



Enhancing dairy-based livelihoods in India and Tanzania through feed innovation and value chain development approaches

## Report of a livestock feed assessment in Kilosa District, Morogoro Region, the United Republic of Tanzania

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## Summary

Kilosa district is mainly characterized by pastoral production system. The Feed assessment tool was applied to characterize feed related innovation prominent in the pastoral systems. The villages involved were Twatwatwa and Mbwade. The exercise was categorized into two sessions, namely, focused group discussions and individual interviews. A number of 68 and 27 participants (farmers) were involved in the focus group discussion and individual interviews respectively. The two villages have similar agro-ecological zones, production system and similar types of livestock but slightly varying in the agricultural practices. Grazing is the major source of feed and highly contributes to the dietary content of the animals. This is in terms of Metabolizable energy (ME) and crude protein (CP). The key constraints were land, water and markets for livestock and milk in both villages. Designing interventions in these areas could highly be boosted through collective action as the pastoralists are largely communalists.

## Acknowledgements

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### Photos:

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## Characterisation of the Livestock Production Systems and Potential for Enhancing Productivity through Improved Feeding in Twatwatwa and Mbwade Villages, Kilosa District, Morogoro Region, Tanzania

### 1.0 Introduction

Kilosa District Council is one of six local government authorities that comprise Morogoro Region. It is located in East Central Tanzania, 300 km West of Dar es Salaam and is bounded by latitudes 5°55' and 7°53' South and longitudes 36°30' and 37°30' East. Kilosa borders Mvomero District to the East, Kilombero and Kilolo Districts to the South, Kiteto (Manyara Region) and Kilindi (Tanga Region) to the North; and Mpwapa District (Dodoma Region) to the West. The market for Kilosa agriculture produce is in the regions of Dar es Salaam, Iringa, Dodoma and Morogoro Municipality.

As per 2002 Population and Housing Census, the District recorded 488,191 people, 243,329 of which were males and 244,862 were females, with an average of 4.6 persons per household (Kilosa district profile, 2012 and NBS, 2012). The climate is influenced by agro-ecological zones present in the district. The highest parts of the district are found in the Ukaguru, Rubeho, and Vidunda Mountains, which are up to 2200 m above sea level (asl.), get annual rainfall between 1000 mm and 1600 mm, while the central and southern parts experience an average rainfall of 800–1400 mm. The major farming systems include maize-rice, agro-pastoralism and pastoralism. The total area for livestock keeping is 483,390 hectares where major types of livestock keeping are mentioned to be nomadic grazing, zero grazing, ranching and large scale farming namely; NAM – Mkata; A. S. Bakhamis – Chanzuru; SAS – Kisanga; Mkata Ranch; Magairo – Manderu; MATI – Ilonga and Madoto farm.



**Figure 1:** Focus group sessions for feed assessment in Twatwatwa (left) and Mbwade (right), Kilosa District, Morogoro Region.

## 2.0 Methodology

### 1.2 Location of the villages

Twatwatwa is a village located about 60 km and Mbwade is at 72 km West of Morogoro.

### 2.1 Location and method applied

The Feed Assessment Tool (FEAST by Duncan et al., 2012) was used to characterize livestock production systems and, in particular, feed-related aspects in Kilosa District, Morogoro Region in Tanzania. The villages involved were Twatwatwa and Mbwade; and the feed assessment took place in February 2013. The assessment was carried out through focus group discussions (FGD) in the Church hall of Twatwatwa and Village hall of Mbwade. The FGD was followed by completion of short structured questionnaires by key farmers' representatives selected according to wealth groups during the FGD. During the exercise, the team was comprised of 4 researchers (3 male and 1 female) and two extension officers (all male from the district office and 1 male and a female village extension officer the village. Table 1 shows a summary description based on the site where the FEAST exercise was conducted.

**Table 1:** Summary description of participants from Mbwade and Twatwatwa villages

Site name	Production System	Venue for PRA	Adult		Youth		Total
			Male	Female	Male	Female	
Twatwatwa 1	Pastoral	Church hall-Parakuyo Day 1	5 (3)	7 (3)	5 (1)	4	18 (7)
Twatwatwa 2	Pastoral	Church hall-Twatwatwa Day 2	7 (2)	4 (3)	3 (1)	2 (1)	16 (7)
Mbwade 1	Agro-pastoral	Village hall Day 1	7 (3)	5 (1)	4 (2)	2 (1)	18 (7)
Mbwade 2	Agro-pastoral	Village hall Day 2	8 (1)	3 (2)	2 (2)	3 (1)	16 (6)

\* In brackets the number of participants in individual interviews

### 2.2 Selection of participants

The selection of farmers was done purposively by the district extension officers through their village extension and village executive officers. The following were the selection criteria:

- Equal/reasonable representation of male, female and youths.
- Selection based on the livestock production systems practiced in the area.
- The number of participants for PRA being 15-20 and 6-9 for the individual interviews.
- Selection of farmers based on distribution of the hamlets within the particular village.

There were a total of 71 participants. Based on the criteria of selection, there was an equal representation of the groups in almost all the PRAs. Except for Twatwatwa 1 with half of the participants being women, men were represented by about 60%. Overall; there were two thirds adult participants and one third youth. Also number of the attending participants was mostly within the range, but ranged from 13 exceeded to 21 farmers in some of the meetings. The number of individual farmers selected for the interviews was 7 in every meeting.

