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Research Article

Evaluation of Growth Performance and Carcass Characteristics of Guraghe Bulls Under Various Feeding Regimes

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Abstract

The experiment was conducted on yearling Guraghe bulls, with an average initial body weight of 111.91 ± 3.98 kg, to evaluate their growth performances and carcass characteristics under three different feeding options and to identify the most economical dietary rations. Twenty-one experimental bulls were randomly assigned to three dietary rations: T1 = Rhodes grass hay ad-libitum + 20% molasses + 40% wheat bran + 40% noug seed cake, T2 = Rhodes grass hay ad-libitum + 20% maize grain + 45% wheat bran + 35% noug seed cake and T3 = Rhodes grass hay ad-libitum + 65% wheat bran + 35% cotton seed cake. The bulls were acclimatized to the experimental diets for days, and the actual feeding trial lasted for 26 weeks. The animals' weights were recorded at 14-day intervals. At the end of the 26 weeks three bulls from each treatment group were randomly selected for carcass evaluation. There were no significant differences (P>0.05) in live weight parameters and carcass characteristics among the treatments. The overall means for total weight gain, average daily gain, and carcass dressing percentage were 112.86 kg, 620g/day, and 57.34%, respectively. The yearling Guraghe bulls did not reach export market weight within 26-weeks of the feeding period. Additionally, the partial budget analysis indicated that fattening yearling Guraghe bulls with the current feeding options were not profitable. This suggests that fattening Guraghe bulls with the current feeding options for twenty-six months is economically not viable. It is recommended to evaluate the growth performances of Guraghe bulls with other feeding options to achieve an export market weight of 250-300 Kg.

Keywords

Guraghe Bulls, Carcass Characteristics, Feeding Regimes

1. Introduction

Ethiopia has a relatively large cattle population compared to other African countries, with an estimated 70.29 heads [1]. However, the average beef yield per animal is 108 kg/head, which is significantly lower than 119 kg/head for Sudan, 146 kg/head for Kenya, 127 kg/head for Eastern Africa, and 205kg/head for the whole world [2]. This disparity is due to the predominantly subsistence nature of livestock production in Ethiopia and limited genetic improvement practices.

Despite the increasing trend in meat consumption driven by population growth, rising income per capita, and urbanization, the current meat production from cattle in Ethiopia does not meet the growing demand. Furthermore, there is a

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significant demand for young Ethiopian beef in export markets, particularly from the European commission, which seeks young bulls with body weights ranging from 250 kg to 300 kg.

In response to this demand, studies have evaluated the growth potential of various indigenous cattle breeds at different ages (1-1.5 and 2-2.5 years) under different feeding regimes at Adami Tulu Agricultural Research Centre [3-8]. These studies indicate that most breeds can meet the export market weight requirements.

However, the growth potential of Guraghe bulls has not yet been evaluated. Guraghe cattle, classified as Abyssinian short-horned zebu or Ethiopian highland zebu [9] are small-sized with red, chestnut, or roan coat colors and are primarily found in the Guraghe and Hadiya areas. They are reared for multipurpose, particularly for milk, meat, and draft power production [10]. Given their significances, this study aims to evaluate the growth performance and carcass characteristics of yearling Guraghe bulls fed different feed options to options to achieve the export market requirements (250-300 Kg) and identify the most profitable feeding strategies.

2. Materials and Methods

2.1. Description of the Experimental Area

The experiment was conducted at Adami Tulu Agricultural Research Centre (ATARC), situated 167 km south of Addis Ababa at an altitude of 1650 meters above sea level in mid-rift valley. The agro-ecological zone of the area is semi-arid and sub-humid with acacia woodland vegetation type. The mean annual rainfall is 760mm. The minimum and maximum temperatures are 12.6 ℃ and 27 ℃, respectively.

