Contribution of Local Tree Fodder Resources in Smallholder Mixed Production Systems of Central Kenya

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1. Introduction

Locally available tree resources are seldom considered in livestock feeding strategies in spite of their nutritional potential to supplement grass forages. Fodder trees can supplement feed gaps during periods of extreme weather conditions. Several are sources of high crude proteins, minerals and energy. Knowledge on fodder trees qualities and availability may be responsible for low utilization. This work sought to avail new knowledge on locally available tree fodder resources for use in alternative feeding strategies by smallholders in mixed dairy production systems in central parts of Kenya.

Objectives of the study:

- Assess fodder tree diversity that can be used to supplement present livestock forages in Githunguri, Lari and Kayata in Kenya
- To characterize common livestock feeds used by dairy farmers in different livestock production systems

2. Materials and Methods

- The survey covered Githunguri and Lari districts in humid livestock production zone and Kayatta division representing arid livestock system (Fig. 1)
- A total of 117 households were randomly selected from the Githunguri dairy cooperative and Kayatta irrigation membership records.
- Household socio-economic characteristics such as: land sizes, number of livestock reared, types of feed resources utilized were recorded using questionnaires during interviews with farmers
- Inventories of fodder tree species on farm was conducted through farm walks and recording of species inventory sheets
- ANOVAs was used to detect differences among and between fodder production areas; General linear regression analysis was used to assess factors influencing tree fodder diversity on farms

3. Results and Discussion

Feed and forage types

- Surveyed farm sizes were about 0.8 ha with 7 Tropical Livestock Units (TLU)
- Common feed and forages used: napier grass (98%); maize-bean stover (86%); banana stems (60%); dairy meal (60%), hay (58%) and fodder trees (58%).
- Feed types used were most diverse in Githunguri (21) followed by Lari (18) & Kayata (11)
- 60 fodder tree species (38 indigenous, 22 exotics) belonging to 27 botanical families were identified.
- 17,546 fodder tree individuals were counted comprised of 2,532 indigenous and 15,014 exotics.
- Exotics such as *Grevillea robusta* (79%), *Persea americana* (78%) were frequent across the surveyed regions
- *Calliandra calothyrsus* and *Grevillea robusta* were most abundant on farms in Lari and Githunguri while *Acacia tortilis* and *Mangifera indica* were abundant in Kayata.

Figure 1: Map showing surveyed farms in Githunguri, Lari and Kayata

Figure 2: Photos of farms with fodder trees on farm boundaries

Figure 3: Common trees on farms: *Grevillea robusta* (a), *Persea americana* (b), *Calliandra calothythus* (c)

3.2 Fodder tree diversity per farm

- Average fodder tree richness on farm was 7 including 3.5 exotics and 3.3 indigenous species.
- Species richness was higher in Kayatta, compared to Lari and Githunguri
- Total trees & indigenous richness and abundance were significantly higher in Kayatta than Githunguri and Lari (Table 1).

3.3 Factors affecting tree diversity

- Age, gender and HH education level had no significant influence on tree diversity
- Farm size had positive influence on total & exotic species richness and indigenous species abundance (Table 2)
- Number of dairy cows had a negative influence on total tree richness, exotic richness and total indigenous individuals.

Table 1: Average number of fodder tree richness and abundance across the three study areas.

Study area	Total species richness	Indigenous species richness	Exotic species richness	Total no. of individuals	Indigenous individuals	Exotic individuals
Lari (40)	5.4b	2.3b	3.1b	78.4a	23.9b	54.5a
Githunguri(40)	5.4b	2.5b	2.9b	165.8a	16.9b	148.9a
Kayata (37)	10a	5.9a	4.1a	210.2a	73.3a	137a
Total	6.8	3.5	3.3	292.4	37.1	112.8

Note: Values in columns followed by different letters are significantly different at p<0.05 according to ANOVA and post-hoc test.
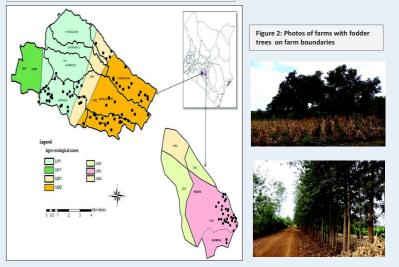
Table 2: General linear regression model to assess effects of socio economic household characteristic and farm size on fodder tree diversity on surveyed farms

	Total tree number	Total tree richness	Exotic tree number	Exotic tree richness	Indigenous tree number	Indigenous tree richness
Adjusted R²	ns	0.218	ns	0.061	0.171	0.25
Independent Variables	ns	ns	ns	ns	ns	ns
Age of HH head	ns	ns	ns	ns	ns	ns
Dependent variable	ns	ns	ns	ns	ns	ns
Education level	ns	ns	ns	ns	ns	ns
Dairy cow TLU	ns	-0.54***	ns	-0.21*	-4.67**	-0.33**
Total TLU	ns	0.59**	ns	0.25*	5.01**	0.34**
Farm size (ha)	ns	1.69***	ns	ns	13.87***	1.29***

4. Conclusions and Recommendations

There was high presence of exotic species and fewer indigenous fodder species available to support dairy production in systems in central parts of Kenya.

Interventions that will increase planting and utilization of fodder tree which are more nutritious can help stabilize smallholder milk production.

New strategies are required to help promote uses and conservation of indigenous fodder tree species, found to be few in the studied areas