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Costs and Benefits of Beef Cattle Fattening Schemes in some Selected Areas of North West Tanzania

Research Article

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ABSTRACT

This study highlights the costs and benefits of indigenous beef cattle fattening schemes in Shinyanga Urban and Kishapu Districts in Tanzania. Specifically, in this study the net profit (NP) for fatteners between beef cattle fattening schemes has been determined. The schemes were divided into two main categories, scheme 1 in which the animals were fed on cottonseed hulls (CSHL) based diets and scheme 2 on cottonseed cake (CSC) based diets. The survey was carried out using a sample of 144 respondents. The tools for data collection were structured questionnaire, interview, personal observation, communication, documentary reviews (e.g. from internet, libraries) and key informants. Data were analysed using descriptive statistics and quantitative statistics and standard procedure of the association of official analytical chemists. Results show that the positive net profit was relatively higher in scheme 2 (Tanzanian shilling (TAS) 119512.87 / USD 76.03 per fed animal per quarter a year) than that in scheme 1 (TAS 92993, 90 / USD 59.17 per fed animal per quarter a year). This implies that the fattening business is more feasible, profitable and efficient for sustainable implementation in scheme 2. Furthermore, the average daily gains (ADG) of 1.5, 1.3 and 1.0 for Tanzania Short Horn Zebu (TSHZ) males, steers and females were higher than the 1.2, 1.0 and 0.9 for TSHZ males, steers and females in scheme 1, respectively. Additionally, the feed conversion ratios (FCRs) of about 5.0, 5.5, 6.3 for TSHZ males, steers and females in scheme 2 were lower than 7.2, 8.6, 8.6 for TSHZ males, steers and females in scheme 1. Therefore, scheme 2 was economically feasible, profitable and therefore is recommended for implementation and monetary support for improved income, livelihoods, poverty reduction and commercialisation of the beef industry.

KEY WORDS average daily gain, beef cattle, net present value, net profit, Tanzania.

INTRODUCTION

The livestock enterprise plays an overwhelmingly important role in the economy of Tanzania because it employs about 80% of the workforce (Pica-Ciamara *et al.* 2011). The industry also offers socio-cultural values and is one of the most common assets among the poor rural households in the country. Based on the 2012 National Population and Housing Census, Shinyanga region has a population of about 3.6 million people, with 158690 total households which depend on the agricultural sector which includes the livestock sub-sector; moreover, agriculture remains the leading sector of the Tanzanian economy accounting for 56% of gross domestic product (GDP). Furthermore, the country possesses economic and development sectors not common in Africa such as fertile arable land, water features, communal grazing lands, huge national parks, mining and tourism industries, all conducive to economic growth. These sectors are envisaged to fuel a demand for quality animals in the country. It further suggests that, a progres-

sive change in the huge indigenous beef cattle enterprise [22.8 million (MLFD, 2012)] would accelerate production of high quality and profitable beef and together with other animal by-products for profitable markets, leading to sustainable development of the industry and the country at large. This aspect conspires with the "Theory of Enterprise Growth" which advocates that improved technology is associated with increased output, quality of goods and profit maximization.

However, with all these investment and take-off opportunities in Tanzania, the situation of poverty in the country is worsening for it is estimated that about 60% of Tanzanians are basically poor (Mwaniki, 2006). This is because poverty is still widespread and acute and is generally a rural phenomenon since about 85% of the country's poor people live in rural areas relying on rudimentary agriculture as their major source of income and livelihood. This situation keeps them in a sticky-cycle of poverty. On top of this, based on income, about 33 percent of Tanzanians live in households classified as hard core poor and about 20% of Tanzanians live in abject poverty (URT, 2009). This is because almost all the indigenous beef cattle in the agro pastoralists (98%) and the national ranches (1.6%) are under-performing because they are kept traditionally in extensive farming without supplementation or improvement strategies. That is, natural pastures are plentiful in the rainy seasons through to the midst of the dry season and thereafter, there is scarcity. Furthermore, the animals are sold at an extremely high age. This scenario has resulted into low quality animals and beef resulting in low prices.

The fattening schemes could be an alternative and promising enterprise for improving livelihoods, increasing household income and poverty reduction for smallholder fatteners through production of high quality animals and meat in confinement.

