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BENEFIT-COST ANALYSIS OF FATTENING OF KIVIRCIK LAMBS FED DIETS CONTAINED DIFFERENT PROTEIN LEVELS AND DETERMINATION OF OPTIMUM FATTENING PERIOD

(With 8 Tables)

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(Received at 9/3/2004)

SUMMARY

This study was carried out to investigate the optimal fattening period and profit of lambs fed diets with different levels of protein. In the experiment, fourty weaned male Kivircik lambs divided into five treatment groups each containing eight lamb. Groups were fed diets contained different levels of protein along 84 days the duration of the experiment. Average daily body weight gain of groups was 165.48 g, 180.95 g, 198.81 g, 202.38 g, 185.71 g; respectively, and feed efficiency ratio was 6.25, 5.69, 5.22, 5.10, 5.56, respectively. Optimal fattening period was achieved by groups 1 and 5 between 70-84 days, and by group 3 between 56-70 days. However, along the 84^{th} d of the experiment, equality of marginal cost-marginal return could not be obtained. As a result of research, benefit-cost analysis of feeding with diets contained different protein levels showed that the highest revenue per lamb was obtained from group 2 and followed by group 4, 3, 5 and 1, respectively.

Key words: *Kivircik Lambs fattening, marginal cost, marginal return.*

INTRODUCTION

Fattening can be described as feeding process that carried out to increase meat yield and quality of livestock (Özkan, 1985). As in the

other production activity, the aim of lamb fattening is profitable production.

In fattening enterprises; live body weight gain, feed intake, feed efficiency and relationship among these parameters are the main factors which affect profit of that enterprises (Sakarya, 1982).

There are many technical and economical necessities for profitable and productive fattening of which determination of optimal fattening period is the most important (Sakarya and Günlü, 1996).

Daily body weight gain of feedlot animals will decrease gradually after a period, and following that consequently, it will not meet the daily expenditures. According to rule of reducing return; continuing of fattening after getting equality between marginal cost and marginal return can be resulted in loss of money (Sakarya and Günlü, 1996). Therefore, fattening period in which marginal cost equal to marginal return should be considered in determination of it.

The aim of this study was to investigate the optimal fattening period for maximum profit and to determine the most profitable protein level for this purpose.

MATERIALS and METHODS

The study was carried out in clinical boxes of Faculty of Veterinary Medicine, Istanbul University. Fourty male weaned Kivircik lambs (90 day-old) and mean weight of 26.7 Kg were randomly and equally allocated to five groups. During the study (84 days), experimental groups were fed diets having different levels of protein. Animals were weighed two week intervals and consecutively two days on an empty stomach.

Diets were formulated and analysed according to AOAC (1984) at Istanbul University, Department of Animal Nutrition and Nutritional Diseases. Daily requirements of animals were met by giving 15% hay and 85% concentrates. Diets 1, 2, 3, 4, 5 costs 258 235 TL, 172 090 TL, 225 400 TL, 234 604 TL, 253 555 TL; respectively (1$ = 1 400 000 TL). Ingredients and nutrient composition of diets are shown in Table 1.

For economical analysis, partial budget analysis was used to determine which group was profitable, and in comparison of alternatives, only changed or added cost components were included to calculation (Aras, 1988).

Optimal fattening period was determined by using marginal cost-marginal return equality (Sakarya, 1982; Türkay, 1977). Marginal return

was calculated by multiplying selling price of kg live body weight of lamb by body weight gain. However, marginal cost was calculated by considering of expenses for feed, worker's pay, repair, amortizaton..etc.

Feed consumption per kg body weight gain was determined by dividing total dry matter intake on body weight gain during fattening period.

RESULTS

Fattening Performance:

Initial body weight, finished body weight, average daily body weight gain, dry matter intake and feed efficiency of experimental groups are presented in Table 2.

