



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

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

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Nairobi, Kenya: International Center for Tropical Agriculture (CIAT)
May 2013



Summary

A Feed assessment tool (FEAST) was applied in characterizing the production systems mainly related to feed innovation in Mvomero district. The villages involved were Wami Sokoine and Manyinga. The exercise was categorized into two sessions, namely, focus group discussions and individual interviews. A number of 63 and 27 participants (farmers) were involved in the focus group discussion and individual interviews, respectively. The two villages have different agro-ecological zones, marking their variation in production systems and other livestock and agricultural activities. In feeding practices, grazing and cut and carry systems dominate in Wami Sokoine and Manyinga villages, respectively, with high contribution in the diets. Key issues identified were markets and improved breeds in Manyinga, while land, water and markets were the key issues in Wami Sokoine. These could mark the potential entry points for interventions in each village.

Acknowledgements

We wish to acknowledge the ready collaboration and openness in sharing their views and experiences of all respondents. The participation of facilitators Dr. Ben Lukuyu (ILRI) and Dr. Brigitte Maass (CIAT) during the training is appreciated; facilitation of the partners in Morogoro by Professors Laswai and Kimambo from SUA. Also, the team participation in FEAST exercise, namely, Mr. Innocent Bakengesa, Ms. Marry Jackson and Mr. Anthony Mbeho from TALIRI Mpwapwa; Mr. Msaki (SUA) and Mr. Herman Mpimwa, Mr. Huzuni and Mr. Materu from Mvomero District livestock office in Morogoro, is thanked for. Logistic support provided by ILRI and CIAT through SUA is also recognized. The feed assessment was funded by IFAD through the MilkIT project.

Citation:

Wassena, F.J., Mbeho, A. and A.E. Kimambo in collaboration with Maass, B.L. and Lukuyu, B. 2013. Report of a Feed Assessment 1 – Mvomero District, Morogoro Region, the United Republic of Tanzania. Report. International Center for Tropical Agriculture (CIAT) and International Livestock Research Institute (ILRI), Nairobi, Kenya, Sokoine University of Agriculture (SUA), Morogoro and Tanzania Livestock Research Institute (TALIRI), Tanga, Tanzania. 18 pp.

Photos:

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Characterization of the Livestock Production System and Potential for Enhancing Productivity through Improved Feeding in Wami Sokoine and Manyinga Villages, Mvomero District – Morogoro Region, Tanzania

1.0 Introduction

The International Livestock Research Institute (ILRI) in collaboration with the International Center for Tropical Agriculture (CIAT) is implementing an agricultural research project in collaboration with Indian and Tanzanian national partners. The Tanzanian partners are SUA (Morogoro) and TALIRI (Tanga). The project is entitled '*Enhancing Dairy-based Livelihoods in India and the United Republic of Tanzania through Feed Innovation and Value Chain Development Approaches*' – MilkIT in short – and is funded by the International Fund for Agricultural Development (IFAD Grant G-I-R-1311-ILRI). The Feed Assessment Tool (FEAST, by Duncan et al., 2012) is one of the instruments applied in this project. It was used to characterize the livestock production systems and, in particular, feed-related aspects in Mvomero District, Morogoro region in Tanzania.

Mvomero is a new district split from the former Morogoro District. District boundaries are as follows: to the north is Handeni district, to the east Bagamoyo, to the south Morogoro Municipal and Morogoro District, and to the west there is Kilosa District. Mvomero District is located at North East of Morogoro Region between latitudes 8,000° and 10,000° South of the Equator and between longitudes 37,000° and 28,022° East. The District has a total area of 7,325 km square (Mvomero District Council, 2012).

The total human population is estimated to be 260,525 of which males are 131,159 and females are 129,376. The total number of households is 58,314 with an average household (HH) size of 4.5 persons and average growth rate of 2.6% (Mvomero District Council, 2012; NBS, 2012). Agriculture (crop production) is the major economic activity. The major farming systems include maize-rice, agro-pastoralism and banana-vegetables.

The major agricultural enterprises include:

- Cash crops: Cotton, coffee, simsim (sesame), sunflower, sugarcane, bananas, and vegetables.
- Food crops: Maize, paddy, millet, cassava, and pulses.
- Livestock: Beef and dairy cattle, indigenous and dairy goats, sheep and chicken.

1.1 Agro-ecological zones

Highland and mountainous zone: This extends to the Nguu Mountain Ranges at an altitude of 1,200-2,000 m above sea level (asl).

Miombo Woodland zone: The zone is flat lowland with an altitude of 600-1200 m asl. and average annual rainfall of 600-1200 mm.

Savannah River Basin Line: This zone extends alongside the great rivers of Mkata, Wami, Mgeta, Mlali, Divue, Diburuma, Mkindo, Mburumi among others. The zone has potential for irrigation, dry season cultivation, production of paddy, sugarcane, cotton, vegetables and fishing.

1.2 Location of the villages

Wami Sokoine is a village located about 40 km north of Morogoro on the road to Dodoma. Manyinga is 100 km northEast of Morogoro on the road to Handeni through Turiani sub-town.

2.0 Methodology

The villages involved were Manyinga and Wami Sokoine. The assessment was carried out through group discussions and completion of short questionnaires by key farmers' representatives. During the exercise, the team was comprised of 4 researchers and two extension officers from the district office and the respective village. Table 1 shows a summary description based on the site where the FEAST exercise was conducted

Table 1: Summary description of the FEAST sites in Mvomero District

Village name (site no.)	Production system	Venue of the PRA meeting	Number of participants*			
			Male	Female	Youth	Total
Wami Sokoine 1	Pastoral	Village office Day 1	10 (3)	6 (3)	5	21 (6)
Wami Sokoine 2	Pastoral	Lutheran church Day 2	17 (3)	8 (4)	2	27 (7)
Manyinga 1	Semi-intensive (mixed crop-livestock)	Village office Day 1	8 (3)	5 (4)	2	15 (7)
Manyinga 2	Semi-intensive (mixed crop-livestock)	Village office Day 2	9 (4)	6 (3)	1	16 (7)

* In brackets the number of participants in individual interviews.

