

# Collecting pearl millet germplasm in Tanzania<sup>1</sup>

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## Introduction

Millet and sorghum are grown in the central regions of Tanzania at altitudes ranging from 800 to 1,500 masl with around 500 mm rainfall during December-May. The crops are extensively grown in the Dodoma, Singida, Shinyanga, Tabora and Mwanza regions.

There have been several previous germplasm collection missions in Tanzania. ICRISAT, in collaboration with the International Board for Plant Genetic Resources (IBPGR) and Tanzania Agricultural Research Organization (TARO) collected sorghum (Prasada Rao and Mengesha, 1979), pigeonpea (Remanandan and Mengesha, 1981) and groundnut (Ramanatha Rao and Mwenda, 1989). The 28 accessions of pearl millet assembled at the Indian Agricultural Research Institute, New Delhi (Rachie, 1963) by the Rockefeller Foundation were contaminated during seed increase and lost their identity before they were transferred to ICRISAT in 1976 (Appa Rao, 1980). Hence, Tanzania was accorded a high priority for collecting pearl millet germplasm to develop cultivars adapted to the unique agroclimatic conditions of Tanzania.

## Germplasm collected

Around Dodoma pearl millet matures early in May. Around Singida, in contrast, the crop is sown when soil moisture is optimum, usually around June-July. Hence crops mature later than in the Dodoma area.

A total of 587 samples consisting of 299 pearl millet, 261 sorghum, seven groundnut, four chickpea, one pigeonpea and 15 finger millet accessions were collected during May-June 1987. All the pearl millet, sorghum and pigeonpea samples collected were obtained from farmers' fields or threshing floors. The chickpea, groundnut and most of the finger millet samples were purchased from local markets. One set of these samples was left at TARI, Ilonga, another was sent to Southern Africa Development Coordination Conference (SADCC)/ICRISAT, Bulawayo, Zimbabwe, and a third taken to India and handed over to the National Bureau of Plant Genetic Resources (NBPGR) for quarantine inspection and release to ICRISAT, India.

## Variability

Around Dodoma, pearl millet produces very long (>50 cm), thick (>50 mm), loose spikes. Basal tillering is poor with no aerial tillers. Around Singida, pearl millet tillers considerably but produces only small spikes. Differences in tillering and spike size

between Dodoma and Singida forms might be because of the evolution of different genotypes adapted to different farming practices. Around Igunga where the soils are heavy and farming is intensive, pearl millet tillers profusely and produces short (15-20 cm long), thick (>60 mm) spikes.

## Variation within populations

The crops in most of the pearl millet fields were highly variable because the farmers grew a mixture of various types. The plants varied in height, flowering time, spike size and shape and grain characters. Even though the farmers select large spike types for next year's seed, new recombinants occur because of cross pollination. The variation within populations was more around Singida than Dodoma.

## Wild relatives

*Pennisetum purpureum* Schum. was found growing extensively in relatively high-rainfall areas. It was used as a fence and the mature stems or stalks were used to make benches. *Pennisetum mezianum* Leke was found in black soils around the roadside and in low-lying areas. *Pennisetum polystachyon* L. Schult. was found almost everywhere, especially on light soils with two distinct types that varied in spike colour. Three more wild species of *Pennisetum*, which need to be identified, were collected near Singida.

## Sorghum

The loose-panicked Guinea type of sorghum with white comeous grain was the most popular landrace grown by farmers. Races Caudatum and Durra were also common towards the north. Most of the landraces grown around Mwanza had red or brown grain. Farmers in the area claim that the coloured-grain sorghums are bird resistant. Around Kondoa and Babati, variation within populations was very limited probably because of strong selection for a particular type, and because the progressive farmers in this region have adopted modern farming methods. Around Singida, types with very large panicles, large grain and yellow endosperm were common. The distribution of different races and their special characters were described by Prasada Rao and Mengesha (1979).

## Genetic erosion

Improved cultivars of pearl millet such as Serere Composites 17 and 31 developed by Ukiriguru Research Station, TARO, were popular around Singida, Igunga and Magu; they have replaced the traditional cultivars. Farmers prefer improved cultivars as they mature earlier than the local types and are suitable for mixed cropping with maize or for late sowing. However, these improved cultivars were not found in the Dodoma region either because farmers there are used to growing long-spiked forms,

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or because the Serere Composite might not be suitable for dry sowing. Even though there is no threat of replacing the traditional cultivars the chronic drought is affecting them and resulting in genetic erosion.

Improved sorghum cultivars such as Serena, Lulu and Tegemeo were very popular. The Department of Agriculture has distributed seeds of improved cultivars in certain identified areas. We were informed that in Igunga district, over 90% of the sorghum area was under improved cultivars. In general, in areas with fertile soils and higher rainfall, improved cultivars were more popular. Though we did not see any sorghum or millet hybrids, it appears that there is a gradual replacement of traditional landraces. Because of overgrazing the wild relatives of both crops are threatened.

### Grain utilization

Both sorghum and pearl millet are used to make a thick porridge called *ugali*. For this, white-grained types with corneous endosperm are preferred. In the northwest, around Mwanza, red-grained types are grown, probably because of their resistance to bird damage. Sorghum is mainly preferred for making home-made beer. Our discussions with the local agricultural officers revealed that the improved cultivars were not popular in some areas because of strong preference for the white corneous grain of the traditional cultivars.

### Germplasm utilization

The pearl millet samples collected from Tanzania may be a good source for cold tolerance since most of them came from high elevations (> 1,000 masl). Cultivars from Dodoma are a good source of large spike size and high grain number. Cultivars from Singida seem to be a good source of high tiller number, and because of their luxurious vegetative growth, they also have potential as forage types. Around Magu we found traditional cultivars introgressed with such improved cultivars as the Serere Composite. These recombinants have long, compact cylindrical spikes with large grains that are likely to have a high yield potential and wide adaptability.

We came across sorghum cultivars with very large panicles and large grains around Singida. As the farmers grow a mixture

of different types varying in panicle size, shape, compactness, grain size, shape and colour, enormous variation was observed in a single field, probably because of natural outcrossing. Hence, each accession collected around Singida, Nzega or Shinyanga may be considered as a segregating population from which plants with desirable characters could be selected. We selected single plants with large panicles, hence it may be advisable to evaluate them in head-to-row progeny rows. Accessions from Babati and Kondoa may have resistance to various smut diseases as they flower during heavy rains but do not appear to have any panicle diseases.

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