# Socio-economic values and traditional management practices of Tarime zebu cattle in Tanzania

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## Abstract

This study was conducted to determine the functions and desirable attributes of Tarime cattle found in northern part of Tanzania. Farmers' breed preferences and willingness to pay for Tarime cattle conservation were also assessed. A structured questionnaire was administered to 120 household heads keeping Tarime cattle in Tarime district.ref  SHAPE  \* MERGEFORMAT

The results indicated that 75.8% of the respondents depended on crop and livestock production and only 10% depended on livestock production alone as the main source of income. With regard to provision of food, both crop production and livestock keeping were equally important. Most farmers (85.9%) preferred to keep Tarime cattle rather than exotic dairy cattle and their crosses. The desirable attributes of Tarime cattle were good tolerance to diseases (73.4%), good draught animals (65%), good and taste meat (30.8%) and better milk quality (14.2%).  The purposes for keeping cattle were ranked in the following order: provision of draught power, dowry payment, milk, income and security against future uncertainties. Farmers practiced controlled breeding in order to maintain the genetic purity of their breed. This was done by choosing the best bulls for mating and castrating or selling young bulls which are not needed for breeding. Bulls for breeding were selected mainly based on size.  Farmers were willing to pay between TShs. 28,290.00 (~ US$ 22) and 159,000.00 (~ US$ 122) per year for conservation project. The willingness to pay was influenced by level of income, use of cattle for dowry payments and the ability of cattle to survive in harsh conditions and to resist diseases.

It is concluded that the livestock keepers in Tarime district prefer Tarime cattle to exotic dairy cattle. The preference of indigenous cattle by most farmers should be viewed as the most favourable starting point for conservation of Tarime cattle through sustainable utilization.

**Keywords:** breed preference, breeding practices, desirable attributes, indigenous cattle, roles

## Introduction

Tanzania is endowed with a large livestock resource mainly comprised of 18.8 million cattle, 13.6 million goats, 3.5 million sheep, 1.37 million pigs, and 53 million chickens (MLD 2007). The livestock sub-sector contributes 6.1% (MWLD 2004) of the total national GDP. Among the livestock species kept in Tanzania, cattle contribute significantly to income and human nutrition, particularly animal protein. Out of the 18.8 million cattle, 95% are indigenous breeds and the remaining are improved dairy (3%) and beef (2%) breeds. The indigenous breeds are the main source of livestock products in the country (Msechu 2001). About 95% of the indigenous breeds are kept under the agro-pastoral farming system, where the farming community is comprised of sedentary farmers who combine crop production with livestock keeping for sustenance of their livelihoods. The dominant management practice under the agro-pastoral system is herded grazing in communal lands, fallow lands and in crop fields after harvesting cereal grains.

The dominant breed kept under the agro-pastoral system is the Tanzania Shorthorn Zebu (TSHZ). The TSHZ breed is comprised by a number of strains, which include Iringa Red, Maasai, Mkalama Dun, Singida White, Mbulu, Gogo, Chaga, Tarime and Pare (Das and Mkonyi 2003). The Tarime cattle are kept by Kurya people who live in Mara region in the northern part of Tanzania. The predominant natural vegetation in the region is the savannah type and receives rainfall between 900 and 1200 mm/year (URT 2003). The Kurya are settled agro-pastoral farmers and mainly depend on crop production (Cassava, maize, sorghum, finger millet, beans, sweet potatoes, cotton and coffee) and livestock keeping (cattle, goats, sheep and chicken). The Kurya communities have been keeping Tarime cattle that were inherited from their great grand parents (Chenyambuga et al 2008b) and have decided to remain with the indigenous breed despite the introduction of high producing dairy breeds in some parts of the region. Although Tarime cattle do not receive much attention in terms of feeding and disease control, they maintain a reasonable level of productivity. The breed shows resilience to ticks and tick-borne diseases in comparison to other breeds found in the same areas (Chenyambuga et al 2008b). This is evidenced by the fact that farmers from other regions, as far as central and southern Tanzania, have been looking for it. The traditional knowledge and local customs of the Kurya has been the basis for shaping the adaptive characteristics of Tarime cattle (Msanga et al 2001). However, there is scanty information on the desirable attributes of Tarime cattle. In addition, indigenous knowledge, breed preference and breeding practices of the communities keeping the Tarime cattle have not been adequately documented. The objectives of this study were to determine the socio-economic roles and desirable attributes of Tarime cattle in order to enhance rational decision on their conservation, improvement and sustainable utilisation. The study also intended to describe farmers' breeding practices, traditional knowledge and breed preferences and to assess the willingness of local people to participate in conservation of their breed.

