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Economic valuation of pastoral meat production system in Arusha region, Tanzania

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Abstract

The livestock sector in Tanzania has had and continues to have a major role for the overall national development. Historically, it has been an important arena for the debate over the appropriate development the country should undertake. Ideas of ‘tradition’ and ‘modern’ livestock production system(s) continue to influence policy making processes with the first, mobile pastoralism, considered backward by policy makers, and the second, the ranching system, being highly regarded in policies that touch on the development of the livestock sector as a whole. This paper uses the value chain approach as an analytical tool to provide a (re)assessment of the value of the pastoral system (from producers to end consumers) which is often absent from official statistics and figures besides the bare number of tax revenues. The analysis focuses specifically on red meat which has a crucial role for food security as well as in the culture of the country. The results of the paper show that the total value of the pastoral value chain with respect to meat only is substantially higher than the value of pastoralism reported in (scant) data in official statistics. These results strengthen the policy-related objective of the paper which is to prove the contribution of pastoralism as a highly efficient system that supports many livelihoods and worthy of more government support. The conclusion that can be drawn is that ranching system may well co-exists with pastoralism but the two need not be mutually exclusive.

Keywords: pastoralism, livestock sector, value chain analysis, economic valuation, red meat production, Tanzania

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1. Introduction

With the third largest livestock herd in Africa after Ethiopia and Sudan, Tanzania is modernising its livestock sector (URT 2006a: 1). Growing domestic and regional demand for livestock products, largely as a result of an increasing urban population with improved income, is driving recent livestock policies. Tanzania's population is projected to grow from 44.7 million in 2010 to 70.8 million by 2025, with the percentage of people living in urban centres rising from 26 per cent (2010) to 34 per cent by 2025 (URT 2006b). In this context, the livestock sector is recognized as having an important role to play in building a strong national economy and contributing to local livelihoods. The sector currently generates 30 per cent of agricultural GDP, and indirectly supports millions of farmers while directly sustaining around one million pastoralists.⁵⁴

The government of Tanzania is earnestly trying to improve the productivity of the livestock sector to meet growing demand for meat, milk and other products such as hides and skins, and in so doing contribute to national economic development. Recent droughts in Tanzania, however, have heightened government concerns for the viability of the country's livestock production systems where 99 per cent of the livestock are reared by small-holder farmers and pastoralists with commercial ranches and dairy farms constituting the remaining 1 per cent.⁵⁵ With increasing climate variability and incidence of extreme events (droughts, floods), there are fears that the 'traditional' livestock sector, as it is known in Tanzania, will collapse, driving millions of people into destitution at huge cost to the national economy.

The focus of the *National Livestock Policy* (2006a) and the *Grazing-Land and Animal Feed Resources Act* (2010) are to promote a commercially oriented, competitive and more efficient livestock industry through further investment in the existing intensive sector (ranching, dairying), and by modernising the extensive sector dominated by small-holder producers (i.e. the pastoralists). A key objective of the Livestock policy 2006 is "to promote commercial production of high quality beef in intensive and extensive (ranching, pastoral and agro-pastoral) systems" (URT 2006a: 6). The *Grazing-Land and Animal Feed Resources Act* 2010 envisions modernising pastoralism by limiting livestock husbandry to specific areas in which forage, water and other inputs are provided, and livestock numbers and movement strictly controlled.

This is a vision of livestock production in Tanzania that seeks to control, through technical means, the major factors of livestock production, and that is informed by a belief that the 'traditional' sector is backward, economically inefficient and environmentally destructive. These views have endured since colonial times (Hodgson 2001) but have re-emerged in recent years, in response to a perception that extensive livestock keeping is incompatible with a modern world, is no longer able to ensure the food security or livelihoods of rural communities, or contribute meaningfully to national economic growth.

It is widely believed that modern commercial ranching (particularly of cattle) that controls stocking densities and invests in high-yielding cattle breeds, water, pasture development and

⁵⁴ Source: <http://www.tanzania.go.tz/livestock.html>.

⁵⁵ Ibid

veterinary inputs, is more productive than traditional livestock systems like pastoralism. But this is not evidence based. Research conducted in the 1980's and 1990's in Ethiopia, Kenya, Botswana and Zimbabwe comparing the productivity of ranching against pastoralism all came to the same conclusion: pastoralism consistently outperforms ranching, and to a quite significant degree as indicated in Table 1 .

