Evaluation of poultry litter as substitute of urea in urea molasses block on growth and carcass characteristics of finished lamb

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Abstract

This study examined the replacement effect of urea molasses block with dried caged layers excreta (PE) on feed intake, digestibility, growth performance, carcass characteristics and cost of production of growing lambs. Treatments (T) varied only with type of feed block supplemented: where dried PE replaced urea of a block (weight by weight) at 0%, 25%, 50%, 75% and 100% in treatments 1, 2, 3, 4 and 5, respectively. Lambs were randomly allotted to treatments in a Complete Randomized Design, individually penned and fed daily on tef straw ad libitum and 300 g of noug cake (Guizotia abyssnica) in addition to block supplementation. Dry matter (DM) intakes of straw, noug cake, feed blocks and total feed were improved significantly ($p<0.001$) with inclusion of block PE up to 50%. Straw DM intake was increased ($p<0.01$) from 419 g in T1, to 472 g in T2, but not depressed at higher rates of PE inclusion. Block DM intake increased from 148g (T1) to 179 g (T5), and the corresponding total intakes were 832 and 890 g, respectively. Digestibility coefficients were not considerably affected ($p>0.05$) by treatments ranging from 0.60 to 0.64; 0.32 to 0.43 and 0.62 to 0.67 for DM, ash, organic matter, respectively. The average daily weight gain was increased ($p<0.001$) with block PE inclusion, in which both the highest weight gain (54g) and feed conversion efficiency (18.1g DMI/g gain) were attained by lambs in T2.. The highest cold carcass weight (11.3 kg) and dressing percentage (45.4) were observed at the highest inclusion rate of PE (T5). Profit per lamb was highest in T2 (79.9 ETB) and lowest in T5 (67.9 ETB). Cost of production of a block was reduced from 2.05 to 1.43 ETB as PE inclusion increased from 0 to 100 %. Moreover, no health problem was detected in lambs due to feeding PE containing block. This study indicates that use of PE as a substituent for urea in urea molasses block production improves growth performance and feed utilization, and reduces cost of lamb feeding.

Keywords: *Intake; growth; digestibility; lamb; feed cost*

Introduction

As is true in many tropical countries, ruminant animal production in Ethiopia is often constrained by poor nutrition. Feed resource bases are mainly natural pasture and crop residues (Alemayehu, 1998b) that are characterized by containing lower crude

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protein and higher fiber contents than optimal for adequate intake and digestibility. The deficit in quality and quantity of available feed resources is often aggravated by dry season and drought occurrence resulting in low animal performances. To improve the production and productivity of animals, the utilization efficiency of the feed resources should be optimized by providing animals with supplements rich in deficient nutrients. Moreover, to maximize profit from production it is necessary to minimize cost of production, in which supplying the nutrient demands of animals represents the single and largest expense. In this case, supplementation strategy based on locally available, low cost and nutrient-rich feeds is of a choice for low income farmers.

Supplementing cereal straws with fermentable nitrogen, soluble carbohydrates, minerals and other nutrients improve their utilization by ruminants (Badurdeen *et al*., 1994, Rafiq *et al*., 1996). Molasses and urea are known to respectively contain available energy and nitrogen and are used in feeding. (Preston and Leng, 1990). On its own, urea is bitter and unpalatable. Combining it with molasses makes the urea more palatable. A safe way of feeding urea is by preparing it into a Urea Molasses Block (UMB). This preparation is an excellent way of providing readily degradable protein and readily fermentable energy to ruminant animals, and they help increase the protein supply to the animal. There are many cases where it can be economical to supplement urea molasses block to ruminants raised on low quality roughages. Urea molasses block contains soluble and fermentable nitrogen from urea, highly fermentable energy from molasses and essential minerals, providing a range of nutrients required by rumen micro-organisms and the host animal. Studies on supplementation of urea molasses block has proven improved performance and feed utilization of ruminant animals (Chen et al., 1993; Hadjipanayiotou et al., 1993b). Urea/molasses feed blocks have been widely advocated to increase the intake and digestibility of poor quality pastures and roughages (Leng, 1984; Hadjipanayiotou et al., 1993b). The use of feed blocks is particularly convenient because they are then easy to transport and the blocks readily give their nutrients to the animals. Making these nutrients in the form of multi- nutrient feed blocks with cement as a binder also ensures slow release of the otherwise toxic molasses and urea. Availability of fermentable nitrogen and readily available carbohydrates and minerals supplied through UMB facilitates the growth of cellulolytic microbes which results in better utilization of wheat straw (Leng, 1984). The feeding of the blocks is a convenient and inexpensive method of providing a range of nutrients required by both the rumen microbes and the animal, which may be deficient in the diet. The main justification for using the blocks depends on their convenience for packaging, storage, transport and ease of feeding (Jayasuriya and Smith, 1999).

