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On-Farm Evaluation of the Replacement Value of Sugarcane Tops in the Basal Diets of Fattening Local Cattle Bulls in Adama Area

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ABSTRACT

A study was conducted in the Adama district of East Shawa Zone in the Oromia Region to evaluate the replacement value of sugarcane tops in the basal diets of fattening local cattle bulls. The primary objective was to assess the effects of feeding sugarcane tops, as opposed to teff straw, on the growth performance of local cattle bulls and to determine the economic benefits. Six farmers, capable of purchasing bulls, were purposefully selected for study. Twelve local cattle bulls, with similar body conditions and ages, were bought from the Adama cattle market. The participating farmers received training on feed preparation, cattle fattening management, and data recording. The bulls were randomly assigned to two groups: six bulls were fed sugarcane tops (T1), and the others six were fed teff straw (T2) as their basal diets. The results showed no significant differences in growth performances between the bulls fed teff straw and those fed sugarcane tops. The overall final body weight, daily body weight gain, and total body weight gain were 322.08 kg, 0.79 kg and 55.58 kg, respectively. However, partial budget analysis indicated that feeding sugarcane tops was more profitable than feeding teff straw. The study concluded that sugarcane tops could effectively replace teff straw as a basal diet for local cattle. Therefore, where available, sugarcane tops can be used solely as a basal diet for fattening local cattle bulls.

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Introduction

Ethiopia's agriculture sector accounts 40% of the country's gross domestic product and employs of 75% a work force. Livestock is a key component in this country, with the country boasting a cattle population of 75 million [1]. However, livestock productivity remains low, primarily due to feed shortages and genetic erosion or inbreeding. Contributing factors to feed shortages include the reduction of natural land, limited development of forage production, low availability of quality feeds, and frequent droughts. Consequently, there is a need to explore alternative feed resources to support livestock production.

One potential alternative is sugarcane tops, a major by-product of sugar industry [2]. Available in burnt form, sugarcane tops constitute 15 to 25% of the plant biomass and can yield 30 tons per hectare of sugarcane field [3,4]. These tops are especially abundant during the dry season, coinciding with cane harvesting when green fodder is scarce. Palatable and rich in soluble carbohydrates, sugarcane tops can reduce feeding costs and provide necessary fiber for ruminants [5].

Despite their benefits, sugarcane tops are low in nutritional protein and energy [6]. Various studies have focused on improving the nutrient content of sugarcane tops through silage making, treatments, and additives, and evaluating their effects on the animal growth [5,7]. However, these studies were primarily conducted on-station and did not assess the practical feasibility of feeding sugarcane tops at farmer level.

Ethiopia's numerous sugar factories generate large quantities of sugarcane tops, yet their use as livestock feed remains limited [8]. In livestock production, feeds costs can constitute 50-80% of total production costs, so reducing costs can significantly enhance economic efficiency.

Modern cattle fattening is a growing business in urban and peri-urban areas, where cattle fatteners often use crop residues like teff straw as a basal diet, particularly around Adama district [4]. recommended that sugarcane tops as basal diets for small holders, and another study suggested they could replace grass hay in cattle feed [8]. However, the impact of replacing teff straw with sugarcane tops on cattle growth has not been evaluated. Therefore, this study was designed to evaluating growth performance of local cattle bulls fed sugarcane tops as a replacement for teff straw and to assess the profitability of this practice.

Materials and Methods

Location of the Study Area

The study was conducted under on-farm condition at Adama district, located in the main Rift Valley of Ethiopia, within the East Shawa Zone of the Oromia Reginal State. Kuriftu kebele was purposely selected with the assistance of livestock expert from Adama district. This kebele is situated near the Wonji Shawa Sugar Factory, appromixately 8 km from Adama town and 105 km east of Addis Ababa, at an altitude of 1500 meters above sea level. The study area receives an annual rainfall of 814 mm, with temperature ranging from 15 to 27oc.

Training and Farmer Selection

Training was provided to 20 male and 10 female farmers, along with kebele development agents and other stakeholders. The training focused on the animal selection, feed preparation, animal feeding, and health management. Following the training, six farmers were selected based on the experience in livestock fattening, willingness and capacity to purchase experimental animals.

Experimental Animal Selection

The age of experimental bulls was estimated through dentition and by inquiring about the animals' history of animals. The local cattle bulls that replaced four pair of teeth and were estimated to be over four years old, with similar body conditions, were purchased from Adama town cattle market. Each farmer individually bought two bulls, resulting in twelve experimental bulls kept under fattening trials.

Experimental Feeds Preparation

The basal feeds used in the study were teff straw and sugarcane tops. Each farmer stored his teff straw in sacks and kept under shade. The sugarcane tops were collected from the factory farm, transported to farmers' homes, chopped into 3-7 cm pieces using a hand cutter, and then stored in sacks under shade. Wheat bran and noug seed cake were purchased from Adama market and mixed in the ratio of 67:33. One kilogram of common salt was added to every 100 kg concentrate-mix.

Animal Feeding and Treatments

Each farmer kept experimental animals in its home backyard. The bulls were randomly assigned to one of the two basal diets: one group was fed the sugarcane tops, while others group was fed teff straw. Teff straw and sugarcane tops were packed in a sack and weighed, then freely given to animals. Each experimental animal received 6 kg of mixed concentrate per day and was allowed to drink water twice daily. The feeding period lasted for seventy days.

Data Collection

A heart girth meter was used to estimate the body weight of the experimental bulls. Initial body weight was taken at the beginning of the experiment, with final body recorded at the of the fattening period. The weight of concentrate-mix, sugarcane tops and teff straw given to experimental bulls were recorded by farmers themselves using the prepared data collection sheet.

