Improving cassava processing for the market

Quirien van Oirschot, Theresia Ngendello and Andrew Westby

Cassava is an important staple food in tropical Africa, and has the potential to become a cash crop in many African countries. It is estimated that in the future, cassava is likely to be used more and more in processed forms for food, animal feed and other starch derived products. New market opportunities for cassava products may help to enable communities to develop their livelihoods and emerge from poverty.

This article describes the experiences of a collaborative project to support cassava commercialization through the introduction of improved processing technologies in the Lake Zone of Tanzania.

Photo: Q. van Oirschot

Pile of dried cassava roots, makopa, in the western part of the Lake Zone.

Traditional processing of cassava

In East Africa, people use relatively simple processing methods for cassava. In the Lake Zone of Tanzania it is mainly consumed as *udaga*, which is made from fermented roots that are cleaned and crushed or pounded into smaller pieces. After that the pieces – with a diameter ranging from 5 cm to 2 mm – are dried for about 4 days and sold. *Udaga* is normally pounded into flour and consumed as a stiff porridge named *ugali*. Sometimes *udaga* flour is sold on the market or in supermarkets. On the west side of the Lake Zone people also produce *makopa* – dried whole roots that can be milled and used for *ugali*.

These traditional products can be produced relatively cheaply using little equipment. However, the processing methods may be too labour intensive for commercial use and the flour is usually not of a high enough quality.

Baseline studies

Baseline research on social, economic and technological issues confirmed the fundamental importance of agricultural production and cassava processing for both food security and income. The studies also showed that there is scope for diversification to new, higher quality cassava products. This is supported by following observations:

- Between 60 and 80 thousand tons of wheat flour are annually imported to the Lake Zone, suggesting that there may be a market for cheaper locally produced cassava flour.
- Cassava market prices are low, ranging from 50 to 200 Tanzanian Shilling (TSh) per kilogram (0.06-0.26 US$/kg) while maize prices range from 180 to 350 TSh/kg and wheat flour from 330 to 500 TSh/kg. This means that there is scope for added value products of cassava at prices still below those for maize and wheat.
- Higher prices are paid for products with higher quality characteristics such as white colour, and good quality products sell faster.
- A surplus of cassava is produced in the region. Many farmers expressed interest in cassava processing equipment during previous technical demonstrations, but the equipment had not been available to them.

A factor that might complicate cassava commercialization is that the area is poor and many people earn less than US$1 per day. In addition, the market situation is not optimal. Market linkages are weak and producers rely on external traders. Farmers or processors often sell to village assemblers, who sell to larger wholesalers or traders who then sell to retailers.

The conclusion of the study was that any processing techniques promoted should be affordable to small cassava producers/processors, be available locally, and generate products for which there is a consumer demand.

A new technology

First the availability of the technology was addressed. Manual chippers with equivalent cost to a bicycle (US$100) seemed the most appropriate. Two local manufacturing enterprises were trained to build the machines in collaboration with the *Southern Africa Root Crops Research Network* (SARRNET). The machines and their products were tested in three villages, and recommendations from the processors were used to improve the initial models. Efficiency tests revealed that the machine from one manufacturer could chip 66 kg per hour while the other model chipped 95 kg per hour. The total time to chip a sack of roots (100 kg) may be 1.5 hours for an average skilled operator, while the traditional process of making *udaga* would take almost four hours for a similar sized sack. This means that although the rate of chipping is not as high as that of a motorized cassava processor (about 500 kg/hr) it is higher than the rate obtained through the traditional processing technique (about 30 kg/hr).

A new product

The manual chippers produced long cassava chips that are 2-4 mm thick, 5 mm wide and 20-50 mm long. They dried quickly and looked attractive. Drying is an important step in the processing of cassava. Current drying systems use canvas sheets placed on the ground. Better quality was obtained when the cassava was dried on elevated tables as this reduces contamination from sand and animals. It is easier to spread the product on a table. Drying tables can be constructed from locally available materials.

Tests revealed that the chips are acceptable, with a good appearance and colour but somewhat stickier than the traditional *udaga* or *makopa*. Overall the new chips were found to be as good as or better than the traditional product, particularly in relation to colour and appearance, factors that are important for marketability.