Furthermore, establishment of modern abattoirs such as at Dodoma and Arusha which require high quality animals are expected to stimulate expansion of the beef industry in the country.

Impressive information from Pica-Camara *et al.* (2011) spells out the ambition of Tanzania to stop exporting live animals by promoting export of value added livestock products such as meat, hides and skins and draws attention to further expansion of the fattening schemes and the livestock sector at large. This study determines the costs and benefits of indigenous beef cattle fattening schemes in Shinyanga region in Tanzania, More specifically; the study determines (i) production performance of feedlot cattle, (ii) viability of indigenous beef cattle fattening schemes and (iii) suggests the best ways of transforming the rudimentary traditional beef cattle industry into a commercially based enterprise.

MATERIALS AND METHODS

Study area

The study was conducted in semi-arid areas in Shinyanga Urban and Kishapu Districts in Shinyanga region in Tanzania. Shinyanga region is located in north-western Tanzania, south of Lake Victoria. The region falls between latitudes 2 ˚13″ to 4 ˚3″ South and longitudes 33 ˚28″ to 35 ˚15″ East. The region occupies an area of 50781 sq. km, with Kishapu and Shinyanga Urban Districts occupying 4334 sq. km and 548 sq. km, respectively, where 46 percent of the total area is arable land potential for agricultural and livestock production, Figure 1.

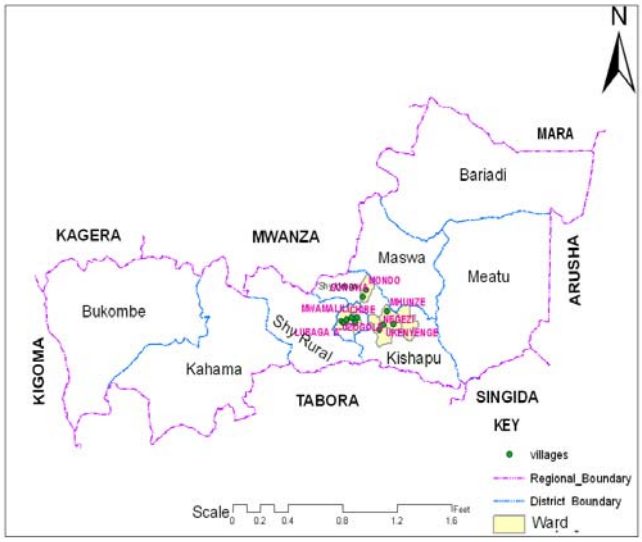

Figure 1 Selected study areas in Shinyanga region

Data collection

Primary data were collected using structured questionnaires, interviews, personal observation and communication. Information from primary data included, buying and selling prices, veterinary drugs and services, whereas secondary data were secured using documentary reviews from internet, websites, libraries and key informants whose information included sustainability of the schemes, demographic data and population of the study area.

Sampling technique

Shinyanga region and its two districts, Kishapu and Shinyanga Urban Districts were purposely selected for the study because it has plenty of indigenous beef cattle (3.8 million). Moreover, the income of the majority of farmers depends on keeping indigenous beef cattle. The area has also some fattening schemes and a lot of cottonseed by-products useful for feeding and fattening the animals. A detailed survey was conducted from March 2011 to June 2012. The house-

holds engaged in fattening cattle were then categorised into various patterns.

Categorization of fattening schemes

Two main fattening schemes were identified: Scheme 1: animals fed on cottonseed hull (CSHL) based rations, e.g. natural pasture (N)+ cottonseed hull (CSHL)+ cottonseed husks (CSH)+ caustic soda / common salt (CS/S) and scheme 2: animals fed on CSC based rations, e.g. cottonseed cake (CSC)+ cottonseed hulls (CSHL)+ cottonseed husks (CSH)+ rice polish / rice bran (RP/RB)+ caustic soda / common salt (CS/S). The animals in scheme 1 were grazed on natural pastures in the communal lands and supplemented with CSH, CSH and CS / common salts during the evening, while those in scheme 2 were confined and fed on concentrates during the day.

