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PRELIMINARY EVALUATION OF THE GROWTH PERFORMANCE AND CARCASS TRAITS OF KATAHDIN CROSSBRED LAMBS GROWN TO VARYING LIVE-WEIGHTS IN TRINIDAD

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ABSTRACT: Thirteen Katahdin (KT) sired male lambs were weaned at 60 days, placed in individual pens and fed on a mixture of commercial feed pellets (14% CP) and sugar cane bagasse. Each ram was randomly assigned to one of 4 groups. Animals in each group were reared to mean live-weights (± 1 kg) of 35 kg (Group 1), 40 kg (Group 2), 45 kg (Group 3) and 50 kg (Group 4). Average daily gain (ADG), feed conversion ratio (FCR), total feed cost per unit weight gained as well as dressing percentage was not significantly different ($P>0.05$) among groups. Based on these indices as well as the significantly ($P<0.01$) longer post weaning period required to attain the respective live-weights associated with the significantly greater ($P< 0.01$) deposition of belly fat and the relatively low increases in income over feed costs, it is recommended that KT crossbred lambs be slaughtered upon attaining a live-weight of 35 kg.

Keywords: Katahdin, sheep, slaughter weight, dressing percentage, carcass traits

INTRODUCTION

The small ruminant industry has been identified as an important socio-economic asset that has a strategic role in the efforts towards diversification from traditional export-crop agriculture. In particular, the industry is credited with making significant contributions to poverty alleviation, rural development and the nutritional well being of the people of the Region (Asiedu, 1999). Within this context, as well as within the framework of CARICOM'S Regional Transformation Programme for agriculture (RTP) the small ruminant industry has been identified as having a strategic role to play in rural development. In this regard, there is an urgent need to improve productivity and marketing skills, as well as trade policy.

With respect to Trinidad and Tobago (T&T), McLean (2003) reported that during the period 1991 – 2000, it was estimated that the small ruminant industry accounted for between 1 and 7.5% of domestic mutton and chevon consumption, averaging 2.8% of annual consumption. Further to this it was noted that self-sufficiency was less than 1% in 2000, with residual demand being satisfied by imports from New Zealand, Australia, the USA, Canada and Ireland. According to McLean (2003), roughly 8.6 million kg of mutton and chevon are imported annually into the country, valued at approximately US$ 3.6 M (2000). This is in contrast to the estimated value of US$ 0.4 M that has been placed on local production. Due to the informal nature of the industry however, these figures understate the actual value of domestic production. It is therefore clear that there is a significant gap that offers tremendous opportunities for investments in the domestic small ruminant industry.

In an effort to increase production efficiency and output, some of the larger farms and government stations in the country are importing 'exotic' breeds such as the Katahdin for use in

their breeding programmes. The Katahdin, unlike previous imports, is a sheep breed with tropical ancestry and as such, should be better suited for use in local crossbreeding systems than other 'exotic' breeds.

Crossbreeding is defined as the mating of sires of one breed or breed combination to dams of another breed or breed combination of the same species (Bourdon, 1997). All crossbreeding has one of 2 fundamental aims: to create a new breed or to make maximum use of heterosis (Charray, Humbert and Levif, 1992) and/or breed complementarity.

It must first be established that in a given environment (including climate, disease situation, feeding and management systems) the most productive animal is one containing a proportion of local blood and a proportion of imported genes before choosing an appropriate breeding system which will maintain this intermediate type after the initial crossing (Mason and Buvanendran, 1982). With respect to Trinidad, evaluations of this nature seem to be in its infancy.

Cross breeding should only occupy a minor place in breeding programmes (Rastogi, Williams, Youssef, 1980). Rastogi *et al.* (1980) further expressed the view that it will be a forlorn hope if farmers were to be misled by the superiority of the cross bred females and continue using them for breeding.

In order to capitalise on the increased performance of the cross-bred animals, it is also critical that the optimum slaughter weight with respect to growth performance and carcass traits under local conditions be determined. This will not only enable farmers to have a targeted slaughter weight when rearing crossbred animals, but also facilitate better selection of terminal sires. In the long-term, this will result in sheep production units being more sustainable and efficient as less feed is wasted and costs are reduced.

MATERIALS AND METHODS

Thirteen Katahdin (KT) sired male lambs were weaned at 60 days, placed in individual pens and fed on a mixture of commercial feed pellets (14% CP) and sugarcane bagasse. The animals were randomly assigned to one of 4 groups, and reared to mean live-weights (± 1 kg) of 35 kg (n = 4), 40 kg (n = 3), 45 kg (n = 3) and 50 kg (n = 3). Animals were weighed every 14 days, before being fed in order to minimise gut-fill error. Upon reaching the target weight, animals were fasted for 24 hours before being slaughtered. The dressing percentage, average daily gain (ADG), the cost of feed per unit weight gained over the fattening period and feed conversion ratio (FCR) were calculated. Feed intake was determined by weighing feed offered and the amount refused. Data on selected carcass traits were also recorded.