There is often, a limitation on extent of production and utilization of feed block due to fluctuations in the price, availability and quality of ingredients used. To be economical in feed block production, it is common to add or replace the constituents with relatively cheap and available feed resources. Studies have shown that most poultry manure/litter contains 25 to 50% crude protein (Fontenot and Hancock, 2001) and significant amounts of Ca, P, K and numerous trace minerals (Ruffin and McCaskey, 1990; Mekasha et al., 2002). Thus, the manure has been incorporated in the diet of ruminants since it serves as a source of nitrogen and minerals in addition to its low cost. Previous studies (Hadjipanayiotou et al., 1993; Paul et al., 1993; Murthy et al., 1995; 1996; Lanyasunya et al., 2006) on inclusion of poultry manure in the diets of ruminant animals have proven improved performances. Poultry manure is also known to contain pathogens and drug residues that may be hazardous to animals and human health. However, the negative aspects of the manure, particularly of the pathogens can be removed from manure through ensiling (Hadjipanayiotou, 1982; Daniels et al., 1983) and deep stacking (Strickler, 1977) or using methods such as fumigation, autoclaving and dry heating with or without formaldehyde (Jakhmola et al., 1988).

In Ethiopia, use of UMB as supplement to ruminant animals in the traditional production system is limited by its low production associated with scarcity and price fluctuation of inputs used. In this case, the use of urea in UMB production is unlikely at smallholder farmers mainly because of its increased price and demand for fertilizer use resulting in increased cost of block production, also limiting its wider application. However, today, a number of traditional and emerging commercial poultry farms in Ethiopia account for the presence of about 39.6 million chicken populations (CSA, 2007/8). Commercial poultry farms contribute substantially to the production of tones of poultry manure, annually. This has created an opportunity to use the manure as alternative source of nutrients (mainly non-protein nitrogen) in ruminants diet, which otherwise can be dumped unwisely and causes environmental pollution. Thus, the objective of this study was to evaluate the inclusion effect of dried caged layer's waste for urea in UMB on feed intake, digestibility, growth rate, carcass characteristics and cost of feeding lambs.

Materials and Methods

Study area

The experiment was conducted at Debre Zeit Agricultural Research Center located at 45 km south east of Addis Ababa, at an altitude of 1900 m.a.s.l. (between 8.44°N latitude and 39.02°E longitude). The maximum and minimum temperature and the mean annual rainfall of the area are 24.3°C, 8.9°C and 851mm, respectively.

Feed block preparation

Caged-layer waste was collected from poultry farms around Debre Zeit town and sun dried at air temperature (21oC) followed by grinding it before used in feed block making. Other ingredients used in the block preparation were: molasses, wheat bran, cement (used as binding agent), fertilizer graded urea and common salt. Five types of feed blocks varying only in the levels (weight/weight) of poultry excreta replaced urea were produced (Table1). A homogenous mixture of block ingredients was manually assured followed by placing the mix in a wooden mould (length,12cm; width, 21cm and height,10cm) that produced a 2 kg molded feed block at a time. The blocks were dried under shade at good ventilation before supplemented to lambs.

