

The role of fodder markets in meeting the year-round forage requirements of smallholder dairy farmers in Tanzania

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Efficient milk production requires a regular supply of fodder of adequate quantity and quality. This is a challenge for smallholder dairy farmers for a number of reasons, including due to: poor forage yields associated with seasonality of rainfall, poor fodder production practices, and overstocking, and the limited supply of land for forage. In response to forage shortages, farmers purchase of forages off-farm, provide their animals less forages, and feed them uneconomic levels of feed concentrates. Effective fodder markets would offer a number of benefits to dairy value chain actors, including:

- Opportunities to engage in dairying for landless, urban and peri-urban farmers with very limited ability to produce their own fodder.
- Access for smallholder dairy farmers to quality fodder at reasonable prices, enabling the milk production at competitive prices.
- Business opportunities for the unemployed and poor to engage in fodder trading without having to invest large sums of capital.

Fodder markets are complex. Fodder marketing takes place at different levels (e.g. village and district), and involves a variety of actors (wholesalers, rural retailers, input sellers, producers) and fodder types (Rhodes grass, maize stovers, oat straws and Lucerne hay) (Nangole et al. 2011). Most fodder trading in Tanzania takes place in towns and peri-urban areas. There is a need for fodder markets to increase the supply of feed to the country's dairy sector.

Provision of market information to producers and buyers is important, if feed marketing systems are to improve. There is also a need to promote feed marketing, conservation and processing, as well as creating platforms to link value chain actors (Nangole et al. 2013). That alone will not solve the problems, however. There is paucity of information on: market arrangements, practices associated with fodder consumption by dairy producers; as well as factors affecting availability of good quality fodder types, challenges facing fodder value chain actors and the overall economic viability of the business.

Most available information is about manufactured feed rather than roughages (Jabbar 2008). This has created an information gap in a very important segment of the market, particularly for smallholder dairy production. Limited work has been undertaken on production and marketing of *Leucaena leucocephala* leaf meal in Tanga (Franzel et al. 2007) and other forages (Massawe 2008), though these forms a small part of the forage market. Gender issues have also been largely unexplored in relation to fodder production and market access.

In short, little effort has been made to improve fodder markets. As a crucial first step in improving this situation, this study assessed fodder markets and fodder trading patterns in Tanzania in order to develop a systematic understanding of these markets and the interactions among various players along the fodder value chain.

Study sites

The study was undertaken at MoreMilkiT sites and other selected regions in the sub-humid and highland areas of Tanzania, (Figure 1)



Figure 1. Map of Tanzania showing sites of the study

Data sources

Focus group discussions (FGDs) were held with producers, traders and consumers. Information was collected on producer forage options, fodder exchange mechanisms, suppliers and buyers, value addition and costs, quality/price relationships, gender issues in fodder marketing, annual fodder availability, and the criteria used by farmers in deciding when and what type of feed to be purchased and the constraints and opportunities at each market node.

FGD participants were also interviewed separately to collect information on their individual attributes. A total number of 251 participants were interviewed, comprising 18 fodder producers, 90 traders and 143 consumers. Informal discussions were held with representatives of feed market actors to obtain an overall picture of fodder

marketing, policy, economic and socio-cultural challenges and opportunities facing stakeholders. Samples of the common fodder types in the market were also collected and analysed for nutritional quality using near infrared reflectance spectroscopy (NIRS) (FOSS NIRS system, model 5000).

Fodder market actors

The fodder market value chain involves three actor types. The largest proportion, 57% of participants, were consumers, followed by traders—most of whom were middle-aged male gatherers. Producers, mostly small-scale farmers, formed the smallest proportion of actors (Figure 1). This high proportion of consumers and very low proportion of producers may partly explain the mismatch between supply and demand.