2.2. Experimental Animals and Management

Twenty-one Guraghe bulls which have similar body condition were purchased from Bole and Vozhover markets of Highland area of Guraghe Zone. The age of the bulls was estimated based on dentition technique and gathering information from the owners of the bulls. The purchased bulls were transported to Adami Tulu Agricultural Research Centre by vehicle. The animals were kept under quarantine for three weeks. During this period, all animals were ear-tagged treated against internal and external parasites with ivermectin injection and vaccinated to prevent anthrax, foot and mouth disease. Bulls were tied at their individual feeding place in the loose house. The bulls were acclimatized for fifteen days to feeding and barn management. The barn water and feeding trough cleaning was undertaken every day ahead of feed offering.

2.3. Feed Preparation, Experimental Animals Housing and Feeding Management

The experimental feeds consisted of cultivated Rhodes grass (*Chloris Gayana)* hay as basal diet and concentrates based on wheat bran, maize grain, cotton seed cake and noug seed cake were purchased through bid process from Adama Town. Molasses was purchased from Wonji-Shewa Sugar factory. The maize grain size was degraded by milling machine. Experimental feeds were mixed by manual method. Rhodes grass hay used as a basal diet was harvested from Adami Tulu Agricultural Research Center and chopped to the required sizes. The dietary treatments were formulated on iso-nitrogenous bases to contain 18% CP. Rhodes grass hay was offered *ad-libitum* to all experimental animals while the supplementary feeds were offered at a rate of 2.5% of their body weight throughout the fattening period. The diets were divided into two equal meals and offered at 08:00 AM and 04:00 PM. The amount of supplementary feed was adjusted every fourteen days depending on the weight change of the experimental bulls during the whole fattening period. All bulls received their respective treatments diet on dry matter basis (DM basis g/kg). The quantities of diets offered were revised biweekly based on their body weight changes. The animals were carefully observed every day for any health-related problems, and records were taken throughout the entire experimental periods. The barn was equipped with feed and water troughs and cleaned every morning ahead of daily offering.

2.4. Experimental Design and Treatments

The experimental design used in this research was randomized complete block design (RCBD) in which the animals were blocked based on their initial body weight and randomly assigned to each dietary treatment. Bulls within a block were assigned randomly to one of the three dietary treatments as indicated in Table 1. Each block had seven animals based on their initial body weight and animals within a block were randomly assigned to one of the three treatment diets. In this case, seven replications from per block and three dietary treatments exist.

Table 1. *Dietary treatments and animals arrangement per treatment.*

Treatments	Molasses (%)	Maize grain (%)	Wheat bran (%)	Noug seed cake (%)	Cotton seed cake (%)
T1	20	0	40	40	0
T2	0	20	45	35	0

Treatments	Molasses (%)	Maize grain (%)	Wheat bran (%)	Noug seed cake (%)	Cotton seed cake (%)
T3	0	0	65	0	35

2.5. Growth Performance Evaluation

Animal body weight was taken once in two weeks at morning hours using ground weighing balance. Total body weight gain was calculated by deducting initial body weight from final body weight of the bulls. The average daily body weight gain of the animal was calculated by dividing the total body weight gain by the total number of days the animal was kept in the feeding trial.

2.6. Carcass Characteristics

At the end of the experiment, three bulls were randomly selected from each treatment for carcass evaluation. Feed was withheld from the bulls over night, they were weighed the next morning, and the weight was recorded as slaughter body weight (SBW). After recording the slaughter body weight, the animals were slaughtered immediately for carcass evaluation, and all important internal organs and carcass parameters were individually measured. The hot carcass weight (HCW) was taken after removing the head, thorax, abdominal and pelvic cavity contents as well as legs below the hock and knee joints. Offal components were categorized into edible and non-edible according to the culture of the society around the study area. The main carcass components were split down at the vertebral column having the two sides as symmetrically as possible and stored in a cold room for 24 hours for properly partitioning the carcass into bone, muscle and fat. The frozen carcass was weighed and the weight was recorded as chilled carcass weight. The right part of the frozen carcass was divided in to five main primal cuts namely: leg, loin, rack, breast and shank and shoulder and neck. The dressing percentage was calculated as the proportion of hot carcass weight to slaughter body weight.