### 2.3 Data Analysis

The analysis was carried out by using the FEAST template, which has been designated to deliver outputs upon data entry.

### 2.4 Experiences and observations on FEAST village survey

The following are the issues experienced and observed during the FEAST village surveys in Twatwatwa and Mbwade villages.

**Table 2:** Observations and experiences during FEAST exercise in Twatwatwa and Mbwade villages.

Issues experienced	Twatwatwa 1	Twatwatwa 2	Mbwade 1	Mbwade 2
• Dominance of men to women (women were not free to express their views).	X	X	X	X
• Farmers were not willing to mention the exact number of livestock owned.	X	X	X	X
• Participants were not punctual.	X	X		
• Farmers were expecting much in terms of payment and immediate outputs; different from the researchers' objectives for the session.	X	X	X	X
• Language barrier as some participants did not understand well Swahili.	X	X		
• Farmers demanded the report/ a feedback from previous interventions done by other livestock stakeholders.				X

### 3.0 Results

The following sections describe the results obtained during the FEAST exercise in the two villages of Kilosa district, combining results obtained through both PRA and individual interviews.

#### 3.1 Household demographics

The demographic characteristics described in this section include household size, farm size, labour issues and household income. The two villages have different characteristics (Table 3), which mark a difference in their practices as far as agriculture and livestock are concerned. Household (HH) sizes in Mbwade are larger and go up to 20 persons.

**Table 3:** Demographic characteristics of the two villages

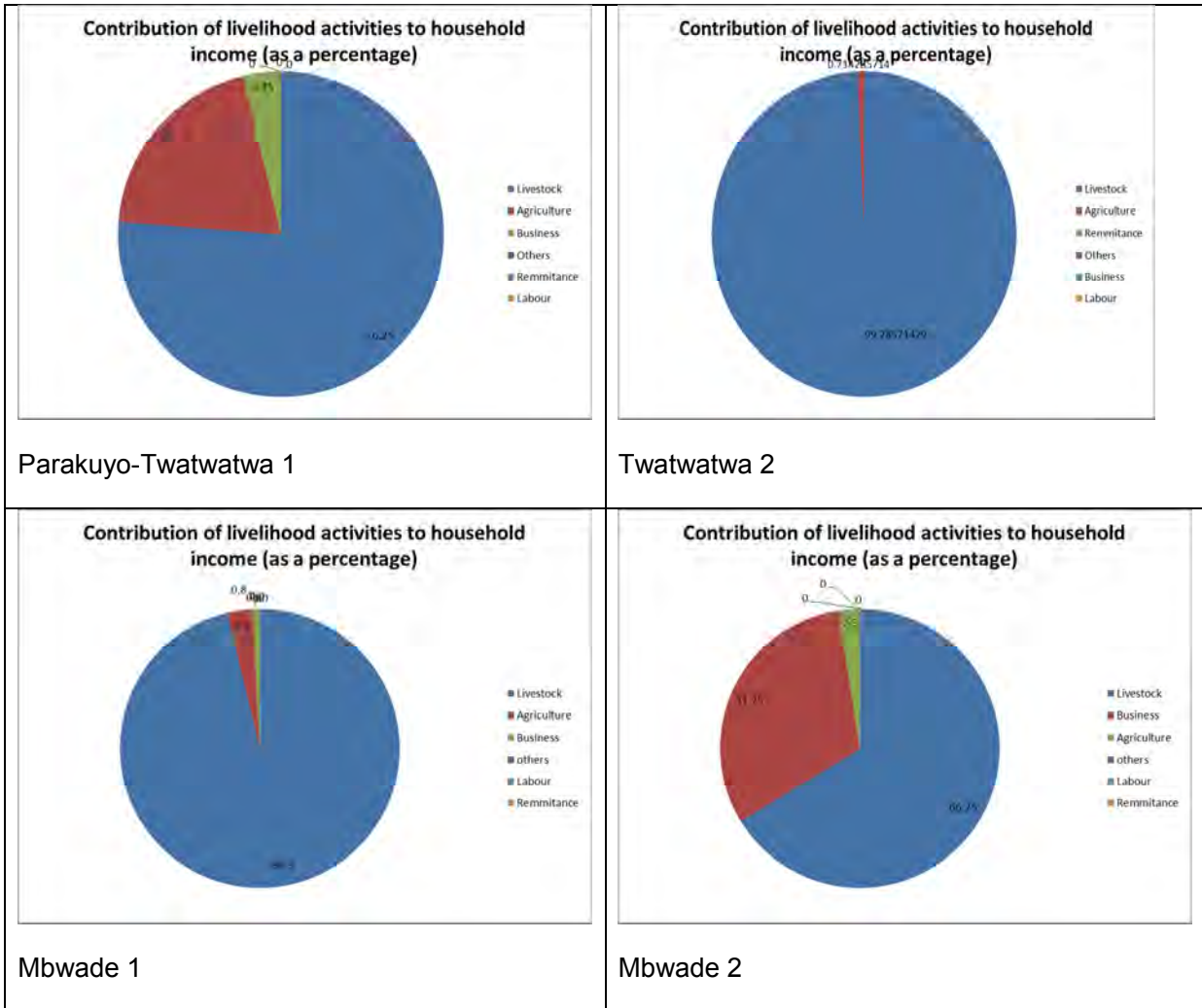
Characteristic	Twatwatwa			Mbwade	
	Average	Range		Average	Range
Household size (persons)	8	4-10		9	5-20
Farm size (acres)	5	1-8		6	1-10

In both Twatwatwa and Mbwade villages, labour is demanded throughout the year. High demand of labour or extra labour is required during the dry season (July-December), when there is shortage of feed supply. During these months, animals are shifted to other parts searching for feeds and water. The labour costs are usually covered by cash and assets. In terms of cash, the labour cost is either Tshs. 2,000 per cow or 30,000 to 70,000 per month<sup>1</sup>. While through asset, one male calf is provided every six months.