As it shown in Table 2, for groups 1, 2, 3, 4, 5, averages of initial body weight were 26.2 kg, 26.6 kg, 25.6 kg, 28.0 kg, 27.5 kg, respectively; average finished body weight were 40.1 kg, 41.8 kg, 42.3 kg, 45.0 kg, 43.1 kg, respectively; average daily body weight gain were 165.48 g, 180.95 g, 198.81 g, 202.38 g, 185.71 g, respectively; dry matter intakes were 1033.65 g, 1030.31 g, 1037.10 g, 1032.28 g, 1033.37 g, respectively; and, feed efficiencies for all groups were 6.25, 5.69, 5.22, 5.10, 5.56, respectively.

Optimal Fattening Period:

Marginal body weight gain, marginal feed consumption, marginal feed cost, marginal return and marginal cost for groups 1, 2, 3, 4, 5 are presented in Tables 3, 4, 5, 6, 7; respectively.

As it shown in Tables 3 and 7, optimal fattening period was detected in groups 1 and 5 between 70^{th} and 84^{th} day of experiment when equalized marginal cost to marginal return. Continuing to fattening after 84^{th} day of experiment is not economical because of marginal cost will be higher than marginal return.

In 84^{th} day of experiment, groups 2 and 4 nearly closed to optimal level but not reached, economically (Tables 4 and 6). In these groups, continuing to fattening after the 84^{th} day of experiment is appropriate due to the increase of marginal return than marginal cost.

In group 3, optimal fattening period was detected between 56^{th} and 70^{th} day of experiment because of lowering marginal return than marginal cost (Table 5).

Benefit-cost Analysis:

Results of partial budget analysis obtained by considering of feed consumption and body weight gain were given inTable 8.

As it shown in Table 8, higher revenue was obtained from group 2 followed by groups 4, 3, 5 and 1; respectively.

DISCUSSION

This study was carried out by using 40 weaned lambs of 90 day-old equally allocated into five groups and given diets containing different levels of protein.

In group 4, feed efficiency ratio was lower and daily body weight gain was higher than the other groups.

In the other studies with Kivircik lambs in Turkey, average daily body weght gain can be influenced by quality of diet, age and the other environmental factors (Demir *et al*., 2001). In this study, average daily body weight gains of the experimental groups were found between 165.48 and 202.38 g, feed efficiency values for groups were found between 5.10 and 6.25. When it was compared with the previous studies on intensive lamb fattening, performance data in this study was similar (Akay and Ak, 1992; Akçapınar, 1981; Demir *et al*., 2001).

Optimal fattening period was detected in group 1 and 5 between 70^{th} and 84^{th} day, and in group 3 between 56^{th} and 70^{th} day of experiment. On 84^{th} day of experiment, groups 2 and 4, equality of marginal cost-marginal return could not be proved. In these groups, continuing fattening after 84^{th} day of experiment was economically approved.

Optimal fattening period was varied between the experimental gorups depending on body weight gain of lambs and cost of feed composition.

In a study that carried out to investigate the optimal fattening period in 75 day-old weaned lambs (Ile de France x Awassi [FxA], Sakiz x Awassi [SxA], Awassi x Awassi [AxA]) fed different diets in a 3x3 factorial design, optimal fattening period was determined 56 as days for AxA and FxA fed first diet, and 63 days for SxA fed first diet and AxA fed second diet (Akdemir *et al*., 1992). In an other study conducted with 2-2.5 month-old weaned Akkaraman lambs, it was concluded that continuing of fattening more than 56 days was economical as a result of marginal analysis (Işık *et al*., 1978). Also, fattening period was estimated according to two different feed composition in a study carried out with 28 day-old early weaned Akkaraman lambs and it was suggested that the fattening period might have been more than 20 days, when the feed cost was 1.50 TL/kg. However, when the feed cost was 2.00 TL/kg, fattening period should have been ended after 20 days

because of the equality of marginal cost to marginal return between 14th and 16th week of fattening (Güneş and Arıkan, 1976).

