CARIBBEAN

FOOD

CROPS SOCIETY

31

Thirty First

Annual Meeting 1995

Barbados

Vol.XXXI

THE PRODUCTION AND ECONOMIC PARAMETERS OF OPERATING A LAMB FEEDLOT IN BARBADOS – A PILOT PROJECT

Gerry Thomas, Gerald Proverbs and Terence Haynes

Caribbean Agricultural Research and Development Institute, Cave Hill Campus, St Michael, Barbados

ABSTRACT

One hundred and twenty weaned Barbados Blackbelly lambs were reared in confinement in batches of 20 between October 1993 and April 1995. They were fed a by-product ration which consisted of poultry litter, wheat middlings, rice bran, molasses and a mineral/vitamin mix. Data collected were used to measure parameters such as average daily gain (ADG), average daily feed intake (ADI), feed efficiency (FE); carcass measurements were also evaluated. The liveweight for each animal was recorded immediately before slaughter and the head, skin, feet, paunch, heart and liver were also weighed. The carcass was divided into fore and hindsaddles at the 12th and 13th rib. ADG, ADI and FE were 0.094, 1.2 and 12.9 kg respectively. Rams were significantly heavier ($P < 0.001$) at slaughter than ewes and the skin and paunch of rams were also significantly heavier ($P < 0.001$). However there was no significant difference ($P > 0.05$) in weight of heads and livers of rams and ewes. Cost per unit gain was US$1.67. ADG for ram and ewe lambs was 100 and 87 g respectively. Average fasted slaughter and carcass weights were 30.8 ± 3.94 and 15.4 ± 2.2 kg respectively with a dressing out of 50%. Fasted weight was approximately 92% of fresh liveweight. There was an additional 7% shrinkage between hot and cold carcass weight and fore and hindsaddles were 51 and 43% of chilled carcass weight respectively. Legs, shoulders and racks represented 60, 56 and 23% of hind and foresaddles respectively. The head, skin, and paunch were 5, 13, and 24.6% of fasted liveweight while the liver was 9.6% of chilled carcass weight.

INTRODUCTION

There is a scarcity of research and development information on the operation of a sheep feedlot in Barbados. Information on investment and operating costs for growth rate of lambs, cost/unit gain, and feed efficiency is the major constraint to the development of a commercial lamb feedlot. One of the potential problems in a feedlot is disease and sheep kept in closely confined conditions are predisposed to disease with the accompanying mortality, morbidity and poor weight gain and lower feed efficiency.

Lamb production in Barbados is not well organized bearing in mind that there are approximately 24,000 sheep. This figure represents 18% of the total number of carcasses imported annually and in 1994 the quantity of frozen mutton/lamb imported represented the equivalent of approximately 130,000 head of sheep. Approximately 90% of the sheep are

owned by farmers who are considered 'landless' or 'land limited' with holdings of less than 1 ha and less than 10 sheep. The size of these holdings is a major constraint to successful economic production of lamb. Another constraint to production is the importation of relatively inexpensive lamb/mutton and the livestock industries' overdependence on imported feedstuffs for the manufacture of livestock feeds.

Previous authors have presented the Barbados Blackbelly (BB) sheep as slow gaining, poorly muscled and lacking the traits to be recommended as a meat breed (Johnson, 1944 cited by Rastogi et al., 1980; Patterson, 1976; Rastogi, 1976; Laurie, 1978; ; Patterson, 1984). The only trait the sheep is consistently given credit for is its prolificacy. Over the years, the breed has demonstrated that it is capable of producing carcasses of acceptable quality at rates of gain comparable to North American and European meat breeds (Quintyne, 1980; Blaylock, 1985; Hunte, 1986). Crossbreeding experiments conducted between 1975 and 1984 produced Barbados Blackbelly carcasses that were equal in quality and muscling to BB x Suffolk and BB x Dorset crosses. Romans (1979) concluded that the carcass quality of the Barbados Blackbelly was sufficient for the meat trade and that the flavour of the meat was considered by many to be superior to the British breeds.

