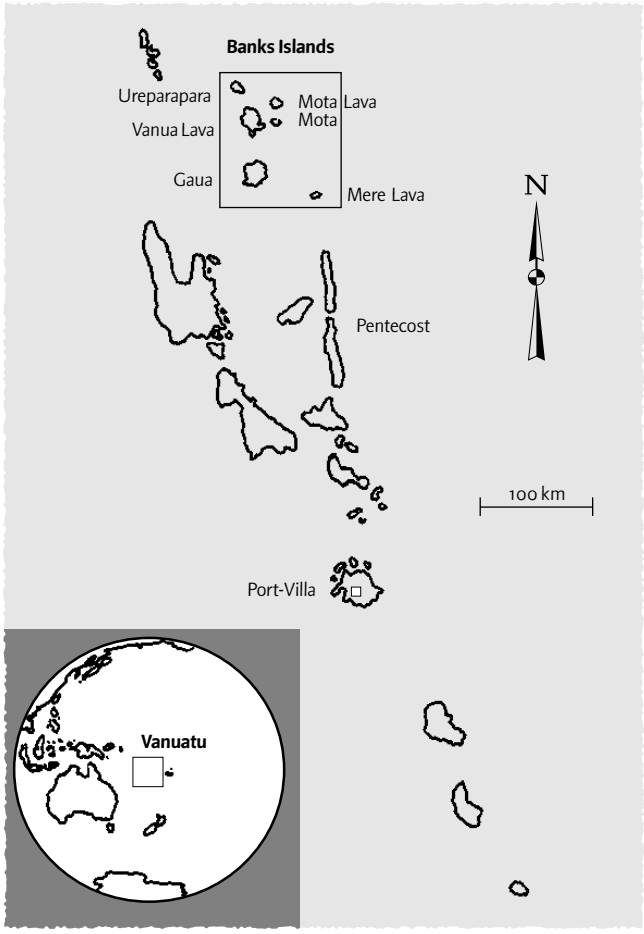
Farmers chose the first group of taros, the 'common' taros, because of their agronomic properties such as time required to mature and yield, and because of their taste. Tasty, "strong" taros with high dry matter content are used to make *nalot*, a taro pudding that is highly valued socially. Non-irritating and soft taros with low dry matter content are reserved for another important Melanesian meal made from grated corms and known as *laplap*. Non-irritating dry, but still soft, taros are roasted. Over the last two generations selection criteria have changed from a preference for a dry corm that can be roasted, to a strong corm that can be boiled. This has coincided with the introduction of cooking pots. This evolution becomes clear when the villagers talk about the history of different cultivars, and can also be seen from the relative importance of different cultivars in their gardens. An example is the cultivar "*Rov*", which today is the cultivar considered to have the best qualities and accounts for 24% of all the taros planted. *Rov* started to become popular just two generations ago, which is comparatively recently. This shows that selection criteria are thus dynamic and adapt to environmental or social changes.

The second group - 'intermediate or rare' taros - are chosen for social reasons on the basis of personal preferences. They can be cultivated for a variety of reasons including their ornamental value or uniqueness, because they are brought back as souvenir from a trip, because they have been handed down within the family or because they are an essential part of the community's mythology and beliefs. By cultivating such cultural diversity, farmers strengthen their own identity and create their own "identification badge".

Taro diversity on Vanua Lava is, therefore, high and stable and loss of knowledge from generation to generation is low. Local farmers recall that only three cultivars had ever been lost. Elsewhere in Vanuatu, however, taro diversity is at risk.

Diversity at risk

It is useful to compare Vanua Lava with some of the other six inhabited islands of the Banks group, islands that are socially and culturally similar. In these islands taro is still an important part of the daily diet, but it is slowly being replaced by other crops. In Gaua, villagers mix taro with a paste of grated manioc (*Manihot esculenta*) in order to make enough *nalot* for social occasions. In Ureparapara the everyday diet as well as the food prepared for ceremonies, is based on new recipes using manioc and unripe bananas. The islanders save their precious taro harvest for Easter.



Map of Vanuatu

In lower and drier islands such as Mota or Mota Lava, where breadfruit (*Artocarpus altilis*) is part of the diet, taros (or at least yams, *Dioscorea* spp.) also play a role in social events. On these islands taro cultivation faces significant agronomic constraints, in particular its high demand for water and its susceptibility to the *Papuana* beetle. When running water is not available, taros have to be planted in the humid and wet environments found at higher altitudes, far away from the village. Thus, people prefer

less demanding species such as bananas, cassavas, and sweet potatoes (*Ipomoea batatas*) that can be planted close to the village, near the coast. On Mota, five taro cultivars disappeared between 2001 and 2003, and 15 since 1999 because of the "drought".

However, agroenvironmental constraints are not the only reason for the genetic erosion of taro. Even in mountainous villages where taro gardens are accessible, diversity is at risk because of a rapid loss of knowledge. During a one-week survey in Central Pentecost, 164 taro cultivars could be named but only 20 of these were found in local gardens. Old people still have a rich knowledge of names - a knowledge not shared by the young - and they do not seem to be worried about the loss of taros as they believe they "must be hiding under grass and will grow again one day". Meanwhile, they try to 'preserve' the taro cultivars by being able to list all their names. However, as farmers spend less and less time in their taro gardens, they forget the identification criteria that allow them to associate a name with a particular variety. In Mota, 60-year-old men were ashamed to admit, when confronted with taros in the field, that they could not remember their names.

Photo: Author

A farmer brings her selected taro for a competition, Vêtuboso, Vanua Lava.

On-farm conservation

If the genetic diversity of taro is to be conserved on farm in Vanuatu, the crop has to become more competitive. It is, for example, urgent to introduce TLB resistance genes into the local varieties before the disease makes its own drastic selection in a country where the genetic base is already narrow. However, the introduction of new characteristics has to be done very carefully so that it will contribute to widening the genetic base and not reduce it further. In the context of a complex mosaic of agro-ecosystems and farming practices, farmers need to be able to choose varieties that are well adapted to their specific ecological environment as well as to their personal preferences, from a wide range of varieties with different characteristics. Such an experiment, a collaboration between the Ministry of Agriculture and CIRAD, is already in progress on the island of Tanna in Vanuatu. Farmers have planted, tested and are now selecting promising planting material based on preferred corm properties.

Such a strategy could be taken a step further if farmers were assisted to create their own diversity. In Ureparapara, for example, farmers collect taro seeds, plant them and select new plants from the next generation when their planting material has been reduced because of droughts or cyclones. The farmers control the germination process but not the pollination, which is in fact not difficult to learn. After a quick demonstration on how to cross plants with each other, farmers were able to cross local taros with exotic taros that had been introduced because of genetic properties such as resistance to TLB. If the material obtained is 'good' enough, farmers will probably find new incentives to plant taro.

The conservationist is usually concerned with trying to preserve the past. In the strategy outlined above, however, it would be possible to build on the practices that farmers have consciously or unconsciously developed over centuries and combine them with new knowledge. In this way, the process of genetic adaptation could be accelerated and diversity preserved. The focus is resolutely on the future. ■

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