2.1 Selection of participants

The criteria set for selection were as follows:

- It has to be random i.e. every listed farmer has an equal chance of being selected.
- Equal/ reasonable representation of male, female and youth.
- Selection based on the typical livestock production system practiced in the area.
- The number of participants invited 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.

The selection of participants was done by the district extension officer through village extension officers and village executive officers. Based on the criteria of selection, there was an equal representation of the groups in almost all the PRAs. Also number of the attending participants was mostly within the range, but went up to 27 in one of the meetings largely due to the interest and need of the farmers to attend; and lastly, the number of individual farmers selected for the interviews was 7 in every meeting except the first group in Wami Sokoine.

2.2 Experiences and observations on FEAST village survey

Issues experienced and observed during the FEAST village surveys in Wami Sokoine and Manyinga villages are summarized in Table 2. Apparently the communication flow from district extension officer to village extension officers and village executive officers and finally to the farmers was not optimal, creating over-expectations by the participants.



Wami Sokoine Village



Manyinga Village

Figure 1: PRAs in Wami Sokoine and Manyinga, Mvomero District.

Table 2: Observations and experiences during FEAST exercise in Wami Sokoine and Manyinga villages, Mvomero District.

Village	Issues experienced
Wami Sokoine	<ul style="list-style-type: none"> • Dominance of men over women (women were not free to express their views) • Farmers were not willing to mention the exact number of livestock owned • Unequal representation of participants concerning the hamlets • Late arrival of farmers to the meeting place and sometimes the discussion took longer time than planned; i.e., 2.30 to 3 hours • Over participation of the farmers in the second meeting • Over expectation of farmers in terms of possible provision of improved cattle
Manyinga	<ul style="list-style-type: none"> • Time management: late arrival of the researchers in the first day • Over expectation of farmers in terms of possible provision of improved cattle

3.0 Results

The following sections describe the results obtained during the FEAST exercise in the two villages. The results obtained through PRA and individual interviews are combined hereunder, based on the particular aspects. Results from individual interviews have been processed by using the FEAST template.

3.1 Household demographics

The demographics described in this section include household size, farm size, labour issues and household income. The two villages have different characteristics (Table 3), marking a remarkable difference in their practices as far as agriculture and livestock are concerned. In both villages, household sizes are substantially larger than the District average of 4.5 persons /HH.

Table 3: Average household and farm sizes of Wami and Manyinga villages, Mvomero District

Characteristics	Wami Sokoine	Manyinga
Average household size	8 people	7 people
Average farm size per household	4.5 acres	8 acres

3.2 Labour

In Manyinga village labour is generally available, but mostly needed in different periods based on the type of activity. For agricultural activities, the demand of labour is high in the period from January to June. This is where the practices of land preparation, weeding and harvesting take place. For livestock activities, extra labour is mostly required during the months of July to October, mainly for cutting and carrying grasses. The reason behind this high labour demand is that availability of collectable grass is limited, thus, farmers have to seek from distant areas, consequently needing extra labour for doing this kind of work.

In Wami Sokoine, labour is available throughout the year, but mostly required during the dry season. This is when farmers need extra labour for herding their livestock in distant areas with pastures, as they lack natural pastures within their close surroundings. Also, some of the farmers tend to move their animals to other areas that are far from their homesteads and, thus, generates a need for extra labour.

3.3 Household income

The predominant contributor to income in Wami Sokoine in both site 1 and 2 was livestock through sales of live animals and milk. The second most important contribution, but much lower than that from livestock, is through business that involves selling of traditional drugs, formal business activities like investments in

guest houses and shops in Wami Sokoine and Morogoro town. Contributions from crop agriculture are negligible. In Manyinga village the main sources of income were also from livestock through milk sales, live animals and other livestock products. This was followed by crop agriculture, mainly maize, sugarcane and rice, and business, like small shops and carpentry contributing to the household income (Figure 2).