##### 3.1.1 Household income

The predominant contributors to income in both Twatwatwa and Mbwade were livestock through sells of live animals, milk and livestock-related business (Figure 2). In both villages, farmers are also practicing crop cultivation. Maize and rice are among the contributors to their income. However, farmers pointed out that they lack a stable market for selling milk thus pouring much of the milk. Also, market for live animals was explained as not efficient enough to benefit farmers.

<sup>1</sup> 1600 Tsh = 1 USD at the time of the survey in February 2013.



**Figure 2:** Contribution of livelihood activities to household income in Twatwatwa and Mbwade villages, Kilosa District.

### 3.2 Crops and cropping systems.

#### 3.2.1 Rainfall pattern

The two villages have different rainfall patterns, though they are closely located to each other (Figure 3). In Twatwatwa, the rainfall pattern has a slight variability, whereby areas closer to Parakuyo hamlet experience four cropping seasons, while the other end of the village experiences only three cropping seasons. Both sites in the village experience same long and short seasons, lasting from March to May and November to February, respectively.

Parakuyo-Twatwatwa 1												
Season	J	F	M	A	M	J	J	A	S	O	N	D
Masika(rainy)												
Vuli(short rainy)												
Kiangazi (dry)												
Kipupwe (cold)												

Twatwatwa 2												
Season	J	F	M	A	M	J	J	A	S	O	N	D
Masika (rainy)												
Vuli(short rainy)												
Kiangazi (dry)												

Mbwade 1												
Season	J	F	M	A	M	J	J	A	S	O	N	D
Masika (rainy)												
Vuli (short rainy)												
Kiangazi (orameyu/dry)												
Kipupwe (oladeruu/cold dry)												

Mbwade 2												
Season	J	F	M	A	M	J	J	A	S	O	N	D
Masika(rainy)												
Vuli(short rainy)												
Kiangazi (orameyu/ dry)												

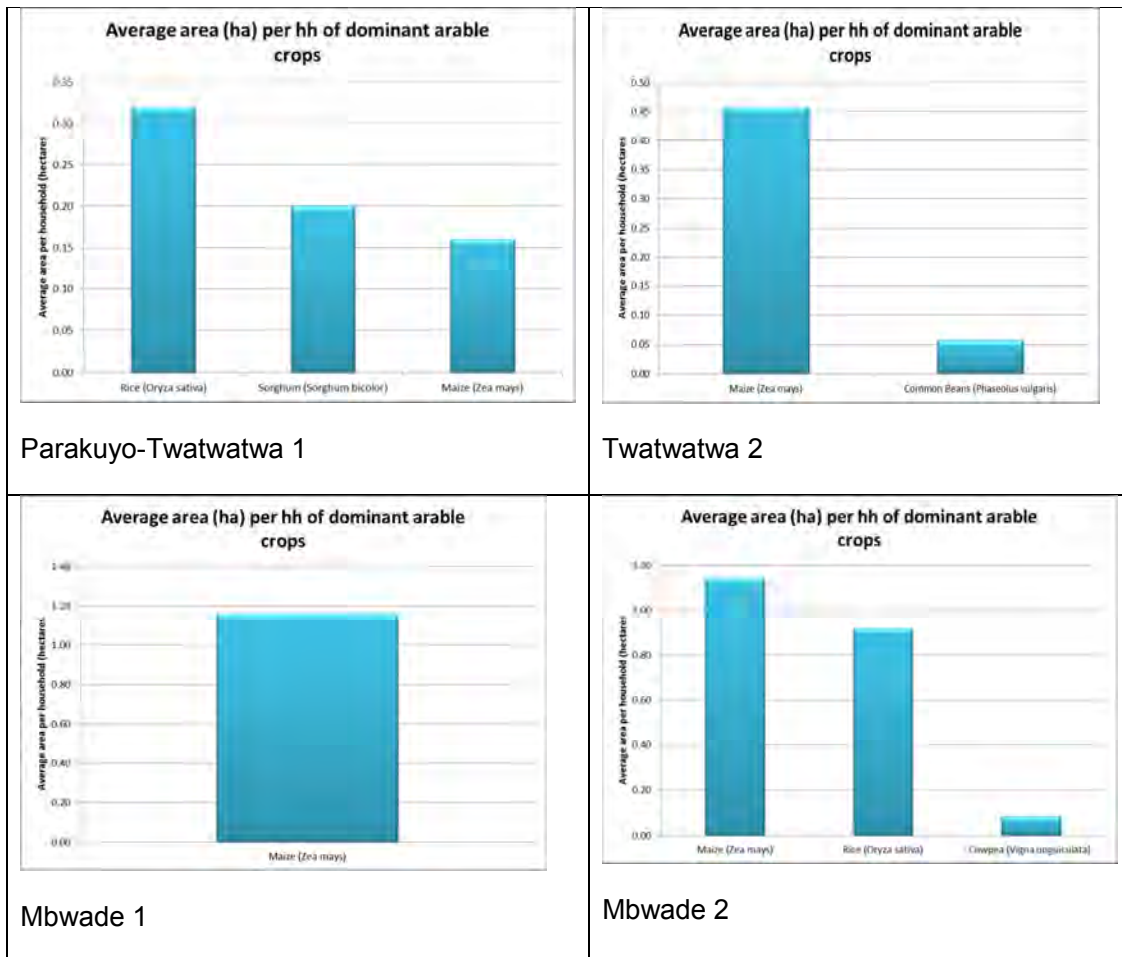
**Figure 3:** Cropping seasons in Twatwatwa and Mbwade villages, Kilosa District.