In this study, according to benefit-cost analysis that made considering feed cost and body wight gain, the most revenue was obtained from group 2 as a result of cost of feed given to this group was lower (172 090 TL) than the other groups, and following it, group 4, group 3, group 5 and group 1; respectively. The lowest revenue was obtained by group 1, because the feed cost was higher (258 235 TL) and body weight gain was lower than the other groups.

As a result of this study, the fattening perod should be finished between 70th and 84th day for groups 1 and 5, between 56th and 70th day for group 3. For groups 2 and 4, continuing fattening after 84th day is appropriate untill marginal cost will be equal to marginal return.

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Table 1: Physical and chemical composition of the experimental diets.

Ingredients (%)	Group 1	Group 2	Group 3	Group 4	Group 5
Pasture grass	15	15	15	15	15
Wheat bran	10	10	10	12	13
Barley grain	11.5	69.5	50	50	47.5
Soybean meal	-	2	10	15	21
Sugar beet-pulp with molasses	60	-	11.5	4.5	-
Salt	1	1	1	1	1
Sodium bicarbonate	0.5	0.5	0.5	0.5	0.5
Limestone	1.5	1.5	1.5	1.5	1.5
Vitamins and mineral mix*	0.5	0.5	0.5	0.5	0.5
Chemical Composition (% DM basis)					
Dry matter (%)	90.09	89.75	90.44	89.55	90.06
Crude protein (%)	10	12	14	16	18
ME (Kcal/kg)	2500	2500	2500	2500	2500

Table 2: Fattening performance values for experimental groups during the experiment.

	Group 1	Group 2	Group 3	Group 4	Group 5
Initial weight, kg	26.2	26.6	25.6	28.0	27.5
Final weight, kg	40.1	41.8	42.3	45.0	43.1
Fattening period, d	84	84	84	84	84
Weight gain, g/d	165.48	180.95	198.81	202.38	185.71
Feed intake, g DM/d	1033.65	1030.31	1037.10	1032.28	1033.37
Feed:Gain	6.25	5.69	5.22	5.10	5.56

Table 3: Optimal fattening period of lambs of group 1.

Fattening period,d	Average body weight, kg	Marginal body weight gain, kg	Marginal feed intake, kg	Marginal feed cost, TL	Marginal return, TL	Maginal cost, TL
Initial	26.2	-	-	-	-	-
14	28.0	2.2	1.50 forage 8.60 concentrate	180 000 2 220821	6 152 760	4 749 368
28	28.7	0.7	1.96 forage 11.20 concentrate.	235 560 2 892 232	1 908 737	5 476 339
42	31.1	2.4	2.28 forage 12.85 concentrate.	273 000 3 318 320	6 544 241	5 939 867
56	33.7	2.6	2.60 forage. 14.81 concentrate.	312 000 3 824 460	7 121 543	6 485 007
70	37.9	4.2	3.00 forage. 17.00 concentrate.	360 000 4 389 995	11 504 031	7 098 542
84	40.1	2.2	3.20 forage. 18.20 concentrate.	384 000 4 699 877	6 255 984	7 432 424

(1 $ = 1 400 000 TL)

Table 4: Optimal fattening period of lambs of group 2.

Fattening period,d	Average body weight, kg	Marginal body weight gain, kg	Marginal feed intake, kg	Marginal feed cost, TL	Marginal return, TL	Maginal cost, TL
Initial	26.6	-	-	-	-	-
14	28.4	1.8	1.50 forage. 8.60 concentrate	180 000 1 479 974	5 034 076	4 008 521
28	29.6	1.2	1.96 forage. 11.20 concentrate	235 560 1 927 408	3 272 120	4 511 515
42	32.9	3.3	2.28 forage. 12.85 concentrate.	273 000 2 211 357	8 998 331	4 832 904
56	36.6	3.7	2.60 forage. 14.81 concentrate	312 000 2 548 653	10 134 504	5 209 200
70	39.7	3.1	3.00 forage 17.00 concentrate.	360 000 2 925 530	8 491 071	5 634 077
84	41.8	2.1	3.20 forage. 18.20 concentrate.	384 000 3 132 038	5 971 621	5 864 585