2.7. Partial Budget Analysis

Variable costs incurred in conducting the trial were recorded. Total variable costs such as animal purchase, animal transportation costs, cost of feeds, labor and veterinary costs were included in partial budget analysis. At the end of the fattening period, the gross output/revenues were obtained from prices of the bulls as estimated by the help of experienced people on the prices of fattened animals. Fixed costs incurred for feeding the animals were not included in the partial budget analysis. Total variable costs (TVC) were added and subtracted from total revenue (TR) to get net return (NR) of Guraghe bulls fattening.

2.8. Statistical Analysis

Data on body weight change and carcass parameters were subjected to analysis of variance (ANOVA) using the General Linear Model (GLM) procedure of SAS [11] version 9.1. When significant, Least Significant Difference (LSD) was employed to locate differences between the treatment means. Statistical model was $Y_{ij} = \mu + T_i + B_j + E_{ij}$, whereas: Y_{ij} = Response variable, μ = Overall mean, T_i = Treatment effect, B_j = Block effect, and E_{ij} = Random error.

3. Results and Discussion

3.1. Growth Performances of Experimental Bulls

The growth performances of Guraghe bulls are listed in the Table 2. The mean of final body weight of experimental bulls was not significantly varied ($P>0.05$) among the treatments. Similarly, total body weight gain and average daily weight gain were not showed significant variation ($P>0.05$) among the experimental treatments. The growth parameters of yearling Boran bulls, Kereyu bulls and Arsi bulls that fed similar feeding options were not varied across the treatments [3, 6, 7]. The average daily weight gain of Guraghe bulls was higher than average daily weight gain (0.470 – 0.566 kg) of yearling Arsi bulls fed similar dietary rations for 238 days [6]. However; the current result was lower than average daily weight gain (0.765 – 0.807 kg) of yearling Kereyu bulls fed similar dietary rations for 179 days [7]. The growth rate of beef animals can be affected by genetic factors like breed and non-genetic factors [12]. The study finding indicated that yearling Guraghe bulls did not attained export market weight within 26 weeks of feeding period. The report of [6] also stated that yearling Arsi bulls fed different feeding options did not attained export market weight in 238 days of feeding.

Table 2. The growth performances of Guraghe bulls fed different dietary rations.

Treatments	Growth performances varaibles			
	IBW (Kg)	FBW (Kg)	TWG (Kg)	ADWG (Kg)
T1	111.71	226.86	114.71	0.630
T2	110.00	223.12	113.12	0.621
T3	114.28	225.00	110.71	0.608
SEM	3.98	8.79	5.66	0.031
SL	NS	NS	NS	NS
Overall mean	111.91	224.77	112.86	0.620

Whereas: IBW=Initial Body Weight; FBW=Final Body Weight; ADWG =Average daily body weight gain; SEM=Standard Error of the Mean; SL=Significance Level; NS= Not significant; T1 = Rhodes grass hay *ad-libitum*+ 20% molasses + 40% wheat bran + 40% noug seed cake; T2 = Rhodes grass hay *ad-libitum* + 20% maize grain + 45% wheat bran + 35% noug seed cake; T3 = Rhodes grass hay *ad-libitum* + 65% wheat bran + 35% cotton seed cake

3.2. Growth Trend

The growth trend of experimental bulls is depicted in Figure 1. The body weight increments of all experimental treatments had a similar trend. There was a steady body weight increment with slight variation during their actual feeding period. As reported by [13] the growth rate of animals during the fetal period and from birth to puberty increases; after puberty, it progressively decreases as the animal reaches maturity under constant environmental conditions and nutrition.

