

## Research Article

# Demonstration and Evaluation of Enset Corm (*Ensete ventricosum*) Based Oxen Fattening in Kachabira and Lemu Districts, Southern Ethiopia

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### Abstract

A study was conducted to demonstrate and evaluate effects of enset corm (root) supplementation for oxen fed on locally available forage sources under farmer's management at Kachabira and Lemu districts, southern Ethiopia. 3 kg concentrate mixtures were prepared from wheat bran (86.5%), noug cake (*Gizotia abissynica*) 13% and salt (1%) were offered for all animals across farmers. Enset corm offered based on body weight, 1.5-2 kg (0.5-1%) DM basis was offered per head per day as supplements and farmers were considered as replicates. The results indicated that on average, the overall weight change is 81.1 kg per head over the fattening period, 90 days. Oxen supplemented with enset corm gained higher ( $p < 0.05$ ) weight at Kachabira compared to those at Lemu. In similar way, an ox fattened at Kachabira is significantly higher final weight compared to Lemu. The overall mean weight (354 kg/head) and the overall gain (900 g/head/day), averaged by locations, indicated that fattening is promising for farmers who fatten animals using enset corm as supplements. On thirteen day, 45<sup>th</sup>, 60<sup>th</sup>, 75<sup>th</sup> and 90<sup>th</sup> days oxen at Kachabira was significantly ( $p < 0.05$ ) higher compared to Lemu. There is an increasing trend in weight gain in both locations; the increase rate was higher in Kachabira than Lemu district. It could be concluded that strategic supplementation and fattening of oxen with 500 gm enset corm DM /head/day could be profitable in enset dominant farming systems.

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### Introduction

The livestock sector contributes considerably to Ethiopian economy, yet productivity is not unequivocally responded to the livestock population of the country. It is eminent that livestock products and by-products in the form of meat, milk, honey, eggs, cheese, and butter supply etc. provide valuable protein that contributes to improve the nutritional status of the peoples of the country [1]. The livestock population of the country was estimated to be about 60 million cattle, 31.3 million sheep, 32.74 million goats, 1.42 million camels in the sedentary areas of the country and poultry estimated to be about 56.87 million [1].

Despite huge potential of livestock population and its diversity, the benefits obtained from the sector are low compared to other African countries and the World standard. Asfaw et al., Berhanu and Pavanello [2-4] reported that on average beef yield per animal is 108.4 kg, which is by far lower than other African countries, 119 kg for Sudan, 146 kg for Kenya, 127 kg for Eastern Africa, 146 kg for Africa, and 205 kg for the world. The number of off take rate is also lower than other African countries [1]. Information is available for the Ethiopian Boran breed which widely used for beef in eastern and south eastern part of the country. In southern region, preliminary characterization results confirmed that bull type in southern took long time to attain market weight. Reports indicated that Boran bull performs well under farmers' management condition in southern Ethiopia [5]. There are local central zone cattle populations which perform nearly equivalent beef yield as Boran under well management [6].

To improve beef yield of the region, various research activities have been undertaken in different parts of the country. The recent study on evaluation of feedlot performance of Wolaiya zebu cattle populations using locally available energy-rich feeds (taro, enset corm, sugarcane and local grasses) at similar ages indicated that the locally available non-conventional feed could substitute factory by products for fattening. However, the great majority (86%) of livestock feed comes from grazing and crop residues [1] Results from feeding experiment indicated that root crops such as taro and enset corm could potentially substitute factory byproducts and could give organic beef that is preferred as food in the district with special taste and aroma.

Beef cattle research has either been fragmented or less targeted the actual domestic and international market. Conscious of this fact, this national project is prepared to generate feasible technologies to meet the required regional and or international market for beef cattle at different ages for different breeds across agro-ecologies. The study is the continuation of the study conducted by Bassa et al. [7] that confirmed fattening oxen by using local available feed as energy supplement is recommended for areas where local forage is available and enset corm used for supplementation. Shewangizawu et al. [6] also reported that farmers in southern Ethiopia used enset parts, sweet potato vines, Taro (*Boloso-1*) as major supplement for cattle fattening. Therefore, this evaluation was proposed to evaluate enset based oxen fattening using locally available feed resources on beef yield and profitability of fattened animals.