Table 1: Productivity of pastoralism and ranching

Productivity of pastoralism and ranching		Unit of measure
Ethiopian Boran pastoralists (Cossins 1985)	157 per cent more productive compared to Kenyan ranches	Megajoules of gross energy derived per hectare per year from meat, milk and edible offal.
Kenya Maasai pastoralists (Western 1982)	185 per cent more productive compared to east African ranches in general	Kilograms of protein produced per hectare per year
Botswana pastoralists (De Ridder and Wagenar 1984)	188 per cent more productive compared to Botswana ranches	Kilograms of protein produced per hectare per year
Zimbabwean pastoralists (Barnett 1992)	150 per cent more productive compared to Zimbabwean ranches	US\$ generated per hectare per year

Given that 90 per cent of the nation's livestock herd is raised under 'traditional' agro-pastoral and pastoral systems, these policy directives, if implemented, will have a significant impact on the country as a whole. If, as earlier research findings indicate, ranching is significantly less productive per hectare of land than pastoralism, then these policies will result in less meat and less milk being produced on Tanzania's rangelands. This will not only disadvantage the majority of livestock keepers in the rural areas, but also the whole Tanzania's growing urban population who currently enjoy relatively abundant and affordable meat produced in the agro-pastoral and pastoral sectors.

"Traditional" pastoral production system is often (if not always) not accounted for in national statistics (Hesse and MacGregor 2006). Therefore, it is often neglected in natural resource management decisions, which instead favour ranching or other (unsustainable) options that can, in short-term, produce goods to sell in the market. Thus, an explicit (rather than implicit) understanding of the economic contribution of the pastoral production system to the local or national economy is crucial.

This study aims to assess the benefits and costs of producing meat under pastoral systems and estimate the economic (and livelihood) contribution of the system to the local economy. Whilst it is recognised that the livestock sector's benefits are far wider than the meat it produces for domestic consumption and regional export, the decision to focus on this one product is a response to the key objective of the National Livestock Policy "to promote commercial

production of high quality beef in intensive and extensive (ranching, pastoral and agro-pastoral) systems” (URT 2006a: 7) and the fact that it plays an important role in the country’s nutritional, social and cultural traditions, particularly in urban centres.

2. Analytical framework: economic valuation of pastoralism

If at all accounted in national statistics, official data on pastoralism set focus exclusively on direct, easily measurable values and fail to incorporate the many indirect values of pastoralism. Information is regularly collected on direct (non-subsistence) outputs such as meat and milk production or the export of live animals and hides and skins, but these focus exclusively on sales in the formal sector and often are estimates built on estimates. When properly collected and analysed, official data can reflect the true extent of economic activity in formal economic sectors. But sectors with a significant informal dimension present a major challenge vis-a-vis official data collection methods, leaving official data available inevitably skewed away from informal sector and hence not reflecting actual economic dynamics.

What is needed, then, is a dynamic economic model of pastoralism that incorporates and quantifies the full range of direct and indirect values that it provides. This approach is termed as *Total Economic Value* (TEV) and brings together both direct and indirect values (Hesse and MacGregor 2006). Applying TEV to pastoralism would reflect environmental benefits as well as the support it provides to rural and urban communities as demand for meat and dairy products rises. Only by investigating the overall contribution of pastoralism to society can its real potential be realised and valued, and relevant policies be targeted more effectively.

Figure 1 uses the TEV approach to identify the range of direct and indirect values that can be attributed to pastoralism as a first step in exploring its total value. However, in this study, a very conservative approach where only the value of meat is used. This choice was taken mainly for the sake of enabling a comparison between the pastoral and ranching value chains, based on the fact that very often (if not always) pastoralism is compared with ranching based on the amount or value of meat that both systems produce.

