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ENERGY REQUIREMENTS FOR MAINTENANCE OF GOATS

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ABSTRACT

The present research work was carried out at Maryout Research Station where results from feeding and metabolism trials were utilized to investigate the energy required for maintenance of goats. Twenty male Sahrawi goats were used. The animals weights ranged from (25 to38 kg). Twelve experimental rations were formulated using barley grains, commercial concentrate mixture and wheat straw in order to achieve the planned varying levels of energy and DCP within the permissible DM intakes. The plan of feeding was to establish 12 combinations of TDN and DCP levels either at recommended, above or below maintenance requirements of sheep, being, 27.8 g TDN/ Kg $W^{0.73}$ and 2.3 g DCP/Kg$W^{0.73}$.

Animal performance varied between a weight loss of -0.18 to a gain of +0.12g/day/Kg, while nitrogen retention ranged from -104 to +386 mg/kg $w^{0.73}$/day. Appropriate regression models were used for the estimation of maintenance energy requirements for the maintenance of body weight. The predicted values were 32.11 g TDN/kg $w^{0.73}$/day, 29.79 g TDN/kg $w^{0.75}$/day, 491 KJ ME / kg $w^{0.73}$/day), 459 KJ ME /kg $w^{0.75}$/day,141 kcal DE /kg $w^{0.73}$/day and 131 kcal DE /kg $w^{0.75}$ /day. All these values were within the range recommended by several authors for other breeds of goats, but were slightly higher than those of Egyptian sheep .

It is hoped that future experiments will determine the energy and DCP requirements for goats during their growth, lactation and pregnancy taking body composition into consideration.

Keywords: goats – maintenance – energy requirements.

INTRODUCTION

The goat was one of the first animals to be domesticated by man. Remains have found in deposits that are 5 millions years old. Today, the goat has penetrated to almost every country. In some countries, it is the most important source of animal protein (meat, milk and hair) and whole communities depend on their flocks of goats. The total world population of goat is about 470 millions. About 75 percent of the goats in the world are in the developing countries, kept by small family units and used for production of meat, skin, milk and hair. (Alan Mowlem, 1992).

When considering the dietary need of an animal, particularly a ruminant, it is normal to categorize the animal according to its physiological or production state. If an animal is full grown and it is not pregnant or lactating, it will require only enough nutrients to maintain body function or in other words to stay alive and this requirement will be termed the maintenance requirement. However, nutritional requirements are known to differ between breeds (Doney and Russel, 1968) and are affected by environmental condition (Krishna *et al, 1977* and Yousri *et al*, 1977).

There is a need, to investigate nutritional requirements of local breeds of domestic animals to develop appropriate feeding standards. In Egypt, it is common to apply the recommended requirements of sheep to goats. The present study was therefore conducted to investigate energy requirements of the Egyptian desert goats for maintenance.

MATERIALS AND METHODS

The present research work was carried out at Maryout Research Station. Twenty entire two years old, adult native male goats raised in the Northern-Western desert (Sahrawi) weighing 27 to 40 kg were used in three experiments. At the beginning of each experiment, the animals were divided into four blocks according to body weight. The four blocks were distributed randomly to the four experimental treatments of each experiment. The plan of feeding was to establish 12 combinations of TDN and DCP levels either at recommended, above or below maintenance requirements of sheep recommended by Salem (1990) being, 27.8g TDN/ Kg $W^{0.73}$ as indicated in Table 1.

Table (1): Plan of dietary TDN and DCP allowances (% from recommended maintenance allowances)[1]

Attributes	Experimental groups							
	I		II		III		IV	
	TDN	DCP	TDN	DCP	TDN	DCP	TDN	DCP
Experiment (I)	70	100	85	100	100	100	115	100
Experiment (II)	100	70	100	85	100	100	100	115
Experiment (III)	70	70	85	85	100	100	115	115

(1) Salem (1990).

