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## Study on growth and carcass weight of male Dumbi lambs under two management systems

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### Abstract

The experiment comprised of 12 male Dumbi lambs, divided equally in two groups i.e. A (semi-intensive management) and B (intensive management). Lambs in group A were fed green fodder + self prepared concentrate mixture and also allowed grazing, while the lambs in group B were fed green fodder + self prepared concentrate mixture.

The results indicated that the male Dumbi lambs in group A (semi-intensive management system) utilized the feed better than their counterparts in group B (intensive management system). The average live body weight of group A at the end of week 1, 2, 3, 4 and 5 was higher than group B. Similar pattern was found in the body weight of male Dumbi lambs in group A & B. The pre-slaughter body weight of lambs in group A and B demonstrated significant difference where group A showed higher body weight than group B. Similarly, dressed carcass, neck weight, shoulder weight, thorax weight, loin and flank weight, leg weight and weight of kidneys of group A was higher than group B. No mortality was recorded in both groups during the experiment. The total feed cost on the lambs of group A (Semi + Intensive management) and B (intensive management) was Rs. 840/lamb equally, but the weight gained by the lambs in groups A was higher than group B whereas, on average, each lamb was sold at the price of Rs. 4225 (group A) and 3950 (group B) per lamb. After deduction of total production costs, the net profit earned in group A was higher than group B. It was concluded that growth, carcass characteristics and economic parameters of male Dumbi sheep lambs were remarkably improved under semi-intensive management system over intensive management; which emphasize the significance of grazing of these lambs in addition to their feeding program.

**Keywords:** Intensive management system, DUMI lambs, growth, carcass

### 1. Introduction

Pakistan is an agricultural country and more than 70 % of the population lives in rural areas and their livelihood direct or indirect engaged with agriculture. Livestock contribution to agriculture value added stood at 55.9 percent while it contributes 11.9 percent to the national GDP during 2013-14 compared to 55.5 percent and 11.8 percent during the corresponding period last year, respectively. Gross value addition of livestock has increased from Rs. 756.3 billion (2012-13) to Rs. 776.5 billion (2013-14), showing an increase of 2.7 percent as compared to last year <sup>[1]</sup>. It is clear from the fact about 30-35 million rural population is engaged in livestock raising, having household holdings of 2-3 cattle/buffalo and 5-6 sheep/goats per family which help them to derive their income <sup>[2]</sup>. Rapid economic development is resulting in considerable pressure on the livestock sector to increase its output, as demand for milk and meat is increasing rapidly.

According to the latest Economic Survey of Pakistan (2013-14) the livestock population consisted of 29.1 million sheep and 66.6 million goat. Sheep produced 38 thousand tons milk and 657 thousand tons of mutton in Pakistan <sup>[1]</sup>. There are 27 sheep breeds in Pakistan which are classified in two major groups i.e. thin tail sheep and fat tail sheep. The thin tail sheep breed included Damani, Kacchi, Kali, Kajli, Kooka and Lohi, while fat tail sheep breeds are Bibrik, Dumbi, Harnai, Pahari and Rakhshani. The sheep breeds originated in Sindh province are Dumbi, Kachhi and Kooka <sup>[3, 4]</sup>. Thin tail sheep are generally found in irrigated areas and fat tail breeds in arid rangelands and mountainous areas of Sindh, Khyber Pakhtoonkhwa and Azad Kashmir <sup>[5]</sup>. Local sheep breeds generally breed once a year and rarely produce twins. Annual lambing rate is about 80 % on overall basis <sup>[6]</sup>.

Dumbi breed originates from the mountainous area of southwestern Sindh comprising of Dadu, Thatta and part of Karachi district. Dumbi breed is medium sized animals.

