Conservation of Tropical Root Crops Agrobiodiversity: On-farm True Seeds Production and Use as a Mean for Geographic Distribution of Allelic Diversity

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Farmers planting taro seedlings

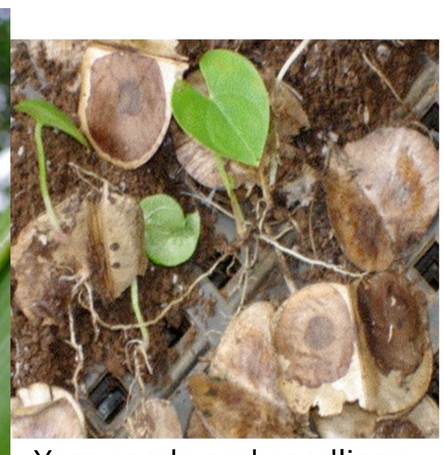
*Root and Tuber Crops (Cassava, sweet-potato,yam, taro) are important staples in many tropical countries. Emerging abiotic and biotic changes are now endangering their agrobiodiversity, thus threatening food security. The high distribution costs for planting materials and limited resources from local research institutes are constraining access to improved cultivars by farmers. This study aims at assessing the potential of : **1.** True seeds production for on-farm plant breeding **2.** Progenies distribution under the form of true seeds and their on-farm use for wide distribution of genetic diversity.*

Cassava flowers

Sweet potato capsules

Sweet potato flowers

Taro infrutescence



Yam seeds and seedlings

- Materials and Methods -

Sites : participative experiments in six villages located in three islands of Vanuatu, involving 4-5 farmers in each island.

Experimental design and measurements:

***On-farm*:**

- Polycross trials for sweet potato seed production (3 cultivars) -> *Nb of fruits per plant (Monthly)*

- Taro seeds and seedlings raising (1 progeny) -> *Germination rate and kinetic, seedlings survival rate and vigour in nursery and in the field.*

On-station :

- Cassava male sterility (20 cultivars) -> *% of male sterile cultivars*

- Polycross trial for sweet potato seed production (20 cvs + 18 hybrids) -> *Flowering dynamics, Nb of fruit per individual (weekly), Nb capsules / Nb of flowers, Nb of seeds per capsule, % of viable seeds*

- Evaluation of yam (130 hybrids) and taro progenies ->*% of eligible hybrids based on tuber quality (no oxidation/ no acridity)*

On-farm and on-station experiments are complementary. The first ones provide information on farmers ability to raise early-stage seminal materials for plant breeding. The second ones provide reliable data regarding reproductive biology. A complementary analysis of farms constraints and characteristics enable us to analyse experiments successes and failures. It is of great use for development oriented recommendations.

- Results and discussion -

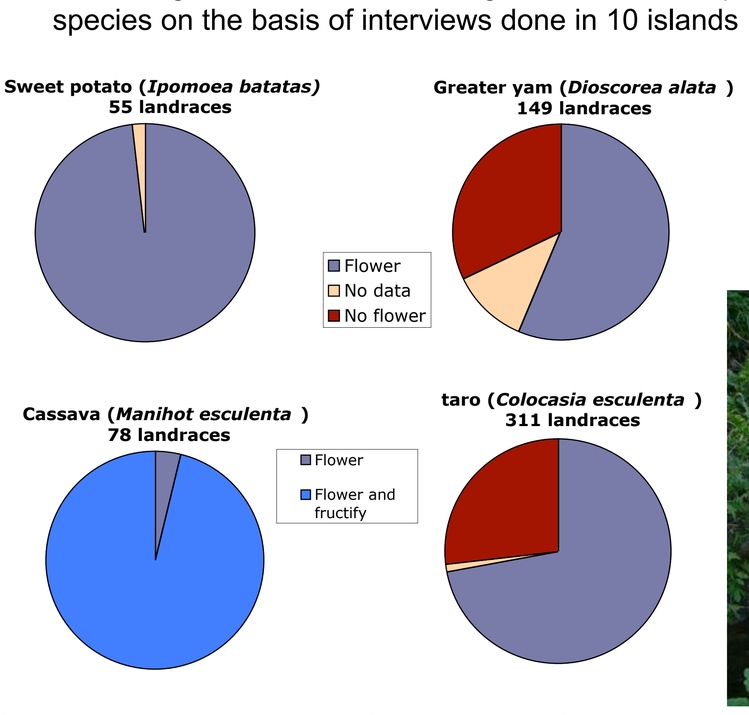
1.Diversity of farms characteristics and constraints