Twelve experimental rations were formulated using barley grains, commercial concentrate mixture, and wheat straw (Table 2) in order to achieve the planned varying levels of energy and DCP within the permissible DM intakes. Before the commencement of the experiments, the feeding values of the rations were calculated using the published data (Kearl, 1982). The roughage to concentrate ratios were (70:30 to 50:50) in experiment I, (73:30 to 43:57) in experiment II and (56:44 to 50:50) in experiment III. Accordingly, the level of dry matter intake also ranged between (51 to 49 g DMI/day/kg $w^{0.73}$) in experiment I, (51 to 36 g DMI/day/kg $w^{0.73}$) in experiment II and (69 to 52 g DMI/day/kg $w^{0.73}$) in experiment III. These changes in DMI were due to the planned TDN and DCP levels to be offered.

Daily rations were calculated for each individual animal and offered once daily at 9.00 a.m. Refusals if any were collected and weighed the following morning. During the feeding time, drinking water was available for one hour daily. Individual live body weights were recorded every week before daily feeding during the experiments, which lasted 90 days each. The first 80 days of each experiment were a preliminary period. The experimental animals were kept in metabolic cages especially designed for quantitative urine and faces collection once excreted during the last 10 days of each experiment. Faces and urine were collected every 24 hours. Urine was allowed to drain into glass bottles containing 25 ml sulphuric acid diluted to half strength, 18 N, 5% of the daily feces and urine were sampled separately. Fecal samples were dried over night at 105° C. Urine samples were stored in a refrigerator. The actual feeding values of the experimental rations were therefore determined and were used for interpreting the results and predicting the maintenance energy requirements.

Proximate composition of feed, feed refusal and faces and total urinary nitrogen were analyzed using the official procedures (AOAC, 1990).

Correlations and regressions were fitted for establishing relationships between relative weight change (RWC) and different parameters i.e. total digestible nutrients (TDN) metabolizable energy (ME) and digested energy (DE), to predict the maintenance energy requirements of goats at zero relative body weight change. The SAS (1982) statistical program was used. Calculations were carried out on individual data expressed per unit metabolic size of animal, both per kg $w^{0.73}$ and kg $w^{0.75}$. Estimates of maintenance energy requirements were determined in terms of TDN, ME and DE.

Table 2: Formulation of the experimental rations and their calculated feeding values (%).

Attributes	Experimental groups			
	I	II	III	IV
Experiment I				
Wheat Straw	29.73	26.34	47.74	47.94
CFM (1)	70.27	73 66	31.23	
Barley grains	-	-	21.03	52.06
Experiment II				
Wheat Straw	61.24	54.17	47.82	40.41
CFM (1)	-	15.79	37.07	44.70
Barley grains	38.26	30.04	15.11	14.89
Experiment III				
Wheat Straw	56.03	56.38	50.11	45.68
CFM (1)	43.97	43.62	29.17	29.60
Barley grains	-	-	20.72	24.72
Calculated nutritive values (% DM)				
Experiment I				
TDN	54.60	54.73	54.24	59.61
DCP	5.60	5.10	4.61	4.37
Experiment II				
TDN	54.54	54.57	53.12	54.60
DCP	3.12	3.96	4.63	5.32
Experiment III				
TDN	48.79	48.72	53.71	55.31
DCP	4.00	3.95	4.40	4.77

1 – Concentrate feed mixture, composed of: : 55% cotton seed cake – 10% rice bran – 30% wheat bran –2% lime stone – 2% molasses and 1% common salt.

RESULTS AND DISCUSSION

The actually determined feeding values of the twelve experimental rations are presented in Table 3.

Table 3 : Determined digestibility coefficients and feeding values of the experimental rations (%).