The Barbados Government's 1988–1993 Draft Agricultural Sector Plan called for self-sufficiency in mutton/lamb production by the end of the planning period and that could only be achieved if there was a shift in production systems from extensive to intensive lamb production (Hunte, 1988). However, feeder lambs can be produced by farmers under semi-intensive or extensive systems with supplementation at strategic times, i.e. 6 weeks before lambing and during lactation (Thomas, 1994) for finishing in a feedlot.

A pilot feedlot was set up to study the production and economic parameters required for the operation of a lamb feedlot. The growth rate and cost of production of lambs from weaning to market weight as well as the incidence of any diseases were monitored.

METHODS

Lambs

One hundred and twenty weaned lambs (rams and ewes), 8–10 weeks old, were purchased from low-resource sheep farmers and reared in confinement in batches of 20 between October 1993 and April 1995. Mean initial body weight of the lambs was 14.9 ± 3.3 kg. All animals were treated on arrival for internal parasites. Initial body weights were taken on arrival and lambs were separated into groups of five on the basis of sex. Animals were weighed before feeding to minimize the gut-fill error and every 28 days thereafter, until they reached approximately 34 kg liveweight.

Feeds

Percentage composition of the ration is given in Table 1. The ration consisted of poultry litter, wheat middlings, rice bran, molasses and a mineral/vitamin mix. Chemical com-

position of the ration was 89% dry matter, 15% crude protein, 15.9% acid detergent fibre, 0.6% calcium, 0.3% phosphorus, 11.9% ash and 13.8 MJ digestible energy (DE)/kg dry matter. Lambs were group fed and feed refusal was taken on a weekly basis. Lambs under 11 kg were fed a commercial lamb starter until they reached 15 kg.

Table 1 Percent of ingredients in by-product ration for lambs fed in feedlot

Ingredient	%
Poultry litter	20
Wheat middlings	50
Rice bran	10
Molasses	18
Mineral/vitamin mix	2

Data collection

Animal performance was monitored on a regular basis and random faecal samples were taken every 4–6 weeks and submitted to the veterinary laboratory for faecal analysis to determine the level of infestation of internal parasites. Treatment was carried out when a score of 2+ or higher was reported. Economic data collected included cost of lambs and feed; income over feed and lamb costs (IOFC) were used to examine economic data.

Carcass evaluation

The liveweight of each animal was recorded immediately before slaughter and the head, feet, paunch and liver were also weighed. The carcass was divided into fore and hindsaddles at the 12th and 13th rib and the shoulders and legs were calculated as a percentage of fore and hindsaddles respectively. The foresaddle is composed of the shoulders, rack, fore shank and breast while the hindsaddle is composed of the loin, legs and flank.

RESULTS

Animal performance

Table 2 summarizes the performance and carcass traits of Barbados Blackbelly lambs in feedlot. Of the 120 lambs brought into the feedlot, nine died from various causes – 30% died from tetanus. Dry matter intake (DMI) was not significantly different between ewes and rams but average daily gain (ADG) was significantly different ($P < 0.001$). Overall ADG over the whole fattening period was 94 g. Dry matter intake was 3.6% of body weight and feed efficiency (FE) was 12.9 kg DMI/kg body weight gain.

Slaughter, carcass, skin and paunch weights of rams were significantly heavier ($P<0.001$) than corresponding weights for ewes but there were no significant differences ($P>0.05$) in weight of heads and livers of rams and ewes (Table 3).