In Mbwade village, there is a slight variability among the area as one experience four seasons while the other has only three. The dry season ('kiangazi') is remarkably long in the village likewise in Twatwatwa. Both sites have a long dry season that lasts from June to October. The situation is also similar for the short and long rainy seasons that take from March to April and November to January, respectively.

### 3.2.2 Major crops

Average cropping areas per HH are small. Maize is the major crop dominant in both villages (Figure 4). Other crops like rice, common beans, sorghum and cowpea are also grown in both villages. Irrigation system, fallow land and land renting were not practiced in either of the villages.



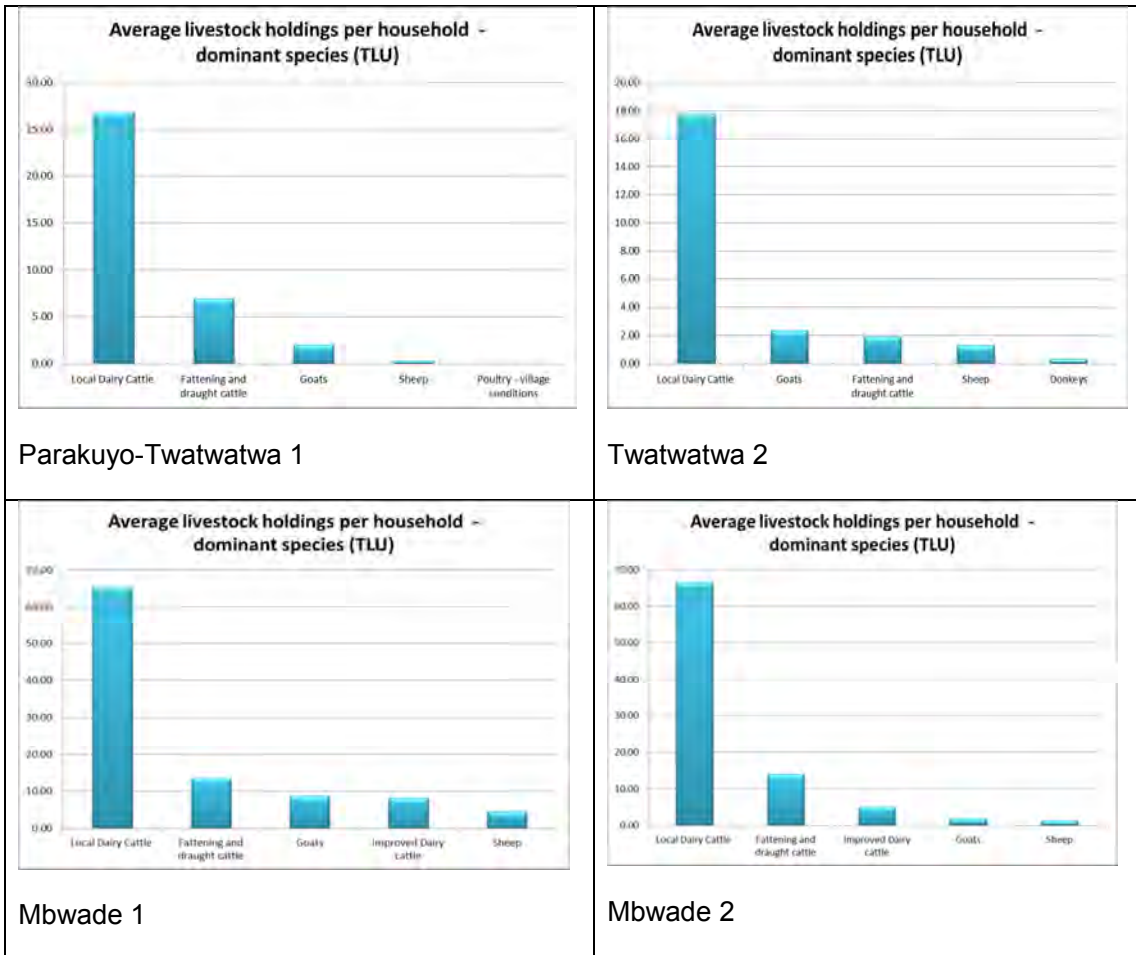


**Figure 4:** Dominant crops found in Twatwatwa and Mbwade villages, Kilosa District.

### 3.3 Livestock and livestock systems

#### 3.3.1 Livestock holdings

There are large differences in overall livestock kept per HH between Twatwatwa and Mbwade (Figure 5); on average 20-25 tropical livestock units (TLU) are kept in the former, while about 90 TLU are kept in the latter. Local dairy cows are used for milk production, sales as live animals to acquire cash, and food. Most of the farmers are keeping the local type of cows. Improved cattle are used for milk production and sales for cash. Fattening cattle are also kept for sales. Sheep are kept as a source of meat, and fats are used as traditional medicine. Similarly, goats are kept for food and as a source of cash. Also, donkeys are present though less in number, mainly used for carrying luggage, fetching water and general means of transport.



