IPM of maize-forage dairying

Alistair Murdoch
Department of Agriculture
The University of Reading
Earley Gate, PO Box 237
Reading RG6 6AR, U.K.
Tel. +44 (0)118 378 6746
Fax: +44 (0)118 935 2421

The problem

In the Central Kenya Highlands, economic activity is dominated by smallholder intensive agriculture and industries based on cash crops such as tea and coffee. Dairying is the most important agricultural activity after tea and coffee growing (Staal *et al.*, 1997). Dairy animals are fed in zero-grazed or semi-zero-grazed systems, mainly on "cut and carry" forage. For example, in the Kiambu district with a population of 744010, 48% of 189709 households stall feed dairy cattle, so that dairy livestock ownership helps alleviate poverty for many. Farming in this area is becoming more intensive as pressure on the land rises as population size increases: reports on average farm sizes range from 1.1 to 2.0 ha per household (Gitau et al., 1994; Staal et al., 1997). In the long-term this intensification is expected to lead to a decline in the availability of purpose-grown forage such as Napier grass (*Pennisetum purpureum*) even though in the short-term, the area under Napier may still be increasing (Miano, pers. comm.). The project's RRA showed that while Napier grass was the main forage source (40%), the maize crop contributed 24% and weeds from the maize crop, a further 5% of annual forage supplies (Fig. 1, McLeod *et al.*, 2001). Producing sufficient forage for dairy cattle is difficult for farmers and low dry matter intake is one of the most important constraints to dairy production (Omore *et al.*, 1996). Forage is particularly scarce during the dry seasons – particularly from January to March and to a lesser extent August and September.

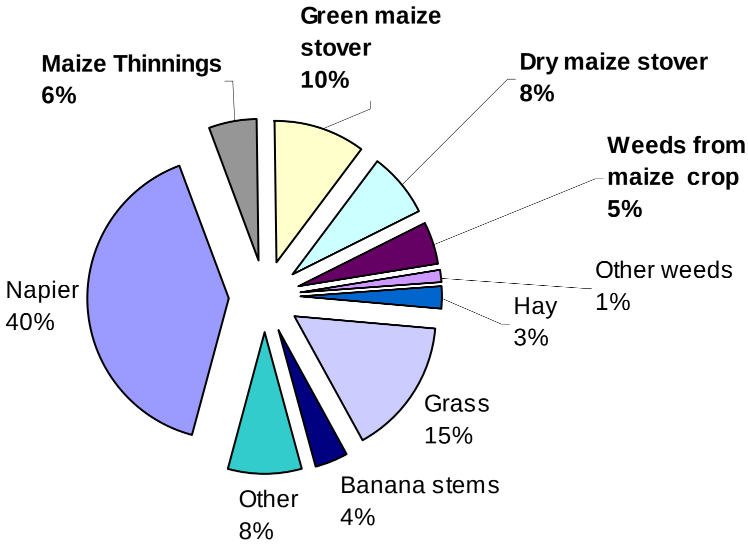


Figure 1: Annual forage usage in Kiambu. Contributions from the maize crop are in bold type. (From R7955 Rapid Rural Appraisal, Mcleod *et al.*, 2001).

The purpose of this project was to help to alleviate such shortages by integrating the control of pest, disease and weed problems so that the forage (and grain) offtake would be greater. The project also linked with the NGO Land O'Lakes to combine their small-scale silage making system with improved crop protection, conserving the excess forage for use in the dry season.

The project was initially funded by LPP and then jointly with CPP after 18 months. The budget over a total of 58 months (April 2001 to January 2006) will be £310k

The process

Stakeholders were engaged in two pre-contract meetings as well as throughout the project. The first activity was a rapid rural appraisal of farmers designed to clarify the importance of maize as forage and of pests, weeds and disease in forage (grain) production. A meeting of all stakeholders was then held three months into the project to approve the experimental programme. It was agreed that the primary foci would be on the impacts of maize streak virus disease and weeds on forage yields and quality from the maize crop. Stakeholders were consulted further half-way through the main project and at this point additional funding was available to carry out participatory research on the adaptation of the Push-Pull habitat management system for maize stem borer control to the central Kenyan maize-dairy farming system. Outreach to farmers was achieved in surveys, field days and participatory on-farm research. Supplementary funding was provided to expand the project as already indicated and then after three years for dissemination and completion of an exit strategy. As part of the exit strategy, promotion partners were trained and then took over responsibility for dissemination to farmer groups with which they were already working.

The research itself included a variety of methods both on-station and on-farm with varying degrees of farmer participation.