Table1. Types of ingredients used and percentage inclusion in feed block preparation

Block Type	Molasses %	Wheat bran %	Cement %	Urea %	PE %	Salt %
B1	45	25	15	10	0	5
B2	45	25	15	7.5	2.5	5
B3	45	25	15	5	5	5
B4	45	25	15	2.5	7.5	5
B5	45	25	15	0	10	5

B1, B2, B3, B4, B5 = feed blocks used in treatment (T) 1,2,3,4 and 5 respectively; PE = poultry excreta

Animals management and dietary treatments

Thirty-five highland yearling male lambs (Arsi-Bale breed) with mean initial weight of 21.27 ±0.76kg were bought from local market. After acclimatization to environment, animals were arranged into five equal weight groups of seven animals each and assigned to treatments in a Complete Randomized Design. Dietary treatments were different only with the type of feed block supplemented, where PE replaced urea of the block (w/w) at 0% in T1, at 25% in T2, at 50% in T3, at 75% in T4 and at 100% in T5. All animals were individually penned and fed on tef straw *ad libitum* and 300 g/head/day of noug cake in addition to free access to block supplementation. The lambs were adapted to diets for 14 days before commencing data collection for a period of three months. Pure water was freely available to all animals at all the times. Noug cake was supplemented daily at 0800 h in the morning, while the remaining feeds were offered at 0900 h. Data on feed offered and refused were taken daily, and the live weight was measured fortnightly after overnight fasting (≈16 hours).

At the end of intake and growth trial, the value of each finished lamb was estimated at the prevailing market price. Three animals were then, randomly selected per treatment and transferred to metabolic crate with slotted floor. The animals were adapted to the crate and the attached fecal bags for three days followed by digestibility trial for seven days. The amount of voided feces per lamb/day was weighed, sub-sampled and placed in freezer at -20^{o}C, pending analysis. Moreover, two lambs were randomly selected per treatment, devoid of experimental feed for 16 hours, weighed and slaughtered for carcass analysis. The carcass was eviscerated and body components such as head, feet, skin, blood, visceral organs (kidneys, liver, heart and lungs), testicles, fat deposited, full and empty guts were weighed. The cold carcass weight was taken after freezing at 4 ^{0}C for 24 hours. After removing the tail, the carcass was spited along the dorsal middle line with a band saw. Rib eye area was measured after tracing the eye muscle (longissimus muscle) at the 12/13th rib position.

Sample chemical analysis

Feeds and fecal samples were analyzed for dry matter, nitrogen, calcium and phosphorus according to the procedures of AOAC (Association of Analytical Chemists) 1990. Neutral detergent fiber and acid detergent fiber were also determined by Van Soest detergent system (1985).

Economic analysis

Partial budget analysis was applied to estimate the economic importance of treatment diets. At the end of feeding period, the prevailing market (sale) price of each finished lamb was estimated using four local sheep traders, and the average of estimates were taken as sale price of an animal. Finally, the total variable costs were deducted from total sale price of lambs to estimate the relative profitability of the diets. Costs of all other inputs were taken at their market prices during the experiment.

Statistical analysis

Data of feed intake, digestibility and live weight gain were analyzed using GLM procedures of SAS (1999). Treatments means were separated using Duncan's multiple range test whenever GLM declared significance. Daily weight gain of individual animal was estimated by regressing weight changes over 14 days of feeding period.

Results and Discussion

Chemical composition

The chemical compositions of experimental feeds are shown in Table 2. Crude protein (N*6.25) content of block was decreased as the proportion of poultry excreta (PE) replacing urea increased implying that more quantities of nitrogen was obtained from urea than equal quantity of PE. Percentages of fiber fractions decreased, but total ash increased as the block PE level increased.