Adult males and females of this breed weigh 36 and 30 kg, respectively. Dumbi sheeps are raised for mutton and wool production [3, 4]. The average carcass yield of sheep was estimated at 10 to 12 kg which is about half of the other sheep producing countries. Sheep are rather unique in producing a suitably finished carcass as a relatively young age (i.e. 6 months) when fed diets high either in good forage or concentrate [7].

Universally, sheep are managed under three systems i.e. extensive, semi-intensive and intensive. The raising of animals specially for slaughter is still not practiced and systematic meat production is largely ignored, resulting in low per unit productivity in Pakistan. On the contrary, the most commonly practiced systems are semi intensive or intensive in most of the developed countries. The present study on growth and meat production capabilities of fat-tailed sheep (Dumbi) was undertaken under two management system viz; semi intensive and intensive. The account of Dumbi breed available in the literature is very superficial and characteristics of Dumbi breeds are not studied in depth. Therefore, aim of our study is to determine the growth, carcass weights and economics of male Dumbi lambs under two management systems in order to suggest a proper management system for better sheep production.

## 2. Materials and Methods

Twelve male Dumbi lambs of Dumbi breed (3 months age) were experimented under two management systems during the year 2014 at the Livestock Experimental Station, Faculty of Animal Husbandry and Veterinary Sciences, Sindh Agriculture University Tandojam. All the lambs were physically examined for their normal health and activeness. The animals were reared in two separate pens six lambs in each pen were grouped and properly tagged for experiments. Group A comprising of six male Dumbi lambs having tag numbers DL1, DL2, DL3, DL4, DL5 and DL6 were reared under semi-intensive management system i.e they were allowed grazing and concentrate ration and water were provided at animal shed whereas, group B comprising of six male Dumbi lambs having tag numbers DL7, DL8, DL9, DL10, DL11 and DL12 were kept under intensive management system at the livestock experimental station i.e no grazing; they were fed on green fodder and concentrate ration. The green fodder and water were provided *ad libitum*. The experimental lambs were kept for the period of 8 weeks. During adaption period lambs were dewormed with 2.5% Albendazole.

During the experiment following parameters were recorded:

- **Initial body weight (kg):** Initial body weight was taken after adaptation period of 10 days.
- **Initial age (months):** Initial age of the lambs was recorded after adaptation period of 10 days.
- **Weekly body weight (kg):** Weekly body weight was taken and recorded on morning time before feeding.
- **Final body weight (kg):** The final body weight was recorded at the end of research.
- **Carcass weight (kg):** At the end of experiment, the live weight of individual male Dumbi lambs in both groups was recorded. Thereafter, all the three lambs in each group were slaughtered. After decaying skin and removing the viscera and offal, the weight of carcass was recorded. Dressing percentage was computed using following formula, and results of both groups were compared accordingly.

$$\text{Dressing (\%age)} = \frac{\text{Carcass weight}}{\text{Live weight}} \times 100$$

- **Organs weight (kg):** The organs weight of slaughtered Dumbi male lambs was noted at the end of experiment.
- **Mortality:** Mortality was recorded during the experiment.
- **Economics:** All the expenditure including animal cost, feeding, vaccination/ medicine cost, labour charges, and proximate price of lamb meal, edible offals, skins and wool were recorded. The profit or loss margin was compared in both groups.

### 2.1 Statistical Analysis

The data were subjected to analysis of variance (ANOVA) and in case of significant differences appeared among the mean, the least significant differences were computed using computer packages i.e. Student Edition of Statistix (SXW), (Copyright 2005, Analytical Software, USA)

## 3. Results

In order to assess the performance of male lambs of Dumbi sheep breed in relation to growth and carcass characteristics, the study was carried out during the year 2014 at the Livestock Experiment Station, Faculty of Animal Husbandry and Veterinary Sciences, Sindh Agriculture University Tandojam. The experiment comprised of 12 male Dumbi lambs, divided equally in two groups (A and B); and the group A lambs were kept under semi-intensive management system and fed green fodder + self-prepared concentrate mixture and also allowed grazing; while the male Dumbi lambs in group B were kept under intensive management system, feeding green fodder, self-prepared concentrate mixture. The data statistically analysed is presented in Tables 1-3 which include growth performance, carcass characteristics and economics of the systems.

