

# Participatory strategies of conserving yam biodiversity in Bénin

A. Dansi (adansi2001@gmail.com), C. Lusty (charlotte.lusty@croptrust.org), R. Asiedu (r.asiedu@cgiar.org), R. Hall, and R. Vodouhè (r.vodouhe@cgiar.org)

Yam (*Dioscorea* spp.) is an important tuber crop in Bénin. Its production is intensive in Collines (Center), Donga and Borgou (North), but marginal in Atakora (Northwest), Plateau (Southeast), and in Alibori (far north). Four species are cultivated (*D. alata*, *D. cayenensis-rotundata* complex, *D. dumetorum*, and *D. bulbifera*). Among these, the native African *D. cayenensis-rotundata* complex remains the most important, preferred, and widely cultivated.

Yam production in Bénin is seriously hampered by numerous constraints including pest and disease pressure, poor soil, and changing climate.

Strategic use of existing genetic diversity is thus an appropriate option for addressing these constraints in an affordable and sustainable way. For this diversity to be well studied, conserved, and used, the International Foundation for Science (IFS), Gatsby Charitable Foundation (UK), IITA, Bioversity International, and more recently the Global Crop Diversity Trust (GCDT) sponsored several research projects in Bénin between 1997 and 2009. Within the framework of these projects, different yam germplasm collection surveys have been conducted that led to a unique collection of 1,017 accessions conserved in the field by the Crop, Aromatic and Medicinal Plant



Yam tuber seeds of different accessions ready for transport to IITA genebank for ex situ conservation. Photo from Alexandre Dansi, IRDCAM.

Biodiversity Research and Development Institute (IRDCAM) in northern Bénin.

The landraces collected were fully documented (origin, agronomic traits, and technological characteristics) and a database was constructed. With the help of farmers, the collected landraces have been fully characterized based on plant morphology and classified into 210 morphotypes. The equivalence of the diverse vernacular names that cause confusion among users has been clearly established. The geographical distribution of the morphotypes, together with genetic diversity analysis, led to the identification of four different zones of diversity. These are Zone 1: Atakora (far Northwest); Zone 2: Bariba cultural area (Northeast); Zone 3: Donga (Northwest); and Zone 4: South-Center.

Analysis at the community level within each of these four zones revealed the high yam diversity in Bénin in Zone 2 (20–82 varieties per village; 40 on average) and in Zone 3 (13–48 varieties per village; 24 on average). Zone 1 (8–27 varieties per village; 17 on average) and Zone 4 (6–51 varieties per village; 20 on average) had less diversity. Early maturing (double-harvested) varieties dominate Zones 1 and 4, while Zone 3 is dominated by late-maturing (single-harvested) varieties. Both late- and early maturing landraces appeared in almost equal proportions across villages in Zone 2.

Within each of the four diversity zones and at community level, several varieties are disappearing or being abandoned. High rates of genetic erosion (32–48% on average) were recorded almost everywhere. This highlights the necessity and urgency of developing strategies to conserve the existing diversity both *in situ* and *ex situ* for use by present and future generations. With the financial support of GCDT, Bénin yam germplasm is already fully regenerated and safely



Germplasm collection points in Bénin.

duplicated in IITA’s Genetic Resources Center at Ibadan (Nigeria) where it will be conserved both *in vitro* and in a field bank.

The causes of the ongoing genetic erosion are diverse (technological, biotic, abiotic, and cultural) and vary in relative importance according to production zones. In the far Northwest (Zone 1), for example, environmental factors, particularly poor adaptation to climate change and susceptibility to poor soils, are the most important. In the Northeast (Zone 2) susceptibility to pests and diseases and cultural beliefs are the principal reasons.

To compensate for the loss in diversity and cope with the environmental (biotic and abiotic) constraints, farmers use different strategies to exploit the

existing diversity. In the dry zone of Atakora where climate change is more perceptible, farmers adopt new varieties to adapt production to actual local conditions that are characterized by increasing frequency of drought. They also alter the timing of planting and other agronomic practices. In central Bénin, farmers increasingly neglect *D. cayenensis-rotundata* varieties in favor of those of *D. alata* since these are better adapted to current agroecological conditions (poor soil, pest and disease pressure, low rainfall, etc.).

To assist farmers with this option for using the genetic diversity, a program for intensive variety exchanges between villages and producers in different diversity zones was launched in 2009 within the framework of the GCDT project. Of 20 to 30 participating villages in each zone, 15 villages have already received new varieties (40 to 50

per village). This year, 15 other villages will also benefit from this program.

The exchanges have been conducted, taking into account the preference criteria determined for each zone. This exchange of varieties is a strategic way of conserving diversity on-farm through utilization. It has a multidimensional importance that includes strengthening yam production, food security, poverty alleviation; improvement of household income generation; strengthening diversity, conservation, and use; and improvement of sociocultural conditions of rural women. The results will rapidly become more evident in Zone 1.

In the northern part of this zone negatively affected by climate change, only one to two varieties out of eight to ten are tolerant of drought. The weather is suitable for the production of dry yam chips, which are in high demand and more expensive than fresh yam, but the late-maturing varieties used for this purpose were almost absent. In the south of the zone (Toucountouna and Natitingou region) dominated by lowlands, flooding is a challenge and only a few varieties were reported to be tolerant of high soil moisture.

We believe that by using, through exchanges, a large number of the Bénin yam varieties available, farmers in these regions will have a chance to find at least 50 that will be suitable for their local conditions. A strong network of yam producers in Bénin is actually being organized by IRDCAM to sustain the effort. The farmers highly appreciate the effort.

Cultivated yam are all domesticated from wild relatives co-evolving with the cultivated forms via gene flows. Because these species are sources of useful genes, participatory strategies have also been developed to preserve their diversity *in situ* while encouraging the domestication process developed by farmers.



Alexandre Dansi (right) and some farmers from Tchakalakou (North Bénin) in a discussion during the participatory yam characterization and classification exercise. Photo from Alexandre Dansi, IRDCAM.