



PAEPARD



BETTER VEGETABLES, BETTER LIVES

Improving African indigenous varieties for greater nutrition and livelihoods



Farmers from Kirinnya-Bukasa Veterans group who are evaluating Nakati landraces.



It is well known that vegetables are good for us, providing important vitamins, minerals and antioxidants essential for a healthy life. As with all fresh produce, vegetables are subject to a number of constraints and challenges along the value chain as they travel from 'farm to fork'. These constraints have an impact on the quality of the produce, and hence on their nutritious content, which in turn has an impact on the health and livelihoods of the consumers. A research project funded by the European Commission (EC) through the PAEPARD¹ initiative seeks to address some of these constraints by improving people's access and adding value to indigenous leafy vegetables in Uganda.

African indigenous leafy vegetables

Africa boasts a large number of indigenous vegetables which are not only highly nutritious, but taste good too. In particular, African leafy vegetables have been an important part of the diet since time immemorial. But as food habits change, some of these leafy vegetables have become less widely available and now fewer types are being cultivated. This trend is a concern because leafy vegetables have beneficial properties which cannot easily be substituted by other foods in the diet. The vitamins and minerals they contain are essential in the absorption and metabolism of food ingested by the body. Many have high levels of vitamin C and carotenoids, a rich source of antioxidants which help to prevent the development of chronic diseases. They also contain minerals such as iron and zinc which are important in maintaining a range of bodily functions.

In Uganda, eastern Africa, some types of African leafy vegetables remain popular and are still widely grown. One such species is *Solanum aethiopicum*, which has two or three groups: the shum group, eaten as a leafy vegetable, and the kumba and gilo groups, grown for their fruits which are commonly called 'garden eggs' or 'mock tomato'. In Central Uganda, the most commonly eaten indigenous vegetable species are Nakati (shum group) and the ntula (Gilo group) which are usually cultivated by women. Nakati fruits may also be eaten and generally look like a tomato or an eggplant but they vary considerably in their appearance, often even within a landrace (local variety). The wild ancestor, *Solanum anguivii*, is also consumed for its fruits. Amaranth is another group of plants that is consumed in the country, including the varieties Bbuga (*Amaranthus graciczans*) and Doodo (*Amaranthus dubius*).

Greater consumption through improved access and quality

However, the overall consumption of vegetables in Uganda is low and is below the recommended daily intake. This is partly due to limited availability of vegetables in markets and the poor quality of the produce. The quality of vegetables is influenced by the way they are grown and the environmental conditions they are exposed to

¹ PAEPARD stands for Platform for African European Partnership on Agricultural Research for Development

during cultivation. The handling of the produce at harvesting and during transportation to the market also has a major effect on produce quality, hence its nutritional value. “These losses can be significantly reduced by adopting good handling and storage practices,” says Dr Elizabeth Kizito, Head of the Agricultural and Biological Sciences Department at the Uganda Christian University in Mukono. “Furthermore, the shelf life of produce can be improved by selecting germplasm with relevant characteristics and by improving the germplasm through plant breeding.”

The project

Dr Kizito is leading the research project seeking to address some of the constraints that limit people’s access to leafy vegetables. The project is called ***Enhancing nutrition security and incomes through adding value to indigenous vegetables in East and Central Uganda*** and is funded by the European Commission through the PAEPARD initiative. PAEPARD’s approach is to facilitate multi-actor research partnerships between organisations from Africa and Europe to help generate solutions for priority issues identified by African stakeholders. Dr Kizito is a specialist in plant genetics and other partners in the indigenous vegetables project bring in complementary skills in food technology, post-harvest storage and packaging, participatory research with farmers, and marketing.



**Dr Elizabeth Kizito
at the germplasm
collection in Mukono**

Novel crop improvement

Dr Kizito states that the Nakati types grown by farmers in Uganda have not been improved through plant breeding. “One of the aims of the project is to find out if there are some indigenous vegetable landraces that have good post-harvest qualities which can be used in a crop improvement programme,” she explains. Dr Kizito and her team, including PhD student Pamela Kabod, are especially interested in identifying landraces which have a high nutritional value. They are also looking for landraces which have traits that allow produce to stay fresh for a longer time after harvest. They have collected landraces from various locations in Uganda and are evaluating them in field trials. The trials are being done together with farmers so that the research team can better understand the full range of characteristics that farmers would like to see in improved varieties.

So far, a collection of about 190 different indigenous vegetables has been assembled at the Uganda Christian University in Mukono, Jinja. This has been done in a participatory manner with local communities who shared information about the landraces they are growing and gave their views on challenges and opportunities in indigenous vegetable production. The landraces are now being grown in Jinja and in Mbale in Eastern Uganda and work has started on evaluating the micronutrient content of the accessions (plant materials being catalogued and tested). Initial results indicate that the Nakati landraces generally have a higher total anti-oxidant capacity than the amaranth species tested. Many of the Nakati and amaranth accessions had high levels of vitamin A and have the capacity to meet most, if not all, of the vitamin A needs of children aged 1–3 years. Some of the Nakati accessions also had high levels of beta carotene. These preliminary findings confirm the high nutritional value of indigenous leafy vegetables and show that there is a rich pool of genetic resources to draw on to improve the landraces currently being grown.