## Materials and methods

### Geographical location of the study area

The study was conducted in Tarime district, Mara region. Tarime district was chosen because it has high concentration of Tarime cattle. The estimated population of Tarime cattle in the district is 386,591. The district has a total area of 11,137 km$^2$, situated in the North of Tanzania and lies between latitudes 1°00" – 1°45" South of the Equator and Longitudes 33°30" - 35°0" East of the Meridian. The district has bimodal rainfall that starts in September to December (short rains) and

March to May (heavy rainfall). The land surface is divided into three zones (i.e. highland, midland and lowland zones). The highland zone has an altitude that ranges from 1500 to 1800 m above sea level (asl). This zone receives an average annual rainfall of 1200 – 1500 mm and average annual temperature is between 14 and 20°C. The midland zone lies between 1200 and 1500 m asl and has average annual rainfall and temperature of 900 – 1200 mm and 20 – 25°C, respectively. The lowland zone includes areas that lie between 1000 and 1200 asl. The zone receives rainfall of about 700 - 900 mm per year and the temperature ranges from 20 to 28°C.

**Research design**

The study was conducted in four wards; two of them were in the highland zone (Muriba and Kemambo) and the other two in the lowland zone (Manga and Kisumwa,). These wards were purposively selected among the 41 wards of Tarime district because they had large numbers of Tarime cattle and could be easily accessed. In each ward three villages were randomly selected from the list of villages in the ward.  The villages involved in the study were as follows: Manga ward (Mtana, Surubu and Bisarwi), Kisumwa ward (Kisumwa, Nyanchabakenye and Nyanjagi), Muriba ward (Muriba, Bungurere and Kobori) and Kemambo ward (Mrito, Kewanja and Kerende). In each village 10 households were randomly selected using random numbers from the list of all households keeping Tarime cattle in the village, making a sample size of 120 households. A cross-sectional research design was employed in this study. This method allows data to be collected at one point in time and it makes possible to determine relationships between different variables that are in focus at the time of the survey (Bernard 1994).

**Data collection methods**

The main instrument for collecting data was a structured questionnaire containing both closed and open-ended questions. The questionnaire was administered through individual interview of household heads. Other members of the household were allowed to attend the interview in order to supplement the information. The questionnaire was used to collect information on demographic parameters (age of household head, Sex of household head and household size), socio-economic characteristics (education level, marital status, occupation and relative importance of crop and livestock production to household income and food), livestock species kept, production systems, farmers' perception on the social and economic roles of Tarime cattle, desirable attributes of Tarime cattle, breed preferences and willingness to pay for conservation project .

Some information was collected through group discussions guided by a checklist. Group discussion involved key informants such as the Village leaders, Village Extension Officers, religious leaders and elders who had experience of keeping Tarime cattle. Information collected through this method included ranking of the socio-economic roles of Tarime cattle, quality of products obtained from Tarime cattle and important traditions used for management of cattle.

**Data processing and analysis**

Both qualitative and quantitative data from field survey were coded and analysed using the Statistical Package for Social Sciences (SPSS 2002) computer programme. Frequencies, percentages, means and standard deviations were used to summarize the data. The recorded

information from group discussions were summarised and synthesised according to the checklist used during the discussion. Further analysis was carried out using regression analysis to determine the influence of selected socio-economic factors on the willingness of farmers to pay for conservation of Tarime cattle. The regression model used is shown below:

$$Y_i = \beta_0 + \beta_1(X_1) + \beta_2(X_2) + \beta_3(X_3) + \beta_4(X_4) + \beta_5(X_5) + \beta_6(X_6) + \beta_7(X_7) + \beta_8(X_8) + e_i.$$

Where:

$Y_i$ = The amount of money that an $i^{th}$ respondent was willing to pay for conserving Tarime cattle.

