# LAMBS FATTENNING UNDER VARIOUS PROTEIN AND ENERGY LEVELS OF THE DIET

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SUMMARY: An experiment with 6 groups of lambs was carried out. The effects of different protein (140,160 and 200 g per kg ration) and energy (4.3,5.1 and 6.0 MJ per kg ration) levels on growth rate of animals, efficiency of food conversion and composition of empty body weight were studied. The animals were fattening from 45 days of age up to 5 1/2 and 7 1/2 months.

Under these experimental conditions the effect of the energy value is more prominent. In parallel with the energy inctease there was a marked growth of life weight and the content of meat in the empty body weight. At both ages the protein deposition depends mainly on the protein/energy ratio in the diet, while the fat deposition does not depend on the protein, but on the energy concentration of the ration.

Our results showed that ratios energy/protein 5.1 MJ/200 g and 6.0 MJ/160 g were optimal for fattening up to 5 1/2 months. The best ratio for longer period of fattening (up to 7 1/2 months) was 5.1 MJ/140 g per kg ration.

INTRODUCTION: Economic effect of fattening is determined not only by genotype of animals but also by both feeding level and duration of fattening period. Both low and high energy and protein feeding are economically unprofitable. The first case leads to a prolongation of fattening period and increased feed intake for unity of gain and the second one to more body fat deposition, accompanied by an increased intake of concentrated feed.

Differentiated feeding according to the age of lambs could lead to considerable saving of feed as well as to improving carcass quality. Regardless of investigations being different by nature ( Banskalieva et al., 1988,A, Gregor et al., 1985, Turgeon et al., 1986 ) relationship between those both factors (economic adventage and quantity of production) are not developed in detail.

The aim of the present study is to investigate the effect of different energy and protein levels in the diet on both weight development, utilization of feed and meat quality, On the other hand proper feeding schemes for lambs should be recommended according to duration of fattening period.

MATERIALS AND METHODS: Trials has been carried out on 6 groups of lambs (at 12 animals each), semifine-flected breed, weaned at 45 days of age, average live weight of 16,7 + 0.4 kg. During the whole fattening period (6 months) animals were reared in groups and fed at libitum on diets whose

composition is presented in table 1. Three energy levels have been tested (4.3,5.1 and 6.0 MJ/kg diet) and 3 protein levels (140,160 and 200 g/kg diet), in different combinations. The quantity of concentrates in the diet increased gradually, for animals in group 6 being 2 times higher than that for animals in group 1. In fattening schems presented, the effect of energy and protein variation has been examined, respectively for isoprotein and isoenergy feeding. The quantity of protein feed was controlled daily and live weight - monthly (table 2).

Samples of slaughter analysis were taken from 5 animals of each group after slaughtering - at the beginning of experiment, after 4 month-feeding (I period) and at the end of fattening period (II period). The object of studing was a mean meat sample, obtained after boning of the left carcass half. In the meat samples, fat and protein contents were determined using routine methods (Soxhlet, Kjeldal).

For statistical evaluation of results, t criterion of Student was used.

RESULTS AND DISCUSSION: Throughout the experimental period animals developped normally and no deviations of their health have observed.

Results concerning live weight of lambs, before starting of experiment as well as in the end of each fattening period, are presented in table 2. Weight growth of animals fed on concentrated feed over 80 % (groups 5 and 6), differs essentially from that of remaining groups at the end of I fattening period. Analogous trend, but strongerly expressed was also established after 6 month- fattening. Data obtained show that increasing of live weight depends mainly on energy level in feed, especially strongly pronounced in groups of isoprotein feeding (1-3, 2-5, 4-6 groups respectively). Similar results have also been obtained in other studies on lambs and steers (Banskalieva et al.,1988, Geleun, 1979). It is known that incorporation of more concentrates in diet increases coefficient of digestion and animals consume more dry matter productive energy (Blaxter, 1962).

Variation of protein in the diet at low energy values (4.3, 5.1 MJ/kg) does not excert effect on the gain of animals. Increased protein level, at high energy values, however, induces the growth of lambs (groups 5 and 6).