Reducing postharvest losses

The project is also investigating where losses after harvesting are occurring and how best to minimise them. The testing of interventions to reduce losses is being done in a participatory manner with farmers, transporters and traders. A major challenge faced by these groups is how to reduce the rapid deterioration in quality of the



produce once it has been harvested. Harvesting is usually done in the evening and the produce is tied in bundles of up to 150 kg and taken immediately to the market. Storing produce in a cold room keeps it fresh for longer and allows more flexibility with transporting it, but this is a costly option and access to such facilities is limited. With this in mind, Dr Agnes Namutebi, a Food Scientist at Makerere University, is leading research into ways to keep produce fresh for as long as possible. She is receiving support in this activity from Dr Debbie Rees, a leading expert in post-harvest issues at the Natural Resources Institute of the University of Greenwich in the United Kingdom.



Prototype charcoal cooler developed at Makerere University.

Fresh charcoal cooler

Dr Namutebi and her colleagues at Makerere have developed a relatively low-cost charcoal cooler. The cooler is constructed with a wooden frame and wire mesh with charcoal used as a filler in the walls. The top section of the structure just below the roof is open to allow air circulation and water is passed over the charcoal to maintain a cool environment. Dr Namutebi and her colleagues have done trials to compare how long produce stays fresh when stored under ambient conditions, in a cold room and in a charcoal cooler. “After five days there was little difference in the appearance of produce when stored in a cold room and in a charcoal cooler. Weight loss and the moisture content in the two treatments were similar and the produce was still in a saleable condition after five days,” says Dr Namutebi. “On the other hand, produce stored under ambient conditions lost weight much more quickly and had a significantly lower moisture content,” she adds. “By the second day, the produce appeared wilted and could not have been sold in that state”.

Unpacking the bundles

Considerable damage is done to produce when it is tied in large bundles. So Dr Namutebi’s group at Makerere is also investigating options for improved packaging using locally available materials. Steven Sekulya, a postgraduate student in Dr Namutebi’s Department, is assessing different designs of perforated polyethylene bags and nylon meshed bags. He places produce in the bags and tests how long it remains fresh under ambient conditions and when stored in a cold room and a charcoal cooler.

Tuning in to veg FM

The project team recognises the importance of information on improved pre- and post-harvest practices to vegetable growers and of listening to their needs and concerns. One of the main activities has been the work with radio stations in central and eastern Uganda, to produce regular shows for this targeting all stakeholders in the vegetable value chain – farmers, transporters, traders, policy makers, schools, consumers and researchers. Dr John Jagwe, Managing Partner in the Agricultural Marketing and Market Information organization FARMGAIN Africa, is the driving force behind this initiative. FM radio is an important source of information for many farmers in Uganda and Dr Jagwe and colleagues at FARMGAIN has engaged with Radio Simba 97.3FM for many years. The format of the radio shows allows vegetable producers to ask questions and this has helped the project team to identify some of the critical challenges facing the growers. The shows have proved to be very popular and are now being broadcast once a week. The radio shows have been able to extend the reach of the project and improve understanding of the key issues surrounding the utilization and exploitation of African indigenous vegetables for nutrition and income security in urban and rural settings. The project team has also produced



a video documentary on indigenous vegetable production which will be available online by the end of 2016.

Radio enables large numbers of people to be reached but it is also important to interact directly with farmers in the places where they produce the crops. The project team is working with farmers at several locations in central and eastern Uganda. This work is being facilitated by Dr Apolo Kasharu, a social economist from the Coalition for Health, Agriculture and Income networks (CHAIN Uganda). CHAIN Uganda is an organisation which supports smallholder farmers to form groups and to transition from subsistence to commercial farming through better access to inputs and technologies.



Mr Abel Nuwamanya, the group publicity secretary, takes researchers to a household that is growing the vegetables in sack gardens.

Evaluating varieties for flavour and ease-of-planting

One of the field sites is at a new community established by war veterans in Kirinya, Wakiso district. Mr Abel Nuwamanya is enthusiastic about the Nakati plant materials he and his group have been evaluating in small plots. "We did not grow leafy vegetables before," he says, "but we plan to sow them again. They are easy to grow and give a harvest in about two months. They taste good and are easy to sell in the local market. We can get 2,000 shillings for a small bundle and we can continue to pick the leaves for a long period." Farmers have expressed distinct preferences for particular varieties and have requested more seed of the types they like best. The main characteristics they are looking for are medium bitterness and a pleasant flavour. According to one of the woman farmers in the group, the best types taste like amaranth and have a soft and tender texture. She said that children also like the taste of Nakati and prefer this to doodo. Another member of the group commented on the health benefits of eating Nakati and described how it had helped relieve a medical condition she suffered from.

Dr Kizito and her team are confident that with improved varieties and better post-harvest practices, there will be a better utilisation of AIVs for improved nutrition for women of child-bearing age and children below 5 years of age, and the safeguard of incomes of resource-poor smallholder farmers. The vegetables are short season crops and therefore ensure quick returns on investment.

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