Table 2. Nutrient composition of experimental diets (% of DM, except for DM)

Feed Items	Nutrients						
	DM	Ash	CP (6.25*N)	ADF	NDF	Ca	P
Tef straw	93.00	8.00	3.91	22.00	40.00	nd	nd
Noug cake	97.00	15.00	30.12	16.00	19.00	nd	nd
T1	96.65	14.98	36.82	25.91	43.73	5.44	0.76
T2	96.07	13.38	32.08	22.97	37.53	5.41	0.66
T3	95.49	11.72	27.34	20.03	31.33	5.24	0.51
T4	95.03	15.45	20.32	17.88	31.09	5.97	0.59
T5	93.77	19.03	19.34	15.47	32.28	5.11	0.39

Where, DM = dry matter; CP = crude protein; ADF = acid detergent fiber; NDF = nutrient detergent fiber; Ca = calcium; P = phosphorus; N = nitrogen; nd = not determined

Intake and digestibility

There was significant difference ($p<0.05$) among treatments in straw DM, ash, N, NDF and ADF intake (Table 3). The highest ($p<0.05$) intake of straw DM and the associated nutrients (with the exception to ADF) was observed in lambs supplemented with block containing 25% poultry manure (T2). The highest ($p<0.05$) intakes of total DM, N and NDF were recorded for T2. Further increase in the substitution rates did not depress ($p>0.05$) intakes of straw DM, Ash, ADF and NDF. However, straw nitrogen (N) intake was higher at lower than at higher inclusion rates of poultry excreta. However, the lowest ($p<0.05$) intakes of total DM, NDF and ADF were recorded for T4.

Except for T4, in most cases dry matter intakes of feed block and noug cake were significantly improved ($p<0.05$) with PE inclusion, although there was no apparent differences among inclusion rates. On the other hand except for T4 and T5 total intake of DM and Ash was increased significantly ($p<0.05$), while that of N and NDF reduced ($p<0.001$) with block PE inclusion. The increased intake of total ash with inclusion of PE partly indicated PE to be an important source of minerals for ruminants. Increased in total ash intake could also be contributed by increased intake of straw and noug cake that in turn increased the crude mineral consumed by lambs. The increased total DM intake associated with block PE inclusion has revealed PE to be an important source of nutrients for improved feed utilization. Similar to the present study, poultry manure containing concentrate mixture supplemented to sheep (Hadjipanayiotou et al., 1993b) and a crossbred calves (Paul et al., 1993) have been shown to improve feed intake.

Table 3. Nutrient intake(g/day) of experimental diets

Measure-ments	Feed items	Treatments						
		T1	T2	T3	T4	T5	SE	p-value
DM	Straw	(419)^{b}	(472)^{a}	(440)^{b}	(433)^{b}	(429)^{b}	9.97	p<0.01
	Noug cake	(264)^{b}	(285)^{a}	(279)^{a}	(282)^{a}	(282)^{a}	4.69	p<0.05
	Block	(148)^{bc}	(162)^{ab}	(194)^{a}	(114)^{c}	(179)^{ab}	13.07	p<0.001
	Total	(831)^{b}	(919)^{a}	(913)^{a}	(829)^{b}	(890)^{a}	16.69	p<0.001
ASH	Straw	(33.5)^{c}	(39.2)^{a}	(36.9)^{b}	(37.5)^{ab}	(36.6)^{b}	0.72	p<0.001
	Noug cake	(39.6)^{b}	(42.7)^{a}	(41.9)^{a}	(42.2)^{a}	(42.2)^{a}	0.71	p<0.05
	Block	(22.2)^{b}	(21.3)^{b}	(22.8)^{b}	(17.7)^{b}	(34.1)^{a}	2.00	p<0.001
	Total	(95.3)^{c}	(103)^{b}	(102)^{bc}	(97.4)^{bc}	(113)^{a}	2.21	p<0.001
N	Straw	(2.65)^{c}	(3.30)^{a}	(3.15)^{ab}	(3.07)^{b}	(2.62)^{c}	0.05	p<0.001
	Noug cake	(12.7)^{b}	(13.7)^{a}	(13.5)^{a}	(13.6)^{a}	(13.6)^{a}	0.21	p<0.05
	Block	(8.74)^{a}	(8.31)^{a}	(8.49)^{a}	(3.71)^{b}	(2.67)^{b}	0.52	p<0.001
	Total	(24.1)^{a}	(25.3)^{a}	(25.1)^{a}	(20.4)^{b}	(18.9)^{b}	0.59	p<0.001
NDF	Straw	(170)^{b}	(185)^{a}	(174)^{a}	(173)^{a}	(178)^{a}	3.96	p<0.05
	Noug cake	(50.2)^{b}	(54.1)^{a}	(53.1)^{a}	(53.5)^{a}	(53.5)^{a}	0.85	p<0.05
	Block	(64.9)^{a}	(60.8)^{a}	(60.9)^{a}	(35.6)^{b}	(57.9)^{a}	4.5	p<0.001
	Total	(285)^{a}	(300)^{a}	(288)^{a}	(262)^{b}	(289)^{a}	6.03	p<0.001
ADF	Straw	(87.6)^{ab}	(73.4)^{c}	(80.0)^{bc}	(79.5)^{bc}	(89.6)^{a}	2.94	p<0.001
	Noug cake	(42.3)^{b}	(45.5)^{a}	(44.7)^{ab}	(45.0)^{a}	(45.1)^{a}	0.72	p<0.05
	Block	(38.5)^{a}	(37.2)^{a}	(38.9)^{a}	(20.5)^{b}	(27.7)^{b}	2.62	p<0.001
	Total	(168)^{a}	(156)^{bc}	(164)^{ba}	(145)^{c}	(162)^{ba}	4.00	p<0.001