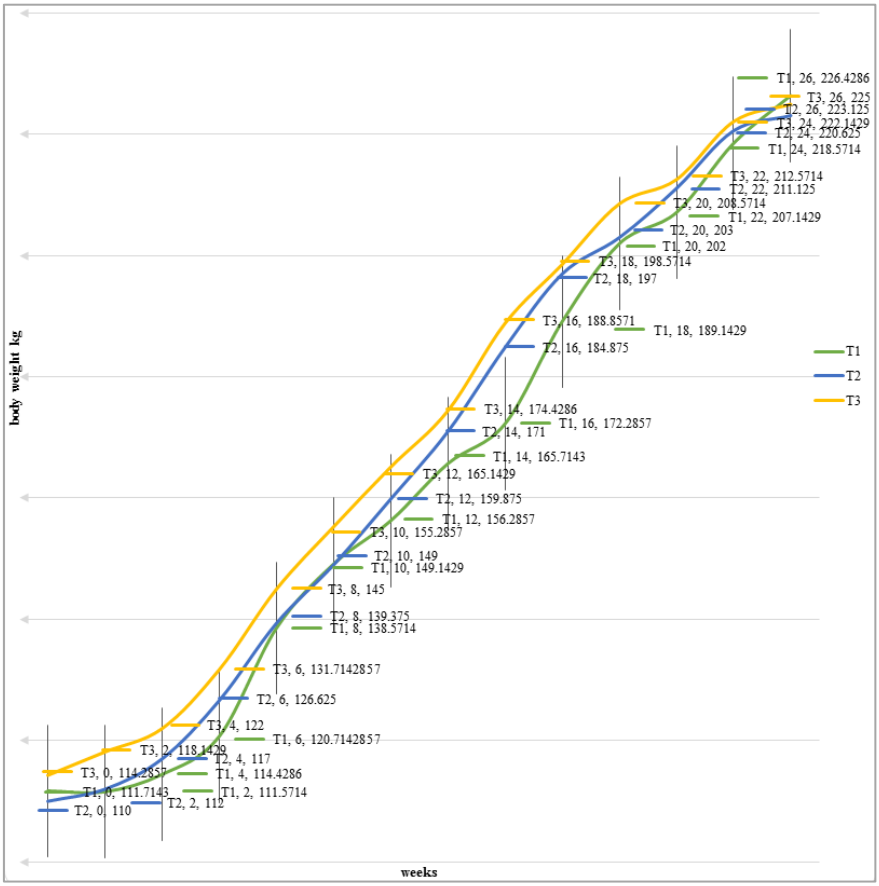

Figure 1. Growth trend of Guraghe bulls under different dietary rations.

3.3. Carcass Charactertics

Carcass Weight and Dressing Percentage

The slaughtering body weight, hot carcass weight, dressing percentage and cold carcass weight of yearling Guraghe bulls fed different dietary rations is shown in Table 3. The study results were not showed significant differences ($P>0.05$) among the treatments. The overall mean of carcass dressing percentage of Guraghe bulls was higher than dressing percentage of yearling Kereyu bulls fed similar dietary rations [7]. However, the current dressing percentage is similar to the report of [6] for yearling Arsi bulls that fed similar dietary rations. However, the dressing percentage of this study was lower than the reports of [8] on two years old Arsi bulls fed different dietary rations. The dressing percentage of beef cattle is affected by genetic and non-genetics factors [14] The overall mean of cold carcass weight of this study was lower than the hot carcass weight due to drip loss of carcass weight during freezing time.