On-farm trials

In order to reach a precise estimate of the daily gains, buying weight, selling weight and duration of fattening, some households dealing with cattle fattening were selected for on-farm trials in which the animals in both schemes (1 and 2) were confined in the feedlots. In this case, fifteen animals were fed on each diet. That is, five males, steers and females were fed on diet 1 and five males, steers and females on diet 2. The formulated diets are shown in Table 1.

Table 1 Rations of feeder cattle in the model feedlot operators

Variable	Type scheme	
Ingredients %	Scheme 1	Scheme 2
	Diet 1	Diet 2
Cottonseed cake (CSC)	0	15
Cottonseed hull (CSHL)	32	32
Cottonseed husk (CSH)	23	30
Rice polish (RP) / rice bran (RB)	0	25
Natural pasture (N)	44.5	0
Caustic soda (CS) / salt (S)	0.5	0.5
Total	100	100

Feeding

In scheme 1, tropical grass was harvested from communal areas in Kishapu and Shinyanga Urban Districts and then carried by cars or bicycles to the fattening plots, where it was chopped using hand held machetes to make the texture more uniform and to minimize losses and selection during feeding. Thereafter, the chopped grasses were mixed with the concentrates to form diet 1. Scheme 2 animals were also kept indoors and fed on a mixture of concentrates as shown on Table 1. Water in each Scheme was given ad libitum.

Measurement of feed intake and estimation of nutrient intake

Feed offered to feedlot bulls, steers and cows under confinement was monitored by research staff for 90 days. Fatteners were also trained on how to measure the amount of feeds given to feeder cattle by using spring balance. Every morning before feeding, all refusals of the previous day's feeding were removed and weighed using a spring balance, The daily feed intakes for each animal were estimated by taking the difference between the amount of feed offered and the quantity refused. Nutrients intake of feedlot cattle under confinement were determined by calculating the nutrient offered and the amount not ingested.

Measuring body weight and animal age in the schemes 1 and 2

The live weight of the animals in the Schemes was measured by using the weight band tape at interval of one week to establish the average daily gain (ADG). That is, on entry into the feedlot, each animal was weighed for three days consecutively, and the mean weight was recorded as the initial weight.

Thereafter, each animal was weighed weekly in the morning before feeding for 12 weeks. At the end of experiment, each animal was weighed for three consecutive days, and the mean weight was used as the final weight. A participatory approach was used by including fatteners and research staff. This approach enabled fatteners to participate in the research and increase the accuracy of data because they considered themselves as part of the research team. The age of the animals was assessed using dentition.

Categories of cattle

There are two main breeds of indigenous beef cattle, the Tanzanian short horn zebu (TSHZ) and the Ankole. The TSHZ includes the three strains, Sukuma, Tarime and Tatulu.

Sample size

The study used a total of 144 fattening respondents to get information on cost, benefits of the cattle fattening enterprise, net profits from sales of finished cattle and chemical composition of the main dietary ingredients in Kishapu and Shinyanga Urban Districts.

Data analysis

Analyzing costs and benefits of the fattening enterprise

Descriptive and quantitative analyses were employed. Descriptive analysis used frequencies and cross tabulation. The quantitative analyses using net profit to assess costs, benefits and viability of the fattening schemes were based on SPSS and Microsoft excel software (MES) (Albert *et al.* 2008). These include calculation of the following:

(i) Net present value (NPV)

The net present value (NPV) was used to determine profita-

bility of the fattening enterprises. The NPV is an economic and financial analytical tool that measures viability or feasibility. It also identifies a superior business / project or an investment marked by accrued positive value and increased cash as opposed to its initial investment capital.

That is, a project with a positive NPV is worthwhile and accepted as being feasible to be undertaken because the future returns would be higher than the investment cost, whereas a project with a negative NPV is considered as an uneconomical investment.

