

## PROJECT SUMMARY

**TITLE OF PROJECT:** Development and on-farm evaluation of agroforestry livestock feeding systems.  
**R NUMBER:** R5732  
**RNRRS PROGRAMME:** Forestry  
**PROGRAMME MANAGER:** OFI  
**SUB-CONTRACTOR:** Natural Resources Institute  
**RNRRS PROGRAMME PURPOSE:** The use of trees within farming systems, including community and farm woodlots, optimised.  
**RNRRS PRODUCTION SYSTEM:** Semi arid  
**COMMODITY BASE:** Tree fodder  
**BENEFICIARIES:** Resource poor farmers  
**TARGET INSTITUTIONS:** KARI, ICRAF  
**GEOGRAPHIC FOCUS:** Kenya

**START DATE:**05/02/94**FINISH DATE:**31/07/96  
**TOTAL COST:**£301,713

### 1. Project purpose:

The contribution that farm animals can make to the welfare of small-scale farmers is, in many areas of Africa, severely constrained by the animals' poor nutrition. Greater use of fodder trees has the potential to make a meaningful contribution to addressing the problem. Such is the situation in the Embu District of the Kenya highlands. Here, the farms are examples of spontaneously developed agroforestry systems that typically consist of arable land for cash crops, and a zero grazing unit producing fodder for cows and small ruminants. Farmers commonly see the grazing unit as central to the farm's activities because milk sales give a reliable cash flow and manure is vital to maintaining the arable land's fertility. However, surveys have shown that inadequate fodder in terms of both quantity and quality, particularly in the dry seasons, are major limitations to farm productivity.

The zero grazing units are typically planted with Napier or similar grasses. Efforts to promote their enrichment with herbaceous legumes (*Desmodium* spp.) has met with only limited success, probably because of management problems associated with the aggressive Napier grass. Tree fodder species that showed early promise in trials were *Leucaena leucocephala*, *Sesbania sesban* and *Calliandra calothyrsus* but the first was heavily attacked by the leucaena psyllid and the second did not survive frequent cutting. *C. calothyrsus*, on the other hand, has combined high productivity with resistance to pests and diseases. It has become very popular with farmers, who make strenuous efforts to acquire seedlings. There is a need to study animal utilisation aspects of this and other species so that **improved understanding of social and economic interactions between people, animals, trees and crops that can be incorporated into land use strategies and promoted.**

### 2. Outputs:

The overall project objective was **to evaluate the socio-economic role of promising tree fodder species in the East African Highlands and to promote their appropriate management.** The specific objectives were:

- 1)to study the effects of both indigenous and exotic tree fodders on the on-farm productivity of cattle, small ruminants and poultry in both the higher potential and the arid and semi-arid lands (ASAL) of the East African Highlands;
- 2)to estimate the replacement value of selected tree fodders in terms of commercially available concentrates;
- 3)to facilitate the availability of tree seedlings to interested farmers through collaboration with both government and non-government nurseries;
- 4)to disseminate results through the establishment of an efficient demonstration zero-grazing unit at the Kenya Agricultural Research Institute (KARI) station, and through farmer participation in on-farm experiments, field days and meetings.

### 3. Contribution of outputs to project goal:

Overseas, the project was based at the Kenya Agricultural Research Institute (KARI) Regional Research Centre in Embu. It operated as part of the wider National Agroforestry Research Programme (NAFRP), which was a collaborative programme between KARI, KEFRI (Kenya Forestry Research Institute) and ICRAF (International Centre for Research in Agroforestry). Substantial progress was made with achieving the objectives set out in 2 above, thus contributing to the knowledge needed for **the use of trees within farming systems to be optimised.**

Objective 1 investigations found no adverse effects on the health or fertility of breeding heifers after feeding them *C. calothyrsus* for 10 months. Mature dairy cows tolerated calliandra well when it was fed to them either as a replacement, or as an addition to commercial concentrate. There was no interaction between the two feed sources in terms of milk production, and calliandra was more efficient than concentrates at promoting high butterfat milk content. Thus it appeared that calliandra is safe, nutritionally useful and cost-effective in the dairy enterprises of small-scale farmers. Less-advanced research with other species indicated that *Morus alba* and *Manihot glaziovii* are possibly useful alternatives that could be used to expand the diversity of tree fodders. Concerning poultry production, the research completed to date indicated that with conventional commercial feeds, the only potential for calliandra and mulberry are as sources of vitamins and pigmentation for egg yolks. The tree fodders are not suitable as extenders for commercial rations, but this does not preclude the possibility of their inclusion as protein sources in low-cost locally-formulated diets.

Objective 2 research was confined to calliandra, for which 3 kg of fresh foliage were determined to be equivalent to 1 kg of commercial concentrate in terms of replacement value for milk production. The fodder had equal efficiency when fed either as a substitute for dairy meal to reduce the cost of milk production, or as a supplement to increase production. Mature lactating cows readily consumed 6 kg of fresh calliandra daily in addition to the normal diet of Napier grass and crop residues. The threshold calliandra intake for increased butterfat content was 2-3 kg per day. There was no sign of tainting, even at the higher levels. There appeared to be considerable flexibility in the use of calliandra fodder as it was well accepted by livestock and there was not any indication of a need for an adaptation period.

In pursuit of objective 3, farmer knowledge and use of indigenous fodder trees were surveyed across the altitudinal gradient in Maseno (Western Kenya) and Embu. In both areas, a variety of trees was found to be fed to livestock. In Embu seedlings and cuttings of farmers' favourite species were raised in the expectation that they would be offered to farmers as part of future collaborative research. Agronomic research was undertaken on both exotic and indigenous fodder tree species and provenances. The local landrace of *C. calothyrsus* was among the most productive and it had the highest crude protein content.

The dissemination of objective 4 had immediate spontaneous impact on the farmers who collaborated in the research. In addition, about 1,000 visitors were received by the NAFRP, most of who were exposed to project activities during visits to the zero-grazing unit at Embu, which was renovated by the project for this purpose. Project staff participated in 16 major farmer meetings, local seminars, local training attachments and international courses, and workshops and conferences to bring the project's activities to the attention of a wide audience. Project documents were prepared in formats appropriate for different audiences and an interview about fodder trees for World Radio for Environment and Natural Resources (WREN) was broadcast in Kenya. This led to a visit by local journalists and several items in the press and on radio that described aspects of project activities. Thus, information about the project's activities and results were widely disseminated in Kenya and elsewhere.

#### **4. Dissemination products:**

See PROREC output.

#### **5. Follow-up:**

Further research and dissemination that builds on the outputs of this project is expected to continue as part of the NAFRP.