Table 3. *Slaughter body weight, hot carcass weight, dressing percentage and cold carcass weight of Guraghe bulls fed different dietary rations.*

Treatments	Carcass parameters			
	SBW (Kg)	HCW (Kg)	DP%	CCW (Kg)
T1	213.00	122.63	58.15	117.44
T2	222.33	130.15	58.60	126.6
T3	207.66	115.50	55.27	112.5
SEM	12.54	8.96	1.59	8.65
SL	NS	NS	NS	NS
Overall mean	214.33	122.66	57.34	118.84

Whereas: SBW= slaughter body weight; HWC= Hot carcass weight; DP: Dressing percentage; CCW=Cold carcass weight; SEM= Standard error of mean; SL=Significant level; NS = none significant; T1 = Rhodes grass hay *ad- libitum* + 20% molasses + 40% wheat bran + 40% noug seed cake; T2 = Rhodes grass hay *ad-libitum* + 20% maize grain + 45% wheat bran + 35% noug seed cake; T3 = Rhodes grass hay *ad-libitum* + 65% wheat bran + 35% cotton seed cake

3.4. Offal Components

3.4.1. Non-Edible Offal Components

Non-edible offal components of Guraghe bulls fed different dietary rations are shown in Table 4. All non-edible offal components were not significantly different ($P>0.05$) among treatments. The current study correlates with the reports of [6, 7] which indicated the non-edible offal parts of yearling Arsi bulls and Kereyu bulls were not significantly affected due to different dietary rations.

Table 4. *Non-edible offal parts of yearling Guraghe bulls fed different feeding options.*

Parameters	Treatments			SEM	SL
	T1	T2	T3		
Head with hide (Kg)	12.26	12.53	13.88	0.96	NS
Hide (Kg)	20.86	20.96	20.55	1.29	NS
Tail (Kg)	0.60	0.58	0.65	0.07	NS
Feet with hooves (Kg)	4.11	4.05	4.11	0.26	NS
Lung with trachea (Kg)	2.53	2.55	2.36	0.17	NS
Pancreas (Kg)	0.20	0.23	0.23	0.02	NS
Bladder (Kg)	0.15	0.23	0.26	0.08	NS
Testicle (Kg)	0.36	0.41	0.38	0.03	NS
Penis (Kg)	0.43	0.50	0.45	0.08	NS
Spleen (Kg)	0.55	0.61	0.40	0.07	NS

Whereas SEM: Standard error of mean; SL= Significant level; NS= Non-significant; T1 = Rhodes grass hay *ad-libitum* + 20% molasses + 40% wheat bran + 40% noug seed cake; T2 = Rhodes grass hay *ad-libitum* + 20% maize grain + 45% wheat bran + 35% noug seed cake; T3 = Rhodes grass hay *ad-libitum* + 65% wheat bran + 35% cotton seed cake

3.4.2. Edible Offal Components

Edible offal components of yearling Guraghe bulls fed different feeding options are presented in Table 5. The edible offal components of the current study were not significantly varied ($P>0.05$) among the treatments except for the empty small intestine. The empty small intestine of treatment two was significantly different ($P>0.05$) from treatments one and three. [15] stated that non-edible and edible offal are less affected by different dietary rations.

Table 5. *Edible offal components of Guraghe bulls fed different feeding options.*

Parameters	Treatments			SEM	SL
	T1	T2	T3		
Tongue (Kg)	0.80	0.66	0.66	0.10	ns
Heart (Kg)	0.95	0.88	0.83	0.05	ns
Kidney (Kg)	0.51	0.46	0.53	0.04	ns

Parameters	Treatments			SEM	SL
	T1	T2	T3		
Hump (Kg)	3.96	5.08	4.30	0.55	ns
ESI (Kg)	3.85[b]	5.61[a]	3.86[b]	0.37	*
ELI (Kg)	3.81	3.15	3.73	0.70	ns
Empty gut (Kg)	8.07	8.73	8.76	0.80	ns

Whereas ESI= Empty small intestine; ELI= Empty large intestine; SEM: Standard error of mean; SL= Significant level; NS= Non-significant; T1 = Rhodes grass hay *ad-libitum* + 20% molasses + 40% wheat bran + 40% noug seed cake; T2 = Rhodes grass hay *ad-libitum* + 20% maize grain + 45% wheat bran + 35% noug seed cake; T3 = Rhodes grass hay *ad-libitum* + 65% wheat bran + 35% cotton seed cake

3.5. Primal Cuts of Carcass

Leg, lion, rack, breast and shank and shoulder and neck with their proportions of Guraghe bulls fed different feeding options are listed in Table 6. Muscle and bone of leg, loin, rack, breast and shank and shoulder and neck were not significantly different (P>0.05) across the treatments. The proportion of fat of different primal cuts was significantly varied (P>0.05) across the treatments.

