

Higher yields and income with disease resistant coffee clones

Hudson Gabriel Lebi

The lowlands of the Isangati division, in Mbeya district, southern Tanzania, enjoy ideal climatic conditions for coffee production. Grown here, at about 1600 metres above sea level, coffee is a cash crop which, since it was introduced after independence, has gradually replaced crops such as millet, sorghum or sweet potatoes, benefiting farmers in the whole region. Yields, however, are low. One of the main reasons for this is the high incidence of two diseases, which together contribute to more than 50 percent of yield loss: Coffee Berry Disease (CBD) and Coffee Leaf Rust (CLR). The use of fungicides is expensive and not always successful, while local alternatives such as the use of plant extracts of *Tephrosia* have worked well, but not over a long period of time.

Trying out resistant varieties

Ten years ago, various organisations decided to try a different approach, looking for and promoting the use of resistant varieties. Under the FARMESA framework (Farm-level Applied Research Methods in Eastern and Southern Africa), an agreement was signed between the Agricultural Research Institute in Uyolet and the Isangati project (later formally registered as the Isangati Agricultural Development Organization, IADO, a local NGO). Activities started by identifying villages which were interested in hosting on-farm trials, together with a series of awareness-raising meetings with farmers and the population in general. Special conditions were set for selecting the fields for the trials: they had to be close to fields infested with CBD and CLR, they had to be managed by a farmer and his family, and had to be easy accessible. Each family was to be responsible for the preparation and management of the plantation.

Seedlings of nine different varieties resistant to CBD and CLR were collected from the Tanzania Coffee Research Institute, TACRI, and were only identified as coded clones (SC2, SC3, SC4, SC7, SC11, SC12, SC13, SC14 and SC16). These were distributed among 18 farmers who met the conditions for the field trials, in nine different villages, and were planted in January 1999. Evaluations were carried out every three months, taking into account a set of criteria developed by the farmers themselves: plant height, physical appearance and vigour, and resistance to CBD and CLR. Over a four year period, the performance of the clones was compared with that of the existing local varieties.

The 18 participant farmers harvested the first coffee berries from the trial plots during the second half of 2003, and these were all processed by the farmers themselves to obtain dried parchment coffee. On average, these plants yielded 1 kg of dried parchment coffee per tree, roughly twice as much as the yields of the local varieties. All plants showed vigorous growth, a good branching pattern, and the capacity to bear fruits within three to four years. And although all nine clones were resistant to CBD and CLR, farmers could identify and select the best ones, as they had been observing them closely over four years. Considering the different criteria, all farmers agreed that the best clones were SC3, SC4, SC7 and SC11. Additional evaluations were made later, hoping these clones would meet an additional set of

criteria: those set by consumers. Parchment coffee was therefore sent to the Mbozi Coffee Curing Company (the factory owned by the Tanzania Coffee Board) for cup taste. All four clones selected by farmers were approved fit for consumption.

A series of feedback meetings were then organised with the farmer groups involved in the process, discussing the advantages of these new varieties and the need to multiply the material they had at hand. Farmers expressed the importance of preserving the genetic qualities which these plants had shown; recognising that this is more difficult when using harvested botanical seeds, due to cross pollination. Therefore, it was agreed to try clonal replication on a larger scale.

Cloning and multiplication of seedlings

The Isangati Agricultural Development Organization selected three of its extension officers to monitor the process. To prepare them for this task, they were trained for two weeks at TACRI's headquarters in Lymungo. Back in Isangati, their first role was to identify a field fit for the multiplication of the seedlings. Having compared the advantages of the different areas, the organisation chose and acquired a plot in Shizungo, a village in Isuto ward. This was provided with the necessary infrastructure, including a materials preparation unit, a vegetative propagation unit and storage unit. At the same time, these extension officers, in co-ordination with the farmers who had been in charge of the trials, prepared the parental stock for the multiplication process, selecting cuttings from the on-farm trials. These were planted in small propagation boxes, and later transferred to the field.



Photo: Karen Hampson

Selecting the best material is the first step in a successful cloning process.

IADO carried on organising meetings with farmers and other stakeholders, reporting on the progress being made with the propagation of the selected clones, and promoting the use of resistant varieties as an effective way of increasing yields. Contact was also maintained with TACRI, the Tanzania Coffee Research Institute, whose representatives visited the field in Shizungo. Impressed by the results achieved, they offered to continue providing backstopping to the whole project, together with an additional training course for two extension officers, and 700 seedlings of the selected varieties to speed up the multiplication process. Management of the plantation also served as part of IADO's broader programme: aiming at the sustainability of the process, the organisation started training four farmers groups in it, later facilitating the establishment and management of coffee clonal gardens in their localities. This has followed the Farmer Field School approach, and included a visit to TACRI.

Following a decision agreed on by farmers, extension agents and researchers, the cloning process does not now make distinctions between the four selected varieties. On the one hand, this means it will not be possible to continue evaluating the yields or response to disease attacks of individual varieties in the future. In production terms, however, it is preferred to have a mix of plants instead of a completely uniform field. This is particularly important with a reproduction process which produces genetically identical plants.

General results

At the moment, the field in Shizungo has 812 "mother bushes", from which stem cuttings are already being harvested. By the end of 2006, over 7000 cuttings had been planted in the reproduction boxes, of which more than 1000 were ready to be sold. At a price of 100 shillings per seedling (approximately US\$ 0.08), this represents a relatively good income. The problem which those in charge are facing now is that the demand from farmers in Isangati and beyond is far larger than the existing supply. This has strongly motivated the four farmer groups to produce their own seedlings, adding to the overall motivation of obtaining higher yields.

This high demand shows how much farmers value resistant varieties as a way of reducing production costs and increasing yields. Seedlings are available in their own villages and at a reasonable price. Although it will be some time before these seedlings produce berries, and replacing the old varieties also costs money and time, planting the new resistant seedlings is, on the whole, a cost-effective practice. Existing demand for the new seedlings also highlights the benefits of involving all farmers throughout the process, and is a direct result of the

effort IADO has put into information exchange among all stakeholders.

During various feedback sessions, farmers agreed that using resistant varieties has many advantages, and through cloning these varieties, more farmers can benefit. By reproducing a plant vegetatively, farmers are sure of what they get, and know exactly how each new seedling will respond to CBD, CLR or to other problems. Having had the trials on farms in their own region, farmers know exactly how the future plantations will look like under their own farming conditions.

These sessions, however, also reported some of the difficulties in the whole process. First of all, farmers referred to the expertise needed for cloning plants, and the quality standards which need to be met throughout the process in order to guarantee good results. Without aseptic conditions, for example, cuttings will generate fewer healthy seedlings, so specific training may be needed for setting up or managing nurseries. Furthermore, the whole process takes time, especially if it also includes a thorough evaluation of different varieties. An additional disadvantage in Isangati was that not much parental material was available, and that the backstopping organisation, TACRI, is based on the other side of the country, more than 1000 km away.

Nevertheless, the benefits of working in association with TACRI and with the Agricultural Research Institute have been clear. Seedlings of resistant varieties are being produced and distributed among farmers in the area, following a process in which farmers themselves are active participants. This has resulted in increased knowledge and confidence and, as some farmers are already witnessing, in increased yields. This may become even clearer in the near future, when the seedlings being planted now start producing. With some of the seedlings being sold, an additional income source is now available to some farmers. The challenge for IADO and the coffee farmers in Isangati now, is to continue to improve production and marketing processes.

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