In animals of the last group, receiving maximum quantity of concentrated feed, highest degree of both energy and protein utilization by the diet was also established, after I period of feeding (table 2). On the contrary, in animals of 1 and 2 groups put under conditions of minimum energy and protein feeding, a worsening of these traits has been observed. Growth degree is low, energy demands are higher, this leading to more energy intake for unity of gain. Similar regularity was observed by Matsukas et al.,1983. Black et al., 1987, point out a low utilizability of metabolite energy of the diet, with reducing of protein content.

In general terms, during II fattening period, compared to animals of younger age, an over- expenditure of nutrients

(energy and protein) has been established for all groups. According to Gregory et al., 1985, increasing the protein in diet excerts a positive effect on live weight and utilization of nutrients but up to certain limits, being this also conected with duration of fattening period. Results obtained are also significant (table 2). In contrast to remaining groups, both energy and protein utilization is more effective in animals fed on lowest level of concentrates. Urbaniak, 1986, in trials on lambs, at isoenergy feeding has also established an optimum utilization of nutrients at a lower crude protein content in diet.

During I and II fattening periods 2 trends of different directions have been observed. In young animals, with increasing of concentrates, quantity of energy intake for kg of gain reduces. In adult animals, utilizability is of a contrary value. In both experimental periods protein utilization under isoenergy feeding is lower at increasing its content in the diet.

Quantity of meat in slaughter carcass does not follow the course of changes in live weight (table 3), this indicating the specific participation of both energy and protein of diet when obtaining useful production. A more intensive meat deposition was observed in early age, at content of concentrates between 70 and 80% (groups 4 and 5). During I fattening period increasing of protein to 160 g/kg of diet at all energy levels also increased the quantity of deposed protein. Such a regularity was not observed at both high energy and protein feeding (group 6), indicating that protein increasing over a certain limit does not induce protein deposition in the carcass.

When fattening period is prolonged until 6 months, maximum meat deposition in carcass is at a lower energy and protein feeding level (5.1 MJ and 140 g/kg). During that period protein quantity in slaughtering carcass does not depend on its content in the diet. On the other hand, at similar values in meat quantity for animals in group 3, a reduced fat deposition is observed compared to lambs in groups 4 and 5.

Results concerning live weight, quantity and quality of meat, obtained for lambs in groups 1 and 2, after 6 month-fattening, correspond to those for animals in groups 5 and 6 in early age. This fact illustrates possibilities of choice for fattening scheme according to concentrate feeding conditions.

In general terms, quantity of fats increase with the level of concentrates in diet - during I period over 70%, and for adult animals over 45%, this conditioning the increase gain of lambs of this feeding type. Protein increasing at high energy diet also leads to increasing degree of fat deposition (group 6), indicating the inexpedience of using expensive protein for formation more lipids in carcass.

Average daily gain reduced at a low-energy feeding is probably associated with the reduced flow of glucose and glycogen precursors (propionat). In our previous studies on lambs, under feeding conditions analogous to those for

animals in groups 1,4 and 6, it was pointed out that a relation exists between propionat content in the rumen and level of plasma insulin (Dimov et al.,1989). Increased insulin secretion at a high-concentrated feeding conditions also an increased rate of deposition of a softer resulting of increasing the oleic acid (Banskalieva et al.,1988,A, 1989, Ray et al.,1975). Protein variation does not excert influence on this trait (Banskalieva et al.,1989), supposing that during the first fattening period deposed fats in animals of group 5 will favour the quality production.

After 6 month-fattening, regardless of feeding type, it was established that differences in fatty acid composition between groups reduce and in general, lipids of adipose tissues become more saturated (Banskalieva et al.,1989). In this case, of an importance for fattening efficiency will be an reduction of the index protein/fats, and a more favourable combination of productive traits and feed inzake.

Results of the present experiment show that depending on duration of fattening period and feeding conditions, different variants of both energy and protein could be recommended. In a 4 month-period, best results are obtainable at diets of 5.1 MJ/200 g and 6.0 MJ/160 g, and for a longer period 5.1 MJ/140 g. Schemes recommended provide a possibility of controlling the participation of both protein and energy of diet in improving the quality of production. Up-to-day requirements for producing meat from lambs and hoggets necessititate searching for optimum development among the value of nutrients, duration of fattening and qualities of production to be obtained.