The chippers are most suitable for sweet cassava varieties that contain low levels of toxic cyanogen. Bitter varieties – containing higher levels of cyanogens – can also be processed by the chippers, but the chips contain cyanogens levels that are similar to levels found in traditional *udaga*, which is higher than the FAO/WHO recommended safe level of 10 mg per kilogram.

Market testing

The marketability of cassava chips was tested in pilot trials. Cassava chips produced at the research centre were taken to several urban (Mwanza) and rural (Ukerewe) markets. The traders were allowed to keep 20% of the income they generated through this exercise. The chips drew a lot of attention on the markets. In Mwanza they sold quickly and retailers obtained the same price per volume for chips as for traditional *udaga*. Since the chips occupy a higher volume than *udaga* it means that the price received per kilogram is higher, in this case by about 30 percent. Some customers commented that the flour from chips is sticky when cooked, but had a good smell, appearance and colour. Customers in urban markets came back for more the next day. At Ukerewe Nansio Market it took longer to sell the chips.

Validation

The next challenge was to integrate this technology into the resource base of communities. Motivated individuals or community groups had the opportunity to test the equipment if they made a down payment of 5000 TSh (US$6.50). Simple contracts were set up stating that after the trial period they would start to pay for the machine or return it. Below are example case studies from four different locations.

Case 1

At Ukerewe Island many households were said to be interested, but only one woman was prepared to make the down payment. The woman was satisfied with the chipping machine, but used it only for home consumption. She said that the machine gave her status and that she saves labour – requiring only half of the normal time – during the chipping process and when pounding into flour. Her husband operates the chipper. When the project finished the woman had started payments towards owning the machine.

Case 2

An existing, well-organized group of farmers and processors based near Mwanza and the research institute used three hand chippers. The group consists of both men and women of all ages. With help of researchers, linkages with a supermarket in Dar es Salaam were developed. The group delivered initially between 100 and 200 kg cassava chips per month to a Dar es Salaam supermarket for a price of 150 TSh per kg (US$ 0.19). The supermarket milled the chips into flour, packed it in 3 kg bags and sold the product for 750 Tanzanian Shilling. The branch manager commented that the flour was of good quality because of the white colour. The group has made a profit and would like to invest in a motorized cassava chipper as they see the opportunity to supply the supermarket with up to one ton per week. They have been brought into in contact with a credit scheme developed as part of the project.

Case 3

In the remote village of Nyarutembo four machines were loaned to individual farmers and to groups. They produce cassava cheaply, but rely mainly on itinerant traders that pass by to purchase the processed cassava products. Access to transport is very limited. Initial trials included visits to the district markets to catalyze the formation of linkages between farmers and traders. Processors agreed to organize themselves and try to market the chips themselves in Bukoba, where prices are twice as high as those obtained from itinerant traders. After three months they delivered the equipment back as they had not found a market. Their lack of access to transport limited their market access.

Case 4

One farmer group in Shinyanga decided to purchase a motorized cassava grater. The group processed all their cassava into cassava flour in a very short time, but they had not identified a buyer or market. Providing ideas, or links to possible buyers did not work. After eight months of storage insects attacked the product, making it worthless.

To facilitate access to capital for investment a financing scheme was set up with a micro-finance association (TAMEA). The scheme was set up to enable farmers and traders involved in growing, processing and marketing cassava to obtain credit for both the purchase of capital assets and working capital requirements. TAMEA used their expertise to select suitable farmers and traders. Only farmer groups are able to obtain credit. This credit scheme was set up in such a way that it could continue after the project had finished.

Photo: Q. van Oirschot

Manual chipper for making cassava chips.

Lessons learnt

Linkages

Considerable input is needed by many different actors to make these processing systems work. Many useful linkages have been established or strengthened through this project. New linkages have been established, including between researchers and machine manufacturers; between microfinance institutes and traders; and between machine manufacturers and farmers. Linkages were strengthened between researchers, NGOs,

extension services and farmers. This was done through a workshop, presentations at agricultural shows, regular visits to farmer communities, visits to markets, and involvement of extension workers and NGOs in fieldwork.