$X_1$ to $X_8$ = independent variables determining the willingness of the $i^{th}$ respondent to pay i.e. $X_1$ = household income, $X_2$ = total number of cattle owned by a farmer, $X_3$ = ability of animals to tolerate harsh conditions and diseases, $X_4$ = education level, $X_5$ = Age of respondent, $X_6$ = breed preference, $X_7$ = use of cattle for draught power, $X_8$ = use of cattle for dowry payment.

$\beta_1$ to $\beta_i$ = Independent variable coefficients

$\beta_0$ = intercept

$e_i$ = Random error

## Results and discussion

## Household characteristics

Some of the household characteristics are presented in Table 1.

**Table 1.** Household related characteristics

| Parameter | Highland zone (n = 60) | Lowland zone (n = 60) |
|---|---|---|
| Average household size | 6.9 | 5.7 |
| Average land size, ha | 1.9 | 2.2 |
| *Most important enterprise to household food security* | | |
| Crop, % | 48.3 | 50 |
| Livestock, % | 51.7 | 50 |
| *Most important enterprise to household income* | | |
| Crop, % | 18.3 | 31.7 |
| Livestock, % | 81.7 | 68.3 |

*Note: n = number of respondents*

The average household size across the entire sample was 6.3. The household size observed in this study is slightly higher than the average household size of 5.5 for Mara region reported in the Population and Housing Census report (URT 2004). The average ages of the household heads in male and female-headed households were 52.3 and 55.3 years, respectively. The majority of the respondents had either primary education (51.7 %) or non-formal education (47.5%). The average household monthly income for the highland zone (TShs. 6,248.30, ~ US$ 4.8) was higher than that of lowland zone households (TShs. 4,570.80, ~ US$ 3.5). The Difference in income can be attributed to cash crop production (coffee and banana) in the highland zone which does not exist in the lowland zone.

A large proportion of the households (79%) in the surveyed villages were male-headed and only 21% were female-headed. The majority of the household heads for the female-headed households were widows. This observation agrees with the findings of Maeda-Machang'u et al (2000) who reported the dominance of males in heading the households and ownership of cattle in agro-pastoral communities of Tanzania. This indicates that the access to resources in the traditional societies is determined by the patriarchal system in which males have dominance over women in all the household-related authorities. This is due to the fact that in these communities, inheritance of resources favours men over women. The basic resources such as land and livestock are owned and controlled by men.

The household heads in the study area were also asked about their major source of income. The results revealed that 75.8% of respondents depended on crop and livestock production while only 10% depended on livestock production alone as the main source of income. When asked to rank between crop production and livestock keeping, most of the respondents said that livestock production was more important than crop production (Table 1). In both zones cattle were regarded as the major contributor to household income through selling of live animals and livestock products (mainly milk, butter and hides). Cash crops in the highland zone (coffee and banana) and food crops (maize, sorghum, rice and finger millet) in the lowland zone were considered as second important enterprises for generating household income. Other sources of income were pension (5%), off-farm business (1.67%) and crop production (1.67%). With regard to food security, both crop production and livestock keeping were equally important and this was reported in both zones (Table 1). This suggests that there is a high level of crop-livestock integration in Tarime district. Livestock contribute to food security indirectly through provision of draught power and manure which in turn results into increased production of food crops (sorghum, maize, finger millet, sweet potatoes, legumes and vegetables) grown in the area. Livestock are also sold during the period of food shortage to buy cereal grains (finger millet, sorghum, maize), thus contributing directly to food security. This agrees with Krishna et al (2004) who reported that livestock play a crucial role in coping with risk and providing livelihood options in the face of increasing climate variability.

**Livestock species kept by the households**

All farmers interviewed kept more than one livestock species. Table 2 summarizes the indigenous animals kept by farmers in the study area.

