Reaching the full potential of sweet potatoes in East Africa

Sweet potato is a vital part of many people's staple diet and livelihood, especially in Africa. The roots are high in carbohydrates and some varieties have significant amounts of pro-vitamin A. Sweet potato yields more edible energy per hectare per day than wheat, rice or cassava, can grow in poor sandy soil, and is relatively drought tolerant. In Eastern Africa it is therefore called "protector of the children". Sweet potato however has a short shelf life and is easily susceptible to postharvest losses. The Natural Resources Institute (NRI) and its partners have investigated several issues relating to improvement of sweet potato keeping qualities, as outlined below:

Extending shelf-life

Credit: Quirien van Oirschot

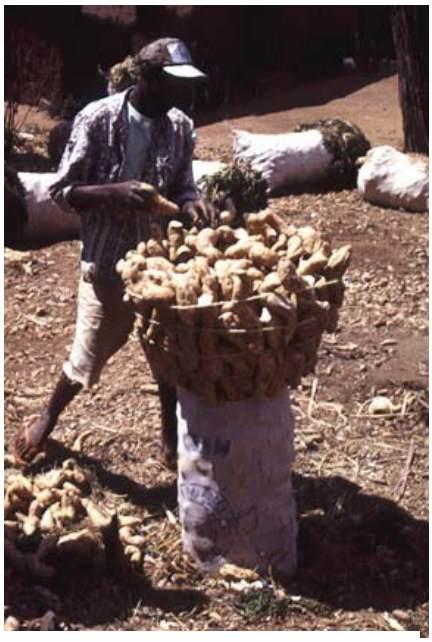
Although sweet potato has many advantages its short shelf-life is a major constraint. In the USA, roots can be kept for up to one year when maintained at 15°C, but in tropical environments where refrigerated storage is not economically feasible roots will generally keep for only a few weeks, and when subjected to normal marketing practices, this is reduced to 1-2 weeks. This means that fresh roots can be eaten only for 3 months of the year in most developing countries. Extending shelf-life would allow people to sell and eat fresh sweet potato for a longer period of time, and would make the crop more marketable hence improving incomes of many of the poorest farmers.

Two strategies to extend sweet potato shelf-life have been investigated: Firstly improvement of handling during transport and marketing , and secondly selecting varieties with better storage characteristics.

Improving market value and shelf-life by reducing postharvest transport loses

In Tanzania sweet potato is now increasingly being marketed, and production has thus increased by 25 to 30% between 1989 and 1999. Production is centred in the Lake Zone, Southern Highlands and Western Zone. The commercial supply chain can involve transporting roots in sacks weighing up to 250 kg several hundred kilometres, by different methods of transport (cart, bicycle, truck, canoe and boat). The marketing system, however, is poorly developed with significant losses in quality; roots attract a significant discount (10 to 30%) when shrivelled, cut or broken and more if the roots are rotten or insect damaged. To investigate the constraints and critical points in the supply and marketing chain that lead to root damage, a novel 'electronic sweet potato' was developed that could be placed in the centre of a sack to continuously monitor impacts, temperature and humidity. The electronic sweet potato indicated that the most severe impacts occurred during unloading and loading from trucks and ships. However, skinning injury and breakage of roots was caused by

continuous vibrational minor impacts occurring during transport. Owing to the fact that transport charges are usually imposed by the sack, sweet potatoes are usually transported in very large sacks, and indeed enormous efforts and a great of time is taken to pack as much as possible into a sack (see picture). The excessive weight and size of the sacks makes them difficult to man handle and transport effectively. However, surprisingly halving the sack weight did not reduce the damage, whereas transporting smaller quantities (20 kg) of roots and replacing sacks with locally available fibreboard boxes did significantly reduced transport losses. Analogous to the use of halm removal to improve skin set in potatoes it has been shown that pruning of the plant canopy 14 days before harvest makes sweet potato roots more durable and less susceptible to post-harvest damage. Research also showed that pre-harvest pruning had another benefit in significantly improving the shelf life by reducing the occurrence of rots.



Credit: Debbie Rees

Selection of cultivars with extended shelf-life– investigating wound healing

For socioeconomic reasons, changes in the handling system are difficult to implement, whereas release of varieties with improved keeping qualities require no changes in practices by growers or traders. Trials conducted in Kenya and Tanzania showed that existing sweet potato cultivars differ greatly in their shelf-life, and that this depends primarily on their tendency to lose water. Most water is lost through the wounds which occur during harvesting, and as a consequence sometimes more than 25% of root weight is lost in two weeks. Like potato tubers, sweet potato roots can heal their wounds, but they are generally less efficient at this than potatoes, and there appears to be a large range among cultivars in their ability to heal in normal marketing environments. It is the varieties with efficient wound-healing that have long-shelf-life. In collaboration with the International Potato Center (CIP), NRI has been investigating the physiological and biochemical differences underlying differences in healing characteristics and weight loss, with the long–term objective of promoting the breeding of improved varieties. A rapid index of wound-healing efficiency has already been developed to facilitate research and varietal selection, and at present an investigation of the links between carbohydrate metabolism and wound-healing is on-going.

Improving farmers incomes and market access through extending the storage life

The seasonal supply of sweet potato and large variations in price and quality presents opportunities and constraints to the farmers, traders and consumers. Since refrigerated storage is not economically feasible, a solution was to develop an appropriate long-term storage technology based on traditional pits and clamps so that

farmers could store roots when the price was low and sell when the price was high. Initially, on-station testing monitored the quality of roots, gases (CO_2, O_2), temperature and humidity. The trials indicated that the market value of roots was improved in unlined, minimally ventilated stores that contain undamaged and disease free roots. On-farm testing of the stores was carried out in partnership with farmers and market traders. The research team was keen to utilise local people's knowledge and research/observations by the farmers. This led to significant improvements in the success of the storage technology; in one zone all 20 stores contained marketable roots. Practical improvements suggested by farmers included locating the stores in the shade under trees and avoiding rainwater flooding. After the first year, many of the farmers would have made profit that varied between break even to a 200% surplus. Other farmers were content to lower the risks and consume the stored roots for food security purposes. This research, in collaboration with the farmers, is still on-going..

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