

Identification of niches for integration of *Brachiaria* grasses in smallholder mixed crop-livestock farming systems in Kenya

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Introduction

Inadequate quantity and quality of feed is the major constraint to livestock productivity in Kenya. Low rainfall, lack of adapted forages and poor management of sown forages are major factors that affect feed resources production. In most of the farming systems, forages are relegated to the less fertile and degraded soils resulting into poor growth. As a result the growth is poor resulting in deficient in minerals content, low crude protein (CP) and energy. The situation is exacerbated by climate variability and frequent drought. On the other hand, feed resources derived from crop residues, particularly cereals are of poor quality and not sufficient to meet animal production (Njarui and Mureithi, 2006).

A research programme was initiated in 2012 to explore superior feed resources and increase availability of high quality forages to increase livestock productivity in East Africa. The program focuses on evaluation of drought and marginal soil adapted improved *Brachiaria* cultivars from South America. The genus *Brachiaria* is predominantly an African grass with about 100 species. The *Brachiaria* grasses are the most widely grown forages in South America (Miles *et al.*, 2004). These grasses produce high biomass, enhance soil fertility and reduce greenhouse gas emission (Peters *et al.*, 2012), are highly nutritious and are known to increase milk (Njarui, *pers. comm.*) thus suitable for different farming systems of Kenya. However, before integration of these grasses into farming systems, it was imperative to identify suitable niches suitable for growing these grasses. The knowledge gained from the study will facilitate development of suitable approaches for promoting these grasses across diverse production systems of Kenya.

Materials and Methods

The study was carried out in coastal lowlands, mid-altitude eastern region, central highlands and north western highlands regions of Kenya. These regions were purposively selected to reflect different farming systems. In the coastal lowlands the study covered from 03°22'S to 03°40'S and from 39°48'E and 39°12'E. In the mid-altitude eastern region it covered from 0°45'S to 1°35'S and 36°45'E and 38°30'E while in central highlands, from 0°8'S and 0°50'S and between 35° 13'E and 36° 42' E. In north western highlands the study concentrated between 0° 7'N to 0° 20'N and 34° 05'E and 35°59'E.

Sampling procedure: A multistage stratified sampling technique was used for selection of the sample respondents. In the first stage of sampling, 12 agro-ecological zones were identified; 3 in coastal lowlands, 2 in mid-eastern eastern region, 4 in central highlands and 3 in north western highlands. In the second stage a systematic random sampling was carried out to select farmers from list compiled

by the agricultural extension officers from each agro-ecological zone. This resulted in sample sizes of 268 for coastal lowlands, 171 for mid-altitude eastern region, 132 for central highlands and 215 households for north western highlands.

Information was collected from farmers using structured questionnaires. The household head or the most senior member of the household was interviewed. Information collected included types of forages grown, production niches and willingness to grow *Brachiaria* grasses. Data were collected through face-to-face single visit interview, discussion and observation between March and September 2013. Data analysis was carried out using descriptive statistics.

Results and Discussion

Cultivation of forages: The highest proportion of farmers who have ever planted forages was in mid-altitude eastern region (97.8%) followed by central highlands (76.5%) and north western highlands (69.2%). In coastal lowlands only 13.8% of farmers sampled had ever planted forages. Among farmers who cultivated forages, Rhodes grass was the most commonly cultivated (Table 1). On the other hand, Napier grass was the main fodder grown with over 95% having planted this fodder (Table 2). The niches for growing the forages were terrace banks, farm land, farm boundary and over-sowing in bush land. The most widely preferred niche for sowing pasture grasses was farmland, with 54 to 86% of farmers preferring this niche (Figure 1). The preferred niches for growing fodders were along terrace banks and farmland.

Table 1: Proportions of farmers who had cultivated pasture grasses

Pasture grasses	% of farmers				
	Coastal lowlands (n=0)	Mid-altitude eastern region (n=48)	Central highlands (n=26)	North western highlands (n=45)	Mean (n=119)
Rhodes grass	-	77.1	69.2	88.9	79.8
Buffel grass	-	2.1	0	8.9	4.2
Brachiaria	-	8.3	0	0.0	3.4
Other	-†	12.5	30.8	2.2	12.6

†No farmers reported to grow pastures

Table 2: Proportion of farmers who had cultivated fodder grasses

Fodder grasses	% of farmers				
	Coastal lowlands (n=23)	Mid-altitude eastern region (n=157)	Central highlands (n=93)	North western highlands (n=144)	Mean (n=417)
Napier grass	14	98.7	100	95.8	98.1
Setaria grass	0	0.0	0	2.1	0.7
Panicum	0	0.6	0	0.0	0.2
Other	0	0.6	0	2.1	1.0

