On-farm verification of improved feeding systems for highland sheep in North Shewa zone of Amhara region

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Abstract

The study was conducted on-farm at Syadebrena Wayu district from end of January to mid April 2008 to verify alternative dry season sheep supplementation under farmers' management. Sixty highland yearling ram lambs were used in the study. Animals were grouped into four feeding treatments: T_1 (grazing alone), T_2 (grazing + 500 g mixed concentrate (30.75% noug cake (*Guizotia abyssinica*), 50% wheat bran, 18% oat grain, 1% limestone, and 0.25% salt)), T_3 (grazing + 150 g oat grain + 150 g noug cake), and T_4 (grazing + teff straw adlib + 300 g noug cake + multi-nutrient block adlib). All the supplemented groups (T_2, T_3 and T_4) gained significantly more weight than the control (T_1). Among the supplemented groups, sheep in T_2 attained the highest final weight (23.88±0.23 kg) and average daily weight gain (50.85±3.06 g $head^{-1}$ day^{-1}). However, there were no significant differences between T_2 and T_3 and between T_3 and T_4 in weight gain. Economic analysis of the feeding packages showed that T_2 was the most economical feed ration with a net return of ETB 99.81. It is recommended that 500 g h^{-1} d^{-1} mixed concentrate can be used to finish grazing sheep for market in North Shewa zone by farmers who have access to commercial concentrates.

Key words: Dry season supplement, highland sheep, noug cake, oat grain.

Introduction

Grain and crop residue as well as locally produced liquor residue (*atela)* are used as livestock fattening ration in the central highlands of North Shewa zone of Amhara region. Farmers of Inewari, Deneba, Angolelana Tera, and Minjar Shenkora districts practice market-oriented livestock fattening, which focus on draught oxen, aged cows and castrate rams.

The expansion of arable farming resulted in shortage of grazing lands which led to an increased utilization of crop residues as animal feed. Grazing is in short supply at Deneba and hence animals depend mainly on crop residues and left over. Farmers usually feed crop

residues mostly without any treatment to enhance the nutritive value. However, numbers of studies suggested the advantage of supplementation and multi nutrient blocks in improving intake and digestibility of crop residues. A study conducted at Debre Zeit Agricultural Research Center showed that urea molasses block improved the performance of Arsi Bale-male lambs by 41.3 g daily gain (unpublished).

A previous on-farm fattening study at Deneba indicated that supplementation with a high plane diet prepared from locally available feeds (1000 g oat straw, 100 g faba bean, 50 g *Lathyrus sativa* grain, and 450 g oat grain) supported a weight gain of 44.9 g day^{-1} than a low plane diet (100 g oat straw, 100 g faba bean, 50 g *Lathyrus sativa* grain) which gave 14.5 g day^{-1} over a 36 week fattening period. A subsequent fattening study at Debre Birhan research center (ILCA, 1989) indicated that adult male highland Menz sheep can be successfully fattened during the dry season if supplemented with a moderate amount of concentrate at a level of 500 g $head^{-1}$ day^{-1} (ILCA, 1988). A lower rate of supplement would not produce quality carcasses required by the market (Gautsch and Peters, 1989).

The traditional sheep and oxen fattening practice in North Shewa, particularly in Deneba and Inewari districts, is based on grain supplementation (Anteneh *et al.*, 2006). Farmers in the area can thus adopt grain-concentrate-based feeding packages. Previous studies showed that sheep could be finished within 120 days of concentrate supplementation. However, the traditional fattening practice in the area takes longer period (Anteneh *et al*., 2006). Development and demonstration of efficient and economical concentrate-based feedlot packages for a market-oriented production system would be especially valuable for areas with limited grazing opportunities and having access to market. The objective of this study was, therefore, to verify three alternative dry season sheep fattening packages suitable to Syadeberna Wayu district.