## Materials and Methods

### Descriptions of the study areas

Kechabira district of Kembata Tembaro (KT) zone and Hadiya zone are located in south Nations, Nationalities, Peoples Region (SNNPR). Kechabira is situated at the south western parts of the KT zone. The woreda lies between 07°12'30.1"-07° 17' 08.3N and 37° 47'48- 37° 50' 30.6E with an altitude of 2400 meters above sea level. Kacha Bira is bordered on the south by an exclave of the Hadiya Zone, on the southwest by the Wolayita Zone, on the west by Hadero Tunto, on the northwest by the Hadiya Zone, on the north by Doyogena and Angacha, and on the east by Kedida Gamela. Kacha Bira has 56 kilometers of all-weather roads and 37 kilometers of dry-weather roads, for an average road density of 310 kilometers per 1000 square kilometers. Lemu is located 230 kms southwest of Addis Ababa. Hadiya zone is among the most extensively cultivated and densely populated areas of the region. The major crops grown in the area include enset, wheat, barley, tef, faba bean and potato. The farmers also keep different types of livestock including cattle, sheep, goat, equine and poultry. Natural pasture is the main (about 75%) feed of livestock among Lemu farmers. 50% of farmers around Lemu practice stall feeding. However, less than 0.09% land is allocated for forage production irrespective of the dairy belt of the region.

### Management of experimental animals

20 beef cattle from Lemu and 16 from Kachabira of similar age were selected for the demonstration and evaluation. All the experimental bulls were given with 3 kg of concentrate (wheat bran, 60%; Noug cake, 38% and salt, 2%) as protein supplement while enset corm was offered based on the body weight (0.5-1% body weight, 1.5-2 kg DM/head/day) of the animals. Enset corm meant for experimental animals was offered after slicing and sun drying about 4 to 6 hrs during day time.

### Preparation of enset corm for supplementation

About 0.2 ha land is occupied by enset plant at the majority of farmer's field. There is an enset corm feeding practices to productive animals and fattening oxen among Kachabira and Lemu communities, a total of 32 participants, 16 from each district. Enset corm is chopped into smaller pieces and sun-dried before feeding. About 1.5-2 kg DM/head/day enset corm (root) was offered to each ox as energy supplement to fattening animals.

### Technology promotion or transfer

16 participants from Lemu and 16 from Kachabira, a total of 32 ox fattening farmers were involved in the demonstration of the technology. Farmer's perception towards technology, experience shared, the way forward was recorded and measured accordingly. Field day was organized for experience sharing, promoting technology transfer and linking farmers to technology to assess whether adopted or not.

### Enset production potential and practices of using enset corm for animals

About 0.125-0.25 ha of land of smallholder farmers is occupied by enset production in central south region (Table 1). Farmers used to practice feeding the whole parts or corm of enset root for productive animals, lactating cows and draft oxen as energy source feed. Usually fattening oxen are supplemented initially with few amount and then the amount increases towards the end of the finishing period.

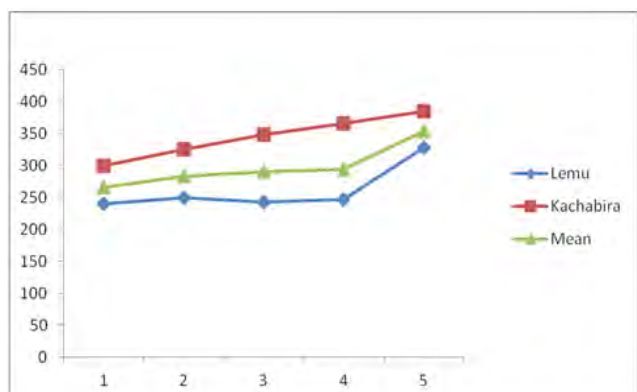
### Data analysis

The data were analyzed using General Linear Model in the procedure of SAS (SAS 2013). Descriptive statistical analysis was used to analyze percentages and socioeconomic parameters. Tukey's test was used to separate means at  $p < 0.05$  (Figure 1).