### 3.1 Growth of Dumbi lambs (8 weeks)

The data regarding the body weight of male Dumbi lambs managed under intensive and semi-intensive management systems is presented in Table-1; which showed that the initial body weight of lambs managed under semi-intensive management system (group A) fed green fodder + self-prepared concentrate mixture and allowed grazing was 6.08±0.139 kg/lamb, while the initial body weight of male Dumbi lambs kept under intensive management system (Group B) fed green fodder + self-prepared concentrate mixture was 5.79±0.068 kg/lamb.

The results indicated that the male Dumbi lambs in group A (semi-intensive management system) utilized the feed better than their counterparts in group-B (intensive management system) with average live body weight at the end of week 1, 2, 3, 4 and 5 of 6.33±0.139, 6.58±0.139, 6.83±0.139, 7.16±0.123 and 7.41±0.123 kg/lamb, against body weight of group-B lambs i.e. 5.85±0.068, 5.88±0.091, 5.94±0.112, 6.10±0.118 and 6.18±0.149 kg/lamb, respectively. Similarly, the body weight of male Dumbi lambs in group A (semi-intensive management) at the end of week 6, 7 and 8 was 7.66±0.123, 8.00±0.111 and 8.33±0.083, against 6.39±0.162, 6.51±0.175 and 6.86±0.207 kg, respectively for male Dumbi lambs in group B (intensive management), respectively.

The results further showed that under semi-intensive management system only grazing was offered to male Dumbi

lambs in addition to green fodder + self-prepared concentrate mixture, but the growth of lambs under semi-intensive management was remarkably better than those under intensive management because of welfare under natural environment during grazing. Under semi-intensive management system, the lambs were able to move with freedom, while this welfare atmosphere was not available for them under intensive management system. Hence, under semi-intensive management system, their growth improved more than their counterparts managed under intensive management system. The differences between management systems as well as weeks for live body weight were highly significant ( $P < 0.01$ ) statistically.

### 3.2 Carcass characters

The carcass characteristics of male Dumbi lambs were measured on the basis of three slaughtered lambs from each group and these traits included dressed carcass weight, weight of neck, shoulder, thorax, loin and flank, legs and kidneys and results on these parameters are presented in Table-2. The data in above table exhibited that over the initial body weight of  $6.08 \pm 0.139$  kg/lamb and  $5.79 \pm 0.068$  kg/lamb in group A (Semi-intensive management system) and group B (intensive management system), the pre-slaughter body weight of male Dumbi lambs in both the groups was  $8.33 \pm 0.083$  and  $6.86 \pm 0.207$  kg/lamb, respectively showing highly significant ( $P = 0.0020^{**}$ ) differences in pre-slaughter weight under two management systems. Similarly, the dressed carcass of male Dumbi lambs in group A and group B was  $6.58 \pm 0.051$  kg and  $5.61 \pm 0.070$ , respectively showing highly significant ( $P < 0.0011^{**}$ ) difference between two management systems for this character.

The results further showed that the weight of neck averaged from three slaughtered lambs of each group also differed significantly ( $P = 0.0141^{**}$ ) between management systems and weight of the neck of lambs in group A (Semi-intensive management system) was significantly higher  $0.86 \pm 0.031$  kg, while neck weight for lambs in group B (intensive management system) was  $0.71 \pm 0.018$  kg. Similarly, weight of the shoulder of lambs in group A (Semi-intensive management system) was also higher ( $1.50 \pm 0.069$  kg/lamb) than the lambs of group B (intensive management system) having an average shoulder weight of  $1.23 \pm 0.074$  kg. Statistically, the differences in shoulder weight between two groups were highly significant ( $P = 0.0303^{**}$ ).