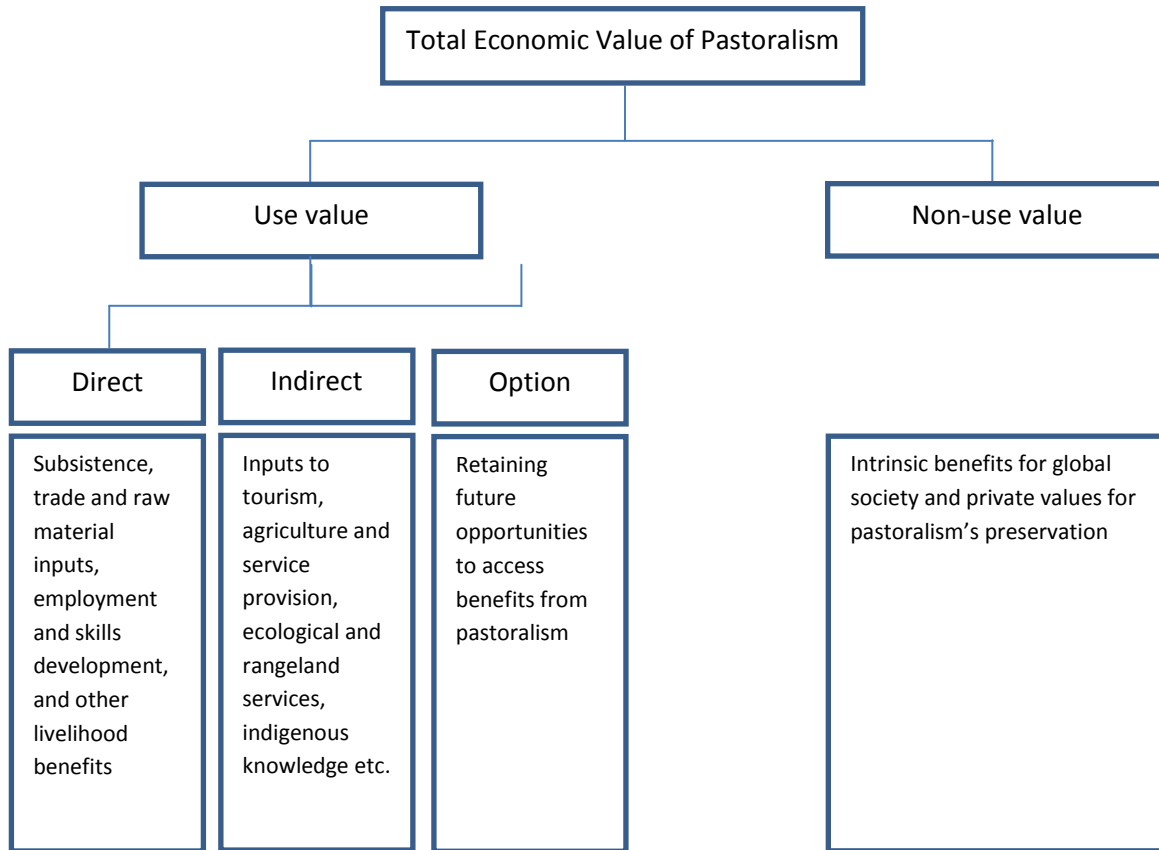


Figure 1 Total economic value of pastoralism. Source: Hesse and MacGregor (2006)

3. Tanzania’s livestock sector at a glance

It is estimated that out of a total of 88.6 million hectares of land in Tanzania 60 million hectares is rangeland suitable for livestock grazing with a carrying capacity of 20 million tropical livestock unity (TLU) against 17 million TLU presently kept in the country (URT 2006a: 15). Such rangeland includes resources such as water for livestock, forests and pastures either communally managed or privately owned. Available data on the contribution of the livestock sector to the national economy are often combined with data on the agricultural sector in national official documents. In the livestock policy 2006 for instance it is stated that livestock accounts for 5.9 per cent of the agriculture sector which in turn constitutes 45.6 per cent of the national GDP (URT 2006a: 2).

The contribution of livestock to the GDP is subdivided into beef production (40 per cent), dairy products (30 per cent) and the remaining 30 per cent is poultry and small stock (URT 2006a: 2). Besides the total share of GDP of the livestock sector the livestock policy 2006 does recognize the importance of other benefits and contribution of livestock to rural people; such benefits, however, are not quantified and no official data are available. Some of the benefits mentioned are: providing animal food products (e.g. meat, milk), providing hides, skins and other raw

materials to the local industries, providing jobs and other sources of income (e.g. livestock trade) especially within the rural informal economy (URT 2006a: 2-3).

Government policies and documents commonly subdivide the livestock sector in Tanzania into three different systems of livestock rearing, namely, pastoral, agro-pastoral and (commercially-oriented) ranching depending on the characteristics, tools and techniques used, and the degree of integration into the official market system. The livestock policy 2006 subdivides the sector into 'extensive' and 'intensive' whereby the former refers to the pastoral and agro-pastoral and the latter to ranching.

A considerable section of the Tanzanian population relies on the pastoral economy based on livestock mobility and shared natural resources. It is estimated that up to 4 million people (10 per cent of the whole population) depend solely on pastoralism with no or little contribution from other activities for their livelihood (MMA and CDP-EA 2008: 6). This kind of system of raising livestock is mostly practiced in what is usually referred to as Arid and Semi-Arid Lands (ASAL) which in Tanzania are mostly found in the northern and central regions. Households involved in agro-pastoralism have significantly less livestock which is raised mostly in privately owned plots and despite the fact that in some areas portions of grazing land are still managed communally.