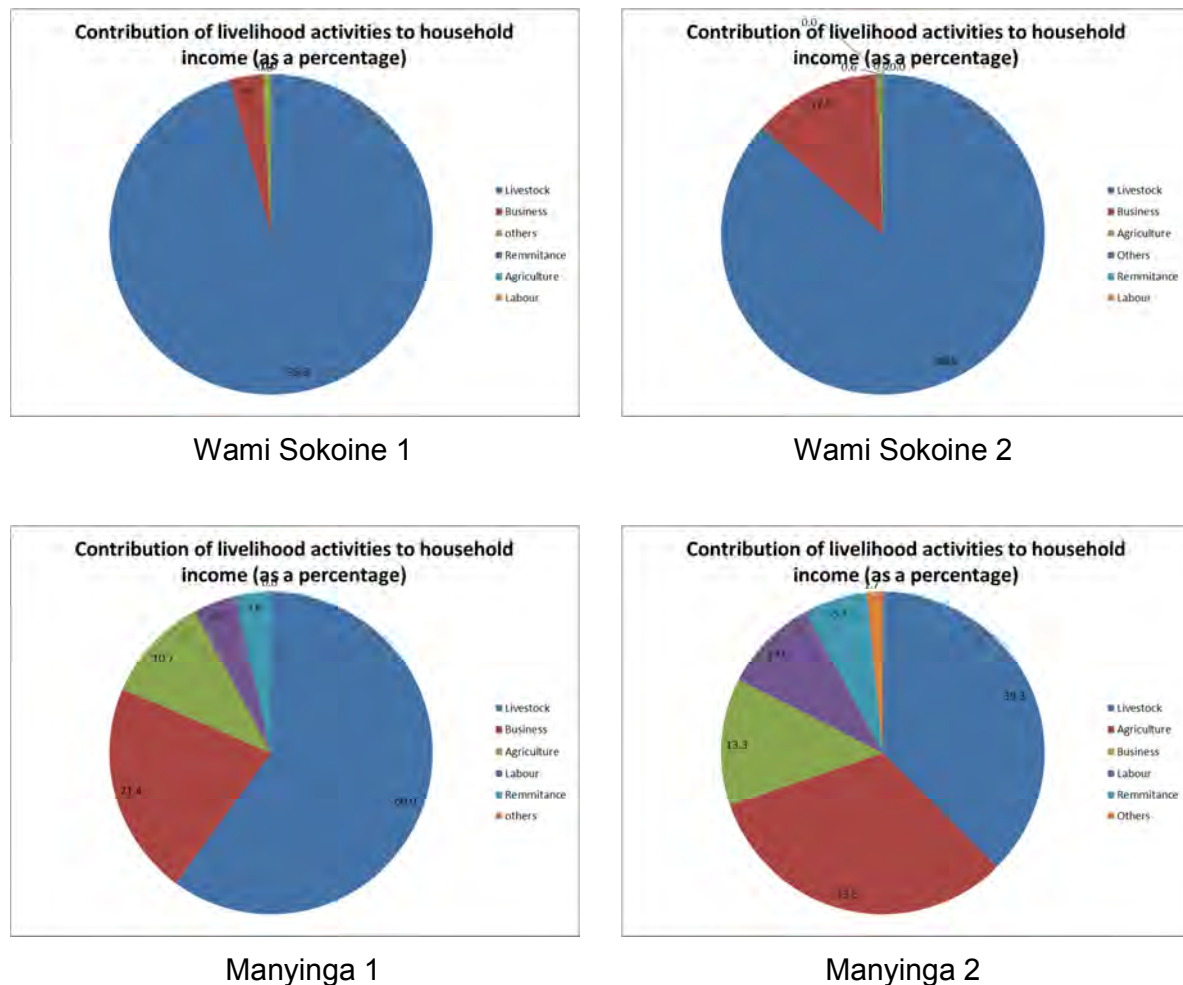


Figure 2: Contribution to livelihood activities to household incomes (as a percentage) in four sites of Mvomero District.

3.2 Crops and cropping systems

3.2.1 Rainfall pattern and cropping seasons

The rainfall patterns were different when comparing the two villages. There were also variations within the different sites in the same village. According to the PRA session, Wami Sokoine site 1 and site 2 had four and two seasons, respectively.

Table 4: Cropping seasons assessed by farmers in four sites in Mvomero District.

Wami Sokoine 1												
Season	J	F	M	A	M	J	J	A	S	O	N	D
Vuli (short rain)	■	■									■	■
Masika (rainy)			■	■	■							
Kiangazi (dry)								■	■	■		
Kipupwe (cold dry)							■					

Season	J	F	M	A	M	J	J	A	S	O	N	D
Masika (rainy)			■	■	■	■						
Kiangazi (dry)	■	■					■	■	■	■	■	■

Wami Sokoine 2

Manyinga 1												
Season	J	F	M	A	M	J	J	A	S	O	N	D
Masika (rainy)			■	■	■	■						
Kiangazi (dry)							■	■	■			
Vuli (short rain)	■	■								■	■	■

Manyinga 2

Season	J	F	M	A	M	J	J	A	S	O	N	D
Masika (rainy)		■	■	■	■							
Vuli (short rain)	■									■	■	■
Kiangazi (dry)							■	■	■			
Kipupwe (cold dry)						■						

In most cases the patterns of rainfall have shown great variability and unreliability particularly in recent years where dry seasons have become much longer than the rainy seasons. Also in some areas (Wami Sokoine 2), the short rainy season is rarely observed. The seasons are named as wet, dry, short rain and, rarely, cold dry seasons (Table 4). Similarly, Manyinga site 1 and site 2 had different cropping seasons. This was also pointed out during the PRA sessions among the two groups. Manyinga site 1 and site 2 had mentioned three and four seasons, respectively.

3.2.2 Major crops grown in the area

Cropping plays a very insignificant role in Wami Sokoine as shown by the very small average cropping areas of arable crops per household (Figure 3). The major crops grown in Wami Sokoine are maize, cowpeas and pumpkins. While in Manyinga village areas were larger and the major crops include maize, rice, sweet potato and sugarcane (Figure 3). In both villages, irrigation is not practiced, and neither fallowing nor intercropping.