Thorax weight was also examined and it also differed significantly ( $P = 0.0583^*$ ) between two management systems and average thorax weight of  $1.20 \pm 0.0083$  kg was significantly ( $P = 0.0583^*$ ) higher in lambs managed under semi-intensive management system (Group-A) as compared to the lambs in group- B (intensive management) with average thorax weight of  $1.05 \pm 0.076$  kg/lamb. Similar trend was observed for the weight of loin and flank which in lambs of group A (semi-intensive management) was higher ( $1.10 \pm 0.028$  kg/lamb) than the lambs managed under intensive management system (Group-B) with average loin and flank weight of  $1.01 \pm 0.083$  kg/lamb.

It was further noted from the experimental results that weight of legs of male Dumbi lambs also differed significantly ( $P = 0.0021^{**}$ ) between management systems and legs weight averagely higher ( $1.80 \pm 0.057$  kg/lamb) in group A (semi-intensive system) than the lambs of group-B (intensive management system) with an average weight of legs of

$1.50 \pm 0.021$  kg/lamb.

The management systems also showed significant ( $P < 0.01$ ) impact on the weight of kidneys ( $P > 0.0554^*$ ) and weight of kidneys in group A (semi-intensive management) was relatively higher ( $0.12 \pm 0.003$  kg/lamb) as compared to the male Dumbi lambs management under intensive management system (Group-B) having average kidneys weight of  $0.11 \pm 0.096$  kg/lamb. The behaviour of the data in relation to the effect of management system on the carcass characteristics of male Dumbi lambs is showing a linear relationship of apparent body growth and development of internal organs of lambs with the feeding and management systems. However, grazing showed quite positive impact on the body growth and carcass characteristics, probably grazing fulfilled the freedom needs of animals and welfare parameters of lambs were conformed and hence more internal and external body development was observed under semi intensive management system as compared to intensive management.

### 3.3 Economics of feeding systems

After completion of the 8 weeks project to investigate the effect of management systems on the growth and carcass characteristics of male Dumbi sheep lambs, the economic analysis of management systems was worked out and the results are shown in Table-3. The feed consumption in both the groups was equal because *ad libitum* feed was offered instead, each lamb in both the groups was given 250 g concentrate mixture and 4 kg green fodder. However, system of feeding was different in both the groups. The total feed cost on the lambs of group A (semi-intensive management) and B (intensive management) was Rs. 840/lamb equally, but the weight gained by the lambs in groups A and B was 2.25 and 1.07 kg/lamb and on average the each lamb was sold at the price of Rs. 4225 and 3950/lamb, respectively. Hence, after deduction of total production costs of Rs. 3688 and 3705/lamb, the net profit earned in group A and B was Rs. 537 and 245/lamb, respectively.

It was observed that economically, the semi-intensive system comprised of feeding green fodder + self-prepared concentrate mixture and grazing was remarkably more profitable than the intensive system, where the equal green fodder and concentrate mixture was given to the experimental lambs, but grazing was not allowed.

**Table 1:** Weekly average body weight (kg/lamb) of male Dumbi lambs as affected by different management systems

Weeks	Average of body weight (kg / lamb)	
	Group-A (Semi-Intensive management system)	Group-B (Intensive management system)
0 week	$6.08 \pm 0.139$ h	$5.79 \pm 0.068$ cd
1 week	$6.33 \pm 0.139$ gh	$5.85 \pm 0.091$ d
2 week	$6.58 \pm 0.139$ fg	$5.88 \pm 0.112$ cd
3 week	$6.83 \pm 0.139$ ef	$5.94 \pm 0.118$ bcd
4 week	$7.16 \pm 0.123$ de	$6.10 \pm 0.149$ bcd
5 week	$7.41 \pm 0.123$ cd	$6.18 \pm 0.127$ abcd
6 week	$7.66 \pm 0.123$ bc	$6.39 \pm 0.162$ abc
7 week	$8.00 \pm 0.111$ ab	$6.51 \pm 0.175$ ab
8 week	$8.33 \pm 0.083$ a	$6.86 \pm 0.207$ a
S.E $\pm$ 0.0832		
LSD 0.05 0.1652		

Mean with different superscripts in rows / columns are significantly different from one another.