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Table 1.- Levels of protein and energy per kg diet

| | GROUPS | | | | | |
|---|---|---|---|---|---|---|
| | 1 | 2 | 3 | 4 | 5 | 6 |
| Net energy (MJ/kg)* | 4.3 | 4.3 | 5.1 | 5.1 | 6.0 | 6.0 |
| Crude protein (g/kg) | 140 | 160 | 140 | 200 | 160 | 200 |
| Roughage/concentrate | 60 | 55 | 42 | 32 | 18 | 11 |
| ratio, % | 40 | 45 | 58 | 68 | 82 | 89 |

* Kellner, O.

Table 2.- Body weight and feed efficiency

| Groups | Body weight (kg) | | | Energy and protein expences per kg gain | | | |
|---|---|---|---|---|---|---|---|
| | | | | Energy | | Protein | |
| | PERIODS | | | | | | |
| | Initial live weight | I | II | I | II | I | II |
| 1 | 16.7 ± 0.4 | 30.7 ± 1.2 | 39.1 ± 2.5 | 7.4 | 6.9 | 1.4 | 1.3 |
| 2 | 16.8 ± 0.4 | 31.5 ± 1.0 | 40.6 ± 1.9 | 7.2 | 9.7 | 1.6 | 2.1 |
| 3 | 16.8 ± 0.4 | 36.1 ± 1.1 | 48.7 ± 1.7 | 6.1 | 9.6 | 1.0 | 1.3 |
| 4 | 16.7 ± 0.4 | 37.9 ± 1.1 | 49.1 ± 3.7 | 6.4 | 8.9 | 1.5 | 2.0 |
| 5 | 16.8 ± 0.3 | 40.4 ± 2.9 | 52.1 ± 3.6 | 6.4 | 10.4 | 1.0 | 1.7 |
| 6 | 16.8 ± 0.3 | 44.8 ± 1.0 | 59.6 ± 2.0 | 5.4 | 9.9 | 1.1 | 2.0 |

Body weight:

a. I period - significant differances ($P<0.05$) between groups: 1-2, 1-6, 2-5, 2-6, 3-6, 4-6;

b. II period - significant differences ($P<0.01$) between groups: 1-3, 1-5, 1-6, 2-3, 2-4, 2-6, 3-6, 4-6.

Table 3.- The amount of meat (kg) and average daily gain of fat(g) and protein(g) of carcass

| Groups | Meat | | Fat | | Protein | |
|---|---|---|---|---|---|---|
| | PERIODS | | | | | |
| | I | II | I | II | I | II |
| 1 | 8.3±1.3 | 9.9±1.0 | 6.7±1.2 | 14.3±1.7 | 8.0±1.4 | 15.0±0.4 |
| 2 | 8.0±0.8 | 12.6±1.1 | 5.5±1.1 | 12.4±1.3 | 11.5±1.1 | 17.0±0.3 |
| 3 | 10.7±1.0 | 19.6±1.7 | 7.5±1.5 | 19.1±0.8 | 11.4±1.4 | 20.0±0.5 |
| 4 | 13.0±0.8 | 20.8±1.2 | 6.1±1.1 | 22.9±1.8 | 15.0±0.9 | 19.0±0.3 |
| 5 | 13.8±0.8 | 18.6±1.2 | 13.7±1.5 | 25.0±1.3 | 16.0±1.5 | 23.0±0.8 |
| 6 | 13.3±0.8 | 17.5±1.6 | 14.9±1.6 | 25.0±0.5 | 14.0±0.9 | 19.0±1.9 |

Meat:

a. I period - significant differences ($P<0.05$) between groups: 1-4, 1-5, 1-6, 2-4, 2-5, 2-6, 3-5, 3-6;
b. II period - significant differences ($P<0.05$) between groups: 1-3, 1-4, 1-5, 1-6, 2-3, 2-5, 2-6, 3-4.

Fat:

a. I period - significant differences ($P<0.01$) between groups: 1-6, 2-6, 3-6, 4-6, 5-6;
b. II period - significant differences ($P<0.05$) between groups: 1-2, 1-3, 1-4, 1-5, 1-6, 2-3, 2-5, 2-6, 5-6.

Protein:

a. I period - significant differences ($P<0.05$) between groups: 1-4, 1-5, 1-6, 3-4, 5-6;
b. II period - significant differences ($P<0.01$) between groups: 1-3, 2-3, 3-4, 3-6.