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## From grazing to stall-feeding: Livestock feeds assessment in Nyandarua highlands in Central Kenya

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### Introduction

Most rural households in Kenya rely on both agriculture and livestock for their nutrition and incomes. With increasing population growth, there is increased demand for food from the same area of land, eventually leading to intensification. Most of these farms practice mixed farming, with both crops and livestock supplying the agricultural produce for domestic consumption and sale. One of the benefits arising from the system at farm level is complementarity. Crops and crop residues supply feed to the animals, while livestock in return supply manure that improves crop performance. These systems are, therefore, dynamic especially with the increasing human population.

Milk productivity has been relatively low in Kenya compared to other areas in the world. Improved cattle and crosses produce about 8 kg/cow/day (Miua *et al.* 2011), while in developed countries like the USA milk yield goes up to about 23 kg/cow/day, which is about three times higher (IFNC 2014). Improving productivity is, therefore, necessary for efficiency in addition to reducing greenhouse gas (methane) production per unit of livestock output. Consequently, the work reported here was to capture the current status in Nyandarua in central Kenya, especially on livestock contribution and management in the area targeted by the 2SCALE project led by IFDC, the International Fertilizer Development Center (<http://ifdc.org/2scale/>) that aims at improving dairy productivity and marketing access for dairy farmers.

### Methodology

The study sites were in Oljoro Orok in Nyandarua county of central Kenya located at about 0° (latitude) and 036° E (longitude). The area is on the lee ward side of the Aberdare ranges with occasional low temperatures and frost bites (Miua *et al.* 2011).

FEAST (Feed Assessment Tool) developed by Duncan *et al.* (2012) was applied to capture information from three farmers groups that deliver their milk produce collectively to Edoville, a private milk processor, in the area (<http://www.eldoville.co.ke/>). The groups were Nyamarura, Hillten and Kanguu. The tool was further applied to a control farmers group (Kagera) not involved in selling their milk to any processor. Farmer selection was assisted by county agricultural extension staff. The tool was applied separately to women and men in each of the

farmer groups. The tool entails two sections, each with structured questions. The first section is through focus group discussions that link to the second session of detailed interviews with selected farmers. The first session categorized farmers in attendance based on their land size, i.e. small, medium, large and telephone farmers. Two farmers from each category were then randomly selected and underwent individual detailed interviews. Data were entered into FEAST software that subsequently helped summarize the various responses from detailed interviews.

## Results

The perception of land sizes among landless, small, medium and large differed amongst the groups, and for both women and men (Table 1). Landless and telephone farmers were considered negligible across all groups. Except in the control group, women reported >50% contribution from livestock to the household incomes, especially from dairy. Men estimated <50% contribution from dairy, except for the Kanguu group. Dairy contribution was estimated least in the control group compared to the rest, but had significant support from agriculture and business (Table 2).

**Table 1.** Land size categories as estimated in Focus Group Discussions by women and men from Nyamarura, Hillten, Kanguu and Kagera (control) farmer groups of Central Kenya (N=110); numbers in brackets denote % of households in the corresponding land size category.

Land category	Gender	Farmer group			
		Nyamarura	Hillten	Kanguu	Kagera (C)
Small	Women	0.25-2.0 (30)	0.125-0.25 (20)	0.5-2.0 (60)	0.125-1.0 (30)
	Men	0.25-5.0 (30)	0.25-1.0 (40)	0.25-2.0 (70)	0.25-2.0 (70)
Medium	Women	3-20 (60)	>0.25-2.0 (60)	3-4 (30)	2-4 (50)
	Men	6-14 (68)	2-4 (40)	3-7 (20)	3-6 (25)
Large	Women	21-100 (5)	3-20 (19)	5-10 (10)	5-20 (15)
	Men	>15 (1)	5-10 (20)	8-15 (5)	7-15 (5)

**Table 2.** Mean contribution (%) of livestock and other sources to household incomes as reported by women and men from Nyamarura, Hillten, Kanguu and Kagera (control) farmer groups (N=64).

Income source	Farmer group and gender							
	Nyamarura		Hillten		Kanguu		Kagera (C)	
	Women	Men	Women	Men	Women	Men	Women	Men
Livestock (dairy)	69	45	50	39	49	67	35	39
Livestock (other)	6	–	7	5	15	11	4	11
Agriculture (crops)	24	41	31	54	27	20	53	27
Business	–	10	10	–	4	–	–	22
Remittance	1	1	1	2	5	2	8	1
Other	–	3	–	–	–	–	–	–