**Table 2:** Average values for carcass characters of male Dumbi lambs under two management systems

Characters	Average of carcass weight (kg / lamb)			
	Group-A (Semi-Intensive management system)	Group-B (Intensive management system)	LSD 0.05	P-Value
1. Initial body weight (kg)	6.08±0.139 a	5.79±0.068 b	0.149	0.0000**
2. Pre-slaughter weight (kg)	8.33±0.083 a	6.86±0.055 b	0.552	0.0020**
3. Dressed carcass (kg)	6.58±0.051 a	5.61±0.070 b	0.302	0.0011**
4. Weight of neck (kg)	0.86±0.031 a	0.71±0.018 b	0.080	0.0141**
5. Weight of shoulder (kg)	1.50±0.069 a	1.23±0.074 b	0.319	0.0303*
6. Weight of thorax (kg)	1.20±0.083 a	1.05±0.076 b	0.230	0.0583*
7. Weight of loin and Flank (kg)	1.10±0.028 a	1.01±0.083 b	0.013	0.0028**
8. Weight of legs (kg)	1.80±0.057 a	1.50±0.021 b	0.091	0.0021**
9. Weight of kidneys (kg)	0.12±0.003 a	0.11±0.096 b	0.007	0.0554*

\* Significant at 0.05 probability level

\*\* Significant at 0.01 probability level

Mean with different superscripts in rows / columns are significantly different from one another.

**Table 3:** Comparative economics of rearing of male Dumbi lambs under intensive and semi-intensive management systems

Sr. No.	Particulars	Groups	
		A	B
1	Per animal feed consumption in 8 weeks (kg)	126	126
2	Concentrate (kg/per animal)	14	14
3	Rate of concentrate (Rs/kg)	32	32
4	Amount of concentrate (Rs) 2 x 3	448	448
5	Quantity of green fodder (kg/animal) 1 – 2	112	112
6	Rate of green fodder (Rs/kg)	3.5	3.5
7	Amount of green fodder (Rs/animal) 5 x 6	392	392
8	Total feed cost/animal (Rs) 4 + 7	840	840
9	Cost medication/vaccination (Rs)	48	75
10	Labour cost (Rs)	210	170
11	Misc. cost (Rs)	110	140
12	Initial cost of lambs (Rs/lamb)	2480	2480
13	Total Costs (Rs)	3688	3705
14	Weight gain/lamb in 8 weeks (kg)	2.25	1.07
15	Initial weight/lamb (kg)	6.08	5.79
16	Total weight (kg/lamb)	8.33	6.86
17	Sale of animal (Rs/lamb)	4225	3950
18	Net profit (Sale of animals – Total cost) 17 – 13	537	245

A=Lambs fed Green fodder + self-made concentrate mixture+grazing

B=Lambs fed Green fodder + self-made concentrate mixture

#### 4. Discussion

Management system plays a significant role in the growth and development of body growth and carcass characteristics of sheep. The experiment was conducted to assess the growth and carcass characteristics of male Dumbi lambs under intensive and semi intensive management.