**Figure 5:** Dominant livestock species found in Twatwatwa and Mbwade villages, Kilosa District.

### 3.3.2 Livestock species and their uses

In all villages, the local breeds are strongly dominant over improved animals (Table 5). This is mainly due to the type of production system practiced. The local species are well adapted to the particular context compared to the improved. On the other hand, farmers in both villages are increasingly becoming aware of the importance of improving their breeds.

**Table 5:** Livestock species and their uses in Twatwatwa and Mbwade villages, Kilosa District

Species	Breed	Uses
Cattle	Local	Milk, meat, savings, sales for income
	Improved	Milk, sales for income
	Fattening	Meat and sales for income
Goats	Local	Meat, savings, sales for income
Sheep	Local	Meat, savings, sales for income and fat for medicine
Donkey	Local	Carrying luggage, fetching water and means of transport.

### 3.4 Livestock diseases

Common diseases mentioned by farmers in Twatwatwa and Mbwade were East coast fever (ECF), Trypanosomiasis, Foot and mouth disease, CBPP, Foot rot and Lumpy skin disease. The prominent diseases are similar because these villages are located close to each other and also practice similar production systems, which is pastoral.

### 3.5 Livestock and livestock products

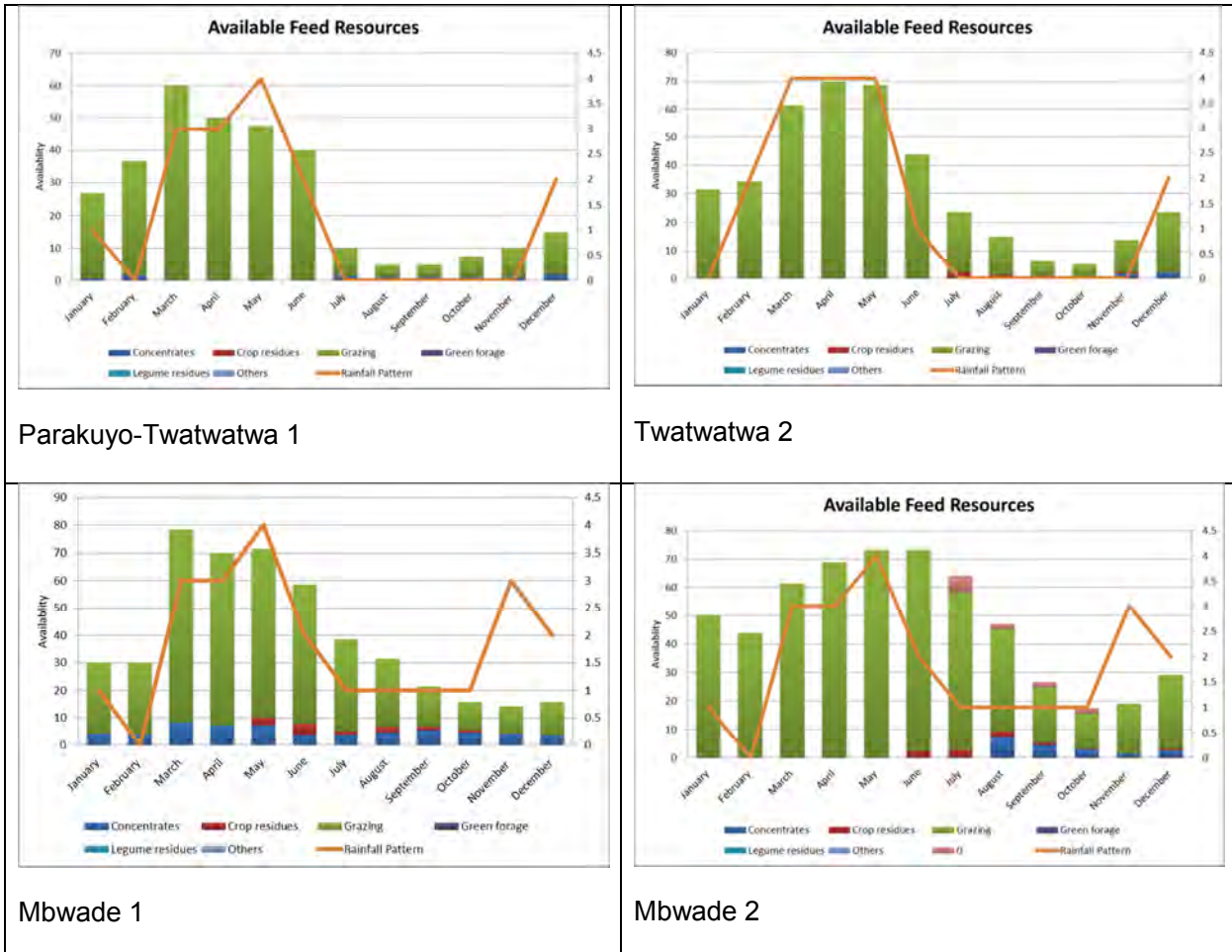
Livestock are sold as live animals or through their products, namely meat, milk and little as hides and skin. For live animals, prices were categorized based on the species, including cattle, goats and sheep. There was little price variation in the two villages, the price range depending on the season of the year. Prices are high during wet seasons and low during the dry season. The average adult cattle price ranges from Tshs. 100,000 to Tshs. 400,000. Also the prices for sheep and goats do not fluctuate much as the animals are mainly sold during emergent needs, in the amount of Tshs. 30,000 and Tshs. 60,000. On the other hand, milk price ranges around Tshs. 500-700 per litre, depending on its strongly seasonal production. During rainy seasons, milk prices are low as milk is excessively produced, while milk prices rise during dry seasons.