Attributes		Experimental groups			
		I	II	III	IV
Experiment I					
Digestion coefficients	CP	62.02±1.60	65.74±2.30	63.57±2.41	66.49±2.80
	EE	61.06±4.39	65.50±4.24	61.60±3.89	63.09±6.11
	CF	50.34±3.29	53.12±2.48	45.29±3.49	53.41±3.22
	NFE	61.58±3.05	62.65±2.11	64.32±2.06	76.00±1.01
Feeding values	TDN	53.65±2.05	54.31±1.93	53.90±2.01	65.08±1.46
	DCP	5.12±0.13	4.62±0.17	3.96±0.18	3.63±0.16
Experiment II					
Digestion coefficients	CP	53.92±2.63	60.48±2.94	59.39±1.64	58.52±2.07
	EE	50.19±3.66	65.13±5.54	59.94±2.28	69.71±2.78
	CF	50.27±2.98	47.66±4.57	44.82±2.27	47.11±3.49
	NFE	65.28±0.72	69.13±0.84	66.61±1.24	70.54±1.54
Feeding value	TDN	55.53±0.93	61.71±1.77	56.53±0.91	60.47±1.77
	DCP	2.99±0.15	4.24±0.20	5.47±0.24	5.88±0.35
Experiment III					
Digestion coefficients	CP	59.57±2.51	53.70±2.07	56.66±2.05	60.98±1.48
	EE	50.83±2.93	43.77±4.11	57.63±3.21	54.40±5.01
	CF	42.21±0.68	40.80±0.90	45.31±1.39	36.87±1.09
	NFE	58.35±1.40	57.77±1.31	67.82±0.36	67.30±0.30
Feeding value	TDN	47.75±0.58	47.07±058	56.26±0.17	54.47±0.17
	DCP	3.38±0.15	3.03±0.12	3.22±0.12	3.66±0.13

It was clear that the actually determined feeding values in terms of TDN were close to those calculated, however the determined DCP values varied from those calculated. This could be mainly due to the inaccuracy of the DCP system, varying degradability of the different ingredients of the rations and/or the possible associative effects. Such differences were reflected on the actually consumed TDN and DCP as indicated in Table 4.

Although the actually consumed TDN and DCP differed from planned, yet they represented wide spectrum of TDN:DCP which would allow wide range to predict the maintenance requirements of energy at maintaining body weight unchanged.

The changes in live body weight along with N balance as affected by the different combinations of TDN and DCP are illustrated in Table 5. The data revealed that the animals slightly gained or lost weight. It is worth noting that the animals were always in slightly positive N balance except in one case where they were slightly in negative N balance. It is clear therefore that such conditions were suitable for the proper prediction of the maintenance energy requirements from body weight changes.

Table 4 : Actual DM, TDN and DCP intakes by the experimental animals.

Attributes	Experimental groups			
	I	II	III	IV
Daily intake				
Experiment I				
DM g/Kg $w^{0.73}$	35.45±1.00	44.61±1.25	48.31±2.40	52.90±0.88
DM g/Kg $w^{0.75}$	32.03±4.68	41.66±2.54	45.15±4.78	49.41±1.79
TDN % from maintenance	68.4	87.1	93.7	123.8
DCP % from maintenance	79.1	89.6	83.4	83.5
Experiment II				
DM, g/Kg $w^{0.73}$	50.73±1.57	49.05±1.59	49.20±2.80	48.98±1.71
DM, g/Kg $w^{0.75}$	47.34±3.15	45.75±3.17	45.87±5.77	46.39±4.15
TDN % from maintenance	101.3	108.8	117.7	108.7
DCP % from maintenance	66.1	90.4	117.0	127.8
Experiment III				
DM, g/Kg $w^{0.73}$	43.04±1.05	51.83±0.93	54.53±1.77	68.84±2.24
DM, g/Kg $w^{0.75}$	40.15±2.20	48.26±1.84	50.83±3.43	65.26±3.64
TDN % from maintenance	73.4	87.8	110.3	134.9
DCP % from maintenance	63.0	68.3	76.5	109.6

Table 5: Animal performance and N balance.