Effective linkages between processors and markets are essential in order to gain real benefits from using improved technologies, but such linkages do not always exist, particularly in remote areas. Case 2 illustrates that a secure market can give a high profit while Case 3 in Nyarutembo illustrated lack of access to markets with the lack of linkages. Farmers may not always be able to set up linkages themselves. Networking is costly and may involve transport, or other forms of communication. The lack of direct return on investment is a major obstacle for a poor farmer or processor. Farmers with more capital are more likely to take more risk (Case 4). These middle class farmers may have better chances of success in pilot tests if a market is identified. The location of pilot groups is also important. Access to markets and assistance from local institutions are vital. The group near Mwanza was successful in marketing the product because they did ask for help.

Photo: Q. van Oirschot

Flour made of udaga being sold at a market place.

Motivation

Asking farmers or processors to make a contribution towards the cost of the equipment is a good way to screen for motivation in getting involved in cassava processing. The down payment of US$6.50 was enough to discourage the non-serious participants. The motivation of traders to sell cassava chips at the markets was triggered by allowing them to keep 20% from the price obtained for the cassava chips. This is equivalent to the average profit margin of an urban retailer.

Traditional cassava processing for home consumption is a women's job, but men will become involved if *udaga* is produced commercially. It is therefore not surprising that more men became interested in processing when the manual chipper was introduced. In case studies 1 and 2 the men took over some of the physical work, like turning the wheel on the chipper, meaning less drudgery for women. Since traditionally *udaga* is traded both by men and women, it can be expected that chips will also be traded by both. It seems that both men and women will benefit from the manual chippers.

Markets

The fact that cassava chips sold so rapidly at Mwanza markets indicates that it may be easier to start testing new markets for a product in urban areas rather than in the rural markets. It is important to ensure that there is a market before production is started on large scale. Case 4, where a farmer community group had processed all their cassava in a short time, but were left with a stock of processed cassava infested by insects, illustrates a lesson learnt the hard way.

There is clearly a market for cassava chippers. Farmers receive information about the technology via the local research institute. However, interested farmers may not be able to pay for the chippers because it is difficult to get credit. One of the two manufacturers, Pamba, has so far sold 70 chippers (25 to the Research Institute, 25 to the Government of the Southern Province of Tanzania, and 20 to farmers directly).

Conclusion

This project introduced two products into the Lake Zone in Tanzania: the technology to produce a hand-operated machine and a 'new' product, cassava chips, prepared with the machine. It was demonstrated that there is a market for the cassava chips, so far especially in urban (super)markets. There is also a market for the chipper (70 machines have been sold, of which 20 outside this project). Farmers with a poor resource base and rural location have more limited access to markets. Access to urban markets and access to assistance in case of pilot trials is important for success. Better results were obtained when farmers were organized in groups. The existence of a group is also a condition to receive credit in microfinance schemes.

Acknowledgements

The authors would like to acknowledge contributions from: Massalakulangwa Farmers Group (Shinyanga and Mwanza), Joanna White, Duncan Burnett, Elisabeth Rwiza, Rahila Amour, Sicco Kolijn, Elias Kisamo, Gilbert Mwakyoma, Pamba Industries Co Ltd, and Vitanda Manufacturing Co. Ltd. This paper is an output from a project funded by the United Kingdom's Department for International Development (DFID) for the benefit of developing countries. The views are not necessarily those of DFID.

■

Quirien van Oirschot. Food scientist and post-harvest technologist. Natural Resources Institute, Kent, United Kingdom. Address for correspondence: Bådalen, 6530 Averøy, Norway. Email: qvanoirschot@yahoo.co.uk
Theresia Ngendello. Sweet potato and cassava post-harvest specialist. Lake Zone Agricultural Research and Development Institute, P.O. Box 1433, Mwanza, Tanzania.
Andrew Westby. Director of Research and Professor in Food Technology. Natural Resources Institute, University of Greenwich, Central Avenue, Chatham, Kent ME4 4TB, United Kingdom. Email: A.Westby@gre.ac.uk

References

- Scott, G.J.; R. Best; M. Rosegrant and M. Bokanga, 2000. **Roots and tubers in a global food system: A vision statement to the year 2020**. A co-publication of CIP, CIAT, IFRI, IITA and IGPRI. CIP, Lima, Peru.

- Van Oirschot; Q., J. White and A. Westby, 2001. **Technical and economic aspects of small-scale cassava processing in a selected village in the Lake Zone of Tanzania.** Case study prepared for FAO in Rome, using data from DFID funded research. 102 p.