Where projects or systems are compared and have positive NPVs, then the one with the highest NPV is chosen for financial support and implementation. The demerit of NPV lies in the fact that it involves tedious calculations. However, it is still recommended as a potential tool for determining viability and profitability of proposed projects / investments. Mathematically, NPV was computed as follows:

$$\eta pv = [f(-\Lambda + [CF1 / (1+r)^1] + [CF2 / (1+r)^2] + \ldots + [CFn / (1+r)^n]$$

Where:
ηvp: net present value.
-Λ: initial investment in cattle industry.
CF: cash flows from sales of cattle.
η: number of years (1, 2, 3, …$_n$) within the fattening project.
r: discount rate.
$1 / (1+r)^1$: discounting factor for any specific cash flow and number of years

(ii) Net profit (NP)
Mathematically, NP was computed as follows:

$$NP = TR – (TC \times (TVC+TFC))$$

Where:
NP: average net profit of cattle per feedlot.
TR: average total Revenue from sales of cattle in TAS per feedlot.
TC: total cost per cattle in TAS.
TVC: average total variable cost per cattle in TAS.
TFC: average total fixed cost per cattle in TAS.

(iii) Analysis of chemical composition of the main diets and their ingredients
Standard procedures of the association of official analytical chemists (AOAC, 1990) were employed to compute the chemical composition of the main diets and ingredients (dry matter (DM), crude protein (CP), ether extracts (EE), ash, acid detergent fiber (ADF), (NDT), total digestible nutrient (TDN), Ca, P, and metabolizable energy (ME) (MJ/kg)).

(iv) Analysing the ADG of the feedlot cattle
The average daily gain was calculated by deducting initial weight from the final weight and dividing by number of days spent by the animal in the feedlots. Mathematically, the ADG was calculated using the following model:

$$ADG = (FWT-IWT) / (NDSL)$$

Where:
ADG: average daily gain.
FWT: initial live weight.
IWT: final live weight.
NDSL: number of days spent in the feedlots.

(v) Analysis of FCR of the feedlot cattle
Feed conversion ratios (FCRs) were computed as a relationship between feed intake dry matter intake (DMI) to weight gain during the fattening period. This variable was calculated because it shows the relationship of feed intake and growth rate or average daily gain (ADG) of the animal; cost of production, income and profit of the entrepreneurs. Mathematically, FCR was calculated using the following model:

$$FCR = DMI / WG$$

Where:
FCR: feed conversion ratio.
DMI: dry matter intake.
WG: weight gain (kg).

RESULTS AND DISCUSSION

Net present value for fatteners in the beef cattle fattening schemes
The findings of this study show that the feedlot business was significantly ($P<0.001$) profitable in both Schemes, though scheme 2 was superior to scheme 1 (Table 2). Scheme 2 had higher NPV which was positive with monetary value of TAS 75 409 959.70 / - (USD 47970.71) and the initial investment costs of TAS 11 831 712.90 / - (USD 7526.53) in three years compared to those in Scheme 1 whose NPV was also positive with monetary values of TAS 63 317 933.00 / - (USD 40278.60) and initial investment cost of about TAS 9 046 480 / - (USD 5754.76). The reasons for higher NPV for scheme 2 investors include better nutritional quality of the supplementary feeds that included better and higher protein ingredients, such as cottonseed cake as opposed to poor quality ingredients namely cotton-

seed hulls and cottonseed husks used for supplementing scheme1 animals. Moreover, shorter fattening periods (2.9 months) of TSHZ cattle in scheme 2 minimized the time schedule and operation costs thus maximizing profit compared to the longer fattening periods (4.3 months) of scheme 1, which reduced profit. Another study by Sharma (1998) in Nepal reported positive but lower NPV of TAS 36.2 / - (i.e. R 0.196) millions in three years. This could be attributed to breed and management differences. Other researchers reported significant and salient benefits in identifying profitable projects such as Adekunle and Sunday (2010) in Nigeria, Pluke and Schlink (2007) and Rao *et al.* (2007) in Oman, Mafimisebi *et al.* (2006) in Nigeria, Perdana (2003) in Indonesia and Jansen *et al.* (1997) in Costa Rica. These differences could be attributed to animal breed differences, management scenarios and marketing criteria.

Net profit and gross margin for fatteners in the model beef cattle fattening schemes'

Net profit

Net profit as the difference between total revenue and total business expenses was used to explore the efficiency, profitability and viability of the fattening business / enterprises. The results show that net profit was positive in scheme 1 (105 691.55 TAS) and scheme 2 (128 508.70 TAS) implying that the fattening enterprise is viable and likely to be implemented. Therefore, profits help to make the decision whether to carry on with the business, update it or forego it, if is worthless. In this study, scheme 2 fattening enterprise is more promising for wealth creation and poverty mitigation than scheme 1. The better performance of scheme 2 fattening compared to scheme 1 could be attributed to optimal preparation of the animals by feeding them with high protein and energy feeds in which the animals fatten within a short period for the market (Table 3). Furthermore, the NP exceeded total cost (TC) and total variable cost (TVC) by 16.2% and 18% in Scheme 1, respectively, whereas the NP in Scheme 2 exceeded the TC and TVC by 19.7% and 22%, respectively.