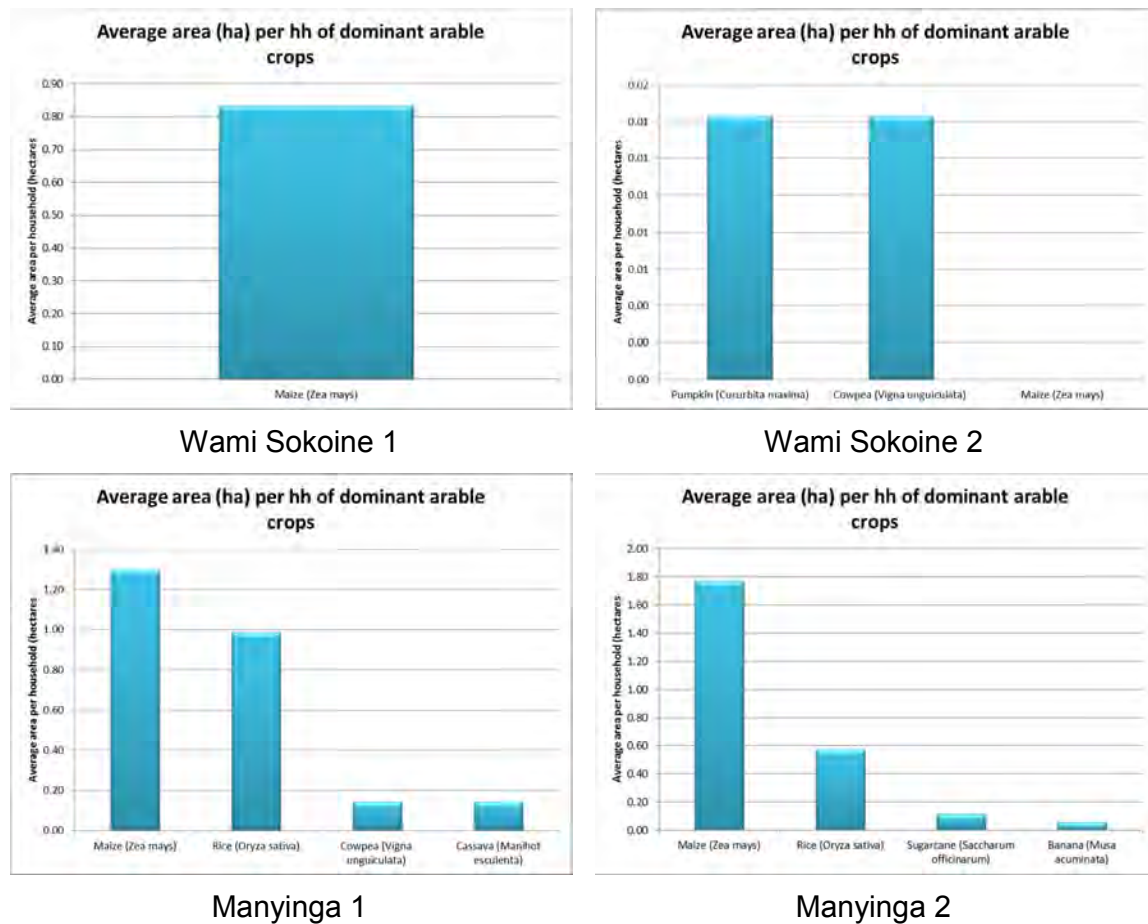


Figure 3: Dominant crops grown in Wami Sokoine and Manyinga villages, Mvomero district.

3.3 Livestock and livestock systems

3.3.1 Livestock holdings

Local dual purpose cattle appear as dominant species of the livestock kept in Wami Sokoine village followed by improved dairy cattle. This may be due to the fact that most of the farmers are pastoralists (Figure 4). While in Manyinga village, improved dairy cattle are the dominant species, followed by local dual purpose cattle and pigs. The dominance of improved dairy cattle in Manyinga may be due to their introduction by different NGOs that insisted farmers to practice stall feeding. Despite their relatively less important role, the number of dairy cattle in Wami Sokoine was more than double as high as in Manyinga. Interestingly, small ruminants seem to play no role in any of the two villages.