**Table 2.** Number of animals for different livestock species kept in the surveyed villages

| Species | Mean | SD | Minimum | Maximum |
|---|---|---|---|---|
| Local cattle | 44.8 | 43.5 | 3 | 256 |
| Local goats | 22.4 | 16.2 | 2 | 94 |
| Local sheep | 12.5 | 16.1 | 0 | 104 |
| Donkeys | 0.7 | 1.3 | 0 | 6 |
| Local chicken | 41.4 | 22.9 | 2 | 105 |
| Ducks | 2.3 | 6.1 | 0 | 42 |

The practice of keeping several types of livestock observed in the present study is common in most smallholder holdings of developing countries where farmers keep different types of livestock species mainly for socio-economic and socio-cultural reasons (Bebe et al 2003). Among the livestock species kept by farmers, cattle had the highest number, followed by chicken, goats and sheep. The observed high number of cattle per household reflects the importance of cattle to the livelihoods of agro-pastoralists in comparison to other livestock species. This is in agreement with the observation by Msechu (2001) that indigenous cattle are the major source of meat and milk in Tanzania and they provide a genetic resource base which is abundantly available and can be exploited for improving the well-being of rural people.

Most farmers (72.5%) reported that they acquired their initial stock of Tarime cattle through inheritance. Others obtained their initial stock by being paid bride price (12.5%), wages after taking care of other people's cattle (10%), and purchasing from their neighbours and local livestock markets (5%). Table 3 shows the herd structure of Tarime cattle.

**Table 3.** Herd structure of Tarime zebu cattle

| Herd structure | Location | | | | | |
| | Highland zone | | | Lowland zone | | |
| | n | Mean | SD | n | Mean | SD |
| --- | --- | --- | --- | --- | --- | --- |
| Male young stock | 60 | 3.70 | 3.50 | 60 | 3.75 | 3.24 |
| Male adults | 60 | 9.17 | 8.14 | 60 | 10.02 | 12.68 |
| Female young stock | 60 | 9.00 | 9.39 | 60 | 9.03 | 7.34 |
| Female adults | 60 | 20.43 | 16.17 | 60 | 24.53 | 27.84 |

*Note: n = number of respondents*

The results indicate that the number of adult females was significantly higher than that of adult males in both zones. The ratio of males to females in highland zone was 1:2.2 while in the lowland was 1:2.4. These ratios portray a proportionately larger number of breeding bulls because; the bulls are also needed for provision of draught power. According to Mwacharo and Rege (2002), this ratio is expected in livestock production system where the main function of bulls is reproduction and provision of draught power.

**Cattle breed preferences and production systems**

The majority of the interviewed farmers in the highland (75%) and lowland (96.7%) zones reported that they still prefer to keep Tarime cattle (Table 4) and rejected the idea of shifting to new improved breeds (Exotic dairy cattle and their crosses).

**Table 4.** Cattle breed Preference and production systems

| Parameter | Highland (n = 60) | Lowland (n = 60) |
| --- | --- | --- |
| *Breed preference* | | |
| Tarime breed, % | 75 | 96.7 |
| Exotic breeds, % | 1.7 | 0 |
| Crosses of Tarime and exotic breeds, % | 23.3 | 3.3 |

| | | |
|---|---|---|
| *Production system* | | |
| Backyard, % | 38.3 | 3.3 |
| Extensive, % | 61.7 | 96.7 |

The farmers argued that the improved breeds cannot survive better in their area because they need special care (good house, frequent use of veterinary drugs for prophylactic and treatment, indoor feeding and watering) which makes cattle keeping enterprise to be very expensive for them. On the other hand, the Tarime cattle were credited for their adaptation characteristics manifested by their ability to walk long distances and grazing and digesting poor quality forages. Furthermore, the farmers reported that Tarime cattle are relatively resistant to endemic diseases. Although the results in Table 4 indicate that the majority of the respondents in both zones preferred Tarime cattle, there was significant association between zone and the breed preferred. More farmers in the highland zone (25%) preferred to keep improved dairy breeds than in the Lowland Zone (3.3%). The farmers who preferred to keep improved breeds said that the improved breeds grow faster, have big mature body size and produce large amount of milk compared to the indigenous breed. However, during group discussions with key informants it was revealed that consumers in Tarime district prefer meat and milk from Tarime cattle, despite the abundant availability of these products from improved dairy cattle. It was reported that the demand for meat and milk from the local cattle is higher than the demand for the same products obtained from improved breeds, both in rural areas and towns.