The third system, ranching, had its peak in the 1980's and 1980's with the National Ranching Company (NARCO). The NARCO experience did not produce the results and outputs planned and wished for, with NARCO ranches eventually privatized and subdivided into smaller ranches of 500-to-5000 hectares even though some ranches are still owned by the government .. Smallholder dairy production has received a particular attention both from government and the development sector and that has allowed a rapid increase of dairy herds from less than 200,000 in the 1980's to over 500,000 dairy cattle in the last decade (MMA and CDP-EA 2008).

3.2 Review of policies involving the livestock sector in Tanzania⁵⁶

The National Strategy for Growth and Reduction of Poverty (NSGRP) 2005 does recognize the importance of pastoralism as a sustainable livelihood system. The Agricultural Policy 1997 acknowledges the challenges and conflicts involving management of natural resources and the vulnerable position of pastoralists; to deal with such issues the policy intends to support mobility through "coordinate planning and the provision of stock routes and other mechanisms" (URT 1997: 29). The policy has also the intent to resolve conflicting interests involving natural resources (URT 1997: 31). The Agricultural Sector Development Strategy (ASDS) 2001 is in line with the Agricultural Policy 1997 in that one of its statements refers to the need to improve the wellbeing of the people whose principal occupation and livelihood are based on livestock. The measures mentioned to achieve this goal are the strengthening of support to the mobile system.

Despite the good intents, these policies and strategies suffer from a lack of legal measures and tools to deal with land conflicts. All policies and acts on the use of land and conservation throughout the 1990's in fact override the policies dealing specifically with the livestock sector in terms of legal tools for the enactment of the proposed goals. The Land Policy 1995

⁵⁶ Views and opinions reported in this policy review are mostly taken from Matte and Shem, 2006

highlighted a negative impact that large herds have on the environment by putting pressure on land and creating conflicts. The Tanzania Investment Act 1997 contributed to make land a marketable commodity by setting aside 2.5 million hectares of land for possible investors. The Wildlife Policy 1998 and Forest Policy 1998 further contributed to the alienation of pastoralists by giving priority to the conservation of environment and wildlife. Both policies saw wildlife and livestock as in conflict with each other and by giving the priority to the first in fact weakened pastoralists' voice in claiming rights over land.

The most recent policies touching on the livestock sector such as the Livestock Policy 2006 and the Grazing Land and Animal Feed Resources Act 2010 openly favour the so-called 'intensive' system of livestock rearing which is commercially-oriented and supposedly contributes to the national development and GDP. The good intents stated in the previous Agricultural policy 1997 and ASDS 2001 on behalf of mobility have disappeared in these two recent documents; communal grazing is deemed to be causing 'uncontrolled' movements of livestock which leads to "spread of animal diseases, social conflicts between livestock farmers and other land users" (URT 2006a: 16) and with traditional pastoralism (the so-called 'extensive' system) being "constrained by poor animal husbandry practices, lack of modernization, accumulation of stock beyond the carrying capacity and lack of market orientation" (URT 2006a: 1).

4. Methodology

4.1 Study site

Data collection was done in Arusha region, in the two areas of Arusha district council, which is part of Arumeru district, and Arusha Municipal, which is a district on its own. Arusha region is one of the 26 administrative regions of Tanzania with a size of 34,516 km² (after the split with the recently formed Manyara region). Arusha region is situated in the north-central area of the country and it borders on the west with Mara and Shinyanga regions, on the south-east with Manyara and Kilimanjaro regions and on the north with Kenya. According to the 2002 demographic census the total population of the region is estimated to be 1,288,088 with an annual increase of 3.9 per cent.

The region is divided into six districts: Arusha Municipal, Arumeru (made of Arusha and Meru District Councils), Karatu, Longido, Monduli and Ngorongoro and the regional capital is Arusha city. The region can be subdivided into three distinct agro-economic zones which differ in soil types and climatic conditions and eventually impact on the dominant economic activities pursued in the region⁵⁷. The three zones are: (1) banana/coffee zone in Arusha and Arumeru (2) Rift Valley highlands in Karatu and Ngorongoro, and (3) Maasai steppe in Longido, Monduli and part of Ngorongoro. The economy of the region is to a major extent still based on traditional activities such as rain-fed agriculture and livestock keeping; it is therefore particularly dependent on climatic conditions and vulnerable to climatic extreme events such as droughts which are particularly frequent especially in the drier areas of the Maasai steppe. Although the region is generally able to produce surplus food, poor infrastructures and communication networks may cause food shortages in some remote areas and especially in drought years.