Attributes	Experimental groups			
	I	II	III	IV
Animal performance				
Experiment I				
Live weight Kg	30.95±5.98	30.3±5.24	30.35±9.53	30.5±2.48
Weight change g/day/Kg	-0.098±0.047	-0.046±0.028	-0.01±0.046	-0.034±0.06
Experiment II				
Live weight Kg	32.2±5.39	32.2±5.95	33.3±5.17	33.45±5.90
Weight change g/day/Kg	-0.082±0.082	0.002±0.038	-0.008±0.072	0.04±0.043
Experiment III				
Live weight Kg	32.9±2.1	36.05±4.59	34.00±8.14	37.31±11.26
Weight change g/day/Kg	-0.162±0.045	-0.08±0.06	-0.058±0.034	0.085±0 026
Nitrogen metabolism data (mg/day/Kg $w^{0.73}$)				
Experiment I				
N – intake	474.63±28.13	501.08±26.28	481.82±53.49	463.17±17.94
Faecal – N	186.96	171.06	173.69	153.24
Digested – N	287.86	330 04	308.13	309.93
Urinary – N	282.28	236.86	320	185.7
N – balance	5.394±94.46	93.16±83.81	-11.87±62.14	124.23±54.85
Experiment II				
N – intake	450.73±29.39	574.04±35.96	739.05±74.77	789.72±115.37
Faecal – N	208.72	226.02	311.42	326.44
Digested – N	242.01	348.01	427.63	463.27
Urinary – N	203.58	247.86	331.66	291.09
N – balance	38.43±91.00	100.15±125.6	95.95±87.48	172.18±135.80
Experiment III				
N – intake	390.11±20 39	467.51±23.00	496.68±36.29	659.41±30.45
Faecal – N	158.55	216.42	512.57	257.49
Digested – N	231.56	251.09	281.10	401.93
Urinary – N	159.72	111.00	122.21	124.96
N – balance	71.84±58.24	140.09±29.39	158.89±48.80	276.97±61.01

The actually consumed energy by the experimental animals in terms of TDN and calculated DE and ME are presented in Table 6.

Table 6: Energy consumed by the experimental animals.

Attributes	Experimental groups			
	I	II	III	IV
Experiment I				
TDN g/Kg $w^{0.73}$	19.34+2.43	24.26+2.89	25.97+4.7	34.35+2.75
TDN g/Kg $w^{0.75}$	17.99+2.26	22.59+2.69	24.18+4.37	32.08+2.56
DE,kcal/Kg $w^{0.73}$	85.4+10.64	106.6+12.88	114.2+21.04	151.6+12.05
DE kcal/Kg $w^{0.75}$	79.6+9.86	99+12.02	106.2+9.00	140.8+11.25
ME KJ/Kg $w^{0.73}$	296.4+37.09	371.8+44.25	398.4+72.29	528.4+42.00
ME KJ/Kg $w^{0.75}$	276+34.69	346.2+41.29	370.8+67.14	492.0+39.31
Experiment II				
TDN g/Kg $w^{0.73}$	28.17+2.14	30.17+1.19	27.79+3.46	29.65+3.33
TDN g/Kg $w^{0.75}$	26.22+1.98	28.10+1.11	25.88+3.22	27.61+3.10
DE kcal/Kg $w^{0.73}$	124.00+9.54	133.00+5.15	122.6+15.09	130.8+14.72
DE kcal/Kg $w^{0.75}$	119.6+9.95	123.6+4.61	114+14.05	121.8+13.81
ME KJ/Kg $w^{0.73}$	432.00+32.73	462.4+18.09	426+53.08	452.2+50.37
ME KJ/Kg $w^{0.75}$	401.8+30.24	433.75+17.22	378+49.28	420.8+46.87
Experiment III				
TDN g/Kg $w^{0.73}$	20.85+1.43	24.38+0.64	30.64+1.48	37.49+2.32
TDN g/Kg $w^{0.75}$	19.41+1.33	22.69+0.59	28.52+1.38	34.9+2.16
DE kcal/Kg $w^{0.73}$	92.00+6.48	107.2+2.77	135.2+6.53	165.25+10.44
DE kcal/Kg $w^{0.75}$	85.46+6.04	99.6+2.30	125.8+6.02	153.75+9.88
ME KJ/Kg $w^{0.73}$	319.4+21.94	373.6+9.55	46.98+22.86	575+35.47
ME KJ/Kg $w^{0.75}$	297.4+20.55	347.6+8.90	437.2+21.05	535.5+33.09

DE (Mcal/Kg) = TDN% * 0.04409 (Crampton *et al.*, 1957 and Swift *et al*, 1957)
ME (MJ/Kg) = (Kearl, 1982).