Materials and methods

The study area

The experiment was conducted at Syadeberena Wayu district at Dawa Kombolcha peasant association. Dawa Kombolcha is located 57 km West of Debre Birhan town at an altitude of 2600 m above sea level. The temperature ranges from a mean minimum of 6 ^{O}C to a mean maximum of 18 ^{O}C. The annual average rainfall is 880 mm with main (July to October) and short (February to April) rainy seasons. The bimodal rainy season corresponds with two cropping seasons in the area with major crops of wheat, teff, faba bean and check pea.

Experimental design and management

An on-farm feeding trail was carried out for a period of 83 days from end of January to mid April 2008. Sixty yearling ram lambs collected from 19 selected farmers were used for the study. The experimental design was a completely randomized design (CRD) with four experimental groups each with 15 sheep.

1. Free grazing (Farmers practice)
2. Free grazing + 500 g mixed concentrate
3. Free grazing + 150 g noug cake +150 g oat grain.
4. Free grazing + *teff straw* adlib + 300 g noug cake + multi-nutrient block (MNB) adlib.

The concentrate mix (treatment 2) was formulated from 30.75% noug cake (*Guizotia abyssinica*), 50% wheat bran, 18% oat grain, 1% limestone, and 0.25% salt. Each MNB weighed 7 kg and was prepared from 30% molasses, 10% urea, 20% wheat bran, 20% noug cake, 15% cement and 5% salt.

The experimental sheep were vaccinated and dewormed against common diseases and parasites in the area before the start of the experiment. Sick animals were treated during the course of the experiment. All animals were grazed together on the same natural pasture from 8:00-17:30 hrs local time. They were separated into their respective treatment groups every day at 10:30 to receive their daily ration. Then after, all the lambs stayed on pasture

together with the exception of group 4 animals that were offered with MNB indoors. The MNB was introduced gradually but was provided *adlib* after the animals were accustomed to it. All animals were watered once a day. The experiment lasted only for 83 days, which was shorter than the recommended 90-120 days, since the farmers sold the sheep for Easter market.

Data collection and analysis

All animals were weighted at the beginning of the trail. Then after, the animals in the supplemented groups (treatments 2-4) were weighed fortnightly, while those in the control group (treatment 1) were weighed every month. All animals, except those in MNB group, were weighed in the morning after overnight fasting. The amounts of feed offered and refused were recorded daily, except for teff straw and MNB. The data were analyzed using the GLM procedure in SAS (2001). The model included feeding treatment as independent and initial weight, final weight and average daily gain as dependent variables. In order to account for initial differences in body weight among the experimental animals, final weight was adjusted in the analysis by including initial weight as covariate in the analysis model.

Economic data collected included the actual costs of feed (oat grain, noug cake, wheat bran, molasses, salt, limestone, and teff straw) and lambs, and estimated sale price of the lambs by local live animal dealers at the end of the trial. Partial budget analysis was employed to evaluate the economics of the different feeding packages.

Results and discussion

Body weight and dry matter (DM) intake

Results on initial weight, total weight gain, average daily weight gain and final weight are presented in Table 1. There were no statistically significant differences ($P \leq 0.05$) in initial weights among the four treatment groups. All the supplemented groups (T_2, T_3 and T_4) gained significantly more weight and thus attained higher final weights than the control group (T_1). The supplemented groups gained from 286% to 208% more weight than the control group at the end of the feeding period. Among the supplemented groups, the sheep

in T_2 attained the highest final weight (23.88±0.23 kg) and average daily weight gain (50.85±3.06 g head^{-1} day^{-1}). However, there were no significant differences between T_2 and T_3 and between T_3 and T_4 in weight gains. All the supplementary feed that was offered to each sheep was completely consumed. Thus the DM feed intake was 100%.

Table1. Effect of supplemental feeding on the final weight, total weight gain and average daily gains of highland ram lambs at Syadeberena Wayu (Least square means ±SE).