Statistical comparison of ADG, FCR, cost of feed consumed per unit weight gained, dressing percentage and selected carcass traits using MINITAB statistical software was used to determine the optimum slaughter weight for KT sired lambs.

RESULTS AND DISCUSSION

Growth performance

ADG and FCR did not vary significantly ($P>0.05$) as the market weight of crossbred lambs increased from 35 kg to 50 kg (Table 1). As is expected the cost of the total feed required by lambs to attain a live-weight of 35 kg (US$ 15.60) significantly ($P<0.01$) increased as live-weight approached 50 kg (US $ 33.40). Although higher, total feed cost **per unit weight** gained for lambs grown to 50 kg did not differ significantly ($P>0.05$) from those grown to 35 kg.

While the carcass value (Table 2) of lambs with a live-weight of 50 kg was also higher than those with a live-weight of 35 kg, the additional number of days required to benefit from that increase is great (89 days). From Table 3 it can be seen that the percentage increase in carcass value and income over feed cost by growing lambs to 40, 45 and 50 kg rather than slaughtering at 35 kg, does not monetarily compensate for the insignificant difference ($P>0.05$) in dressing percentage plus the significant ($P<0.01$) increase in the post weaning period. The additional costs incurred as a result of the use of more resources like labour, utilities and space would make it unprofitable to slaughter animals above 35 kg live-weight in this system. The unexpected shorter post-weaning period for group 3 when compared with group 2 could be attributed to the higher average weaning weight of group 3.

A longer post -weaning period translates into increased labour costs and a reduced rate of turnover (lambs/year) while occupying physical infrastructure, which is generally limited on small ruminant farms in Trinidad.

Carcass traits

The weight of the skin, liver, heart, gut (without content) and kidneys along with the dressing percentage did not vary significantly ($P>0.05$) at different slaughter weight (Table 4). Obvious differences ($P< 0.001$) were observed in the live weight of animals between groups before and after fasting for 24 hours.

The weight of blood ($P<0.05$), head ($P<0.01$), feet ($P<0.01$), lungs ($P<0.05$), belly fat ($P<0.001$) and testicles ($P<0.05$) were also significantly higher for animals slaughtered at higher slaughter weights. Particular note should be taken of the deposition of belly fat being over 730% higher at 50 kg live body weight than at 35 kg.

Mean values for some carcass traits doesn't seem to vary much when expressed as a percentage of fasted live weight (Table 5) with the exception of belly fat which was again significantly higher for Group 1 when compared to the corresponding value for Group 4. The skin seems to be accounting for a considerable proportion of the crossbred (10.1-10.8%) regardless of live-weight between 35-50 kg and producers should therefore make a serious effort to make use of this particular ' by-product'.

CONCLUSIONS

As indicated previously, the need to determine optimal slaughter weight under local conditions is critical not only in order to assist farmers to have a target slaughter weight when rearing crossbred animals, but to also facilitate better selection of terminal sires. Based on the trial conducted, a cautious recommendation can be made that the optimal slaughter weight/liveweight for KT cross-bred lambs is 35 kg. Rearing these crossbreds beyond this weight will result in low marginal returns.

RECOMMENDATIONS FOR FUTURE WORK

- The trial should be replicated using a forage-based feeding system approach
- A larger sample size is definitely required to improve statistical accuracy
- Proximate analysis on feed offered and refused should be done in order to report findings in the context of nutrient intake

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Table 1 Mean (± SEM) feed conversion ratio (FCR), average daily gain (ADG) and total feed cost/unit weight gained ($US) and dressing percentage of growing Katahdin crossbred lambs from weaning to varying slaughter weights (35±1 kg-Group1, 40±1 kg-Group 2, 45±1 kg-Group 3 and 50±1 kg-Group 4)**

Groups	Initial weaning wt. (kg)	No. days from weaning to market wt	ADG	FCR	Total feed cost ($US)	Total Feed cost ($US)/unit kg gained	Dressing percentage
Group 1 (n = 4)	20.5 ± 0.7	116.0 ± 3.5	132.8 ± 9.5	7.6 ± 0.6	15.6 ± 0.6	1.0 ± 0.1	46.85 ± 1.1
Group 2 (n = 3)	19.2 ± 1.7	173.0 ± 26.0	131.8 ± 15.0	7.9 ± 0.8	24.5 ± 3.7	1.1 ± 0.1	45.89 ± 0.88
Group 3 (n = 3)	21.5 ± 1.1	163.0 ± 16.8	150.8 ± 18.1	7.8 ± 1.1	25.6 ± 2.9	1.1 ± 0.2	46.54 ± 1.83
Group 4 (n = 3)	20.3 ± 1.2	205.0 ± 4.7	146.9 ± 9.4	8.0 ± 0.4	33.4 ± 1.1	1.1 ± 0.05	49.47 ± 0.74
	NS	*	NS	NS	*	NS	NS

SEM: Standard error of mean; NS- non-significant (P>0.05); *P<0.01, ** Diet- Fortnight 1-6 post-weaning: 75% feed pellets (14 % CP), 25% Sugarcane bagasse, Fortnight 6 to slaughter wt.: 85% feed pellets (14% CP), 15% Sugarcane bagasse

Table 2 Carcass value and total feed* cost ($US) of rearing Katahdin crossbred lambs from weaning to varying market weights

Market wt.	Length of the post weaning period (days)	**Total feed cost**	Carcass value**	Income over Feed cost
35 kg	116	15.6	103.30	87.7
40 kg	173	24.5	115.64	91.14
45 kg	163	25.6	131.94	106.34
50 kg	205	33.4	155.83	122.43

- Diet- Fortnight 1-6 post-weaning: 75% feed pellets (14 % CP), 25% Sugarcane bagasse; Fortnight 6 to slaughter wt. 85% feed pellets (14% CP), 15% Sugarcane bagasse; **US$ 6.30/ kg dressed wt.