Region/zone	Production in Quintals			Yield (Quintals/plant)		
	Amicho	Kocho	Bulla	Amicho	Kocho	Bulla
SNNPR	17,220,257.28	19,935,121.40	589,993.22	0.22	0.26	0.01
Guraghe	831,678.13	865,877.78	33,059.91	0.29	0.30	0.01
Hadya	590,662.03	622,029.31	60,567.01	0.22	0.23	0.02
KT	17,404.11	24,984.73	947.96	0.01	0.02	*
Sidama	9,834,586.49	9,422,838.03	294,456.75	0.25	0.24	0.01
Gedeo	3,003,975.22	3,421,855.40	61,909.36	0.39	0.44	0.01
Wolayita	444,343.35	476,065.62	46,910.55	0.22	0.24	0.02
Sheka	931,646.82	2,786,619.67	15,486.49	0.15	0.44	*
Keffa	35,642.69	152,250.85	3,126.45	0.01	0.02	*
Gamo Gofa	45,511.31	78,975.41	5,423.93	0.02	0.03	*
Bench Maji	43,344.01	99,627.53	926.40	0.10	0.24	
Yem	-	168,750.88	6,529.44	-	0.60	0.02
Dawuro	593,772.08	1,087,415.75	-	0.24	0.44	-
Konta	81,552.52	103,337.63	-	0.35	0.45	-
Silitie	446,757.09	304,825.98	23,917.08	0.58	0.40	0.03
Segene people	319,381.44	319,669.85	36,731.89	0.39	0.39	0.05

**Table 1:** Enset production potential and productivity in SNNPR.

Source: CSA, 2017; KT, Kembata Tembaro zone, \*, not estimated



**Figure 1:** Pattern of weight changes for oxen fattening using enset corm in Kachabira and Lemu, southern Ethiopia.

## Results and Discussion

### Live weight and average daily gain

Weight changes and average daily gain of oxen fattening with active participation using enset corm as supplementary feed is presented in table 2. There was no initial weight variations between two the locations and among the fattening oxen. Both locations are known by enset-based wheat farming. Both locations are known by stall feeding (limited movements) of animals with intensive cultivation and extremely high human population pressure. Variations across locations and among farmers is unavoidable due to variation in feed resources and management differences. Weight changes is significantly varied between the locations, oxen fattened at Kachabira showed significantly ( $p < 0.05$ ) higher weight changes over Lemu. On average, the overall weight change is 81.1 kg per head over the fattening period, 90 days. Oxen supplemented at Kachabira gained higher ( $p < 0.05$ ) weight compared to those at Lemu. In similar

way, final weight of oxen fattened at Kachabira was significantly higher final weight compared to Lemu. The mean weight (354 kg/head) and the overall gain, averaged by locations, indicated that oxen fattened using enset corm gained 900 g per head/day, which is promising for smallholder farmers who fatten animals using enset corm as supplements. All animals were dewormed before fattening. Diseases and seasonal price fluctuations are identified as risk factors hindering profit made from cattle fattening. However, indigenous breeds have capacity to cope up with harsh environmental conditions, like disease, heat and poor quality feeds [8].

This value is comparable with weight gain of Boran oxen while reasonably higher weight changes compared to other breeds (Bassa et al., 2016). The weight gain of local animals varies based on quality feeds, disease control and other inputs provision [8].

### Pattern of weight changes

A trend of weight in both locations is indicated in Table 3. Initial weight was not significantly varied across locations while from thirteen day to final weight varied significantly across locations. On thirteen day, 45<sup>th</sup>, 60<sup>th</sup>, 75<sup>th</sup> and 90<sup>th</sup> days oxen at Kachabira was significantly ( $p < 0.05$ ) higher compared to Lemu. The mean finishing weight was 354 kg/head and was consistently increased. There is an increasing trend in weight gain across locations; the increase rate being higher in Kachabira compared with Lemu district.