Table 2 Performance and carcass traits of Barbados Blackbelly lambs in feedlot

Parameter	Rams	Ewes	Rams and ewes
No. of animals	53	48	101
Slaughter age (days)	202	202	202
Slaughter wt (kg)	32.75^{a} (0.47)	28.52^{b} (0.50)	30.77 (0.39)
Mean carcass wt (kg)	15.91^{a} (0.29)	14.82^{b} (0.31)	15.42 (0.22)
Dressing %	49	52	50
Carcass wt/d (g)	79	73	76

Standard error of the mean (SEM) in parentheses
Means with different superscripts differ ($P < 0.001$)

Carcass evaluation

Average fasted and carcass weights were 30.8 ± 3.94 and 15.4 ± 2.2 kg respectively with a dressing out of 50%. However, the chilled carcass weight of rams was 7% heavier than that of ewes, with ewes having a higher dressing out percentage. Fasted weight was approximately 92% of fresh weight and there was an additional 7% shrinkage between hot and chilled carcass weight.

The foresaddle comprised 51% of the carcass and 25% of the live animal while the hindsaddle comprised 49% of the carcass and 21% of the live weight. The shoulders and legs were 56 and 60% of the fore and hindsaddles and had correlation values (r^2) of 0.033 and 0.9 respectively (Table 4).

Table 3 Mean weight of head, liver, paunch and skin as a percentage of fasted weight

Parameter	Mean weight (kg)	% Fasted weight	SE
Head	1.56 (101)	5	0.25
Liver	1.47 (86)	5	0.23
Paunch	7.61 (101)	25	1.25
Skin	4.03 (101)	13	0.86

No. of animals in parenthesis

Table 4 Mean weight of legs, flanks, shoulders, racks and neck as a percentage of carcass, hind and foresaddles

Parameter	Mean weight (kg)	% Fasted weight	SE
Legs	26 (11)	-	60
Flanks	14 (11)	-	31
Shoulders	28 (11)	56	-
Racks	12 (11)	23	-
Neck	7 (11)	14	-

No. of observations in parenthesis

Economic evaluation

The most significant variable costs were feed and feeder lambs. The average lamb and feed cost was US$25.00 and $0.13/kg respectively. Table 5 summarizes the economic parameters using the income over feed (IOFC) and lamb costs. The cost of feeding lambs for the fattening period was US$26.00 while cost/kg gain was $1.67. The income over feed and lamb cost was US$29.00 per lamb. The income would have been higher if the heads and livers had been sold. If these carcasses had been sold in the traditional manner, i.e. at farmgate, the income over feed and lamb cost on a per lamb basis would have been US$12.00.

Table 5 Economic data used to evaluate the performance of lambs in feedlot

Parameter	Input/output (BAS)	Input/output (Farmgate)
Cost of animals (US$)	3,000	
Total carcass wt (kg)	1,555.4	1,555.4
Income (US$)	8,550	6,844
Feed cost (US$)	2,658	2,658
Income over feed & lamb costs	2,892	1,186
IOFC & lamb cost/lamb	29	12
Cost/kg gain (US$)	1.67	1.67

Barbados Agricultural Society (BAS) pricing structure: legs, US$6.45/kg; shoulders, $5.00; stew, $4.95. Farmgate US$4.40/kg

DISCUSSION

The average daily gain recorded was lower than that reported by Blaylock (1985) and Hunte and Swartz (1992) for lambs reared under confinement. The lower ADG obtained with the use of a low-cost ration has implications for commercial lamb producers since the number of days to reach market weight will be increased (Blaylock, 1985; Hunte, 1988). The animals used in the growth trials reported by both Blaylock and Hunte were genetically more uniform than those used in the feedlot which were of very diverse genetic make up and had been produced on widely different nutritional planes. In addition, the feeding of commercial concentrate would have allowed these animals to fully exploit their genetic potential. However, the feedlot ration consisting of by-products produced satisfactory weight gains under intensive systems of production.

The faster growth rate of rams in this study compares favourably with the findings of Stagnaro (1983), Thompson and Lee (1984), Hunte (1988) and Thomas (1994). Jones et al. (1983) also reported that ram lambs had more muscle in the shoulder and less muscle in the legs than ewes. The shoulders in this study had a higher percentage of carcass weight than the legs. However, Wynn and Thwaites (1981) concluded that muscle distribution did not vary in any economically important way. The feed efficiency for both rams and ewes was approximately the same but the average weight before slaughter was significantly higher in rams since ram lambs are more efficient converters of feed to carcass (Thompson and Lee, 1984). This characteristic as an efficient converter and the fact that the meat from ram lambs is leaner (Kirton et al., 1982; Seideman et al., 1982) makes ram lambs better suited to lamb-producing systems like feedlots.