Superscripts in the same row (for each measurement) with different letters are significantly different

The apparent digestibility coefficients of DM, OM and ash were not significantly (p>0.05) different among treatments (Table 4).However, the apparent digestibility coefficients of CP varied among treatments (p<0.001), being highest (0.76) in lambs supplemented with a feed block containing 100% PE than that without (0.62). The non-significant difference among treatments in the digestibility coefficients of DM, OM and ash indicated that lambs utilized PE as effective as urea in the block.

Table 4. Least squares means values of digestibility coefficients, growth performance and feed conversion efficiency

Parameter	T1	T2	T3	T4	T5	SE	P-value
DM	0.64	0.62	0.63	0.63	0.61	0.02	ns
Ash	0.43	0..33	0.42	0.42	0.32	0.05	ns
OM	0.67	0.62	0.67	0.66	0.66	0.02	ns
CP	0.62^{c}	0.55^{d}	0.74^{ab}	0.69^{b}	0.76^{a}	0.02	P<0.001
IBWT(Kg)	21.2	21.5	20.9	21.6	21.1	0.76	ns
FBWT(Kg)	24.9	26.3	24.8	24.8	24.6	0.84	ns
ADG(g)	41.3b	54.0a	43.6ab	34.9b	39.7b	4.37	p<0.05
FCR(g DMI/ g gain)	20.5^{ab}	18.1^{a}	22.5^{ab}	24.8^{b}	23.8^{ab}	2.23	p<0.05

Superscripts in the same rows with different letters are significantly different; ns = not significant; DM=Dry matter; OM=Organic matter; CP=Crude protein IBWT=Initial body weight; FBWT=Final body weight; ADG =Average daily gain; DMI =Dry matter intake; FCR = feed conversion ratio

The increase in dietary CP digestibility associated with increased substitution rates of block PE seem to be strange as it appeared to show lower digestibility of urea than PE, whilst urea is 100% degradable in rumen. This observation indirectly indicated that increased apparent CP digestibility with PE containing block supplementation might largely be contributed by increased digestibility of CPs of straw and noug cake associated with improved rumen fermentation, which could also be explained from increase in their corresponding CP intake. In other words, other than serving as N source, PE could also serve as a source of essential nutrients, perhaps minerals that foster microbial growth and dietary CP digestibility. Similar to the present result, Muthy et al. (1996) observed comparable nutrient digestibility in Nellore lambs and goat supplemented with concentrate containing different levels of poultry droppings.