### 3.6 Feeds and feeding systems.

#### 3.6.1 Feed availability and seasonality

The major feeds available in Twatwatwa and Mbwade are mentioned in Table 5. In Twatwatwa, grazing of natural grassland was the main source of feed. There is plenty of natural grasses during the wet season (March to June) (Figure 6). However, there is inadequate supply of this feed during the dry and short rain seasons (July to December). During the dry season, grazing of natural grasses is complemented with maize bran as concentrate, while crop residues play a very

minor role. Maize bran is only provided to some animals based on their body condition (if weak or poor) and productive (e.g. lactating) role. Feed processing, like making hay or silage, is not practiced in the area.



**Figure 6:** Seasonal feed availability in Twatwatwa and Mbwade villages, Kilosa District.

In Mbwade, the situation is similar to Twatwatwa, except that animals are supplemented with crop residues like maize stover and rice straws during the dry season from July to December. Also purchased concentrates, mainly maize bran, are largely used to supplement the animals during drought but intended for the weak and productive animals at large. Feed processing is not practiced in this village either. In both villages farmers neither practice pasture improvement nor conservation of grasses.

### 3.6.2 Feed types and sources

Table 6 provides a summary of the major feed types and sources in the two villages. They differ mainly due to the production systems (including livestock system and type of livestock species) practiced and the agro-ecology of the particular village.

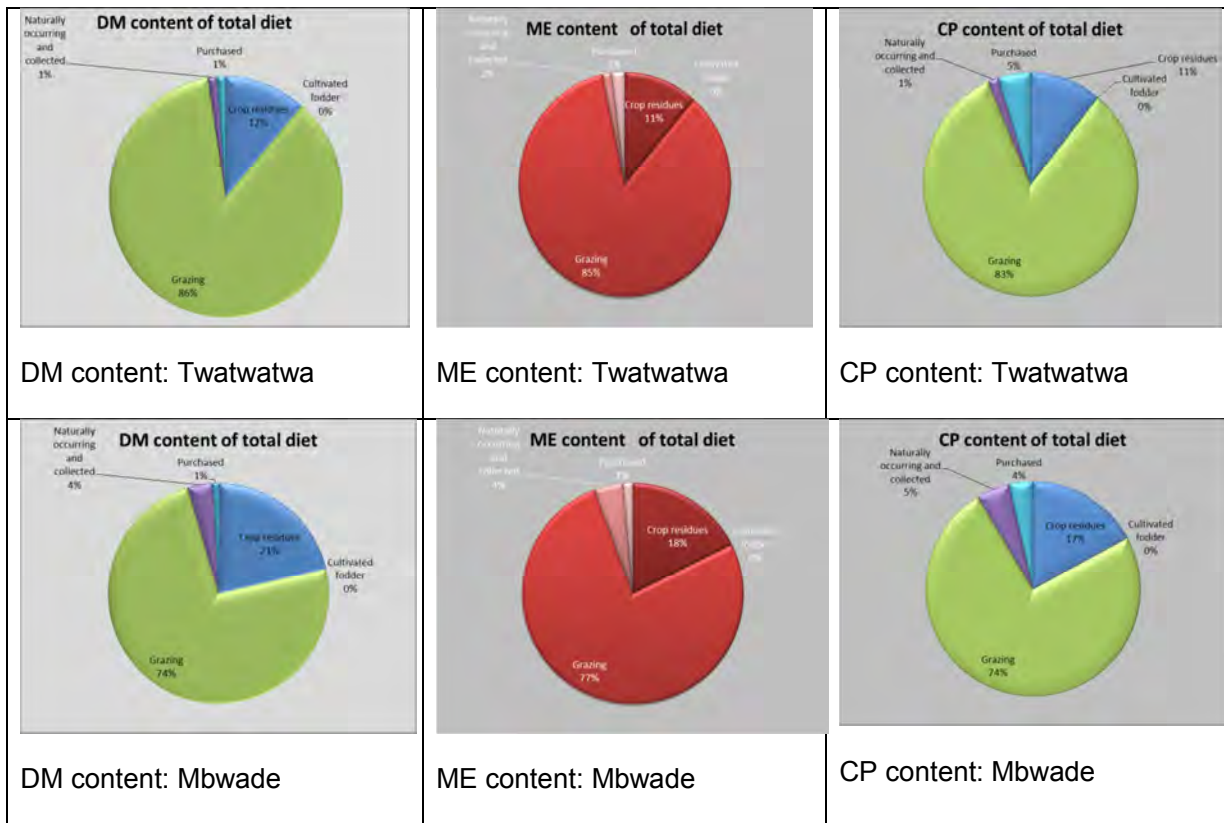
**Table 6:** Feed types and sources available in Twatwatwa and Mbwade villages, Kilosa District