The weight and percentage of muscle, fat and bone of Guraghe bulls fed different feeding options are listed in Table 7. The weight of muscle and bone was not significantly varied (P>0.05) among the treatments. However, weight and percentage of fat significantly varied (P>0.05) across the treatments. Experimental bulls fed 20% molasses + 40% wheat bran + 40% noug seed cake had higher fat than bulls fed 65% wheat bran + 35% cotton seed cake. The results illustrated that different dietary rations have different effects on fat accumulation. In the current results, the muscle percentage was highest as compared to the bone and fat percentage. Previous studies reported that the muscle proportion of Kereyu bulls fed different feeding options and Arsi bulls fed different proportions of poultry litter and concentrate mix had the highest percentage of bone and fat [7, 15]

Table 6. *Physical composition of primal cuts of Guraghe bulls fed different feeding options.*

Primal Cuts	variables	Treatments			SEM	SL
		T1	T2	T3		
Leg (Kg)	Muscle	13.96	13.5	12.05	1.17	NS
	Fat	2.46	2.23	1.63	0.35	NS
	Bone	0.42	3.36	3.15	0.42	NS
Lion (Kg)	Muscle	4.73	4.06	3.80	0.68	NS
	Fat	3.05[a]	1.86[b]	1.85[b]	0.24	*
	Bone	1.45	1.55	1.08	0.27	NS
Rack (Kg)	Muscle	4.85	4.35	4.12	0.32	NS
	Fat	2.03[a]	1.95[a]	1.18[b]	0.14	*
	Bone	1.93	1.90	1.60	0.27	NS
Breast and shank (Kg)	Muscle	4.18	3.65	3.51	0.33	NS
	Fat	2.08	2.00	1.63	0.22	NS
	Bone	1.90	1.66	1.50	0.15	NS
Shoulder and neck (Kg)	Muscle	12.26	11.45	11.14	1.20	NS
	Fat	2.40[a]	2.01[ab]	1.73[b]	0.18	*
	Bone	3.13	2.90	2.73	0.52	NS

Notice: the primal cuts represent only on side of dissected carcass. Whereas SEM: Standard error of mean; SL= Significant level; NS= Non-significant; T1 = Rhodes grass hay *ad-libitum* + 20% molasses + 40% wheat bran + 40% noug seed cake; T2 = Rhodes grass hay *ad-libitum* + 20% maize grain + 45% wheat bran + 35% noug seed cake; T3 = Rhodes grass hay ad-libitum + 65% wheat bran + 35% cotton seed cake

Table 7. Weight of muscle, fat and bone of Guraghe bulls fed different feeding options.

Treatments	Carcass proportion					
	Muscle (kg)	Muscle %	Fat (kg)	Fat %	Bone (kg)	Bone %
T1	37.28	64.12	10.26[a]	19.95[a]	10.47	17.95[a]
T2	38.68	64.13	10.26[ab]	17.95[ab]	11.15	18.09[ab]
T3	36.30	62.67	8.03[b]	14.89[b]	10.47	17.91[b]
SEM	2.80	0.86	0.66	1.13	1.44	0.70
SL	NS	NS	*	*	NS	*

Notice: the primal cuts represent only on side of dissected carcass. Whereas SEM: Standard error of mean; SL= Significant level; NS= Non-significant; T1 = Rhodes grass hay *ad-libitum* + 20% molasses + 40% wheat bran + 40% noug seed cake; T2 = Rhodes grass hay *ad-libitum* + 20% maize grain + 45% wheat bran + 35% noug seed cake; T3 = Rhodes grass hay *ad-libitum* + 65% wheat bran + 35% cotton seed cake