### Profitability of fattening business

Purchase prices, sold amount (birr) and differences due to fattening is presented in Table 4. On average, the initial purchase price was about 10115.63 Ethiopian birr (ETB) while the average sale price was 18743.85 ETB.

Parameters	Lemu (Hadiya)	Kachabira (KT)	Mean	SE	Sign level
Initial weight	263.84	283.95	272.8	8.9	0.1423 (NS)
Weight changes (kg)	65.41	100.63	81.06	6.47	0.0009 (***)
Final weight (kg)	328.25	384.58	353.8	12.38	<0.001 (***)
Average daily gain (g/head/day)	0.73	1.12	0.90	0.07	0.0009 (***)

**Table 2:** Average daily gain and live weight changes (kg) in selected districts of central South zones, southern Ethiopia.

Mean weight in a row with different superscript letters are statistically different. \*\*\* $P < 0.001$ ; NS, non-significant; KT, Kembata Tembaro zone.

Parameters	Lemu	Kachabira	Mean	SE	Sign level
Initial weight	263.84	283.95	272.8	8.9	0.1423 (NS)
Thirteen day	240.01 <sup>a</sup>	299.82 <sup>b</sup>	266.6	10.85	0.0008 (***)
45 <sup>th</sup> day	249.64 <sup>a</sup>	325.31 <sup>b</sup>	283.3	10.75	<0.001 (***)
60 <sup>th</sup> day	243.73 <sup>a</sup>	348.95 <sup>b</sup>	290.5	10.70	<0.001 (***)
75 <sup>th</sup> day	247.40 <sup>a</sup>	365.56 <sup>b</sup>	294.5	14.92	<0.001 (***)
90 <sup>th</sup> day	328.25 <sup>a</sup>	384.58 <sup>b</sup>	353.8	12.38	<0.001 (***)

**Table 3:** Weekly weight change (kg) trends in selected districts of central South zones, Southern Ethiopia.

Mean weight in a row with different superscript letters are statistically different. \*\*\* $P < 0.001$ ; NS, non-significant.

Code #	Purchase	Sold	Net difference
<b>Kachabira</b>			
Code #1*	10350.00	16000.00	5650.00
#2	7500.00	15500.00	8000.00
#3	4500.00	7000.00	2500.00
#4	9500.00	17000.00	7500.00
#5	8000.00	16000.00	8000.00
#6	12000.00	19000.00	7000.00
#7	7000.00	13500.00	6500.00
#8	13000.00	20000.00	7000.00
#9	11000.00	18000.00	7000.00
#10	13000.00	21000.00	8000.00
#11	6000.00	14000.00	8000.00
#12	15000.00	28000.00	13000.00
#13	7500.00	16500.00	9000.00
#14	16000.00	29000.00	13000.00
#15	9500.00	16000.00	6500.00
#16	12000.00	19000.00	7000.00
Mean	10115.63	17843.75	7728.13
Max	16000.00	29000.00	13000.00
Min	4500.00	7000.00	2500.00

**Table 4:** Market prices and profitability of fattened oxen in Kachabira and Lemu (Averaged), Southern Ethiopia.

Code #1...represents participants involved in the demonstration, as they fattened an ox, participants number is equal to number of oxen, \* farmers who fatten the ox under similar management pooled (averaged) together.

The total amount of concentrate mixture fed to trial animals was 1680 kg, which is about 1500 and other family costs were estimated to be 1228.13 ETB. Thus, 7728.13-1500=5000, that means smallholder farmers who feed two animals in one fattening period (90 days) using locally available feeds and supplements the animals with enset corm could obtain over 10,000 ETB and minimum of 5000 ETB.

## Conclusion

The overall mean weight (354 kg/head) and the overall gain (900 g/head/day), averaged by locations, is generally and reasonably higher and implies that smallholder farmers could plan supplementation of enset corm for finishing animals in enset dominant farming system. It could also be concluded that supplementing oxen with about 500 gm DM enset corm/head/day along with the available local feeds could help fattening oxen in enset dominant farming systems.

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