– implies, no contribution

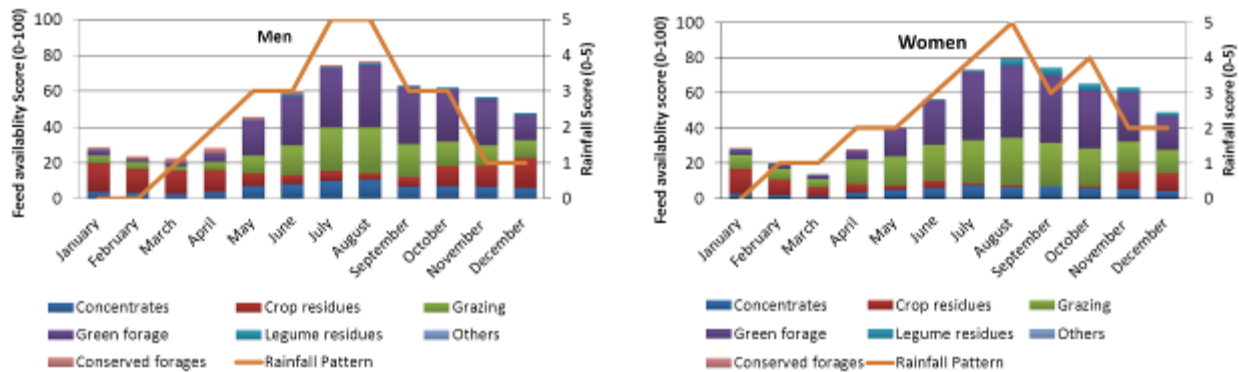
A variety of fodder crops were reported across the groups that are usually utilized in the area. These included Napier grass (*Pennisetum purpureum*), and stovers and thinnings of sorghum (*Sorghum bicolor*) and maize (*Zea mays*). Other fodders included oats (*Avena sativa*), Lucerne (*Medicago sativa*), Columbus grass (*Sorghum x almum*), lupins, desmodiums, vetch (*Vicia sativa*) and Rhodes grass (*Chloris gayana*) not used for grazing directly, unlike Kikuyu grass (*Pennisetum clandestinum*), but harvested and availed to the animals. The use of maize for fodder featured strongly except in Kagera, the control group, where oats played an even stronger role (Table 3). Gender differences in estimating areas planted with fodder were very conspicuous with women giving much smaller areas.

**Table 3.** Mean coverage (ha) of forage types utilized in Nyandarua as reported by women and men from Nyamarura, Hillten, Kanguu and Kagera (control) farmer groups (N=64).

Fodder type	Nyamarura		Hillten		Kanguu		Kagera (C)		Average	
	Women	Men	Women	Men	Women	Men	Women	Men	Women	Men
Maize	0.16	1.08	0.20	0.11	0.01	2.00	–	–	0.09	0.79
Oat	0.08	0.68	0.07	0.08	0.03	0.76	–	0.09	0.04	0.40
Napier grass	0.08	0.11	0.08	0.11	0.17	0.16	0.03	0.16	0.09	0.14
Rhodes grass	–	0.04	–	–	–	0.50	0.03	0.05	<0.01	0.15
Sorghum	–	–	0.006	–	–	0.50	0.01	0.05	<0.01	0.14
Vetch	–	0.28	–	–	–	–	–	–	–	0.07
Lupin	0.08	0.15	–	0.03	–	–	–	–	0.02	0.04
Kikuyu grass	–	–	–	–	–	0.05	–	–	–	0.01
Lucerne	–	–	0.02	–	0.01	0.03	–	–	<0.01	<0.01
Desmodium	–	0.03	–	–	–	0.01	–	0.01	–	0.01
Columbus grass	–	–	–	–	0.01	–	–	–	<0.01	–

– means, not mentioned

Animal feed availability throughout the year was appraised similar amongst the four groups and both by women and men groups. Although availability was closely related to rainfall, it was noticeable even after the rainy season that fodder was not adequate with about 75% availability, at best. Fodder deficit was felt most during the first five months of the calendar year (Figure 1). Overall, the use of green forage was higher than grazing followed by crop residues.



**Figure 1.** Mean fodder availability estimated across women and men from Nyamarura, Hillten, Kanguu and Kagera (control) farmer groups, Central Kenya (N=64).

## Discussion

The main objective of this study was to assess the status of livestock, especially dairy cattle regarding feeds and feeding management and contribution to household incomes. Substantial use of collected green forage and crop residues indicates a departure from predominant grazing to more intensified systems as farm sizes decrease due to subdivision mainly caused by generational inheritance. Indeed, most of the land sizes were categorized as small by either gender (Table 1) and with largely less than two acres of land, while <15% farms were perceived as large size, and negligible for telephone farmers, across the groups. This may partly explain the increased use of maize as a fodder, which is rather new for Kenyan households, where maize is the staple in most diets (Kang'ethe 2011), but typical for trends in the region (De Groot *et al.* 2013). Intensification is, therefore, likely to continue as population increases (ASDSP 2011) in Nyandarua, an area that had been known for livestock grazing. Forage demand will most likely increase as livestock and especially dairy continue to be important in household incomes (Table 3). Market pull from the

processor will almost certainly trigger further impetus for increased milk productivity and subsequent forage cultivation to support the production.

Involvement of both women and men in agricultural activities in the area is concomitant with the importance of agriculture in household nutrition and incomes. However, differences in levels of involvement may explain the wider range of forages and substantially larger areas perceived by men. Usually, women may be more involved in the actual implementation of livestock activities like milking and feeding, while men may have more opportunities of access to information, but probably not shared in equal measure with the real implementers. Nevertheless, fodder availability and rainfall pattern were estimated alike between women and men. Although fodder availability increased during rains, at no time did it become abundantly available, suggesting the animals never expressed their full potential. There is need, therefore, to increase fodder production in the area to support livestock performance and increase milk production and especially productivity per area.

## Conclusion

Livestock, especially dairy, is key in the area for household incomes but, there is need to improve productivity as more intensified systems emerge. Improving milk marketing by the 2SCALE project is most likely to enhance and improve the contribution of dairy to household incomes. This is evident from the lower contribution of livestock to household incomes by the control group, compared to the groups organized in their milk marketing.

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