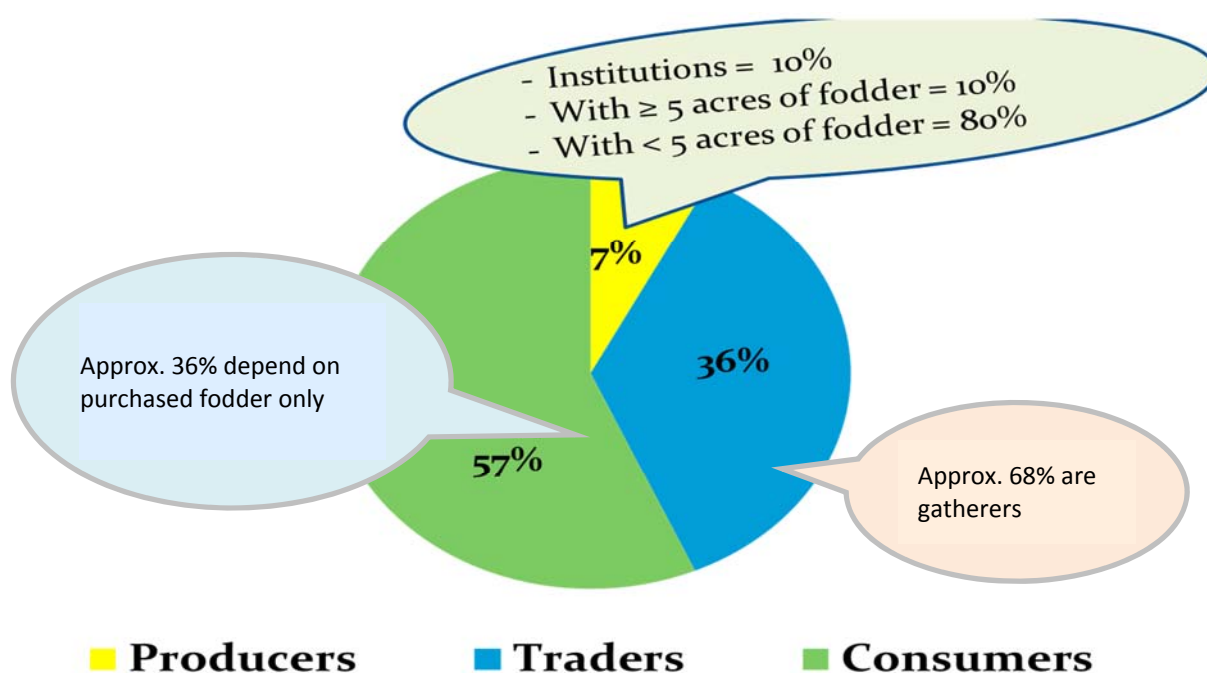


Figure 2: Proportions of different fodder market actors across all study sites

Most fodder consumers were female, probably because most dairy activities were carried out by women. Producers were predominantly male, probably related to their ownership of land. Gender disparities among traders were determined by the type and source of fodder traded.

For instance, women dominated leucaena leaf meal market in Tanga because men viewed the process of drying and threshing as a women's job. Men dominated the natural grass market in Dar es Salaam because the gathering and transporting was considered too difficult for women.

The fodder value chain

The fodder market is informal and complex with all the actors somehow interrelated (Figure 3). Fodder move from source to the consumer through a number of available channels, which may be through intermediaries or directly. This has implications for efficiency, cost and benefits. To add an additional layer of complexity, the nature of the value chain varies between the rainy and dry seasons.

During the rainy season, fodder supply is plentiful. Gatherers harvest freely from open areas and sell to retail traders or directly to consumers, while wholesale traders purchase grass hay from large-scale farms and institutions, and store or sell to retail traders. Retail traders purchase fodder from gatherers, small- and large-scale farms and even from wholesale traders. Some consumers do not purchase fodder at this time as it is available on farm and

¹ Tanga has been cited as the only area in sub-Saharan Africa where leucaena leaf meal is widely marketed (Franzel et al. 2007; Nangole et al. 2013).

in nearby open areas. In fact, farmers who have excess fodder give it out for free. The market at this time is dominated by small-scale traders (gatherers) who sell fodder cheaply, otherwise the surplus will go to waste. During the dry season, there is a scarcity of fodder and consumers purchase it from any of the traders and even directly from producers. Gatherers obtain most of their

fodder through: purchases from small-scale farms, and/or harvesting on faraway open or uncultivated public land or private land at a fee. The distance to fodder sources impacts heavily on transportation costs and, eventually, the cost per bundle to consumers. Availability and quality were reported as the main determinants of fodder price.