⁵⁷ Arusha Region Socio-Economic Profile

The livestock sector in Arusha region is particularly important. The region ranks second in the total number of livestock units; in terms of cattle only, it ranks fourth after Shinyanga, Tabora and Mwanza regions. It also ranks first and second respectively in number of goats and sheep (URT 2012: 56). Arusha district and municipal council host one of the most modern public abattoirs (the other being in Dodoma) which slaughters and processes meat for internal and export market with a capacity of 200 cattle and 200 other ruminants per day (MMA and CDP-EA 2008: 17). The meat sector is particularly developed in Arusha district and municipal council with increasing demand of meat by local people and a growing number of *nyama choma* businesses.

Table 2 Livestock population in Arusha district and municipal council

	Local Cattle	Local Goats	Sheep
Arusha District Council	197,958	199,858	185,100
Arusha Municipal Council	23,420	12,223	6,740

3.2. The value chain approach to valuation

There are different techniques that can be employed to estimate or measure the economic value of goods and services. In this study, as highlighted above, the economic contribution of pastoral meat production system is assessed with the value chain approach which involves mapping value chain actors, starting from pastoralists to end consumers. The costs of production and revenues of each actor are estimated. The net benefit gained by each actor represents the average (monetary) value accrued by that actor. The total sum of value accrued by each actor multiplied by the number of actors in the production system within a defined geographical boundaries can be interpreted as *total value added*. In other words, the total value added in the meat production system is the economic contribution of pastoralism to the local economy.

This can be mathematically represented by the equation:

$$VA_i = TR_i - TC_i \quad [1]$$

Where VA_i is value added or net profit of actor i ; TR_i is total revenue of actor i ; and TC_i is the total cost of actor i .

To estimate the total value added or net profit accrued by each actor, equation 1 was multiplied by the number of actors in each classified business; therefore,

$$TEV_i = (TR_i - TC_i) N_i \quad [2]$$

To obtain the total economic value of pastoral meat production system, the ‘total’ net benefits accrued by each identified actor were added.

$$TEV = \text{sum} [(TR_i - TC_i) N_i] \quad [3]$$

3.3 Value chain actors

To identify the value chain actors, key informant interviews with policy makers, practitioners and local communities were held. This enabled us to map the value chain actors. Eight supply chain actors were identified. Brief descriptions of the actors are provided below.

Pastoralists: An exact definition of a pastoralist may be difficult to formulate. Generally speaking a pastoralist depends to a great extent on livestock production to sustain himself and his/her family. The degree of dependence, system of raising livestock and type of livestock itself may vary depending on the geographical area and level of economic diversification. In this paper the kind of pastoralist and pastoralism analysed are those typical of the Arid and Semi Arid Lands with scarce availability of natural resources and unpredictable rains which entail seasonal movements in search of pastures.

Iljirusi: These are middlemen (of Maasai ethnicity) who act informally between livestock keepers and large-scale traders. They play a certain role in determining livestock prices. They make small profits by buying livestock from pastoralists and reselling it in local markets. They often gather information about market prices and dynamics by physically attending markets. The distinction between pastoralists and *iljirusi* is rather fuzzy as practically all *iljirusi* are in the first place pastoralists (Allegretti, forthcoming).

Traders: Conduct larger businesses in terms of number of animals traded as compared to *iljirusi*. Unlike *iljirusi*, traders often have official business licenses issued by district authorities. They may use trucks for transporting livestock between markets and rarely purchase livestock directly from producers.

Abattoirs or Slaughter houses: A change in legislation for meat safety reasons and for generating revenues for local authorities has led to a ban of private slaughtering of livestock in butcheries and meat houses premises. The only available and allowed slaughterhouses are owned and managed by district councils. To date, there are five such slaughterhouses in Arusha District council.

Nyama choma: Literally means roasted meat but it refers too to the joints where the meat is served and consumed. *Nyama choma* joints buy meat from butcheries, meat shops, slaughter houses, and/or in markets. Besides roasted meat, *nyama choma* joints also prepare meat soups as well as other meat-based dishes.

Butcheries and meat shops: Butcheries may buy 10-20 heads of cattle as well as sheep and goats in pastoral markets (not ranches) around Arusha (Ngaramtoni, Meserani, Olokii, Kisongo and Mbauda). They may keep the animals within their premises and slaughter them in a licensed slaughter house when needed to bring the carcasses to their premises. They sell the meat to meat shops, *nyama choma* joints and individual customers. Meat shops usually buy already slaughtered animals and sell sliced and filleted meat to *nyama choma* joints, restaurants, hotels and individual consumers.

Mama Lishe: Are women street-food vendors. They locate themselves near construction sites, industrial areas (e.g. breweries), and sometimes near schools targeting workers as their main clientele. They prepare simple meals with meat (mainly beef) such as rice and beef in a sauce. They buy meat from butcheries and meat shops.