Village site	Type	Source	Feed processing
Twatwatwa 1 & 2	Natural grass	Grazing	None
	Crop residues, i.e. maize stover	Grazed in the farms after crop harvest	None
	Concentrates, only maize bran	Purchased from milling centres	None
Mbwade 1 & 2	Natural grass	Grazing	
	Crop residues, i.e. maize stover and rice straw	Grazed in the farms after crop harvest	None
	Concentrates, only maize bran	Purchased in milling centres	None

### 3.6.3 Nutrient contribution to the diets

Figure 7 describes the nutrient contribution of the various diets available in the villages. In Twatwatwa, grazing which contributes 86% of the DM is shown to contribute 85% of CP and 83% of ME. This indicates that grazed pastures have relatively sufficient levels of CP and ME in their diets. However, this contribution is mostly associated during the seasons with plenty or available pastures. Similar case can be explained in the crop residues. The 12% DM content of crop residues contribute the same amount (11%) to both CP and ME of the total diet. On the other hand, purchased feeds (maize bran here) contribute significantly by increasing the protein content in the diet, while their effect on energy content is negligible.

In Mbwade village, grazed pastures provide 74% DM, 77% ME and 74% CP. Figure 7 indicates a slightly higher proportion of the grazed pastures to the energy level than to the protein level within the total diet. The crop residues of maize stover and rice straw also show significant contribution to the ME and CP contents in the diet, as they are major supplements of grazed pasture during dry seasons. The contribution of purchased feeds (maize bran) to CP content appears similar as in Twatwatwa village.



**Figure 7:** Dietary contribution of different feed resources in Twatwatwa and Mbwade villages, Kilosa District.

### 3.7 Agriculture and livestock inputs and services

Agricultural inputs for livestock and crops are available in both of the villages. These include veterinary drugs, acaricides, and crop seeds which are provided by private suppliers in auctions and the nearby town of Kibamba. Villagers, however, lack sufficient access to extension services and veterinary centres, due to the geographical location, particularly of Twatwatwa village. As a result, many of these pastoralists have acquired skills and ability to treat their animals by themselves as much as possible. Sources of credits are also limited in the area, mainly due to the lack of motivation and interest among the farmers and also the non-recognition of livestock as collaterals for acquiring credits.

### 3.8 Problems, issues and opportunities

During the PRA sessions, participants were required to name their problems related to livestock production within their areas (Figure 8). Several problems were mentioned, followed by ranking of the five key problems out of all listed problems. Also farmers suggested solutions of each among the key problems. This was followed by a pairwise ranking as indicated in brackets (Table 7), which shows how a specific problem ranks among the most important five. Problems of water and land shortage appeared equally most important for all participants in the four sessions. Market for livestock and livestock products was ranked lower, but again in all four sessions. Several issues related to animal health and vet services were next in the ranking by participants, while feed as such was not mentioned. Nevertheless, adequate land resources are synonymous with available feed for pastoralists. Proposed solutions were mostly requests to the state and less so the insight that the participants could do something by themselves in order to improve their livestock situation.



**Figure 8:** Identifying and ranking problems in Twatwatwa (left); one of the problems identified are encroaching plants in grazing lands (right).

**Table 7:** Key livestock-related problems identified and solutions proposed by farmers for their particular sites in Twatwatwa and Mbwade villages, Kilosa District, Morogoro Region.

Problems	Solutions	Ranking			
		Ttt1*	Ttt2	Mb 1	Mb 2
Water	<ul style="list-style-type: none"> <li>• Construction of dams</li> <li>• Improvement of water schemes, e.g. river so as to sustain availability of water throughout the year</li> <li>• Proper management of the sources of water</li> </ul>	3 (2)	4 (1)	3 (2)	4 (1)
Land	<ul style="list-style-type: none"> <li>• Land be designated for livestock keepers/grazing</li> <li>• Public ranch be designated to the farmers rather than investors</li> <li>• Ownership of land to pastoralists farmers</li> </ul>	4 (1)	3 (2)	4 (1)	3 (2)
Market	<ul style="list-style-type: none"> <li>• Milk prices be increased and controlled</li> <li>• Establishment of milk collection centre</li> <li>• Improve Market for milk and livestock</li> <li>• Establish farmers groups/ cooperatives</li> </ul>	1 (4)	1 (4)	1 (4)	2 (3)
Vet services	<ul style="list-style-type: none"> <li>• Building of a veterinary centre</li> <li>• Subsidize veterinary drugs</li> </ul>	0 (5)	0	0	0
Gender imbalance	<ul style="list-style-type: none"> <li>• Empowerment through education</li> <li>• Women development projects</li> </ul>	2 (3)	0	0	0
Dip tank	<ul style="list-style-type: none"> <li>• Renovation of dip tanks</li> <li>• Building more dip tanks</li> </ul>	0	0	0	1 (4)
Credit	<ul style="list-style-type: none"> <li>• Recognition of livestock as collateral</li> </ul>	0	0	0	0 (5)
Suppressing plant	<ul style="list-style-type: none"> <li>• Research on the effects of Acacia spp, locally known as Mklorit</li> </ul>	0	0 (5)	0	0
Disease	<ul style="list-style-type: none"> <li>• Veterinary services be accessible</li> <li>• Infrastructures</li> </ul>	0	2 (3)	0 (5)	0
Feeds	<ul style="list-style-type: none"> <li>• Bush encroachment to allow growth of grasses</li> </ul>	0	0	0 (3)	

\* Ttt, Twatwatwa and Mb, Mbwade.

\* In brackets indicate the ranking of a particular problem among the five.