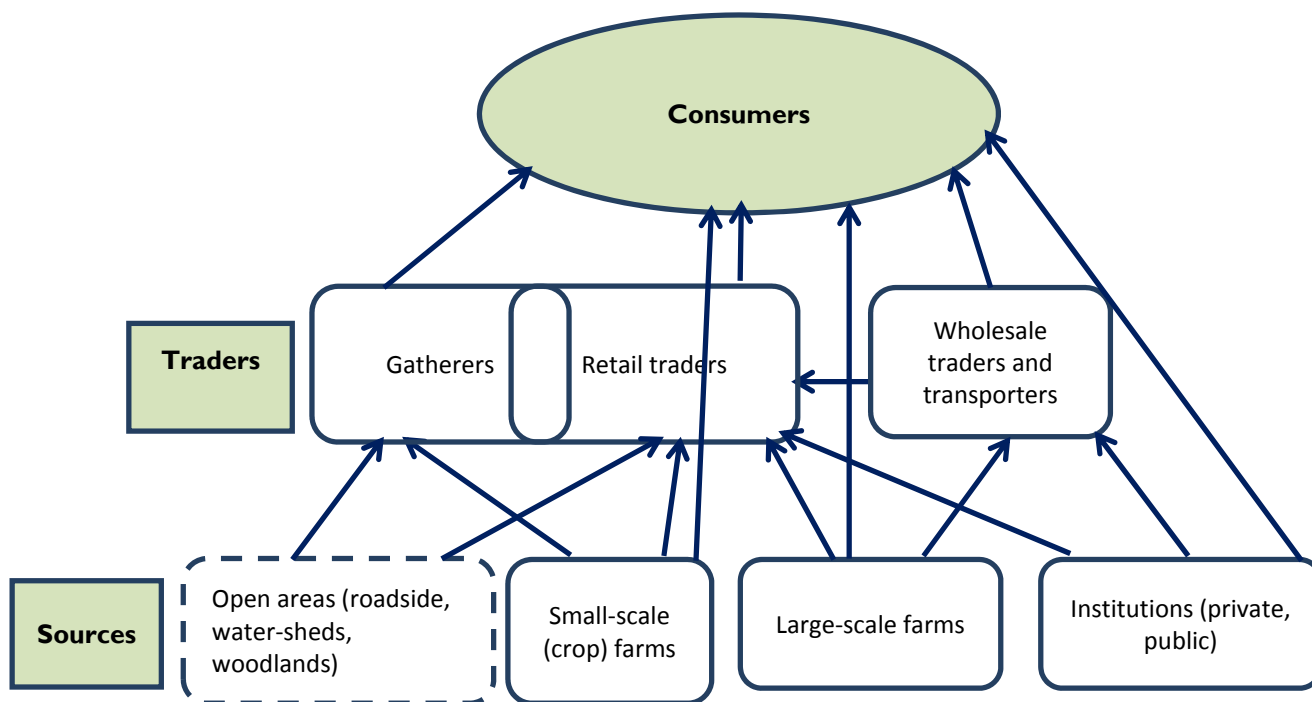


Figure 3. The fodder value chain actors and their linkages

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Fodder types

The most common fodder in the market was naturally grown grass. It was traded throughout the year in its fresh or dry form or as a mixture with wild legumes or weeds—which has implications on quality. Rhodes grass hay, Napier grass and leucaena leaf meal were traded throughout the year, but in low quantities. Other important but seasonal feeds included dry maize stover, rice straw and bean haulms. Fodder conservation by the various actors, except in form of hay, was low—mainly due to a lack of technical knowledge. Napier grass fodder trading was mentioned by consumers and producers only, which may indicate that consumers purchase it directly from the farm. This may also suggest that the quantities available are not enough to attract traders. Napier grass may also be difficult to trade due to its bulky nature and short shelf life.

Fodder quality: perceptions and reality

In current markets, fodder quality is typically determined from its physical appearance and smell. Its important attributes are: i) colour; ii) stage of maturity; iii) leaf-to-stem ratio; tenderness of the leaves; and iv) absence of undesirable plants (e.g. poisonous, unappealing or unpalatable to animals). Some fodder types—e.g. bean leaves—were also considered to be more nutritious and hence better quality. In some cases, forage quality was assessed from consumer feedback as a results of increased milk yield. In most cases, buyers selected fodder based on its green colour and presence of leguminous forage species.

The real quality of a feed is determined by its nutritional content, particularly energy and protein, and this necessitates analysis of the feed in question. These findings can be used to cost the feed in terms of individual nutrients. The nutritive value of marketed fodder was similar across the sites, but generally of low to medium quality (Table 1). Although the natural grass in Mwanza and Morogoro appeared to have higher protein content.

Generally, grasses are considered to be of good quality when they contain less than 55% neutral detergent fibre (NDF), less than 35% Acid detergent fibre (ADF) and more than 9% crude protein (CP), while good quality legumes contain less than 40% NDF, less than 35% ADF and more than 15% CP (Hancock et al. 2014).