Estimation of maintenance requirements of energy as DE intake from live body weight changes:

The digested energy (DE) intakes calculated from digestibility trials were utilized to estimate DE requirements for maintenance of body weight. Simple regression models were fitted to investigate the relationship between relative weight change (Y) in g/day/kg and DE intake kcal (X) per metabolic size (kg $w^{0.73}$ or kg $w^{0.75}$) .The two equations were respectively as follows:

$$RWC = - 0.253 + 0.00179 * \text{DE intake (kcal/ Kg } W^{0.73})$$
$$n = 58, r = 0.592, P \leq 0.0001)$$
$$RWC = - 0.253 + 0.001928 * \text{DE intake (kcal/ kg } W^{0.75})$$
$$(n = 58, r = 0.593, P \leq 0.0001)$$

These equations indicate that the energy requirements for the maintenance of body weight of goats are 141 kcal DE/kg $w^{0.73}$ and 131 kcal DE / kg $w^{0.75}$.

Since the correlation coefficient (r) was significant ($P \leq 0.0001$), the value 141 kcal DE/day/kg $w^{0.73}$ was considered as a satisfactory estimate. It is similar to the results obtained by Stohman *et al.* (1968) ; Singh and Sengar

(1970) ; Singh and Sengar (1978) ; Heinlein (1980) and Sauvant and Morand Fehr (1991), who found that the estimated DE intakes were 142, 142, 142, 143and 137 kcal DE/day/kg $w^{0.73}$, respectively.

On the same way, the correlation coefficient (r) was significant ($P \le 0.0001$), the value 131 kcal DE/day/kg $w^{0.75}$, was considered as satisfactory estimate. It was similar the results obtained by Stohman *et al.*1(968); Singh and Sengar (1970); Singh and Sengar 1978); Haenlein (1980) and Sauvant and Morand Fehr (1991), who found that the estimated DE intakes were 132, 132, 132, 133, 127 kcal DE/day/kg $w^{0.75}$, respectively.

Estimation of maintenance energy requirements as ME intakes from live body weight changes:

The metabolizable energy (ME) intakes calculated from digestibility trials were used to estimate ME requirements for maintenance of body weight. Simple regression models were fitted to investigate the relationship between relative weight change (Y) in g/day/kg and ME intake (X) in terms of KJ per metabolic body size (Kg $W^{0.73}$ or kg $W^{0.75}$). The two equations were respectively as follows:

$$RWC = -0.252 + 0.000513 * ME\ intake\ (KJ/kg\ W^{0.73})$$
$$(n = 58,\ r = 0.590,\ P \le 0.0001)$$
$$RWC = -0.293 + 0.0005901 * ME\ intake\ (KJ/kg W^{0.75})$$
$$(n = 58,\ r = 0.558,\ P \le 0.0001)$$

These equations indicate that the energy requirements for the maintenance of body weight of goats are 491 KJ ME/kg $w^{0.73}$ and 459 KJ ME / kg $w^{0.75}$.

Since the correlation coefficient (r) was significant ($P \le 0.0001$), the value 491 kJ ME/kg $w^{0.73}$ was considered a satisfactory estimate. It was similar to the results obtained by Haenlein (1950) ; Stohman *et al*, (1968) ; Singh and Sengar (1970) ; Singh and Sengar (1978) and Haenlein (1980) who found that the estimated ME intakes were 498,494,494,494, and 498 KJ ME/kg $w^{0.73}$, respectively.