There was considerable variation in animal performance and this is consistent with other findings when ruminants were fed poultry litter based rations (Jakhmola et al., 1988). This could be attributed to the differences between animals, location factors affecting the nutritive value of the litter, the nature of other feed ingredients in the ration and the variability of the nitrogen content of the litter (Bhattacharya and Fontenot, 1966; Bhattacharya and Taylor, 1975).

The ADI by intact crossbred Persian Blackhead rams reported by Lallo and Benn (1993) compares favourably with that reported here but the FE was twice that reported by Lallo and Benn (1993) and McClure et al. (1991) for crossbreds but cost/unit gain and income over feed and lamb costs was much lower in this study, probably because lower feed cost.

Carcass composition within a genotype is mainly a function of empty body weight (Burton and Reid, 1969) but may be altered by nutrition at the same body weight (Usborne et al., 1961; Soeparno and Davies, 1982). The dressing percentage reported compares favourably with those reported by Blaylock (1985) and Hunte and Swartz (1992) for weight range but was higher than those reported by Lallo and Benn (1993) and Stagnaro (1983) using high-grade West African wethers. The chilled carcass weight in this study compares favourably with the findings of McClure et al. (1991) and the shrunk carcass weight was similar to that reported by Lallo and Benn (1993). The percent shrinkage observed in this

study is in agreement with Hunte and Swartz (1986) and the hindsaddle was similar to that reported by Boyd (1983) for Dorset and Suffolk-sired Barbados Blackbelly lambs. The weight of the fore and hindsaddles as a percentage of carcass weight compares favourably with the findings of Romans and Ziegler (1974) using the Uniform Retail Meat Identity Standards of the US National Livestock and Meat Board.

Thomas (1994) has shown that weaned lambs can be produced economically under semi-intensive and extensive production systems depending on the season. Lamb production under these systems can be used to produce feeder lambs for feedlot operations if the enterprise is to be profitable since the ewe cost will be substantially reduced from that reported by Blaylock (1985) and Thomas (1994) for intensively reared ewes.

CONCLUSION

The production of acceptable carcasses from Barbados Blackbelly lambs in feedlot is possible and dispels the theory that the Barbados Blackbelly sheep lacks the traits for it to be recommended as a meat breed. This fact was emphasized by Romans (1979) who concluded that the carcass quality of the Barbados Blackbelly was sufficient for the meat trade and the flavour of the meat was considered by many to be superior to the British breeds. However, for this goal to be realized the commercial production of a ration made from by-products, which meets the nutritional requirements, needs to be further refined.

ACKNOWLEDGMENTS

This study was undertaken as part of the CARDI executed CIDA-funded Caribbean Sheep Production and Marketing Project (No.255/12723). CARDI would like to express its sincere appreciation to Dr Stephen St John of the government veterinary laboratory, Messers Michael Hunte and Maurice Skeete, and staff of the Central Livestock Station and Greenland for their support during this trial, and also to Mr Haynesley Benn and staff of the Barbados Agricultural Society.

REFERENCES

Blaylock, L.G. 1985. Commercial and small farm management and feeding of Barbados Blackbelly sheep in Barbados. Extension manual, Ministry of Agriculture, Food and Consumer Affairs, Barbados.

Bhattacharya, A.N. and Fontenot, J.P. 1966. Protein and energy value of peanut hull and wood shaving poultry litter. J. Anim. Sci. 25:367.

Bhattacharya, A.N. and Taylor, J.C. 1975. Recycling animal waste as a feedstuff. J. Anim. Sci. 41:1,438.

Burton, J.H. and Reid, R.D. 1969. J. Nutrition 97:517.

