

## **Farmer to farmer cassava varietal selection and breeding: The Domasi experience**

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**Abstract.** In the year 2001 there was a national initiative to enhance the economic role of cassava in Malawi. Stakeholders ranging from farmers to entrepreneurs were invited to attend a symposium that provided impetus for nationally promoting the much-neglected cassava. For the resource poor-farmers this initiative could not have come at a more inappropriate time. There was a severe shortage of cassava planting material and some of the preferred varieties were extinct or at the verge of extinction due to pre-emptive harvesting and diseases.

For decades, farmers in Domasi had neglected their cassava due to the generous fertiliser subsidies that had up until the early nineties provided high yields of maize. The decline in fertiliser subsidies forced farmers in Domasi to turn to their “old trusted crop”, cassava. Unfortunately, cassava planting material was/is in short supply food shortage a recurrent problem further compounding the situation. Farmers started mobilising themselves into clubs in order to secure extra income or food production. Through the active involvement of the chiefs, local society and a Christian community based local NGO the farmers in Domasi have together with researchers and farmers from Mulanje introduced “new” local varieties to the area. The 17 varieties are currently under cassava club farmer field experimental condition. In this paper we present the process of forming cassava clubs and an exchange visit with

other cassava farmers in Mulanje district that has enabled the Domasi community to breed 17 locally adapted varieties within one year. The paper discusses mechanisms for improving the co-operation between resource-poor farmer’s and formal agricultural research and extension services.

### **Introduction**

Cassava has become a major food staple of both rural and urban households in Malawi (Akoroda and Mwabumba, 2000). Even in good food crop production years, it forms the basic element in the food security of chronically food short households, an estimated one third of Malawi’s rural population (Benson, 2002). At times of food crisis, cassava takes over as the most important component in crop-based food security for almost all resource-poor families in Malawi (Moyo and Benesi, 1998). Moreover, output appears to be more robust in the face of biotic and abiotic stress and shock than other food crops (Mkumbira and Mahungu, 2003). The increase in overall cassava output has been more steady than maize over the last two decades (Haggblade and Zulu, 2003), a trend paralleling that estimated on the basis of aggregate statistics for Africa as a whole (IITA analysis for the period 1982- 2002, based on FAO production figures for cassava, sweet potato, and cereals).

Both men and women farmers produce, process and sell cassava (Chiwona-Karltun, 2001). However, they tend to have different variety preferences and roles, to work through gender-segregated networks, and to experience different social, agronomic and economic constraints in the production and sale of fresh and dried roots, and in opportunities to add value and generate income from product sales. Previous work (Chiwona-Karltun and Mkumbira, 1998; Mkumbira and Chiwona-Karltun, 2003) has shown that both male and female farmers are able to discriminate reliably among varieties on the basis of their morphological characteristics, and between bitter and cool/sweet varieties by the 'taste test' (Chiwona-Karltun and Brimer in press) and confirmed by molecular analysis.

However, in some areas farmers face major problems in maintaining the cultivation of preferred varieties because of poverty-related in-field thefts of fresh roots from a standing crop. Thieves appear to favour sweet varieties whose roots can be sold fresh without processing. Thieving reduces the diversity of the cultivars locally available and gives rise to chronic non-availability of planting stems. The shortage arises because (a) there are fewer plants left to take cuttings from; (b) taking cuttings from ratooned plants considerably reduces root yield, (c) the cuttings taken from the plants uprooted by thieves rarely survive through the dry season into the next planting season (unless there is irrigation). Only where the rainfall pattern allows continuous harvest and immediate re-planting are these chronic problems avoided (although thieving pressure remains a problem even in these areas, its knock-on impact on cassava biodiversity and food security is not so devastating). In order to protect household food security, farmers especially women often favour bitter over cool/sweet cultivars, even though the bitter varieties require considerable processing to remove the higher and potentially dangerously health-threatening levels of cyanogenic glucosides.

The aim of these studies (on going) is to design a participatory and efficient system of cassava cultivar introduction. The findings from these studies will facilitate in theory development, with respect to: innovation processes, thievery as a determining factor in cultivar selection and in comprehending cassava-based livelihood and gender issues.