This implies that both schemes are potentially fit for intervention, wealth creation and poverty reduction, though scheme 2 is more promising and superior to scheme 1. Therefore, net profit helped to make the decision whether to carry on with the business or to update it or forego it. Other researchers reported the importance of NP in checking performance of a given project, (Pica-Ciamara *et al.* 2011). Our findings also indicate that feeds and feeder cattle prices explain about 85.29% and 84.54% of the total variable costs in schemes 1 and 2, respectively.

This implies that feed and feeder cattle prices are important variable costs to consider if profit maximization from beef cattle fattening is to be achieved. These findings also reveal that the cost figures in both schemes are similar, though scheme 1 used cheaper feed ingredients like cottonseed hulls and cottonseed husks as opposed to the high quality cottonseed concentrates used in scheme 2. This is because the low quality concentrates like cottonseed hulls and husks cause lower daily gains and hence a longer period of fattening and more inputs, leading to higher costs. Additionally, the higher selling price of scheme 2 cattle could be attributed to higher quality of the animals fed on higher quality rations. Table (3) details the reasons for the similarities in the ration costs between scheme 1 and scheme 2 (this last using more valuable and costly feeds for shorter period of time, ranging between two and three months). Other studies of fattening businesses have shown the importance of close monitoring of the price environment of feeder cattle and feeds for a profitable, efficient and sustainable beef industry (Musemwa *et al.* 2007; Moll, 2005; Okoruwa et al. 2005).

Gross margin for fatteners in the model fattening schemes

Gross margin is among the economic tools that measures efficiency and profitability and determines the market value of a given commodity in any agro-enterprise. The research findings indicate that Scheme 2 fatteners had higher gross margin (GM) of 227 322; 10 TAS per head fed compared to the GM of 205 618.55 TAS per head fed in scheme 1. As mentioned earlier, this could be attributed to high quality of diets in scheme 2 which contained higher CP levels in cottonseed cakes ingredients as opposed to lower CP rations in scheme 1, thereby creating less competitive animals at the markets. This aspect underlines that scheme 2 fatteners managed their feedlot cattle more efficiently compared to those in scheme 1. Other researchers reported on the importance of GM in determining benefits of agro-enterprises, such as Tawaf and Suryadi (2011) in Indonesia, Sarma and Ahmed (2011) in Bangladesh and Umar *et al.* (2008) in Nigeria.

Chemical composition of feeder cattle diets in fattening schemes

Statistical analysis on chemical composition of the main ingredients and diets show that the diet offered in scheme 1 had lower levels of crude protein (CP), metabolisable energy ME (MJ/kg) and dry matter (DM) compared to the diet offered in scheme 2 (Table4). This means that scheme 2 animals were fed rations which fulfilled the requirements of the animals for maximum production and profit, where the marginal cost of feed equals marginal value of output as recommended in the nutritional requirements of beef cattle (NRC, 1996).

Table 2 Net present value for fatteners in the fattening schemes

Variables	Scheme 1 (n=73)		Scheme 2 (n=72)		T
	Mean	SD	Mean	SD	
Net present value (TAS)	63 317 933.00	29 180.150	75 400 959.70	34 845.810	-4.287***
Initial capital / feedlot (TAS)	3 046 480.81	4231.96	6 831 712.91	4 489.460	-3.758**
Fattening period (months)	4.237	0.375	2.897	0.501	-17.840***

* (P< 0.05); ** (P<0.01) and *** (P<0001).