3.6. Partial Budget Analysis

A partial budget analysis of Guraghe bulls fed different feeding options is presented in Table 8. The study results indicated that experimental bulls fed T1 and T3 had better net returns than the bulls fed T2. This might be, due to the cost of molasses being cheap as compared to other concentrates. The results of the partial budget analysis indicated that fattening yearling Guraghe bulls for 26 weeks using different feeding options was not profitable due to the high cost of concentrates. The cost of feeds negatively correlates to the profitability of beef fattening [16].

Table 8. Partial budget analysis of Guraghe bulls fed different feeding options.

List of items	Treatment 1	Treatment 2	Treatment 3
Purchasing price/bull (ETB)	8500.00	8500.00	8500.00
Transport cost/bull (ETB)	500.00	500.00	500.00
Feed cost/bull (ETB)	15725.59	18532.61	15617.88
Veterinary cost/bull (ETB)	635.00	635.00	635.00
Labor cost/bull (ETB)	1230.00	1230.00	1230.00
Total cost/bull (ETB)	26590.59	29397.01	26482.88
Gross return/bull (ETB)	27000.00	27000.00	27000.00
Net return/bull (ETB)	409.4	-2396.61	517.11

Whereas ETB=Ethiopian birr, T1 = Rhodes grass hay *ad-libitum* + 20% molasses + 40% wheat bran + 40% noug seed cake; T2 = Rhodes grass hay *ad-libitum* + 20% maize grain + 45% wheat bran + 35% noug seed cake; T3 = Rhodes grass hay *ad-libitum* + 65% wheat bran + 35% cotton seed cake

4. Conclusion

Yearling Guraghe bulls did not attain export market weight through feeding the current feeding options at 26 weeks of feeding periods. Therefore, looking for other feeding options that would enable the bulls to attain the export market body weight demand with profit is imperative.

Abbreviations

ANOVA	Analysis of Variance
CCW	Chilled Carcass Weight
DP	Dressing Percentage
FBW	Final Body Weight
GLM	General Linear Model

HCW	Hot Carcass Weight
IBW	Initial Body Weight
LSD	Least Significance Difference
RCBD	Randomized Complete Block Design
SAS	Statistical Analysis System
SBW	Slaughter Body Weight
SEM	Standard Error of Mean
TWC	Total Weight Change

Author Contributions

Aman Gudeto: Conceptualization, Data curation, Formal Analysis, Investigation Methodology, Project administration Resources, Validation Visualization, Writing – original draft, Writing – review & editing

Berhanu Tassew: Funding acquisition, Investigation, Project administration, Resources, Supervision, Validation Visualization, Writing – review & editing

Conflicts of Interest

The authors declare no conflicts of interest.

References

[1] CSA (Central Statistical Agency). (2021). Livestock and Livestock Characteristics (Private Peasant Holdings), Federal Democratic Republic of Ethiopia, Agricultural Sample Survey. Statistical Bulletin 589 Volume II, Addis Ababa, Ethiopia.

[2] Asfaw Negassa, Shahidur Rashid, and Berhanu Gebremedhin. (2011). Livestock Production and Marketing in Ethiopia. Ethiopian Support Strategy Program II (ESSP II) Working Paper 26. Washington, D. C.: IFPRI.

[3] Mieso G., Girma D., Tesfaye A. T., Frehiwot M., Tesfaye A. (2013). Evaluation of Different Feeding Options on Yearling Borana Bulls to Attain Export Market Weight at Adami Tulu Agricultural Research Center. American Journal of Cell and Animal Biology, 1(1).

[4] Girma D., Mieso G., Tesfaye A., Arse G., Frehowit M., Ashebir W., and Aman G. (2015). Effect of Different Feeding Options on Growth Response and Carcass Characteristics of Two-Year-Old Borana Bulls for Export Market Weight Gain at Adami Tulu Agricultural Research Center. Basic Research Journal of Agricultural Science and Review, 4(5).