During group discussions it was also revealed that, despite having mixed types of colour in their herds, the majority of farmers prefer Tarime cattle with brown colour or mixture of brown and white colour, but they do not prefer cattle with black colour due to the reasons that they easily get tired when used as draught animals and succumb to ticks. Hence, in the local livestock markets the black coloured animals are sold at a cheaper price than the brown or red cattle.

Table 4 shows the cattle production systems practiced in the study area. The majority (79.2%) of farmers practiced traditional extensive grazing system, whereby cattle were herded continuously during dry and wet seasons. Some few farmers practiced backyard production system whereby cattle were grazed around the households. There were more farmers in the highland zone (38.3%) who practiced this system than in the lowland zone (3.3%). This is due to the fact that there is high land pressure in the highland zone while in the lowland zone there is ample space which can be used for grazing. Feeding of cattle depended entirely on grazing natural pastures in communal lands.

**Socio-economic values of cattle**

The purposes of keeping Tarime cattle are summarized in Table 5.

**Table 5.** Purposes of keeping Tarime cattle and their ranking order according to importance

| Purpose | Highland zone (n =60) | | Lowland zone (n = 60) | |
|---|---|---|---|---|
| | Respondents, % | Ranking order | Respondents, % | Ranking order |
| *Socio-Economic uses* | | | | |
| Home consumed milk | 88.3 | 3 | 90.0 | 3 |

| | Highland % | Highland rank | Lowland % | Lowland rank |
|---|---|---|---|---|
| Home consumed meat | 58.3 | 6 | 75.0 | 6 |
| Store of wealth /assets | 11.7 | 7 | 11.7 | 7 |
| Income from livestock products and live animals sales | 30.0 | 5 | 50.0 | 5 |
| Security (savings and insurance) | 16.7 | 4 | 30.0 | 4 |
| Draught power | 60.0 | 1 | 85.0 | 2 |
| Manure | 6.7 | 9 | 6.7 | 9 |
| *Socio-Cultural uses* | | | | |
| Dowry payments | 45.0 | 2 | 56.7 | 1 |
| Prestige | 8.3 | 8 | 8.3 | 8 |
| Sacrifice | 1.7 | 11 | 1.7 | 11 |
| Hides/skin | 5.0 | 10 | 5.0 | 10 |

*Note: Data on percentages were based on multiple responses*

The purposes for keeping cattle were to provide milk for home consumption (89.2%), draught power (72.5%), meat for home consumption (66.7%), dowry payment (50.8%), source of income (40%) and savings and security against future uncertainties (23.3%). The observations in the present study are consistent with the findings of Rege and Gibson (2003) who reported that indigenous cattle produce milk and meat for subsistence, supply draught power and manure for cropping and provide fibre, skin and transport and sales of livestock provide farmers with cash to purchase household necessities and farm inputs. In the present study provision of draught power, dowry payment, milk for home consumption, income from sales of live animals and livestock products and security against future uncertainties were ranked high while sacrifice, prestige and manure were ranked low by farmers of both zones (Table 5). However, the orders of ranking were slightly different between the two zones. Provision of draught power and dowry payment were ranked first and second purposes of keeping cattle in the highland zone while in the lowland zone dowry payment was more important compared to draught power. The findings of the present study slightly differ with the observation of Chenyambuga et al (2008a) who assessed the uses of Iringa Red cattle in Iringa region, Tanzania. In their study, provision of manure was ranked first while draught power and milk were ranked as second and third purposes for keeping cattle.

**Traits/attributes of Tarime cattle preferred by farmers**

The desirable characteristics of Tarime cattle according to the respondents are indicated in Table 6.