## Material and Methods

**The Context and Background** The activity described here is taking place in 17 villages in Malosa Extension Planning Area (EPA), Naisi Section, and Naming'azi Ward. Domasi is the modest commercial centre at the heart of the Ward. It straddles the main Zomba -Lilongwe highway in southern Malawi, toward the border with Mozambique. There is a small roadside market and a large periodic market some 6-km along the highway to the south leading to Blantyre. Zomba town, some 12 km towards the south, offers a range of modern commercial and administrative services, as well as the amenities associated with Chancellor College, one of Malawi's most prestigious universities. The national Teacher Training College lies within Domasi itself and there is an extended middle class residential area to one side of the highway.

**The original research design.** The original research design envisaged materials flowing from the formal system to a selected village, in support of local breeding processes, which we assumed on the basis of previous research (Chiwona-Karltun, 2001) were occurring through varietal selection and exchange of materials between villages.

We further assumed that there was some necessary relation between farmers' selection preferences and market demand. We intended to track the existing flow of materials, and those introduced through both the formal and informal systems, by means of molecular marker characterisation (Fregene and Suarez, 2003) in farmer-preferred varieties, and subsequent recovery of cassava materials

from designated markets, in order to track the penetration of these preferred materials.

The study design has been modified considerably in the light of facts on the ground. The most important of these are fundamental to any long-term sustainability of cassava breeding: The impact of HIV/Aids. Our data show that HIV/AIDS is profoundly altering the following variables:

**Leadership and entrepreneurial capacity at the local level.** This is evident in the decimation of the chiefs; the incidence of households headed by women alone and by children; the decline of local market demand, and the marked shifts in cropping systems (de Waal and Whiteside, 2003).

**Governance.** Those dependent on government salaries are demanding that the pensionable age be reduced to 35 years, so that dependants left behind are able to enjoy some support. Around a third of all Malawians are thought to be infected. With so much time off taken for attending funerals, services are further badly hit; the loss of efficiency is spiralling into increasing indebtedness and further loss of capacity.

**Economic relations.** Local economies are falling back on former patterns of exchange relations and social networking in order to survive. The efficiency and effectiveness of public services is reduced, to the point where many official bodies are no longer capable of delivering any service.

This spiral into long term decline has many negative aspects. One of the most serious for the research question is the chronic weakness of the formal agricultural research system. The research stations most relevant for cassava breeding, are unable to supply sufficient (and at times, any) cassava cuttings, they have inadequate on-station multiplication capacity, no security, virtually no transport, and virtually no financial resources. The research staff is languishing through sickness, premature death, lack of trained scientific supervision and research project funding, and

inadequate or broken equipment, or ill-supplied facilities. In short, the formal system is not able consistently to supply new cultivars, let alone sustain close and reliable interaction with farmers in a participatory plant breeding (PPB) relationship.

## Results

**Adaptations of the research design.** First, the project provided transport, and facilitated the contact, between farmers in Domasi and farmers further south close to the Mozambique border, where there are better soils, good rains, and a wider variety of cultivars, where the researchers had had previous research contacts. Farmers' visual characterisations were recorded, and sets of selected varieties were tagged. Each Cassava Club received their preferred set, to plant in their own Farmer Trials. Individual farmers also took materials for planting in their own fields. One complete set of all accessions in the farmers' trials was planted out in a reserve plot donated by a missionary-run Farmer Training Centre, Namingazi Farm Centre, close to Domasi. The trial and reserve accessions subsequently were described morphologically by a trained technician.

**Farmer exchange visits.** Subsequently, the farmers from Mulanje, the south, visited the Domasi cassava clubs and made their own selections, they only selected one variety due to lack of cassava as well as participating in a product development session run by a local entrepreneur. Later on, Domasi farmers visited and made selections from the accessions managed by the regional cassava network, SARRNET. The accessions included varieties grown for leaf quality and harvesting and some farmers chose to take a number of these – for them, it was a novel idea that you might choose to specialise in leaf harvesting and sale. Although leaves are consumed, they are harvested sporadically and only for home consumption. Again, the farmers', and this time also the scientists', selection criteria were recorded, and the accessions were tagged and

those entered into the reserve plot and Club trials were later morphologically described.