Boyd, L.H. 1983. Barbados Blackbelly sheep in Mississippi. In: Hair sheep of Western Africa and the Americas. Boulder, CO, USA: Westview Press, pp. 299–304.

Hunte, M.D. 1988. Performance of Barbados Blackbelly lambs reared in confinement and the implications for commercial lamb production in Barbados. A paper presented at the 23rd West Indian Sugar Technologists Conference. Barbados, 18–22 April 1988.

Hunte, M.D. and Swartz, H.A. 1992. A preliminary evaluation of the effect of total confinement, semi-confinement and total pasture on ewe productivity and lamb performance.

Jakhmola, R.C., Kundu, S.S., Punj, M.L., Singh, K., Kamra, D.N. and Singh, R. 1988. Animal excreta as ruminant feed – scope and limitation under Indian conditions. J. Anim. Feed. Sci. Technol. 19:1.

Johnson, D.H. 1944. Quintuple lambs of wooless domestic sheep. J. Heredity, 35:251–253.

Jones, S.D.M., Burgess, T.D., Dupchak, K. and Pollock, E. 1984. Can. J. Anim. Sci. 64:631.

Kirton, A.H., Clarke, J.N. and Hickey, S.M. 1982. Proc. N.Z. Soc. Anim. Prod. 42:117.

Lallo, C.H.O and Benn A. 1993. The effect of castration on performance of crossbred Blackhead Persian lambs reared in confinement. In: Opportunities and constraints for the development of a sustainable small ruminant subsector in the Caribbean region. Barbados, 15–17 September 1992.

Laurie, C.K. 1978. The economics of prolificacy. A case for keeping the Barbados Blackbelly sheep pure. A paper presented at the 2nd Regional Livestock Meeting, Barbados. 27–28 September 1978.

McClure, K.E., Parker, C.F. and Parrett, N.A. 1991. Feedlot performance and carcass characteristics of hair, wool and hair crossbred lambs fed high energy diets. In: Wileus, S. (ed) Proceedings of a symposium on Hair Sheep Research, St. Croix.

Patterson, H.C. 1976. The Barbados Blackbelly sheep Bulletin of the Ministry of Agriculture, Science and Technology, Barbados.

Patterson, H.C. 1984. Performance of Barbados Blackbelly sheep in two experimental flocks in Barbados. A paper presented at the Fifth Regional Livestock Meeting, Sept. 26-28, 1984, Nassau, Bahamas.

Rastogi, R.K. 1976. Barbados Blackbelly sheep – Improving their performance. Extension Newsletter, 7(4):13–16. St Augustine, Trinidad and Tobago: The University of the West Indies,. Dept. Agric. Extension.

Rastogi C.K., Williams, H.E. and Youssef, F.G. 1980. Barbados Blackbelly sheep. In: Mason, I.L.(ed) Prolific tropical sheep. FAO Animal Production and Health Paper 17. Rome: FAO. pp. 5–28.

Romans, J.R. 1979. Final report. Carcass evaluation and composition of a sample of Barbados Blackbelly sheep. Caribbean Council.

Romans, J.R. and Ziegler, P.T. 1974. The meat we eat.

Seideman, S.C., Cross, H.R., Oltjen, R.R. and Shanbacher, B.D. 1982. J. Anim. Sci. 55:826.

Soeparno and Davies, H. L. 1982. Proc. Aust. Soc. Anim. Prod. 14:503.

Stagnaro, C.G. 1983. Commercial hair sheep production in a semi-arid region of Venezuela. In: Hair sheep of Western Africa and the Americas. Boulder, CO, USA: , Westview Press, pp. 85–104.

Thompson, J.M. and Lee, G.L. 1984. Wool technology and sheep breeding. 32:141.

Wynn, P.C. and Thwaites, C.J. 1981. Aust. J. Agric.. Res. 32:957.

Thomas, G.W. 1994. A comparison of sheep production systems in Barbados. M.Phil Thesis