Table 6. Preferred traits/attributes of Tarime cattle (N = 120)

| Parameter | Highland, % (n = 60) | Lowland, % (n = 60) | Overall, % (N = 120) |
|---|---|---|---|
| Disease resistance | 70 | 86.7 | 78.3 |
| Draught power | 61.7 | 68.3 | 65 |
| Good meat taste | 30 | 31.7 | 30.8 |

| | | | |
|---|---|---|---|
| Meat production | 6.7 | 26.7 | 16.7 |
| Good milk quality | 25 | 3.3 | 14.2 |

*Note: Data were based on multiple responses*

Most respondents in both zones mentioned that Tarime cattle have good tolerance to diseases, are good draught animals and have good and taste meat. With regard to milk, 14.2% of the respondents said that milk from Tarime cattle has better quality compared to the milk from improved dairy breeds. This was reflected by the fact that more supply of milk in Tarime town was obtained from the traditional sector. During the group discussions with key informants it was revealed that most people in Tarime district prefer milk from indigenous cattle. Also Tarime cattle were reported to be docile and easier to train as draught animals.

The perception by the livestock keepers that Tarime cattle are tolerant to diseases, good draught animals and have good meat taste, indicates that these cattle are important to their livelihood and posses survival traits which enable them to live and produce under low level of management. The results are consistent with the findings of Rege and Tawah (1999) who reported that, indigenous cattle are blessed with tick resistance and tolerance to vector-borne diseases and they frequently perform better than exotic breeds under low-input conditions, climatic stresses, especially during times of drought. The desirable characteristics of Tarime cattle were their high level of resistance to diseases and efficient utilization of poor quality feeds and good adaptability to harsh environment. This is due to the fact that most farmers do not control ectoparasites and endoparasites through dipping and drenching, respectively, and the animals are only housed at night in yard/kraal without being protected from sun, rains and harsh winds. All farmers reported that they do not provide supplementary feeds to their animals, thus feeding is solely dependent on natural pastures and cereal crop residues in the dry season after harvesting the grains.

**Socio-economic factors influencing the willingness to pay for conservation of Tarime cattle**

The purpose of this study was to find out if livestock keepers would be willing to contribute to the costs of conserving Tarime cattle. The results indicated that 55% of the farmers interviewed were willing to pay while 45% said that they cannot afford to pay for conservation project. Most of the respondents who were willing to pay were interested in paying cash rather than using their livestock, reflecting the strong attachment these people have with their livestock. The average amount of money that farmers were willing to pay in order to conserve Tarime cattle was TShs. 28,290.00 (~ US$ 22) and 159,000.00 (~ US$ 122) per year in the highland and lowland zone, respectively. This means that the keepers of indigenous livestock can contribute to conservation of their breeds if properly sensitized. The difference in the amount that farmers were willing to pay is a reflection of the fact that a significant number of farmers in the highland zone would prefer to keep improved breeds not only because of the favourable agro-ecological climate but also the shortage of grazing land.

The multiple regression analysis employed to determine the socio-economic factors that influence the willingness to pay indicated that the level of income significantly ($P \leq 0.05$) influenced the willingness to pay for conservation of Tarime cattle (Table 7).

**Table 7.** The relationship between socio-economic variables and willingness to pay for Tarime cattle conservation

| Variable | $\beta_i$ | P |
|---|---|---|
| Household Income | 0.301 | 0.000 |
| Number of cattle owned by household | 0.116 | 0.202 |
| Ability of animals to tolerate diseases | 0.220 | 0.015 |
| Age of household head | -0.181 | 0.079 |
| Dowry payment | 0.276 | 0.005 |
| Household head education level | -0.116 | 0.267 |
| Cattle breed preferred | 0.082 | 0.342 |
| Draught power | 0.104 | 0.201 |

*Coefficient of determination ($R^2$) = 0.503*

This is probably due to the fact that the households with higher incomes were deriving most of their incomes from indigenous livestock related activities and hence, the household heads were more willing to pay in order to conserve their cattle. If outputs from Tarime cattle are assumed as normal goods, it is expected that farmers with higher income would bid larger amounts. Another variable that influenced the willingness to pay for conservation of Tarime cattle was dowry payments. Dowry payment is very common in the area and it ranges from 7 to 40 heads of cattle. The household heads would like to maintain large number of cattle in order to be able to pay bride price for their sons and hence, more willing to pay for Tarime cattle conservation. The third factor that influenced the willingness to pay for conservation of Tarime cattle was the ability of cattle to survive in harsh conditions and to resist diseases. This is expected as traditional livestock keepers live in marginal areas with poor infrastructure and, therefore, would like to maintain the animals which are adapted to their environment and can survive and reproduce with minimum care. With regard to herd size, no systematic relationship between the total number of cattle owned by households and the amount of the bid was found. However, the coefficient was positive, indicating that households with large number of cattle would bid more. The remaining socio-economic variables (age of house head, education level, breed preference and use of animals for draught power) were not important factors for motivating the livestock keepers to pay for Tarime cattle conservation.