Treatments	Number of sheep	Initial weight (kg)	Final weight (kg)	Total weight gain (kg)	Average daily weight gain (g)
T_1-Grazing(G)	15	21.10±0.97	21.11±0.24a	1.49±0.24a	17.23±3.13a
T_2 -G + 500 g mixed concentrate	15	19±0.97	23.88±0.23b	4.26±0.23b	50.85±3.06b
T_3-G +150g oat grain +150g Noug cake	15	18.96±0.97	23.42±0.24bc	3.80±0.24bc	42.63±3.06bc
T_4-G + teff straw + 300 g noug cake + MNB	15	18.96±0.97	22.72±0.23c	3.10±0.23c	37.07±3.06c
Over all mean		19.51±0.49	22.77±0.65	3.16±0.65	36.94±1.57
R^2 (%)		6	95	57	49
CV (%)		19.35	3.94	28.76	33

Economics of fattening

Economic analysis of the different feeding treatments was conducted to identify a recommended fattening ration for Syadeberena Wayu district and elsewhere with similar conditions. In all economic analyses, labor cost was not considered since there was no specific labor allocated for the feeding practice. Results of the partial budget analysis indicate that T_2 (500 g head^{-1} day^{-1} concentrate mix) was the most economical feed ration with a net return of ETB 99.81 (Table 2).

Sensitivity analysis was done to confirm to what extent the result will sustain changes in cost of feeding and animal sale prices assuming a bad expectation. That is, assuming changes towards the worse in input and output prices or in some aspects of the enterprise

that lead to a decrease in the volume of the production. The result showed that profitability of the fattening practice would result in a positive net benefit for the study area up to 10% output price reduction and input price increment from current estimated average output price and input price levels.

Table 2. Partial budgeting and sensitivity analysis for fattening practice at Syadeberena Wayu.

	Treatments			
Description	T1*	T2	T3	T4
Average selling price of fattened animal (ETB head^{-1})	114.33	260.71	253	230.67
Average feed cost (ETB head^{-1})	0	72.97	76.11	95.32
Average initial animal cost (ETB head^{-1})	100.53	87.53	87.2	89.46
Average medical cost (ETB head^{-1})	0.4	0.4	0.4	0.4
Total fattening cost (ETB head^{-1})	100.93	160.9	163.71	185.18
Net benefit (ETB head^{-1})	13.4	**99.81**	89.29	45.49
Sensitivity analysis				
+ 5% fattening cost (ETB head^{-1})	106.00	168.955	171.89	194.44
-5% selling Price of fattened animal (ETB head^{-1})	108.61	247.67	240.35	219.14
Net benefit (ETB head^{-1})	2.64	78.73	68.45	24.70
+ 10% fattening cost (ETB head^{-1})	111.02	176.99	180.08	203.70
-10% selling Price of fattened animal (ETB head^{-1})	102.90	234.64	227.70	207.60
Net benefit (ETB head^{-1})	-8.13	57.65	47.62	3.91

* *T_1 = Grazing (G), T_2 = G+ 500 g mixed concentrate, T3 = G+150 g oat grain +150 g Noug cake, T_4 = G + teff straw + 300 g noug cake +MNB*

Conclusions and Recommendation

Short-term strategic fattening packages based on concentrate supplementation could be feasible in areas where there is shortage of grazing land for extensive livestock production like in Syadeberena Wayu district. Based on our results, it can be recommended that 500 g head^{-1} day^{-1} mixed concentrate can be used in the dry season to finish grazing sheep for market in areas similar to Syadeberena Wayu district by farmers who have access to commercial concentrates. An alternative feeding practice, which is also economically competitive to concentrate supplementation, is the feeding of 150 g oat grain and 150 g noug

cake head^{-1} day^{-1}. Farmers could benefit from these feeding practices with a net benefit of ETB 99.8–89.3 per sheep fattened. The results of the study may have to be verified under wet season condition.

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