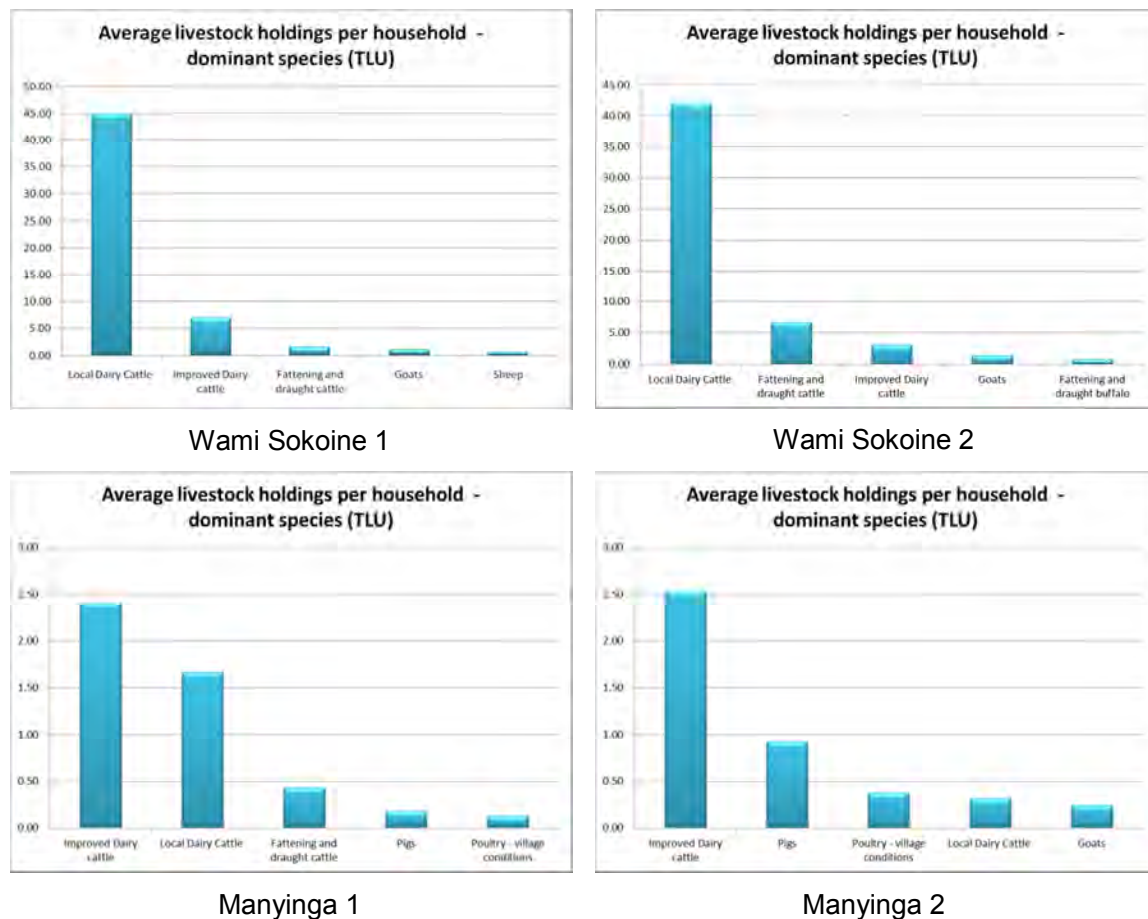


Figure 4: Average livestock holdings per household – dominant species (TLU) in four sites of Mvomero District.

3.3.2 Livestock species and their uses

Table 5 indicates that the livestock species are kept for similar purposes in the two villages. The common purposes are milk, meat, savings and sales for income among others. However, the importance and levels of the mentioned purposes vary between the two villages depending on the specific role of the livestock species and production system practiced. A good example can be seen in Manyinga village, where the improved cattle are mainly dairy animals kept for milk production plus serving for other minor purposes while in Wami Sokoine the local cattle serve purposes of milk and meat equivalently.

Table 5: Livestock species, breeds and their uses in four sites of Mvomero District

Village	Species	Breed	Uses
Wami Sokoine	Cattle	Local	Milk, meat, savings, sales for income
		Improved	Milk, sales for income
	Goats	Local	Meat, savings, sales for income
	Sheep	Local	Meat, savings, sales for income, fat for medicine
	Chicken	Local	Meat and sales for income
Manyinga	Cattle	Improved	Milk, employment, sales for income, manure
		Local	Milk, meat, savings, sales for income, manure
		Fattening	Sales for income
	Goats	Local	Meat, savings, sales for income
	Sheep	Local	Meat, savings, sales for income
	Chicken	Local	Meat, eggs and sales for income

3.3.3 Livestock diseases

In most cases, similar animal diseases are found in the two villages, with exception of a few. Apart from the difference in production system, also the agro-ecological difference contributes towards disease infection in the two areas. In both villages, Wami Sokoine and Manyinga, the following diseases were major problems as mentioned by farmers (Table 6).

Table 6: Lists of livestock diseases found in Wami Sokoine and Manyinga village, Mvomero District.

Village	Diseases
Wami Sokoine	East coast fever, Trypanosomiasis, Foot and mouth disease, CBPP ¹ , Foot rot, Lumpy skin;
Manyinga	East coast fever, Trypanosomiasis, Foot and mouth disease, CBPP, mastitis, Foot rot, Lumpy skin, and worms.

3.3.4 Livestock and livestock products

Livestock are sold as live animals and through their products, namely meat and milk. As live animals the prices were categorized based on the species, which include cattle, goats and sheep. The prices ranged depending on the season of the year, of which they are high during dry season and low during wet season in Wami Sokoine. On average the price of adult cattle ranges from Tsh.150,000 to 430,000². Also the prices of sheep and goats do not fluctuate much as they are mainly sold when need arises; they are around Tsh. 30,000 and 60,000 for sheep and goats, respectively. Milk is sold to neighbors, hawkers and milk collection centers in Wami Dakawa. The price of milk ranges from Tsh. 500 to 700 per litre. Prices are lower during the wet season and higher during dry season due to seasonality in the amount of milk produced.

In Manyinga, sales of livestock are not a frequent common practice. When sold, the prices range from Tsh. 200,000 to 500,000 for a cow as they are mainly improved breeds. Sheep and goats are in most cases not for sale, unless there is need for money. They are very few in number per household. The price for milk ranges from Tsh. 800 to 1000 per litre. There is no processing of milk in the two villages. The milk is sold fresh and raw to both neighbours and hawkers.

3.4 Feeds and feeding systems

3.4.1 Feed availability

The major feed types available in Wami Sokoine and Manyinga are presented in Table 7. In Wami Sokoine, grazing of natural grass was the main source of feed. Natural grasses are plentiful during the wet season from March to June (Figure 5). However, there is inadequate supply of this feed type during the dry and short rainy seasons from July to December. During the dry season, grazing of natural grasses was complemented with crop residues of maize stover and purchased rice straw. In

¹ See Appendix for explanation of abbreviations

² 1600 Tsh. = 1 USD at the time of the survey

cases of drought, the animals are supplemented with maize bran based on their body condition and their roles in production e.g. lactating or milking cow. Feed processing is not practiced in the area.

In Manyinga village, where many farmers practice stall feeding, natural grasses and legumes are the major sources of feed. They are usually collected from the roadside, river banks and uncultivated land. These collected grasses and legumes are available throughout the year, but especially plentiful during the wet season from March to August (Figure 5). The practice is through cut and carry. During the dry season, availability of feeds becomes limited, thus, farmers have to travel long distances to source for feed in areas like river banks and flood plains to cut and collect grasses. Crop residues, namely maize stover and rice straw, are collected from the farms after crop harvest, stored and fed during the dry season when grasses are scarce.