Growth Performance Evaluation

Total body weight gain was calculated by substracting initial body weight from final body weight of the bulls. The average daily body weight gain was determined by dividing the total body weight gain by the total number of days the animal was kept in the feeding trial.

Partial Budget Analysis

The purchasing and selling prices of bulls were recorded, along with other variable costs such as feed, veterinary care, and transportation costs for the sugarcane tops during the experimental period. Labor and fixed costs were not included in the budget analysis. The price of teff straw was estimated based on market price of one packed sack. Since farmers collected sugarcane tops from the Wonji Shawa Sugar Factory farm without payments, only transportation costs were included in the analysis. So, only the transportation cost of sugarcane tops was included in the analysis. Total variable costs were subtracted from total revenue to get net profit of local cattle bulls' fattening.

Statistical Analysis

The data on body weight change were analyzed using analysis of variance (ANOVA) with the following model: $Yijk = \mu + Ti + Eij$, Where, Yij = the response variable, μ = overall mean, Ti = treatment effect and Eij = random error. When differences were found significant at $P<0.05$, Least significance difference (LSD) was used to separate the means.

Results and Discussion

Growth Performances

The initial body weight, final body weight, daily weight gain and total body weight gain of local cattle bulls are listed in Table 1. The study results showed no significant variations between local cattle bulls fed teff straw and those ssugarcane tops on their final body weight, daily body weight gain and total body weight gain.

Table 1: The Growth Performance of Cattle Bulls Fed Sugarcane Top and Teff Straw as Basal Diets

Treatments	IBW (kg)	FBW (kg)	DWG (kg)	TWG (kg)
T1	274.5±8.5	327.6±11.0	0.758±0.75	53.16±5.31
T2	258.5±8.4	316.5±11.0	0.823±0.76	58.00±5.33
Overall mean	266.5±6.0	322.08±7.7	0.79±0.054	55.58±3.77

T1: Sugarcane top; T2: teff straw; DWG: Daily weight gain; FBW: Final body weight; IBW: Initial body weight; TWG: Total weight gain.

The study result aligns with a report of, which indicated no differences in growth performances of Fogera bull calves fed sugarcane tops and those fed grass hay [8]. Similarly, reported no significant differences among different blood levels of crossed Friesian with Kenana cattle calves fed diets with 20% and 30% sugarcane tops sugarcane tops added to total mixed rations [4]. found that afar a the other author also reported that there were no significant differences among different blood levels of crossed Friesian with Kenana cattle calves fed on 20% and 30% sugarcane tops added to total mixed rations [4]. However, found that Afar bulls fed urea treated sugarcane tops with concentrate-mix showed significantly better growth performance than those fed grass hay with concentrate-mix [7].

The observed on daily body weight gain of fattened animals in this study is consistent with the report of on Boran bulls, which achieved a daily weight gain of 0.79 kg when fed various formulated dilatory rations in an Adami Tulu Jiddokombolcha district of East Shewa Zone [9]. Additionally, the daily body weight gain of experimental bulls in this study was higher than that reported by for aged oxen, which attained 0.65 kg per day fed formulated concentrate (cotton seed cake and wheat bran) and wheat straw as basal diets in Dodola district of West Arsi Zone of Oromia [10].

Partial Budget Analysis

The partial budget analysis of local cattle bulls fed sugarcane tops as replacement to teff straw are listed on Table 2. The costs for purchasing bulls, concentrate-mix, veterinary care, and gross return did not show significant variations between the groups fed on sugarcane tops and teff straw. However, there were significant differences between cost of basal diets, total variable costs and net return for fattened bulls fed on sugarcane tops versus teff straw. The animals fed sugarcane tops generated higher profit those teff straws, likely due to the cost differences between teff straw and sugarcane tops.

Table 2: Partial Budget Analysis of Local Cattle Bulls Fed Sugarcane Tops and Teff Straw

Items (ETB)	T1	T2	Overall mean
Purchase price per bull	19,166.67	18,666.67	18,916.67
Concentrate cost per bull	8,805.30	8,805.30	8,805.30
Basal diets cost per bull	160.42b	2,044.00a	1,102.21
Veterinary cost per bull	726.70	750.00	738.35
Total variable cost per bull	28,859.09b	30,265.97a	29,562.53
Gross return per bull	43,500.00	43,000.00	43,250.00
Net return per bull	14,640.91a	12,734.03b	13,687.47

ETB: Ethiopia Birr; T1: Sugarcane tops; T2: teff straw

Farmers' Evaluation of the Experiment and Feedback

Farmers provided their evaluations of the experiment, which involved fattening local cattle bulls by feeding them sugarcane tops as a replacement for teff straw as basal diets. They learned about various aspects of animal fattening including animal selection criteria, feeding management, and dietary ration preparation. The participating farmers appreciated the final body condition of the bulls and the efficiency of formulated and basal diets. They found the fattening experiments to be profitable and easily manageable. Additionally, they agreed that the sugarcane tops can effectively teff straw as a basal diet for cattle fattening.

Conclusions and Recommendations

The study reveals that feeding the sugarcane tops or teff straw to local cattle bulls as basal diets has a similar effect on their growth performances. This indicates that the sugarcane tops can replace the teff straw as basal diet for fattening local cattle bulls. The partial budget analysis shows that animals fed sugarcane tops as basal diets are more profitable than those fed teff straw. Therefore, in areas where sugarcane tops are available, feeding them as basal diets to local cattle bulls can make farmers more profitable compared to using teff straw.

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