Table 1. Average nutrient content and cost of commonly marketed feed types in MoreMilkiT sites and other selected regions of Tanzania

Feed types	CP (%)	NDF (%)	ADF (%)	ME (MJ/Kg)	IVOMD (%)	Cost/Kg DM ² (USD ³)
Leucaena leaf meal	28.0	49.2	29.2	8.3	63.1	0.18
Napier grass	12.6	68.1	42.4	7.3	55.2	0.14
Natural grass	9.1	73.1	46.9	7.3	52.6	0.13
Bean haulms	6.4	62.6	53.9	7.9	54.3	0.09
Dry maize stover	6.0	75.5	51.0	7.5	52.7	0.03
Rice straw*	9.4	66.5	49.2	6.3	48.6	0.06
Hay (Rhodes)	4.2	77.8	53.9	7.2	49.4	0.08
Grass/legumes mixture	7.0	76.2	52.3	7.2	50.1	n.a
Banana stems*	10.9	63.0	45.0	6.7	51.9	n.a.
Hay (Cenchrus)	3.5	83.3	58.7	7.3	48.0	n.a.
Natural grass only (per site)						
Arusha	8.4	75.9	50.0	7.1	50.9	
Dar es Salaam	7.7	73.8	47.0	7.3	52.1	
Morogoro	13.0	73.1	44.0	7.2	54.2	
Moshi	7.7	69.1	46.1	7.6	53.8	
Mwanza	10.5	71.2	46.5	7.4	54.0	
Tanga	6.7	75.7	50.7	7.0	49.2	

CP = Crude protein; NDF = Neutral detergent fibre; ADF = Acid detergent fibre; ME MJ/kg = Metabolizable energy (MJ/kg DM), IVOMD = *In vitro* organic matter digestibility;

Note: ¹Cost of feed as at the sampling period; ²Dry matter values were obtained from samples collected during the study; ³TSZ 1 = USD 0.00044; n.a. = Not available

*CP values unusually high: rice straw samples may have contained other materials; banana samples may have comprised banana stems and leaves.

Most of the natural grass marketed was collected from open areas. Hence, there was wide variation in species but on average, it was of medium quality. Quality may be influenced by the species, stage at harvest and storage. Since natural grass is the fodder available on the market all year round, interventions designed to improve its quality and availability to the consumer would increase overall availability to smallholder dairy farms. Simple technologies that enhance preservation and processing of crop residues and/or reduce the labour required for forage harvesting are needed to increase the quantity and quality of fodder available in the market, as well as reduce the burden on women involved in fodder trading.

sites and fodder market actors. Producers faced additional challenges related to shortages of farm machinery and pests and the effects of disease, while traders faced difficulties gaining access to fodder in sufficient quantities and of satisfactory quality, as well as constraints due to the informal nature of the fodder business. The lack of local-government designated markets was of particular importance as it forced traders to sell fodder on the roadside without any structures for shelter or storage. The designation of fodder market sites/centres would facilitate investment by traders in storage structures, enhancing quality and preservation, while offering local authorities opportunities for service provision and enforcement of regulations.

Challenges and opportunities

Although each actor faced specific challenges, fodder quality, supply shortages due to a scarcity of land for production and the effect of seasonality, and a lack of technical knowledge and capital negatively affected all

Fodder consumers—i.e. dairy farmers—faced the additional challenges related to low milk prices and high farm labour costs, which ultimately affecting profit margins and, thereby, reducing their capacity to purchase fodder. This further aggravated fodder scarcity on

smallholder dairy farms. Nevertheless, rising demand for fodder, especially in urban areas, the presence of actors along the value chain, and huge potential for value addition in the sub-sector, offer real livelihood improvement opportunities for rural and urban poor. However, targeted actions are needed to realize the potential of the value chain, including the:

- Recognition of the fodder value chain as a business system worthy of attention and critical to increased productivity of many livestock sub-sectors, not only milk. There is huge opportunity to establish policy and institutional support structures and services for fodder businesses in Tanzania.
- Development of a practical feed quality assessment system. This is necessary if fodder quality is to increase, but would need to be coupled with a quality-price signal.
- Development of the capacity of market actors to conserve fodder as a way of reducing waste during the rainy season.
- Establishment of appropriate structures for organizing and building the capacity of all fodder value chain actors to strengthen fodder businesses in rural and urban areas.
- Provision of relevant market and technical information to the whole fodder value chain to enhance the growth of fodder marketing.
- Implementation of interventions that lead to increased production of and access to quality fodder—options for improving fodder quality such as integration of grass-legumes mixtures—in order to stabilize supply of fodder to the market.

Conclusion

The rising demand for fodder is being driven by increasing demand for milk, the expansion of dairy farming in urban areas and decreasing peri-urban grazing. Improving fodder market efficiency would enhance dairy farming profitability and income-generation opportunities, particularly for women and young people.

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