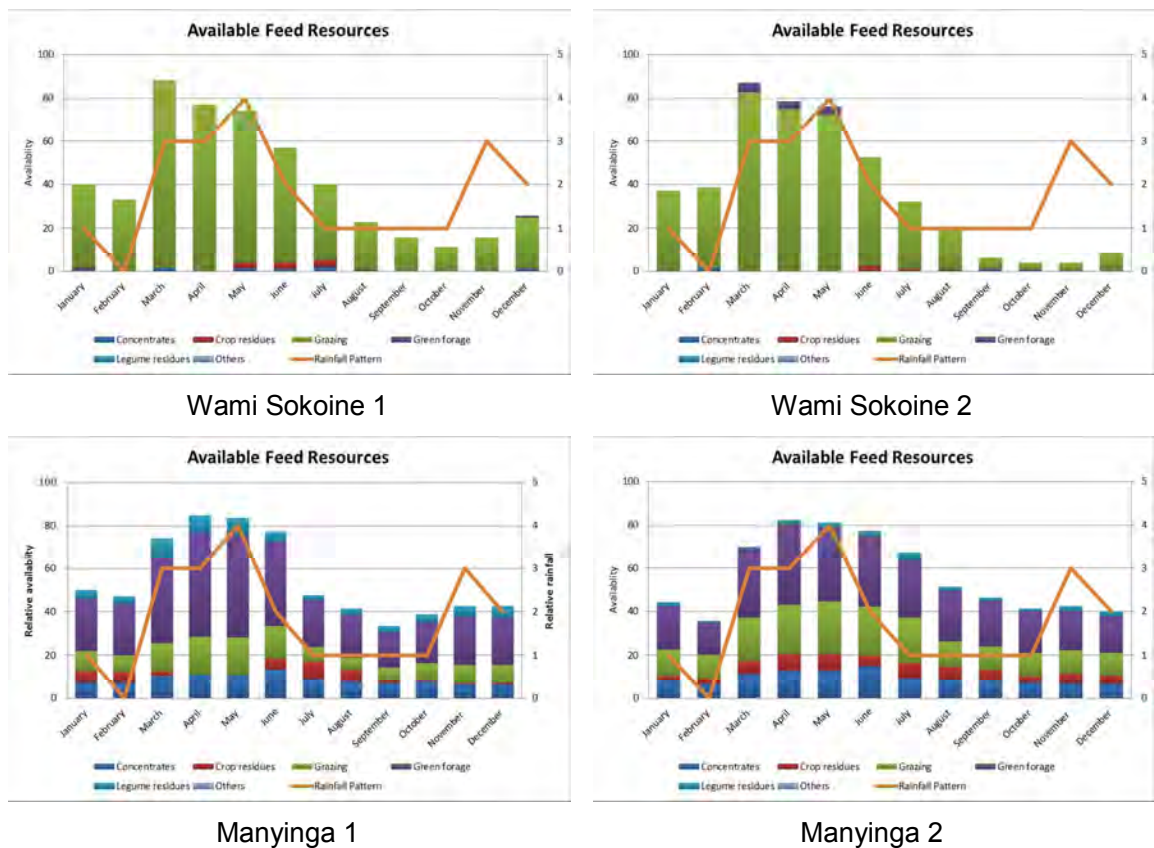


Figure 5: Available feed sources utilized by farmers throughout the year in Wami Sokoine and Manyinga villages, Mvomero District.

However, storage of these residues is still a challenge as some farmers do not have proper facilities for storage. Concentrates that are compounded in the farm are also provided to the lactating animal during milking and to the calves. Feed processing through chopping, mixing with molasses and compounding of concentrates is practiced in the area. In both villages, conservation of the grasses and improvement of the crop residues are not practiced.

3.4.2 Feed types and sources

Table 7 provides a summary of the major feed types and sources in the two villages. The types and sources differ mainly due to the production systems practiced (including livestock system and type of livestock species kept) and the agro-ecology of the particular village.

Table 7: Major feed types and sources in Wami Sokoine and Manyinga villages, Mvomero District

Site/Village	Type	Source	Feed processing
Wami Sokoine	Natural grass	Grazing	None
	Crop residues (maize stover and rice straw)	Grazing and purchased	None
	Concentrates only maize bran	Purchased feed from milling and input suppliers	None
	Fodder crop of orchard tree (<i>Bauhinia variegata</i>)	Cultivated fodder	None
Manyinga	Naturally occurring collected grasses and legumes	Collected grass on roadside, own farms, river banks and uncultivated land	Chopping and mixing with molasses
	Crop residues	Collected on own farm and purchased from neighbours	Chopping and mixing with molasses
	Concentrate ingredients i.e. maize bran, sunflower seed cake and minerals, molasses and rice polishing	Purchased feeds from milling and input suppliers	Compounding of concentrates using the purchased ingredients