[5] Tesfaye A. T., Tesfaye A. A., Girma D., Mieso G., Ashebir W., Aman G., and Frehowit M. (2017). Effect of Different Feeding Options on Growth Response and Carcass Characteristics of Two-Year-Old Kereyu Bulls for Export Market Weight Gain at Adami Tulu Agricultural Research Center. In Annual Completed Research Proceedings of Oromia Agricultural Research Institute (OARI) Held at Batu, Oromia.

[6] Aman Gudeto, Tesfaye Alemu, Mieso Guru, Ashebir Worku, and Genet Dadi. (2019). Evaluation of Different Feeding Options for Yearling Arsi Bulls to Attain Export Market Weight. Journal of Biology, Agriculture and Health Care, 9(14). ISSN 2224-3208 (Paper), ISSN 2225-093X (Online). http://doi.org/10.7176/JBAH

[7] Ashebir Worku, Tesfaye Alemu Tucho, Mieso Guru, Aman Gudeto, Frehiwot Messele, and Genet Dadi. (2019). Evaluation of Different Feeding Options on Growth Response and Carcass Characteristics of Yearling Kereyu-Bulls to Attain Local/Export Market Weight. International Journal of Agricultural Science and Food Technology, 5(2), 050-053. http://doi.org/10.17352/2455-815X.00004

[8] Tesfaye Alemu Tucho, Ashebir Worku, Genet Dadi, Mieso Gurru, and Aman Gudeto. (2019). Evaluation of Different Feeding Options for Growing Two-Year-Old Arsi Bulls to Attain Export Market Weight. Basic Research Journal of Agricultural Science and Review, 7(1).

[9] Rege J. E. O., Kahi A. K., Okomo-Adhiambo M., Mwacharo J., Hanotte O. (2001). Zebu Cattle of Kenya: Uses, Performance, Farmer Preferences, Measures of Genetic Diversity and Options for Improved Use. Animal Genetic Resources Research, 1. International Livestock Research Institute (ILRI), Nairobi, Kenya, p. 103.

[10] Ayalew W. and Feyisa T. (2017). Productive and Reproductive Performances of Local Cows in Guraghe Zone, South West Ethiopia. Online Journal of Animal Feed Research, 7(5), 105-112.

[11] SAS (Statistical Analysis System) Institute Inc, 2004. SAS Online Doc® 9.1.3. Cary, NC, SAS Institute Inc.

[12] Tewordos Alemneh and Mebrate Getabalew. (2019). Factors Influencing the Growth and Development of Meat Animals. International Journal of Animal Science, 3(3).

[13] McDonald, P., Edwards, R. A., Greenhalgh, J. F. D., Morgan, C. A., Sinclair, L. A., and Wilkinson, R. G. (2010). Animal Nutrition, 7th ed. Prentice Hall, Harlow, England, London.

[14] Jessica M. Coyne, Ross D. Evans, and Donagh P. Berry. (2019). Dressing Percentage and the Differential Between Live Weight and Carcass Weight in Cattle are Influenced by Both Genetic and Non-genetic Factors. Journal of Animal Science, 97, 1501-1512.

[15] Berhanu Tassew, Genet Dadi, Aman Gudeto, and Frehiwot Mesele. (2023). Effect of Partial Substitution of Concentrate Mix with Poultry Litter on Body Weight Gain and Carcass Characteristics of Arsi Cattle Young Bulls. International Journal of Advanced Research in Biological Sciences, 10(7), 43-55.

[16] E. A. Abo Elfadl, A. M. Fardos, and H. A. A Radwan. (2015). Quantitative Methods to Determine Factors Affecting Productivity and Profitability of Beef Fattening Enterprises in Egypt. Global Veterinarian, 14(1), 77-82.