(1 $ = 1 400 000 TL)

Table 5: Optimal fattening period of lambs of group 3

Fattening period,d	Average body weight, kg	Marginal body weight gain, kg	Marginal feed intake, kg	Marginal feed cost, TL	Marginal return, TL	Maginal cost, TL
Initial	25.6					
14	28.2	2.6	1.50 forage 8.60 concentrate	180 000 1 938 440	7 271 443	4 466 987
28	29.1	0.9	1.96 forage 11.20 concentrate	235 560 2 524 480	2 454 090	5 108 587
42	32.7	3.6	2.28 forage. 12.85 concentrate.	273 000 2 896 390	9 816 361	5 517 937
56	37.9	5.2	2.60 forage. 14.81 concentrate.	312 000 3 338 174	14 243 086	5998 721
70	39.9	2.0	3.00 forage. 17.00 concentrate.	360 000 3 831 800	5 478 110	6 540 347
84	42,3	2.4	3.20 forage 18.20 concentrate.	384 000 4 102 280	6 824 710	6 834 827

(1 $ = 1 400 000 TL)

Table 6: Optimal fattening period of lambs of group 4.

Fattening period,d	Average body weight, kg	Marginal body weight gain, kg	Marginal feed intake, kg	Marginal feed cost, TL	Marginal return, TL	Maginal cost, TL
Initial	28.0	-	-	-	-	-
14	32.3	4.3	1.50 forage 8.60 concentrate	180 000 2 017 594	12 025 849	4 546 141
28	33.4	1.1	1.96 forage. 11.20 concentrate	235 560 2 627 565	2 999 444	5 211 672
42	36.7	3.3	2.28 forage 12.85 concentrate	273 000 3 014 661	8 998 331	5 636 208
56	40.9	4.2	2.60 forage. 14.81 concentrate	312 000 3 474 485	11 504 031	6 135 032
70	42.7	1.8	3.00 forage. 17.00 concentrate	360 000 3 988 268	4 930 299	6 696 815
84	45.0	2.3	3.20 forage 18.20 concentrate	384 000 4 269 793	7 962 161	7 002 340

(1 $ = 1 400 000 TL)

Table 7: Optimal fattening period of lambs of group 5.

Fattening period,d	Average body weight, kg	Marginal body weight gain, kg	Marginal feed intake, kg	Marginal feed cost, TL	Marginal return, TL	Maginal cost, TL
Initial	27.5	-	-	-	-	-
14	29.5	2.0	1.50 forage 8.60 concentrate	180 000 2 180 573	5 593 418	4 709 120
28	31.6	2.1	1.96 forage 11.20 concentrate	235 560 2839 816	5 726 211	5 423 923
42	35.3	3.7	2.28 forage. 12.85 concentrate	273 000 3 258 182	10 089 038	5 879 729
56	38.6	3.3	2.60 forage 14.81 concentrate	312 000 3 755 150	9 038 882	6 415 697
70	41.6	3.0	3.00forage. 17.00 concentrate	360 000 4 310 435	8 217 165	7 018 982
84	43.1	1.5	3.20 forage. 18.20 concentrate	384 000 4 614 701	4 265 444	7 347 248

(1 $ = 1 400 000 TL)

Table 8: Benefit-cost analysis for lambs fed diets containing different levels of protein.

Cost and revenue (TL)	Group I n=8	Group 2 n=8	Group 3 n=8	Group 4 n=8	Group 5 n=8
Feed cost	23 090 505	15 969 759	20 376 364	21 137 167	22 703 656
Revenue from body weight gain	39 526 443	43 223 161	47 488 604	48 341 693	44 360 612
Benefit	16 435 938	27 253 402	27 112 240	27 204 526	21 656 956

(1 $ = 1 400 000 TL)