Table 3 Percentage difference in number of days from weaning to market, total feed cost and carcass value of Katahdin crossbred lambs between the live-weights of 35 – 40 kg, 40 – 45 kg and 45 – 50 kg

	% increase between 35-40 kg live weight	% increase between 40-45 kg live weight	% increase between 45-50 kg live weight	% increase between 35-50 kg live weight
No. days weaning to market wt	49.14	-5.78	25.77	76.72
Total feed cost	56.98	4.54	30.56	114.26
Carcass value*(US$ 6.30/kg)	11.95	14.10	18.11	50.85
Income over feed cost	3.92	16.68	15.13	39.60

* Using a dressing percentage of 46.85, 45.89, 46.54, and 49.47% for live-weights of 35, 40, 45 and 50 kg respectively

Table 4 Mean (± SEM) values for selected carcass traits of Katahdin crossbred lambs slaughtered at 35 ± 1 (group 1), 40 ± 1 (group 2), 45 ± 1 (group 3) and 50 ±1 kg (group 4)

Parameter	Group				
	1	2	3	4	
L. wt. Bf fast (kg)	35.73 ±0.29	41.37 ± 0.43	45.63 ± 0.32	50.53 ± 1.24	***
L. wt. After fast (kg)	33.92 ± 0.53	38.49 ± 0.4	43.64 ± 0.95	47.94 ± 1.08	***
Blood (g)	866 ± 189	1506 ± 159	1485 ± 328	1833.3 ± 88.2	*
Head (g)	2189.8 ± 10.2	2524 ± 129	2765 ± 211	3100 ± 173	**
Feet (g)	1005.7 ± 5.7	1178.8 ± 61.5	1271.2 ± 48.4	1300.0 ± 57.7	**
Skin (g)	3599 ± 239	3892.4 ± 96.4	4697 ± 200	5007 ± 747	NS
Liver (g)	656.4 ± 51.1	713.3 ± 99.6	716.8 ± 41.4	793.7 ± 53.2	NS
Heart (g)	205.9 ± 36.3	233.3 ± 35.3	301.5 ± 77.9	269.7 ± 30.3	NS
Lungs (g)	563.6 ± 39.2	571.7 ± 65.0	612.3 ± 35.0	791.0 ± 67.4	*
Gut with content (g)	6866 ± 185	8594 ± 236	10078 ± 775	9333 ± 561	**
Belly fat (g)	192.2 ± 46.0	460 ±130	1003 ± 270	1597 ± 296	**
Gut without content (g)	1858 ± 145	1840 ± 688	2573 ± 458	2333 ± 203	NS
Hot carcass wt. (g)	15890 ± 410	17658 ± 279	20303 ± 844	23727 ± 867	***
Chill wt. After 24 hrs. (g)	15199 ± 280	16591 ± 131	19621 ± 723	22576 ± 994	***
Testicles (g)	614.5 ± 68.6	736 ± 122	939.4 ± 72.3	1128 ± 161	*
Kidneys (g)	115.41 ± 2.24	127.3 ± 38.3	161.8 ± 33.4	153.3 ± 24.0	NS
Dressing percentage (DP)*	46.85 ± 1.11	45.89 ± 0.88	46.54 ± 1.83	49.47 ± 0.74	NS

*DP= (hot carcass / l/wt after fast)*100;
NS: non significant (P>0.05), *P<0.05, **P<0.01, ***P<0.001, SEM- standard

Table 5 Mean weight of selected carcass traits of Katahdin sired lambs expressed as a percentage of fasted live-weight.

Parameter				
Groups*	1	2	3	4
Blood	2.55	3.91	3.40	3.82
Head	6.46	6.56	6.34	6.47
Feet	2.96	3.06	2.91	2.71
Skin	10.61	10.11	10.77	10.44
Liver	1.94	1.85	1.64	1.66
Heart	0.61	0.61	0.69	0.56
Lungs	1.66	1.49	1.40	1.65
Belly fat	0.57	1.20	2.30	3.33
Gut without content	5.48	4.78	5.90	4.87
Testicles	1.81	1.91	2.15	2.35
Kidneys	0.34	0.33	0.37	0.32

* Mean live weight before fasting (kg)- Group1 (35 ± 1), Group2 (40 ± 1), (Group3 (45 ± 1) and Group4 (50 ±1 kg)