**Varietal assessment by Domasi Farmers of acquired cultivars.** In September 2003, farmer assessments made at harvesting from the reserve plot and their own trials were recorded, through to cooking quality and taste assessments (forthcoming). On the basis of the results of these exercises, it was decided that some should be put back into trial, some planted for multiplication, and some sold as fresh roots in order to generate funds for the Clubs. The remaining roots and planting materials were shared out among Club members, based on a 'fair' allocation devised among the farmers themselves. Because of the need to be able to determine the distinctiveness of varieties of roots collected, at a later date, in markets and non-participating farmers' fields, work also has been initiated to carry out DNA analysis from both the leaves and roots. It is worth noting that none of the farmers' trials, or the reserve plot, has been robbed; though the risk is always there.

#### **Market Research and product Development.**

The original research design has also been modified with respect to the product development and marketing objectives. A small, farmer-selected, market research team has participated in the investigation of the conditions in which fresh roots and processed products are sold in town and periodic markets and cassava trading. They have also actively promoted a range of cassava products in various venues. A number of farming families are beginning to take up some of these ideas.

#### **Discussion and Conclusion**

The question naturally arises: where is the public research system in what is evolving. Researchers at Bvumbwe, Chitedze, Makoka Research Station, and SARRNET have provided invaluable advice, and have smoothed the way through numerous administrative and operational problems. They have willingly engaged in cost sharing,

whenever their own funds have permitted, and given generously of their time whenever transport was available. SARRNET has provided access to the farmers of their own accessions. However, it has to be faced that what in particular Bvumbwe, Chitedze and Makoka Agricultural Research Stations can offer is at best an "unreliable" and limited back-up; they are simply not in a position to act effectively towards creating an enduring, and institutionalised, participatory breeding system in terms of human, technical and financial resources. Malawi NARS, though willing and able, are not in a position to execute decentralised cassava breeding to address cassavas' specificity due to genotype by environment interactions as is recommended by the international agricultural research centres (Dixon and Bandyopadhyay, 2003). The most feasible solution for the time being, for optimising the cultivation of cassava as a food security crop as well as for commercial purposes is by expanded participatory varietal selection (PVS) in the absence of policy and investment reforms (Rosegrant and Cline, 2003).

Although the process described appears to offer promise and to be "the right research" (Lightfoot and Scheurmeier, 2003) it would be imprudent to over-value what has occurred. There are tensions that will have to be confronted and overcome. This has to do with the inequalities that inevitably exist within any community: who is benefiting and who is left out? The drivers of the activity are the somewhat better off farmers, the younger chiefs, and the somewhat more educated, although club membership includes the socially vulnerable and the HIV/AIDS affected. So far the group decision-making process has satisfied the need to spread opportunities from the leading actors to the core group of cassava club members and beyond. This is largely in the form of access to farmer-preferred planting stems, and sharing the experience of farmer-led cassava development, through the Cassava Farmers' Fair. The project has been up and running for two years and this is a short time for any

meaningful conclusions to be drawn for a crop that is vegetatively propagated and for communities whose social fabric is constantly tested by the vagaries of nature.

## Acknowledgements

The work in Malawi has been carried out under a SIDA/Sarec research grant SWE-2002-283, in collaboration with Roots and Tuber Programme, Malawi; and Farmer Research Partners: Mrs. C. Katundu, founder member of Roots and Tubers Association CMRTA, Domasi, and member of Product Development and Market Research Team; Mr. G. Kwere, member of Product Development and Market Research Team; Farmer Research Team members Village Headman Chilimba, Chilimba Village; Village Headwoman Mai Kumalonje, Kumalonje Village; Mai Whiskey, Chindenga Village; Mr. Jones Pillo, Village to Village HIV/SIDS Community-based Services; and Mr. Special Kanyesi, Field Research Assistant, Naming'azi Farmer Field Site; Naming'azi Blantyre Synod Community Agricultural Extension Service and Naisi Ward Agricultural Extension Services.

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