On other hand, the correlation coefficient (r) was significant ($P \le 0.0001$), the value 459 KJ ME/day / kg $w^{0.75}$ was considered as satisfactory estimate. It was similar to the results which were obtained by Haenlein (1950); Stohman *et al*, (1968); Singh and Sengar (1970); Singh and Sengar (1978) and Haenlein (1980), who found that the estimated ME intakes were 464, 460, 460, 460 and 464 KJ ME/day/kg $w^{0.75}$, respectively.

Estimation of maintenance energy requirements as TDN intake from live body weight changes:

An attempt was made to predict the TDN at which goats are expected to maintain their body weights unchanged from the data of animal performance and energy intakes (Table 6). A liner regression between the TDN intake (X; g/day/kg $w^{0.73}$) or (X; g/day/kg $w^{0.75}$) and the relative changes

Table 7: **Summary of the energy requirements for maintenance of goats.**

Breed	Method of study	TDN (g /KgW$^{0.75}$/day)	TDN (g /KgW$^{0.73}$/day)	ME (KJ/KgW$^{0.75}$/day)	ME (KJ/KgW$^{0.73}$/day)	DE (kcal/KgW$^{0.75}$/day)	DE (kcal/KgW$^{0.73}$/day)	Authors
Present study	Prediction from correlation between relative body weight change and							
	TDN (g /KgW$^{0.75}$/day)	29.79						Present study
	TDN (g/ KgW$^{0.73}$/day)		32.11					
	ME (KJ /KgW$^{0.75}$/day)			459				
	ME (KJ /KgW$^{0.73}$/day)				491			
Mature males	DE (kcal/kg$^{0.75}$/day)					131		
	DE (kcal/kgW$^{0.73}$/day)						141	
Jammapria	Prediction from endogenous N study	31.43	33.78	482	518	138.29	148.6	Majurdar (1960)
Kambing Katjing	Confined to maintain weight in feeding trial.	24.65	26.47	378	406	108.46	116.5	Devendra (1967)
West Africa Dwarf.	Confined and fed to grow.	31.1	33.39	477	512	136.84	146 9	Oyenuga and Akinsoyinu (1977)
Indian goats	Confined and fed to grow.	27.85	29.86	427	458	122.5	131.4	Rajpoot (1979)
Beetal	Confined and fed to maintenance in a balance study.	34.03	36.58	522	561	149.73	161	Kurar and Mudgal (1981)
Alpine X Beetal	Confined in a feeding and metabolism trial	43.82	47.08	672	722	192.8	207.2	Kurar (1983)
Kenya goats	Confined and fed to grow.	36.25	38.93	556	597	159.5	171.3	Abate (1989)
Japanese native	Respiration caloremetry	23.8	25.56	365	392	104.72	112.1	Itah *et al* (1979)
Granadina	Respiration calommetry	28.89	31.04	443	476	127.12	136.6	Prieto *et al* (1990)
Granadina	Respiration caloremetry	27.45	29.47	421	452	120.78	129.7	Aguilera *et al* (1991)
Developing Countries goats		28.98	31.12	444	477	127.51	136.9	Kearl (1982)
National Council, U.S.A		28.27	30.36	433	465	124.39	133.6	NRC (1981)
Range of the above other studies		23.8 – 43.8	26.47-47.08	365-672	392-722	104.7-192.8	112.1-207.2	

in body weight (Y; g/day/kg) were calculated as in the following two equations, respectively:

$$RWC= - 0.254 + 0.0079 * TDN\ intake\ (g/Kg\ W^{0.73})$$
(n =59, r=0.594, P≤0.0001)
$$RWC= - 0.249 + 0.0083 * TDN\ intake\ (g/kgW^{0.75})$$
(n=59, r=0.594, P≤0.0001)