Approaches that led to success included the following:

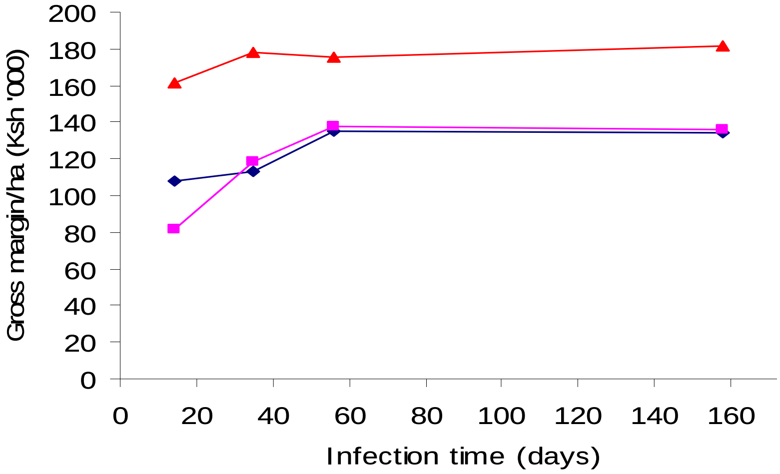
1. **Interdisciplinary approach** and research team including both natural and social scientists and crop and livestock specialists. This was not always easy as funding sponsors are discipline oriented, while crop scientists and plant breeders in East Africa tend to forget the importance of forage – maize is a dual-purpose crop for many farmers..
2. **Team motivation** was maintained in various ways. For example, by including training of one PhD and one MSc which gave the opportunity to young scientists to study scientific problems and for older scientists to supervise younger ones. Research was designed to test specific hypotheses by robust science to ensure refereed journal publication and an opportunity to attend international and regional conferences. Perhaps above all, the team was motivated by the project's scope for helping those in need and alleviating poverty (fig.3).
3. A variety of **stakeholders** had to be involved throughout the project. These included breeders to ensure multiple crop uses and most appropriate varieties are tested, policy makers to ensure seed distribution was feasible, seed companies for seed availability and perhaps most crucially, extension and NGOs as promotion partners – throughout the project. Farmers and existing farmer groups were also involved throughout project but the main focus for dissemination was on encouraging promotion partners.
4. A feature of the project was in offering **a basket of technologies and training for promotion partners**. These technologies included Maize Streak Virus Disease resistant cultivars, herbicides vs hand-weeding, the push-pull habitat

management system for controlling maize stalk borer and increasing forage production, tube silage and head smut management for both maize and Napier.

5. **On-station and on-farm participatory research** were both utilised in order to ensure robustness of hypothesis testing, appropriate adaptation and a high interest in adoption. The on-station approach was not problem free as it proved impossible to replicate or simulate the diversity and intuition of farmer practices for fertiliser and thinning in a controlled experiment. Farmers have different and multiple objectives – food security being more important than testing a hypothesis. Participatory approaches also need to be applied with care as researchers need training and it is not always easy to know how to measure “success” as the objectives of participating farmers were not always transparent. For example, the farmer on whose land a trial is being run may own the crop and this may determine the effort and measurements made.
6. Clear **dissemination and upscaling exit strategies** were developed during the project and in extensions to the project (months 36-58) once the initial research objectives were largely achieved.
7. We aimed for self-sustaining dissemination after the end of the project by training and then supporting carefully selected **promotion partners**. These partners were selected on the basis that they were already working with farmer groups and so would not require funding for fuel, per diems etc. IN the case of extension, front line extension workers attended with managers and NGOs with a desire and capacity for outreach. After training ongoing support to trainees was achieved by maintaining regular contact by visits, phone calls, review days and by supplying specialist seeds supplied – maize cultivars; *Desmodium*.

Figure 2. Benjamin Musembi (MSc student) and Jedidah Maina (KARI research scientist) explaining benefits of weed control on maize forage and grain at a farmer field day on February 2002. Plot in foreground was unweeded, that in the background was weeded.

Figure 3 Gross margins of the three cultivars infected with *Maize Streak Virus* Disease at various periods post-crop emergence in the short rains 2001. The uninfected control is shown as though it were infected on the date of harvesting at the end of the experiment. H511 (squares) is a commonly grown hybrid and Gikuyu (diamonds) a local landrace. KH521 (triangles) is an MSVD resistant cultivar. The gross margin includes all forage and a bean intercrop. The main point to note is that the difference between earliest infection time (14 days post-crop emergence) is smaller for the resistant cultivar than for H511 and Gikuyu.



It is still too early to assess the ultimate impact of the project but it is interesting that before the project started, farmers did not include disease resistance among their criteria for selecting maize cultivars and indeed MSVD resistant cultivars were not generally available. The project clearly demonstrated the advantages of MSVD resistant cultivars to farmers and other stakeholders. The project showed the benefits were not limited to grain but to forage and overall gross margins (Fig. 3). While project R7955 does not claim the sole credit for their wider use, it was certainly involved.

IPM of maize forage dairying website:
http://www.apd.rdg.ac.uk/Agriculture/Research/CropScience/Projects/IntegratedWeed/index.htm