Restaurants and hoteli: Are small local restaurants owned by individuals. They are sometimes associated with a bar. The difference between restaurants/*hoteli* and *nyama choma* is that restaurants prepare a larger variety of dishes but not roasted meat.

3.4 Study design and data collection

Having identified the value chain actors, the following step was to identify the general population (i.e. total number of value chain actors) from which a sample for each actor would subsequently be drawn. Socioeconomic and demographic reports prepared by Arusha District and Municipal Councils were the sources for identifying the general population. Statistics from Arusha District council indicate that there are 48 meat shops and butchers, 5 slaughterhouses, an estimated 100 *nyama choma* joints, over 200 *mama lishe* and 50 restaurants in the district. Statistics obtained from Arusha Municipal District estimate 100 meat shops & butchers, 1 slaughter house, 1,000 *nyama choma* joints, 600 *mama lishe*, and over 200 restaurants in the area (Table 3).

Table 3 Total population studied

Actor	Total number
Abattoirs	6
Butchers/m. shops	148
<i>Nyama choma</i>	1100
<i>Mama Lishe</i>	800
Supermarkets	158
Hotels/restaurants	250

Data collection with selected actors was conducted through a survey over two phases⁵⁸. The survey included questions on socioeconomic characteristics of the respondents, costs and benefits of production/business activities, and revenues. Each informant from each actor of the chain was asked to name the categories of input costs for their business activity (e.g. rent, labour etc...) and provide an estimate for the actual expenses for each category they incurred in a year. Estimates of benefits (i.e. monetary gains from sales) were also collected in order to finally estimate the net profit. These are the pool of data on which analysis of total added value was carried out. Other data that support the argument on the value of the pastoral system for producing meat were perceptions and key constraints of the pastoral system (for producing meat) as mentioned by the value chain actors.

Phase I consisted of a survey covering 154 subjects and conducted in February 2009. During Phase I (Table 4) several responses were considered inconsistent and categorised as ‘unreliable’.

⁵⁸ This was due to practical circumstances having to do with time, money and other logistical issues rather than an explicit study design choice

Also, abattoirs and *mama lishe* were not included in Phase I as they could be identified only at a later stage. These complications prompted Phase II which covered 65 respondents from different actors of the chain not including *iljirusi* and supermarkets but this time including abattoirs (five) and *mama lishe* (six) and conducted from April to October 2011 (see Table 4).

While data on the first three actors of the chain (pastoralists, *iljirusi* and traders) were successfully collected, it was subsequently decided not to include such data in the analysis of total value added. The choice was taken because of the difficulty associated with estimating what proportion of the livestock raised by pastoralists and then sold to *Iljirusi* and traders actually entered the Arusha ‘market’ through the abattoirs/slaughter slabs. It was decided therefore to focus the analysis on the point in the value chain when meat, produced under pastoral conditions, entered the Arusha ‘market’ – i.e. from abattoirs and butchers that slaughtered. This will facilitate the comparison with the ranching system as it will feasibly be easy to identify or estimate at the level of abattoirs and slaughter slabs the origin of animals slaughtered (i.e. animals reared by pastoralists or in ranches). The comparison between the two different systems will be the focus of a subsequent research project; on this occasion, it was decided to proceed to disseminating the findings on the pastoral value chain only. Although partial, these findings certainly have policy-related significance in light of the absence of data on the pastoral system of raising meat in official statistics which has led to an underestimation of the contribution of the pastoral system.

In the end, choices as to which actors to include in the value chain analysis were taken with the objective of achieving as reliable and realistic as possible a picture of the total and real worth of the pastoral system for raising meat. Including pastoralists, *iljirusi* and traders would have ‘inflated’ the figure in the sense that not all animals raised by pastoralists ‘enter’ the chain (as mentioned above knowing such figure is problematic), hence, total value of the chain would not have reflected the real value to the general population considered. Likewise, choices as to the sample to select from each actor of the chain were not taken with a purely statistical approach but more generally with the objective of increasing as much as possible the number of informants for an analysis as robust as possible and considering time, logistical and financial constraints of a quite sizeable research project such as this.

Table 4 Sample size by actors

Actors	Phase I	Phase II	Total	Final sample considered
Pastoralists	27	25	52	0
<i>Iljirusi</i>	11	-	11	0
Traders	9	5	14	0
Abattoirs	-	5	5	5
Butchers/m. shops	40	15	55	15
<i>Nyama choma</i>	57	9	66	9
<i>Mama Lishe</i>	-	6	6	6
Supermarkets	2	-	2	2
Hotels/restaurants	5	3	8	3

4. Results and Discussion

As stated in the introductory section, the economic contribution of pastoral meat production system is often (if not always) not accounted for in national statistics. This is likely a tangible result of long-held assumptions about pastoralism as an inefficient and environmentally destructive system. Such assumptions in history, in Tanzania as in Kenya and many other countries that host pastoral population, have affected the lives of pastoralists (Homewood et al. 2009: 369) leading at times even to forced displacement and land dispossession (Hodgson 2001, Hughes 2006).