The growth of male Dumbi lambs was remarkably improved under semi-intensive management system over intensive management. The results of this study are fully supported by [8] reported that semi-intensive system did improve live and slaughter weights and increase dressing percentage. [9] reported that kids in semi-intensive and extensive system grew faster than intensive system. From the similar studies, [10] indicated that the increasing levels of supplemental energy improved live weight gain of grazing sheep and supplementation of higher level of dietary energy may be suggested for optimizing growth of sheep under grazing condition. In a similar experiment, [11] found significantly higher average daily gain (161.52 g versus 132.05 g) and daily concentrate intake (851 g versus 725 g) in Saanen lambs compared to Bornova lambs. [12] studied the effects of feeding concentrate on growth performances and body composition on fifteen local sheep male lambs with an average body weight of 23.3 kg as initial weight and reported that during the first 6 weeks of the experiment lambs gained less weight

than those in the later stages of experiment with feeding concentrates. In the rest of the experimental period, animals receiving the medium diet had the highest growth rate. The present study further showed that carcass characteristics and economic parameters of male Dumbi sheep lambs were remarkably improved under semi-intensive management system over intensive management, which emphasizes the significance of grazing of these lambs in addition to their feeding program. The results further showed that under semi-intensive management system only grazing was offered to male Dumbi lambs in addition to green fodder + self prepared concentrate mixture, but the growth of lambs under semi-intensive management was remarkably better than those under intensive management because of welfare under natural environment during grazing. Under semi-intensive management system, the lambs were able to move with freedom, while this welfare atmosphere was not available for them under intensive management system. Hence, under semi-intensive management system, their growth improved more than their counterparts managed under intensive management system. The differences between management systems as well as for weekly live body weights were highly significant statistically. The current study has agreement with [13, 14] they reported that body weight increases significantly in semi-intensive management system than intensive

management system. In a similar study, <sup>[15]</sup> determined the effects on growth performance of sheep lambs consuming 75% concentrate diet for 24 weeks or for 12 weeks subsequent to 12 weeks of feeding a 50% concentrate diet having initial body weight of 20.2, 12.2, 20.7 and 19.2 kg for Alpine, Angora, Boer and Spanish, respectively, and age around 4 months. It was reported that there were no interactions between breed and dietary treatment.

The behaviour of the data in relation to the effect of management system on the carcass characteristics of male Dumbi lambs is showing a linear relationship of apparent body growth and development of internal organs of lambs with the feeding and management systems. However, grazing showed quite a positive impact on the body growth and carcass characteristics, probably grazing fulfilled the freedom needs of animals and welfare parameters of lambs were conformed and hence more internal and external body development was observed under semi intensive management system as compared to intensive management. The findings of the present experiment are in concurrence with those of <sup>[16]</sup> who found considerable variation in body weight and other body conformation traits in different sheep breeds and under different feeding and management systems. In another study, <sup>[17]</sup> reported high body weights of lambs under high protein diets. The above results are further supported by <sup>[18]</sup> who determined the effect of forage: concentrate ratio on growth performance and carcass characteristics of growing Baladi (black) sheep lambs and found that average daily gain for lambs fed the low fodder diet ( $179 \text{ g day}^{-1}$ ) was greater compared with lambs fed the high fodder diet ( $78 \text{ g day}^{-1}$ ) and digestibilities increased with increasing the concentrate portion of the diets. In another study, <sup>[19]</sup> concluded that the quantity of fat deposited appeared to be positively related to dietary energy concentration; while <sup>[20]</sup> reported significant influence on net returns due to feeding and management systems; while the findings of <sup>[21]</sup> are also in concurrence with those achieved in the present study. Similar results have also been reported by <sup>[22, 23]</sup> whose consolidated findings showed that Tapri and Pateri goat also behaved the same as recorded in the present study for Dumbi sheep breed lambs.

It was observed that economically, the semi-intensive system comprised of feeding green fodder + self-prepared concentrate mixture and grazing was remarkably more profitable than the intensive system, where the equal green fodder and concentrate mixture was given to the experimental lambs, but grazing was not allowed. The current findings also agreed with <sup>[24]</sup> reported higher incremental return per goat / year, whereas <sup>[25]</sup> who reported significance influence on net returns due to feeding and management systems, while findings of <sup>[26]</sup> are also in concurrence with the present findings.

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