Table 3 Net profit for fatteners between beef cattle fattening schemes

Parameters	Scheme 1		Scheme 2		P-value
Variable costs per head	**Mean**	**Percent**	**Mean**	**Percent**	
Total revenue (TAS) per cattle (males)					
Fed cattle sales	757 878.25	-	778 596.50	-	0.01
Variable costs per cattle					
Feeder cattle price	299 376.72	46.5	299 690.43	46.1	0.01
Feed price	206 727.89	37.8	205 427.72	37.3	0.01
Labour	20 802.81	3.2	22 753.07	3.5	0.02
Animal health	25 353.42	3.8	23 403.16	3.6	0.01
Total variable cost (TVC)	552260.81	-	551274.41	-	-
Gross margins	205618.55	-	227 322.10	-	-
Fixed cost per cattle					
Depreciation	24 703.33	3.8.00	21 452.89	3.30.00	0.01
Overheads	26 003.51	4	26 003.50	4	0.02
Taxes / levies	14 164.05	2.2	14 301.96	2.2	0.01
Total fixed cost per year	64 870.89	**100**	61 758.35	**100**	0.01
Total cost (TC)	**654 186.70**	-	**650 087.80**	-	-
Net income	**105 691.55**	-	**128 508.70**	-	-

* (P<0.01).

Table 4 Chemical composition (%) of diets and ingredients for feeder cattle in the fattening schemes

Main Ingredients	DM	CP	CF	EE	ASH	NPF	ADF	TDN	Ca	P	ME (MJ/kg)
Cotton seed cake	93.10	30.38	21.70	12.68	7.60	42.55	25.70	80.50	1.23	0.97	16.90
Cotton seed hulls	86.97	4.57	46.83	1.70	3.57	86.27	65.90	41.00	0.40	0.15	13.38
Cottonseed husks	89.63	7.83	12.67	6.13	3.07	82.30	65.27	57.33	0.54	0.15	10.42
Rice polish	91.75	6.75	39.70	3.25	7.25	55.40	39.50	59.00	0.95	0.30	15.90
Natural pasture	93.00	12.00	23.00	1.70	11.20	67.00	36.00	79.00	0.35	0.02	7.50
Diet 1 (scheme 1)	89.45	6.38	33.07	3.69	4.63	74.66	56.89	52.44	0.63	0.20	9.02
Diet 2 (scheme 2)	91.09	15.08	29.29	6.88	5.41	66.16	41.21	48.32	0.89	0.28	14.18

DM: dry matter; CP: crude protein; EE: ether extracts; ADF: acid detergent fiber; TDN: total digestible nutrient and ME: metabolizable energy.

Production and economic performance of the value added in schemes 1 and 2

The findings of this study reveal that the economic traits of the stock such as FCR, ADG, weight gain per fattening period and selling weights were significantly higher (P<0.001) for males, steers and females in scheme 2 compared to those in scheme1 (Table 5). For example, feed conversion ratio (FCR) was lower for Ankole and TSHZ males, steers and females in scheme 2 than the case of Ankole and TSHZ males, steers and females in Scheme 1.

This shows that the animals in scheme 2 attained higher gains using lower amount of feeds, meaning that scheme 2 diets are economically more efficient and it suggests that CSC based rations can be effective, qualitative and lead to production of profitable animals that are likely to increase the income of the fattening households.

Furthermore, the results show that TSHZ cattle had lower FCR, short fattening period and quicker returns compared to Ankole cattle. This implies that investing in scheme 2 using TSHZ animals was more likely to improve livelihoods and thereby reduce the poverty burden of the fattening entrepreneurs. Moreover, Table 4 shows that males, steers and females in scheme 2 were 14%, 11% and 33% superior to males, steers and females in scheme 1 when measured in terms of ADG, while in terms of weight gain per fattening period, males, steers and females in scheme 2 exceeded those ones in scheme 1 by 11%, 6% and 16%, respectively, for TSHZ. Similarly, final weights for Ankole breeds were higher for the animals in scheme 2 than those in scheme 1. The reasons for the higher daily gain, weight gain and final live weight of scheme 2 animals over those in scheme 1 are attributed to the practices of feeding the anim-

Table 5 Economic and production attributes of the value added TSHZ and Ankole breeds in schemes 1 and 2