Growth performance

There was no significant difference (p>0.05) in final body weights of lambs among treatments (Table 4). All animals supplemented with their respective feed block tended to increase live weight at the end of feeding period, the maximum weight being 26.35 kg achieved by lambs supplemented with 25% PE containing block (T2). The average daily live weight change was significantly different (p<0.001) among treatments, where the highest (54.0g) and the lowest (34.9g) gains were achieved at 25 (T2) and 75% (T4) replacement levels, respectively. Although not statistically significant (p>0.05), feed conversion ratio was the highest in lambs supplemented with block containing 25% PE (T2). The improved growth performance of lambs supplemented with block containing PE could be due to improved total dry matter intake, digestibility of protein and feed conversion efficiency. This result agrees with the reports of Murthy et al. (1996) who observed improved average daily gain in lambs(56.9g) and kids(44.6g) supplemented with pellets containing 15 to 30% dried poultry manure. Moreover, studies by Hadjipanayiotou et al. (1993b) have shown that inclusion of PE in the diets of dry Chios ewes improved growth and feed utilization. In the present study, no adverse effect on health status of lambs was noticed associated with PE containing block supplementation.

Carcass characteristics

The mean values of edible and non-edible carcass traits of slaughtered lambs (n=2 per treatment) are shown in Table 5. The magnitudes of most edible carcass components such as hot and cold carcasses, kidney, liver, heart, kidney fat, omental fat and total ribs were increased in animals supplemented with feed block containing PE than that without. Moreover, carcass weights and dressing percentages were increased as block PE inclusion level increased. Lambs supplemented with feed block at 100% PE had the highest carcass weight (11.3 kg) and dressing percentage (45.4). Similarly, most non-edible carcass traits such as head, feet, testicle, scrotal fat, lung, spleen, pancreas, penis, and subcutaneous fat weights were increased in lambs supplemented with PE containing block.

Table 5. Mean values (n=2) of carcass components of experimental lambs

Traits	Treatment				
	T1	T2	T3	T4	T5
a. Edible carcass components:					
Kidney (g)	66.2	73.9	67.4	67.3	69.6
Liver (g)	302	339	295	295	278
Heart (g)	134	149	128	125	134
Empty gut (kg)	1.29	1.47	1.41	1.45	1.18
Pelvic fat (g)	27.6	13.9	21.6	33.8	21.4
Kidney fat (g)	41.4	35.3	56.9	89.2	62.8
Omental and Mesentric fat (g)	115	138	176	192	211
Hot carcass (kg)	9.15	9.20	10.5	10.3	11.3
Cold Carcass (kg)	9.59	11.1	10.9	9.49	9.92
Lean thickness (mm)	4.50	4.0	3.5	3.5	4.0
Tail (g)	569	410	325	435	365
Total ribs (g)	91.3	145	115	119	130
Ribs fat (g)	12.0	5.7	10.3	8.05	8.8
Ribs lean (g)	61.5	108	81.4	87.4	99.4
Rib eye area (cm2)	8.25	11.1	8.25	6.4	9.5
Slaughter wt (kg)	25.2	28.0	24.5	26.0	25.0
Dressing percentage	36.2	32.9	42.9	39.7	45.4
b. Non-edible carcass components:					
Head (Kg)	1.75	1.87	1.81	1.81	1.71
Feet (g)	462	495	454	467	458
Skin (kg)	1.81	1.81	1.87	2.10	1.88

Blood (kg)	1.26	1.18	0.94	1.08	1.06
Testicle (g)	253	326	286	253	313
Scrotal fat (g)	12.0	38.7	49.9	46.2	45.4
Ribs bone (g)	16.8	26.5	20.7	18.8	20
Full gut (kg)	6.99	8.23	6.94	8.28	3.67
Lung	242	306	270	260	252
Spleen (g)	33.1	43.9	30.9	37.5	29.6
Pancreas (g)	27.6	31.2	31.8	34.4	25.4
Urinary Bladder (g)	30.2	21.6	25.4	28.3	25.1
Penis (g)	47.5	47.6	44.2	41.2	41
Subcutaneous fat (mm)	2.0	3.5	3.0	2.0	2.5