3.4.3 Nutrient contribution to the diets

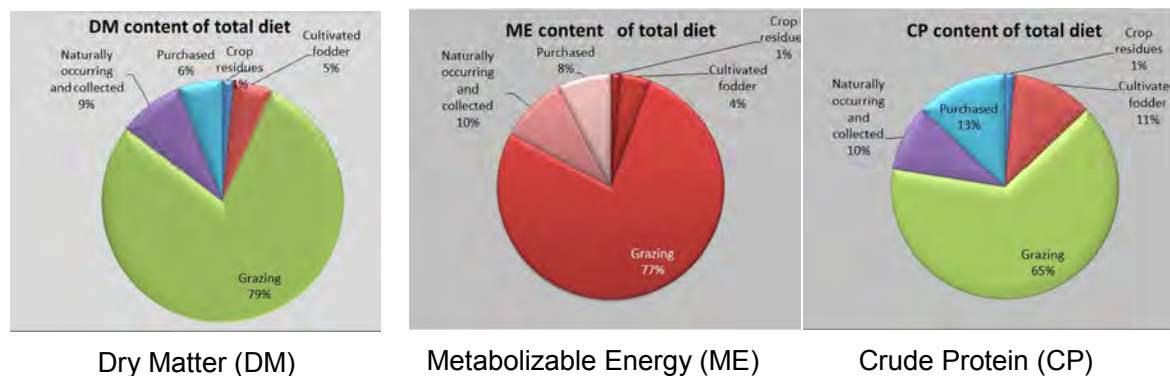
Figure 6 describes the nutrient contribution of the various diets available in the villages. In Wami Sokoine, grazing that contributes 79% of the DM is indicated to contribute 65% of CP and 77% of ME. This reflects that grazed pastures have relatively low CP content. Although cultivated fodder contributes only 5% of the DM, it has 11% of the CP, reflecting its high CP content. Similarly, purchased feed

contributes 6% of the total DM, but 13% of the total CP content, indicating its importance due to high CP concentration.

In Manyinga village, naturally occurring collected grasses and legumes contribute 59% of the total DM content, 64% CP and 54% ME of the diet. This implies that the collected grasses and legumes have high CP content and low ME content in the total diet. Purchased feeds contribute 23% to the DM content, 22% to CP and 33% to ME content of the total diet. This indicates that purchased feeds are mainly an energy source rather than protein source.

For the grazing areas, inclusion of high protein planted forages would improve the CP content of the diets, while in the stall-fed areas, inclusion of purchased feed ingredients with relatively high CP content would help also improve the overall protein content of the diets.

Wami Sokoine



Manyinga

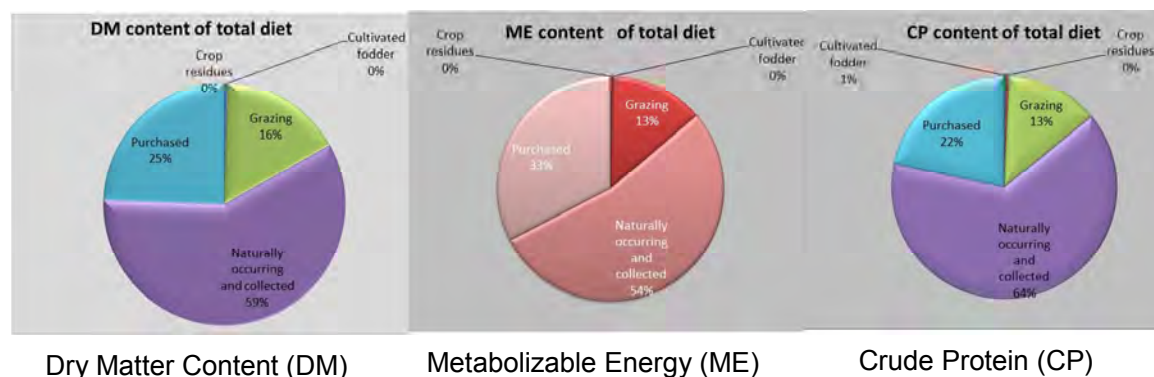


Figure 6: Contributions of various feeds to the dietary requirements in Wami Sokoine (left) and Manyinga (right) villages, Mvomero District.

3.5 Agriculture and livestock inputs and services

The supply and availability of agricultural and livestock inputs and services vary between the two villages. In Wami Sokoine, available inputs include veterinary drugs, acaricides, and fertilizers and are provided by private suppliers who own the shops within the area and in Morogoro town. They have access to extension service. Credit sources are available in the area, but hardly accessible due to the lack of recognition of livestock as collaterals for acquiring credits.

Agricultural inputs are available in Manyinga village, including both livestock and agricultural inputs like fertilizers, vet drugs, seeds, acaricides and pesticides with the exception of AI service. Credit sources are hardly accessible due to limitations on their livestock and untitled land, which are both not recognized for accessing credits. The access to extension service is erratic, as the extension staffs hardly visit the farmers to provide services or information.



Wami Sokoine



Manyinga

Figure 7: Discussing problems and opportunities during the PRAs in Wami Sokoine and Manyinga, Mvomero district.

3.6 Problems, challenges and opportunities

During the PRA sessions, farmers were required to mention the problems related to livestock production within their areas (Figure 7). Several problems were pointed out, of which five key problems were ranked out of all the listed problems. Also farmers suggested solutions of each among the key problems. This was followed by pairwise ranking as indicated in brackets (Table 8). The problems of market for livestock and livestock products, lack of access to credits and lack of improved breeds appeared as the most prominent in the sites. Feed did not feature prominently as a challenge;

however, land shortage perceived in Wami Sokoine reflects the limitations in grasslands.

Table 8: Problems and opportunities identified and ranked (1-5) during the PRAs in Wami Sokoine and Manyinga villages, Mvomero District; ranking of the particular problem among the five is indicated in brackets.