Recent research (Letare et al. 2006, Hesse and MacGregor 2006) has tried to evaluate the contribution of pastoralism having highlighted the informal nature of the system which makes it invisible to official accounts. This section attempts to show the actual contribution of the pastoral system by looking at the value added for each value chain actor as well as the final total value added.

The input costs of the actors in the value chain considered in the analysis was estimated (along with monetary benefit). Meat shops/butcher owners were regarded as one category as there is no clear distinction between them. The main input cost for butchers and meat shop owners was the cost of purchasing meat from abattoirs or slaughter houses making up for about 89% of the total costs incurred. The rest of the costs include paying rent (when properties are not owned) (about 1%), servicing debt (2%), daily labour (1.5%) and others costs (7%) which include transportation and utility bills. *Nyama choma* joints' managers' main cost is also meat purchases, which make up for about 95% of the total cost. The rest of the costs include rent (less than 1%), labour (0.5%), servicing debt (1.7%) and other utility costs (about 2%). The composition of input cost with regards to *mama lishe* differs slightly from that of butchers, meat shops and *nyama choma* joints' managers. For *mama lishe* businesses, meat purchases make up for about 60% of the cost, while costs of charcoal, and ingredients such as spices, make up for about 20%. Another 20% is spent on hiring labour. Finally, restaurants and hotels (locally called '*hoteli*') spend about 96% of the total cost on meat purchases. The rest of the costs is made up of labour, rent, and utility bills.

Using equations 1, 2, and 3 above, the total cost, total revenue, and net profit or value added by each actor were estimated. These figures were multiplied by the total number of businesses (or actors) in order to estimate the total value added of the pastoral meat production system. The summary of the results is presented in Table 5.

Table 5: Total Value Added by Actor

Actors	Sample	Cost/p.a	Sales/p.a	Valued added	# Business	Total value added
Abattoir	5	40,000,000	44,850,000	4,850,000	6	29,100,000.00
<i>Mama Lishe</i>	6	3,609,333.33	8,516,667	4,907,333	800	3,925,866,400.00
Meats/Butcher	15	143,015,000	273,818,133	130,803,133	148	19,358,863,684.00
Supermarkets	2	49,444,341	56,160,000	6,715,659	158	1,061,074,122.00
<i>Nyama choma</i>	9	28,312,361.1	40,859,722	12,547,361	1100	13,802,097,100.00
Restaurants	3	14,210,666.7	46,720,000	32,509,333	250	8,127,333,250.00
Total	40	278,591,702.1	470,924,522	192,332,819	2462	46,304,334,556.00

As is shown in Table 5, the total value added or total economic contribution of pastoral meat production to the economy of Arusha District and Arusha Municipal Council is estimated to be 46 billion TSH (29 million USD) per year. This is significantly higher than what is reported as 'inland tax revenue' by both local governments, i.e. only about 19,000 USD per year through taxes, levies, rents and other services as contribution of the 'traditional' pastoral system. In the end, the total value added shows the actual contribution of the pastoral system under which meat is produced. Even though it is beyond the scope of the study to compare these estimated monetary values with that of ranching, it is evident that the economic contribution of pastoral meat production system is by any measure not negligible.

4.1. Net present value

A further step was taken into analysing the estimated economic value of pastoral meat production system. Net present value is estimated to take into account the time value of money. Estimated values are factored for discount rates and time.

This can be mathematically expressed as:

$$\text{NPV} = \text{CI}_t - \text{CO}_t / (1+r)^t \quad [4]$$

Where; CI_t is cash inflow at time t ; CO_t is cash outflow at time t , and r is discount rate.

From the above equation it can be noted that net present value is inversely proportional to discount rate and time. The main challenge is the level of discount rate and time period to use. In a formal economy context, discount rates can be estimated from inflation rate and internal rate of return of the production system. However, in a rather informal system such as pastoralism, it is not as straightforward.

Different researchers have used a range of discount rates to estimate the net present value of pastoral production systems. For example, Sandford and Scoones (2006) employ discount rates ranging between 0% and 17%. Since their study was based on a review of pastoral production systems in Africa, a range of discount rates similar to theirs was employed in this study.