The obtained results indicated that the estimated TDN intake at zero weight change was 32.11 g/day/kg $w^{0.73}$ and 29.79 g/day/kg $w^{0.75}$ This estimated value of TDN intake was considered as satisfactory estimate because the correlation coefficient (r) was significant (P≤0.0001). It is nearly similar to the values obtained by (Senger, 1980), (Sauvant and Morand Fehr, 1991) and (Haque *et al*, 1998) who found that the estimated maintenance TDN intakes were 33.57, 31.63 and 33.83 g TDN/day/kg $w^{0.73}$, respectively. In addition, slightly lower values were reported by Stohman *et al*, (1968); (Singh and Sengar, (1970); Singh and Sengar, (1978) and (Haenlein, 1980) ranging from, 29.02 to 31.00 g TDN/day/kg $w^{0.75}$.

All the predicted values in this study fall within the range recommended by several authors, but tended to be towards the lower limit as indicated in Table 7.

It is of importance to indicate that the TDN maintenance requirements assessed in the present study (32.11 g TDN/Kg $W^{0.73}$) is higher than that previously estimated for sheep, being 27.8g TDN/Kg$W^{0.73}$(Salem, 1990).

It should be pointed out however, that absolute body weight change could be only valid under the assumption that body composition remained unchanged.

In future studies, the concept of body composition should be taken into consideration for accurate assessment of nutrient requirements.

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الاحتياجات الغذائية الحافظة من الطاقة للماعز

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أجريت هذه الدراسة بمحطة تجارب مريوط حيث استخدمت نتائج تجارب تغذية وتمثيل غذائي على الماعز لاستنباط احتياجاتها الحافظة من الطاقة .

أشتملت هذه الدراسة على ٢٠ ماعز صحراوي ، و كانت اوزان هذه الحيوانات تتراوح ما بين ٢٥ الى ٣٨ كجم. تم تركيب ١٢ عليقة باستخدام حبوب الشعير والعلف المركز وتبن القمح بنسب مختلفة للوصول إلي مستويات مختلفة من المركبات الغذائية المهضومة والبروتين الخام المهضوم في حدود الموصي به من المادة المستهلكة حيث كان الهدف الوصول إلي ١٢ مستوي من الطاقة إلي البروتين لتوفير الاحتياجات الغذائية الحافظة أو أكثر أو أقل من الموصي به للأغنام (٢٧,٨ جم TDN و ٢,٣ جم DCP /كجم و ^{٠,٧٣})

تراوحت كفاءة الحيوانات ما بين نقص الوزن -١٨. الي زيادة ١٢جرام/اليوم/كجم ، بينما تراوح ميزان النيتروجين ما بين -١٠٤ الي + ٣٨٦,٤٨ مليجرام نيتروجين /اليوم كجم ^{٠,٧٣} .و استخدم نموذج العلاقة الخطية وذلك لاستباط الاحتياجات الحافظة من الطاقة . وتم تقدير الاحتياجات الحافظة من الطاقة في حالة ثبات الوزن فكانت كمية المركبات الكلية المهضومة ٣٢,١١ جرام /اليوم/كجرام ^{٠,٧٣} ، ٢٩,٧٩ جرام/اليوم /كجم ^{٠,٧٥} وكانت الطاقة الممثلة بالكيلو جول٤٩١ كيلو جول /اليوم/كجم^{٠,٧٣}، ٤٥٩ كيلوجول/اليوم /كجم^{٠,٧٥} وكانت كمية الطاقة المهضومة بالكيلوكالوري١٤١ كيلو كالورى/اليوم/كجم ^{٠,٧٣} ، ١٣١ كيلوكالوري /اليوم/كجم ^{٠,٧٥} . ووجد أن هذه الاحتياجات الحافظة من الطاقة المستبطة للماعز مشابهة لاحتياجات الأنواع الأخري من الماعز ولكنها كانت أعلي بقليل من احتياجات الأغنام في مصر .

ونأمل في المستقبل أن نقوم بتقدير الاحتياجات الحافظة من الطاقة والبروتين خلال فترات النمو والحمل وإنتاج اللبن مع الأخذ في الاعتبار تركيب الجسم.