Problems	Solutions	WamiS 1	WamiS 2	Manyin- ga 1	Manyin- ga 2
Land shortage	<ul style="list-style-type: none"> - Land be designated for livestock keepers/grazing - Public ranch be demarcated to the farmers - Livestock is to be recognized so that farmers can get access to land for grazing 	4 (1)	4 (1)	0	0
Inadequate markets for livestock and livestock products	<ul style="list-style-type: none"> - Milk collection centre - Group formation - Milk processing plant 	2 (3)	2 (3)	3 (2)	1 (3)
Lack of water	<ul style="list-style-type: none"> - Construction of dams 	3 (2)	3 (2)	0	0
Lack of access to credits	<ul style="list-style-type: none"> - Livestock be recognized as collateral for accessing credits - Group formation - Interest rates be reduced - Training on entrepreneurial skills 	0 (5)	5 (0)	2 (3)	0
Lack of improved breeding bulls	<ul style="list-style-type: none"> - Dissemination of improved breeding bulls 	1 (4)	0	4 (1)	2 (2)
Diseases	<ul style="list-style-type: none"> - Subsidise veterinary drugs - Mass vaccination programme for important diseases - Services from extension staff (regular) - Regular training and seminars 	0	1 (4)	0	2 (2)
Lack of dip tanks	<ul style="list-style-type: none"> - Construction of dip tanks 	0	0	0 (5)	1 (3)
Inadequate knowledge on livestock husbandry	<ul style="list-style-type: none"> - Regular training and seminars - Knowledge dissemination through brochures and leaflets 	0	0	1 (4)	4 (1)

4.0 Conclusions

The two areas have different production systems, namely pastoralism for Wami Sokoine and semi-intensive with stall feeding for Manyinga village, strongly dependent on varying rainfall and cropping patterns. The livestock species kept are almost similar in both areas except for pigs, which are only found in Manyinga village.

Livestock was found to be the major contributor to the household income of both the villages mainly through the sales of live animals and milk. Their major uses were found to be for milk production, meat and source of cash in the two villages.

Based on the production systems, crops grown were different in the two areas. However, fodder cultivation is limited. The major sources of feed were natural grazed pastures and collected grasses and legumes in Wami Sokoine and Manyinga, respectively. In both villages, conservation and improvement of the grasses and crop residues are not effectively practiced.

Furthermore, issues of seasonality remain prominent, as the mentioned sources of feeds are very scarce during dry seasons in the two villages. As a result, supplementation with purchased concentrates and crop residues help to alleviate the situation, although not sufficiently regarding both quantity and quality. The inclusion of protein-rich forages could add a crucial value to the grazing areas, while inclusion of purchased feed ingredients could perform the same in the situation of semi-intensive production system.

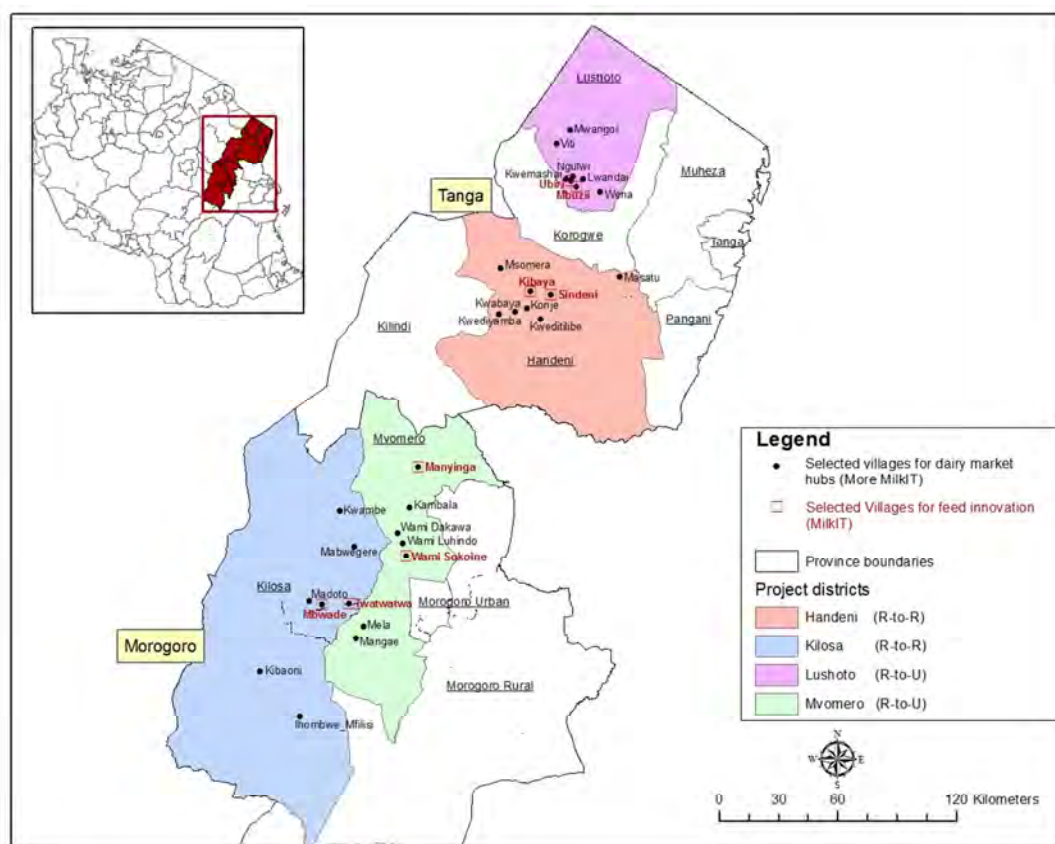
Therefore, interventions in the issues of markets and improved breeds that also counterpart feeds will have a great value in Manyinga village. On the other hand, intervening on markets, land and water issues with a complement of feeds will also make a progressive impact to farmers in Wami Sokoine.

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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
FEAST	Feed assessment tool, see http://www.ilri.org/feast
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: Enhancing Dairy-based Livelihoods in India and the United Republic of Tanzania through Feed Innovation and Value Chain Development Approaches)
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.