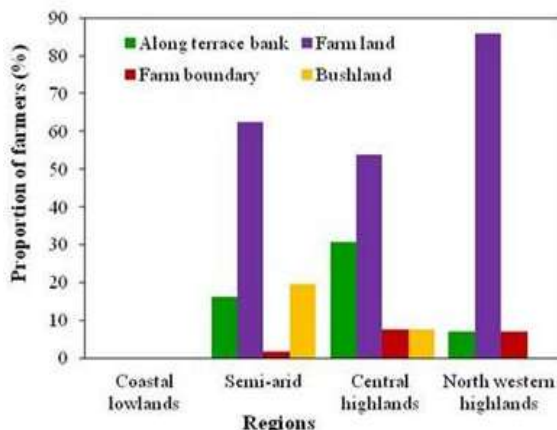


Figure 1. Niches for growing pasture grasses in the regions

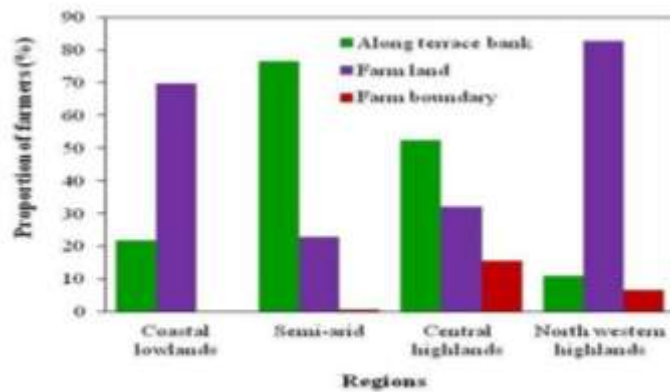


Figure 2: Reasons for growing fodder grasses in four regions of Kenya

Constraints to forage cultivation

Lack of seeds, small land sizes, inadequate labour and limited knowledge were the key factors that limited farmers from growing forages. In the coastal lowlands and mid-altitude eastern region, majority of farmers who did not grow forages reported lack of knowledge on the management of forages as main constraint (Table 3). In the central highlands the major limitation was lack of seeds (39.3%) while in the north western highlands, it was inadequate land (31.3%).

Table 3: Reasons for not planting forages in four regions of Kenya

Reasons	Coastal lowlands (n=219)	Mid-altitude eastern region (n=5)	Central highlands (n=28)	North western highlands (n=48)	Mean (n=300)
	% of farmers				
Lack of seeds	22.5	0.0	39.3	8.3	19.0
Land is small	17.3	0.0	21.4	31.3	26.6
Lack of labour	2.7	33.4	7.1	8.3	8.9
No idea on fodder types to plant	20.3	0.0	14.3	10.4	11.4
Inadequate knowledge	35.8	33.3	14.3	16.7	16.5
Cheap to buy feeds	1.4	0.0	3.6	0	1.3
Other	0	33.3	0.0	25.0	16.5

Farmer's knowledge of Brachiaria grasses: A relatively high proportion of farmers in north western highlands (61.2%) were aware about Brachiaria grasses compared with those in the other regions (17-37%) (Table 4). This was mainly attributed to past research activities that promoted cultivation of Brachiaria species in the region. In coastal lowlands, mid-altitude eastern region and central highlands farmers were aware of the indigenous Brachiaria species but were not widely distributed in the region. When asked whether they would be willing to plant Brachiaria grass, virtually all farmers (93-100%) would like to plant but the area they would commit was relatively small (<0.4 ha). Most farmers preferred to grow it in farmland. This shows willingness of farmers to integrate Brachiaria grasses into their farming system.

Table 4: Proportion of farmers aware of Brachiaria grasses, willingness to grow and niches for planting Brachiaria in four region of Kenya

Region	Farmers aware of Brachiaria grass (%)	Proportion willing to grow Brachiaria grass (%)	Area willing to plant (ha)	Preferred niches for planting (% of farmer)				
				Terrace banks	Farm land	Farm boundary	Bushland	Terrace bank and farmland
Coastal lowlands	27.4	97.0	0.38±0.52	4.3	91.0	4.7	0	0
Mid-altitude eastern region	37.4	100	0.29±0.34	22.9	69.0	0.0	2.3	5.8
Central highlands	17.4	100	0.26±0.35	6.8	87.3	5.9	0.0	0.0
North western highlands	61.2	93.4	0.17±0.34	6.1	83.7	9.2	1.0	0.0

Conclusion

Generally, a good proportion of farmers cultivate forages in mid-altitude eastern region, central highlands and north western highland except at the coastal lowlands. The most preferred niche for growing Brachiaria was in farmland. The study revealed that farmers were willing to integrate Brachiaria grasses in their farming system to alleviate feed shortage.

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