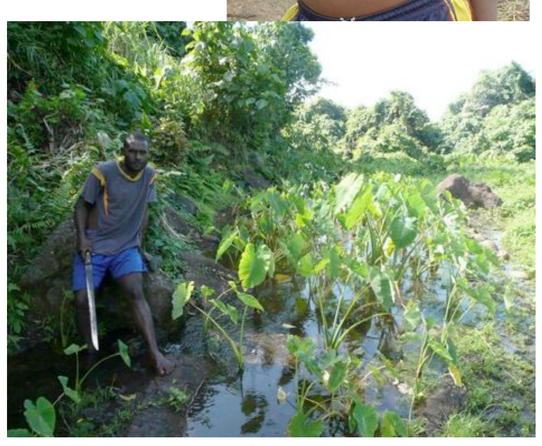
Differences are mostly based on : main crop, importance of cash crops, intensity of land use.

Farms practicing a less intensive land use and oriented on subsistence, appear more inclined to conduct plant breeding activities.

2. Efficiency of on-farm seed production

Percentage of landraces flowering for each root crop species on the basis of interviews done in 10 islands





Cassava : high rate of male-sterile landraces enable on-farm production of highly heterozygous and vigorous seedlings. This occurs spontaneously in farmer's fields.

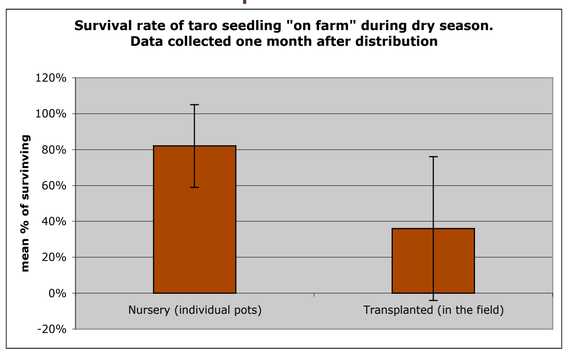
Sweet potato: Low fructification (very few seeds per individual). But high variation between genotypes and influence of climate. Genetic improvement is thus possible for this criteria.

Taro: High sexual multiplication rate, but many landraces do not flower.

Yam : Landraces are mainly male (dioceous), impeding fructification. Anthracnose often destroy plants before fruits are fully formed.

3. *On-farm* use efficiency of true seeds

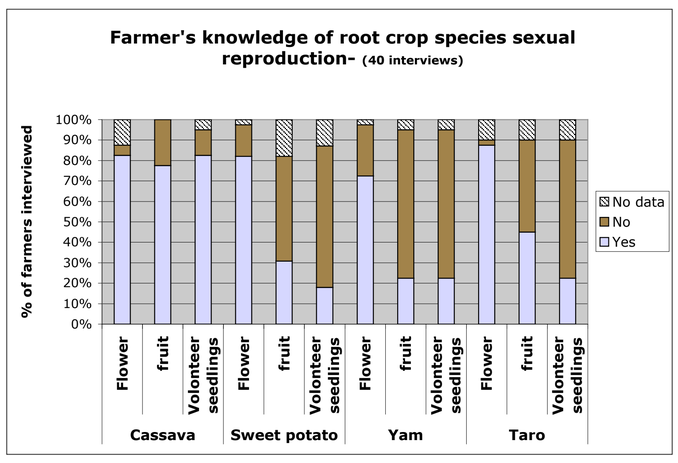
Reasonable germination rates in very simple seed-beds for **yam** (45 %) and **taro** (over hundred seeds per infructescence) but not for sweet potato.



• Low survival rate of **taro** seedlings in individual pots during dry season (36%). But high survival rate if quickly transplanted (82%). Significant differences of care between farmers.

• Low percentage of eligible hybrids in taro and yam progenies (less than 10%), but high variation between progenies. Farmers are less hard to please than scientists.

4. Socio-cultural issues



• Farmers knowledge on each species sexual reproduction reflects its complexity.

• For them, the creation of new varieties is a way to get notoriety.

•Diffusion of new technologies is very low within communities, but diffusion of planting materials is intensive.

- Conclusions -

On-farm seed production has potential for taro and sweet potato if productive genotypes are used. Production of true yam seeds is less adapted to farm conditions.

On-farm seedlings raising and progenies evaluation is feasible, but more work has to be done to identify good crosses and recommend them to farmers.

However, farmers are not used to manipulate seedling materials in early growth stages.

This study highlighted the need for reliable intermediaries which would conduct the early stages of seed production and nursery management. This work could be done in primary schools.

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*This work is done in partial fulfilments for the MSc requirements of SupAgro.