n=no of slaughtered animals

Economic Analysis

Detail of all costs involved and profit obtained from feeding lambs is shown in Table 6. All treatments resulted in a positive net returns with the highest profit per lamb in T2 (79.9 ETB) and the lowest in T5 (67.9 ETB). This finding was also supported by research works on lactating Shami and Black Syrian Mountain goats and Shami heifers and bull calves, where cost of feeding was considerably reduced by supplementing a concentrate mixture of dried poultry manure (Hadjipanayiotou et al., 1993). The total variable costs were, however, higher for lambs supplemented with PE containing block than that without, which could be due to improved feed consumption that contributed to increased feed cost. On the other hand, cost of a block production was reduced from 2.05 ETB, where there is no PE inclusion, to 1.43 ETB at complete substitution of urea with PE (100%). This could be due to differences in the prevailing prices of urea and PE. Cost of block feeding was highest (14.3 ETB/lamb) at 25% PE inclusion, but reduced thereof, at higher substitution rates influenced by the lower cost of PE compared to urea and change in extent of consumption. Although sensitivity of other input costs matter profitability, partial or total replacement of feed block urea with PE in this study appeared to be an affordable strategy.

Table 6. Partial budget analysis for lambs finished on experimental diets (in ETB/lamb)

Criteria	Treatment				
	T1	T2	T3	T4	T5
Income from sale (1)	246	260	245	245	243
Variable costs:					
Purchase of sheep	80	80	80	80	80
Feed cost:					
Tef straw	24.8	30.3	25.6	27.8	27.5

Nug cake	19.2	22.4	21.7	22.2	22.2
Urea	4.43	3.98	3.17	0.94	0.0
PE	0.0	0.15	0.36	0.32	0.68
Molasses	2.84	3.41	4.07	2.43	3.87
Common salt	0.54	0.65	0.78	0.46	0.74
Cement	2.84	3.41	4.07	2.43	3.87
Wheat bran	2.31	2.76	0.14	1.97	3.14
Block cost/treatment					
Cost of ingredients/block(2 kg)					
Labour cost:					
Perdiem	1.61	1.61	1.61	1.61	1.61
Feed preparation & data collection	25.7	25.7	25.7	25.7	25.7
Vet. service	1.50	1.50	1.50	1.50	1.50
Transportation	4.57	4.57	4.57	4.57	4.57
Total variable cost(2)	170	180	173	172	175
Net return(1-2)	75.9	79.9	72.0	72.9	67.9
Net return over control	-	3.98	-3.74	-3.03	-8.0

Tef straw = 10 ETB/bale, (1 bale = 15kg); Noug cake =0.85 ETB /kg; Urea = 3.5 ETB/kg; Air dried poultry excreta = 0.4 ETB/kg; Molasses = 0.5 ETB/litre; Wheat bran = 0.73 ETB/kg; Common Salt = 0.86 ETB/kg; Cement = 1.5 ETB/kg; ETB=Ethiopian Birr

Conclusion

This study indicated that the layers-cage waste is an alternative source of nutrients (mainly of protein) and replaces urea in molasses block manufacturing, improves feed utilization and performance of growing lambs, and reduces cost of feeding. Given the gap in feed availability to ruminants, especially during the dry season, UMB containing PE can be potential sources of readily available energy and nitrogen. Undoubtedly, this will ensure that the animals are not just being maintained but will be sustained for productive purposes such as weight gain. Apart from low price, feed blocks containing PE are nutritionally as good as feed blocks containing urea. Therefore, where there is a poultry farm, it is wise to incorporate poultry excreta in feed block production so as to be economical in production and promote its wider application, besides enhancing recycled use of the manure.

Urea-molasses blocks containing PE can play a positive role in extensive animal production systems. Therefore, there should be a mechanism to transfer the technology to the smallholder farmers who can be benefited through the utilization of such types of technologies. If UMB is properly disseminated and extended, it will play a vital role for poverty alleviation of poor livestock farmers. Research on feed blocks manufacturing should be pursued while diversifying the ingredients to include other agro-industrial by-products and to design blocks for higher performance levels with the inclusion of good quality protein sources.

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