The issue of defining the time frame is not straightforward either. Qtaishat, Al-Sharafat and Majdalawi (2012) in their comparative economic analysis of sheep production system in Jordan use ten years. However, since the turnover rate and the time the animals reach maturity is different for cattle, it was decided that 15 years is used instead.

In the situation where the government is favouring ranching and pastoralism is undermined it is very difficult to estimate how much the government would be investing to boost pastoral meat production system. In line with the conservative approach of the study, a rather generous hypothetical future government investment figures were estimated. It was assumed that the government would make an investment equivalent to 30 per cent of the total economic value estimated at $t = 0$ (initial investment), and 20 per cent at $t = 5$ (year five of the project), and another 30 per cent at $t = 10$ (year ten of the project). Net present values depict the financial viability of any project that requires investment. For any project to go ahead, it has to have a NPV greater than one. As is shown in Table 6, the suggested levels of investments have positive

NPV even at higher discount rates. Therefore, the suggested levels of investment are financially or economically feasible and the results show that the region could benefit economically if the government was to make such investments to promote pastoral meat production system.

Table 6 Net present values (NPV) at different discount rates and t = 15 years

	Discount Rates			
	5%	8%	12%	17%
NPV	4,199,442,735,268.66	3,340,592,250,812.29	2,515,592,164,610.64	1,814,229,288,116.77

4.2. Perceptions of selected actors

To conclude the discussion of the results, this final section is dedicated to the chain actors' perceptions and understanding of meat production under pastoral system as well as the constraints they face and the possible solutions they envision to overcome such constraints. Policy makers are often faced with challenges to make decisions that involve tradeoffs between different economic development interventions mainly due to resource constraints. This is more pronounced in low income countries such as Tanzania. The decisions that policy makers make need to be well informed so that the welfare of the public is maintained, enhanced or even maximised. Actors' perceptions and experiences aid policy makers in such choices and decisions.

Abattoirs: Both state owned and private abattoir managers clearly recognised the importance of pastoralism as their main source of livestock. They stated that more than 60 per cent of the livestock that are slaughtered are supplied by pastoralists. They suggested that the government should promote and support livestock marketing through the creation of cooperatives in pastoral communities as well as introduction of modern marketing systems.

Meat shops and butchers: 95 per cent of meat shops and butchery owners mainly depend on meat selling to support their household. The subjects stated that pastoralism has a number of benefits such as building social networks (social capital), affordable meat, better meat quality (as compared to meat that comes from the ranching system), and accessibility by different segments of society. Two thirds of the respondents mentioned lack of capital as their main constraint. They suggested government's investing in micro-credit schemes as a possible measure to overcome such constraint. They also suggested improvements of the livestock market in the form of better services (e.g. veterinary services, better market infrastructures) specifically aimed at aiding the meat producers (i.e. the pastoralists).

Nyama choma joints' managers also acknowledged the importance of pastoralism in terms of creating jobs and meat affordability. Interestingly and importantly, they argued that non-pastoral meat production systems (i.e. ranching) cannot cope with the growing demand of meat. One of the main challenges mentioned by *nyama choma* joints' managers is the shortage of supply and consequent increase in prices during the rainy season. This is mainly because pastoralists do not have the incentive to sell their livestock during wet season as this (the wet season) is the time for pastoralists to 'invest' in the general size and health of their herds. Therefore, they urged the

government to provide incentives to pastoralists to raise more cattle and supply more livestock during the wet season. This was echoed by *mama lische* as well as restaurant and hotel owners.

5. Conclusion

The results of this study clearly show that the pastoral system for producing meat is definitely viable and supports a high number of livelihoods not only among pastoralists but also for a wide range of citizens involved in the food sector. The value of the pastoral system would certainly be much higher if other products such as milk, skins as well as ‘non-use’ benefits such as those of ecological and cultural nature were accounted.

Besides economic evaluations, this study also contributes to bust the myth that links the supposed ‘backwardness’ of the ‘traditional’ system to its supposed inefficiency: besides the categories of the ‘traditional’ and ‘modern’, the results here prove that the pastoral system is far from being inefficient. The next obvious step is the comparison with the ranching system.

Policies should be formulated to promote pastoralism by addressing some key systemic constraints voiced by most of the actors including: providing microcredit, establishing cooperatives of all actors to avoid producers becoming the victims of fierce competition, investment to improve livestock market places, providing pastoralists with incentives to supply more livestock to the market particularly during the wet season.

It is wise to mention that these measures could easily be taken side by side investments in ranching. Commercial meat production systems could still be promoted but that should not be done at the expense of pastoralism. There could be a greater scope where both production systems can complement each other in meeting the market demand for meat in the country.

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