## 4.0 Conclusions

The two villages are dominated by pastoralism. Most of the characteristics are similar with a slight variation. Local livestock species, especially cattle, are the dominant animals kept by farmers in the areas. Their major uses were found to be for milk production, meat and source of cash in the two villages.

Livestock was found to be the predominant contributor to the household income of both the villages mainly through the sales of live animals. However, crop farming has shown some contribution to their income, though in low proportions.

In both villages, natural grasses/pasture were identified to be the major feed type and sources for the animals with a significant contribution to the energy and protein levels of the total diet. Also maize bran and crop residues of maize stover and rice straw are effective supplements among many farm households.

Seasonality remains the major setback in terms of feed availability, production and prices of livestock and livestock products. The scenario is observed during the dry seasons when customary feeds are unavailable and the production of milk goes lower as well. The dry seasons affect both quantity and quality of feeds in the areas.

Pasture improvement and forage conservation are also issues in the areas in that they offer opportunities, but farmers lack knowledge in these aspects. Thus, effort is needed so as to improve their understanding. This would help to stabilize feed availability throughout the year and avoid the propagation of undesirable plants that invade the grazing areas and, hence, affect the growth of preferable forages.

Lastly, the prominent problems of land, water and markets need to be overlooked at the community level. A community approach could lead to effective solutions as the areas of these villages are characteristically communal, thus individual approaches will hardly lead to any impact.

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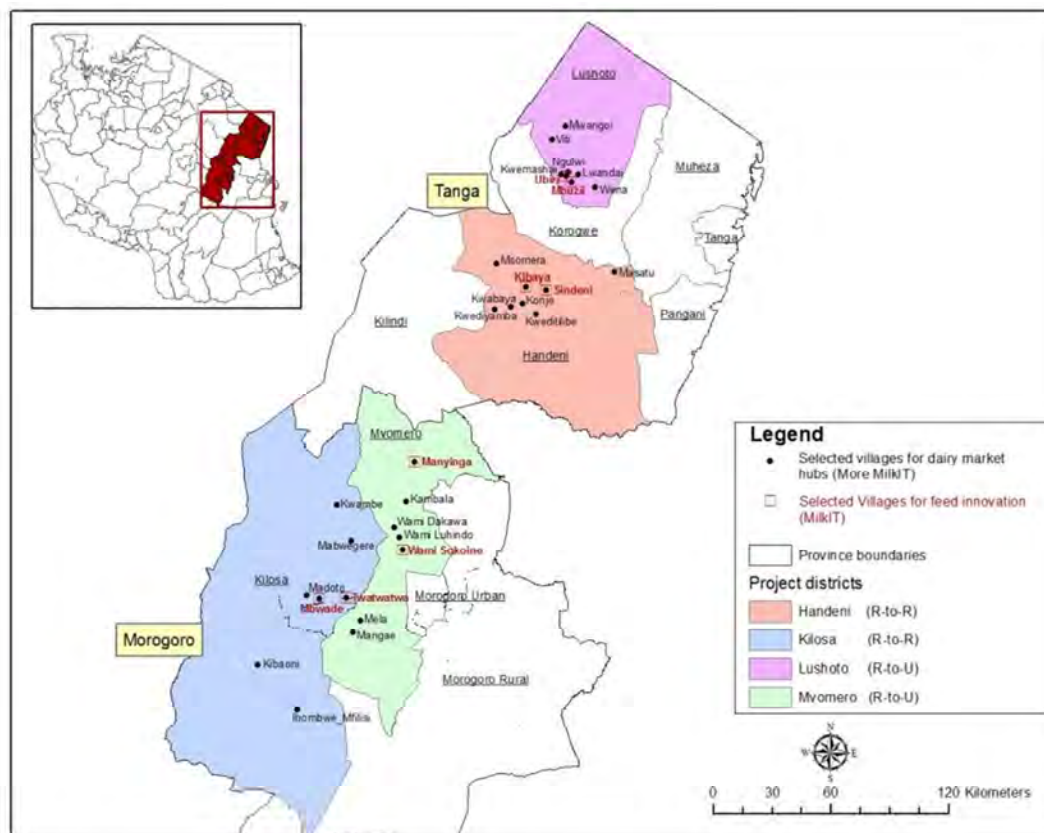
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## Appendix: Acronyms and abbreviations

AI	Artificial insemination
CBPP	Contagious Bovine Pleuropneumonia
CP	Crude protein
CIAT	International Center for Tropical Agriculture
DM	Dry matter
ECF	East Coast Fever
FEAST	Feed assessment tool, see <a href="http://www.ilri.org/feast">http://www.ilri.org/feast</a>
IFAD	International Funds for Agricultural Development of the United Nations
ILRI	International Livestock Research Institute
ME	Metabolizable energy
MilkIT	A research project funded by IFAD (Title: <i>Enhancing Dairy-based Livelihoods in India and the United Republic of Tanzania through Feed Innovation and Value Chain Development Approaches</i> )
NBS	National Bureau of Statistics
PRA	Participatory Rural Appraisal
SUA	Sokoine University of Agriculture, Morogoro, Tanzania
TALIRI	Tanzania Livestock Research Institute
Tsh.	Tanzanian Shilling; about 1600 Tsh. = 1 USD at the time of the survey



**Annex Figure 1:** MilkIT project sites in Morogoro and Tanga Regions of Tanzania; map produced by ILRI.