Variable	Type of scheme						P-value
	Scheme 1			Scheme 2			
	Male	Steer	Female	Male	Steer	Female	
TSHZ breed							
DMI (kg) per fattening period	1083.6	1131	927.1	774.30	827.70	648.00	0.01
Weight gain (kg) in the lots	151.20	130.20	93.90	155,25	149.43	101.760	0.01
Feed conversion ratio (FCR)	7.20	8.60	8.60	5.00	5.50	6.30	0.02
Growth rate (ADG)	1.20	1.00	0.70	1.50	1.30	1.00	0.01
Entry age (years)	4.50	5.20	5.70	4.30	4.40	4.60	0.01
Purchasing / initial BWT (kg)	178.82	159.39	141.52	185.53	166.25	147.11	0.02
Final / selling body weight (kg)	330.02	289.41	235.42	340.78	315.68	248.87	0.01
Fattening period (days)	126	130	127	87	93	90	0.01
Ankole breed							
DMI (kg) per fattening period	1755.00	1812.40	1521.00	1800.00	1984.50	1628.70	0.01
Weight gain (kg) in the lots	239.34	223.20	179.90	273.00	257.40	225.30	0.01
Feed conversion ratio (FCR)	8.50	9.60	9.70	6.60	7.70	7.20	0.02
Growth rate (ADG)	1.00	0.80	0.70	1.200	1.00	0.80	0.01
Entry age (years)	5.00	4.90	5.8	4.30	4.10	4.70	0.01
Final/selling body weight (kg)	709.34	657..39	565.38	730.89	687.85	587.74	0.02
Purchasing / initial BWT (kg)	470.00	434.19	385.39	457.89	430.45	362.49	0.01
Fattening period (days)	195.00	197.00	195.00	180.00	186.00	183.00	0.01

** (P<0.01).
TSHZ: Tanzanian short horn zebu; MDI: dry matter intake; ADG: average daily gain and BWT: body weight total.

als with protein and energy rich diets. Ibrahim (2006), observed that animals in Turkey are usually fattened for a period that ranges from two to five months to gain about 275 to 325 kg. However, this weight is far less than that of Ankole breed whose final live weight ranges from 650 to 740 kg. Furthermore, the entry age is an economic trait which determines competitiveness of the fattening enterprise in the beef industry. For example, very old animals put on much more fat rather than muscles and thus become less attractive in the markets. Moderately young animals are characterised by good cutability, leanest cuts, tenderness, fast muscling, and a good ratio of muscles to fats, giving palatable carcasses that attract the market. In this case, the average entry age of 4.6 years is promising for the approach of selling moderately young animals in future. However, female's entry age was higher than that of males and steers. This is because the cows are used initially for breeding and milk production. Thus, the producers were reported to sell the barren females and cull animals.

CONCLUSION

From the findings of this study, the following conclusions are made:

(i) Higher net profit values per head in Scheme 2 showed that animals fed on cotton seed cake (CSC) in Scheme 2 gained weight faster compared to those fed on cottonseed hulls in Scheme 1.

This implies that interventions using high protein and energy concentrates shorten the fattening period and were thus more profitable.

(ii) The ADG is an economic trait which addresses high profit from the breed of animals that gain faster, for example, the short duration of fattening of about 2 to 3 months for the Sukuma breed compared to 5to 6 months for Ankole breed. This implies that the Sukuma breed is suitable for quick income gains and thus poverty eradication.

(iii) The fattening business would be an option for rural communities and urban dwellers to earn better livelihoods through sales of high quality animals and beef.

Based on the findings drawn from this study the following underlying recommendations are made for improvement of production and marketing strategies in the value chain of beef cattle:

(i) District authorities should create strong linkages among various chain actors including producers (the Pastoral-agro-pastoralists), fatteners and intermediary traders who could cooperate on mutually beneficial relationships.

(ii) Establishment of practically based - training directed to increase skills, marketing, record keeping and formation of business relationships among feedlot operators are essentially important.

(iii) Formation of producer groups and feedlotters associations to increase access to market information to prevent exploitation of fatteners and producers by well-informed buyers specified as middlemen and intermediary traders in

the value chain needs immediate attention. The association may also link stakeholders to other actors in the domestic and export markets and further increase negotiating or bargaining powers of fatteners as well as reducing transport cost by using the same track to the terminal market.

Extension and veterinary services should be based on participatory rural appraisal in identification of feedlot-cattle production and marketing problems and come up with solutions based on market demand.

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