**Breeding practices and local customs used in the management of Tarime cattle**

The breeding method used by all farmers was natural mating. Most respondents reported that they practice controlled breeding in order to maintain the genetic purity of their breed. This was done by choosing the best bulls for mating (75.8%) and castrating (63.3%) or selling (5%) young bulls which are not needed for breeding. Some farmers were grazing their animals separately (5%) to avoid bulls from other herds. Bulls for breeding were selected based on size (73.3%), shape/conformation (36.7%), health status (31.7%), survival of bull's offspring (28.2%), colour (red or brown and mixture of these with white colour) (24.2%), milk production of the dam (10.0%) and size of the testicles (10.0%). Some farmers (24.2%) practiced uncontrolled mating as they did not use their own breeding bulls, but allowed their cows to mate randomly with bulls from other herds in the same village or nearby villages during grazing time.

During group discussions it was revealed that the Kurya, who are the traditional keepers of Tarime cattle, have local customs that contribute to maintaining genetic diversity of their cattle. It was mentioned that there is a traditional practice which is known as "kusaghari" in Kulya language. It involves dividing the herd into small groups and distributing them to relatives and friends who can rear the animals on behalf of the owner. It was reported that one individual can give up to two-third of the animals in his/her herd. This practice is ubiquitously practiced in many parts of Tarime district and the region as a whole and serves an important function of reducing the risk of loosing animals through disease outbreak, natural catastrophes and cattle raids. The practice is also regarded as a form of assistance, whereby people with large number of cattle give some of their animals to poor families (those without or with few cattle) so that they can get milk and draught power. In this way poor people are helped to improve their livelihoods by getting milk, hence, better nutrition and more food and income resulting from increased acreage of crop farms through the use of draught animals. This practice portrays the importance of social capital, including factors such as trust, and it provides opportunity for *in-situ* conservation. This observation is in agreement with Mbwambo (2000) who reported that local institutions constitute an essential component of any attempt to facilitate community engagement in conservation and management of biological diversity. The observations are also consistent with the findings of Köhler-Rollefson (2000) who reported that; it is difficult, if not impossible, to implement *in-situ* conservation without understanding and invigorating local institutions and embedded knowledge systems.

## Conclusions and recommendations

- The present study has revealed that the livestock keepers in Tarime district prefer Tarime cattle due to their ability to tolerate diseases, especially tick-borne diseases and walk long distances in search for pastures and water. Other desirable characteristics were their working ability, testier meat and good quality milk. Docile temperament and easiness to train as draught animals were the other criteria that made Tarime cattle to be preferred by farmers. The most important function of Tarime cattle are dowry payment, provision of draught power, milk, security against future uncertainties, income and meat, in that order of decreasing importance.

- Most Farmers practiced controlled breeding in order to maintain the genetic purity of their breed. This was done by choosing the best bulls for mating, castrating or selling young bulls which were not needed for breeding and grazing separately to avoid bulls from other herds. Bulls for breeding were selected based on size, shape/conformation, health status, survival of bull's offspring, colour (red or brown and mixture of these with white colour), milk production of the dam and size of the testicles.

- The majority of farmers in the highland and lowland zones still prefer to keep Tarime cattle and are willing to pay for conservation project. The preference of indigenous cattle

by most farmers can be viewed as the most favourable starting point for conservation of Tarime cattle through sustainable utilization. Thus, there is a need to establish reliable source of support from government, research institutions, non-government organizations and other institutions including donors for conservation of Tarime cattle. Also there is a need to give special recognition for Tarime cattle through advocacy and documentations of their special adaptive traits. The people who keep Tarime cattle should have guaranteed access to grazing lands in order to be in a position to maintain their animals.

## Acknowledgement

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