

## IMPLEMENTATION OF GOOD NUTRITIONAL PRACTICES TO STIMULATE MEAT PRODUCTION IN SHEEP USING SAME HORTICULTURAL SPECIES

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### Abstract

*To reduce the pressure of sheep on plant resources, good nutritional practice models must provide new farming systems and feed management models, which reduce the pressure on grasslands by developing sheep farms integrated in the production of fodder in agricultural crops and on mowing pastures, well-managed grazing and improving the floristic composition of meadows and increasing their nutritional value, by administering phosphorus fertilizers for the development of nitrogen-fixing leguminous species or using organic fertilizers to increase the production of green mass. The good nutritional practices proposed for implementation contribute to the improvement of feed assimilation by sheep in different exploitation systems, because breastfeeding plays a fundamental role in the nutritional intake due to the intake of nutrients from the feed, milk production and weaning weight of the lambs.*

**Key words:** sheep, meat, nutrition, good practices.

### INTRODUCTION

Achieving large productions from sheep in efficient conditions is conditioned by several key points of the production system that must be solved by the management implemented at the farm level (Csizmadia et al., 2023; Nuthal, 2010):

- improving production systems by abandoning traditional systems and implementing modern exploitation technologies through nutrition control; (Heber et al., 2010);
- implementation according to the financial strength of the farm of the best management of the production system (Petroman et al., 2019);
- improving the livestock and specializing the production according to the needs of the market (Avramescu et al., 2013);
- stimulating the organization of farms through association for increasing the breeding material and the fattening of young sheep (Petroman et al., 2010; Ristea et al., 2018);
- supporting the milk and sheep meat product and stimulating consumption;
- marketing of production through distribution through the product chain (Adzig et al., 2018).

In climatic conditions of Romania, the exploitation of sheep for different productions, milk, meat or wool in different production

systems, is done depending on the season, using the value of pastures during April-October months and during the stable period from warm season green table, administered mowing at the manger (Csizmadia et al., 2021). In winter, in the feed of sheep in different physiological states, canned fodder, hay, coarse and concentrated, but also other resources from the processing industries are used. The stable system of animal production presents a multitude of economic advantages over grazing methods because it is easier to control nutrition by balancing feed rations and improve feed conversion rates, resulting in:

- a higher consumption degree of fodder plants;
- a better balancing of rations;
- feeding possibilities with unique feed mixtures;
- better yields in using fodder;
- a better utilization of green fodder;
- quantitative and qualitative indicators of productions (Căpeț et al., 2021);
- constant productions (Petroman, 2007).

Exploitation on unmanaged pasture can produce pressure on meadows, due to overgrazing and their degradation, imbalances of environmental factors and requiring major investments for their regeneration:

- getting good gains in weight gain and large quantities of milk;
- scaling the production according to the possibilities of balancing rations and resources (Petroman, 2016);
- exploitation of plant resources in sheep feed without degrading environmental factors, through optimization of the livestock;
- diversification of farm activities;
- limiting grain consumption through efficient use of green fodder (Virtosu, 2019);
- increasing the economic efficiency of sheep farming (Zoican, 2019).

## MATERIALS AND METHODS

The efficient use of plant resources in sheep's feed depends on the management of the production system, their availability, quantity and quality in the stable operation, but also on the adaptability degree of sheep to provide the necessary by grazing on the meadows, with a certain value of the floristic composition, by plants maturity degree of and their suitability for grazing according to the category of sheep and the management methods of grazing.

Organic fertilization of meadows with manure, raking, leads to a change in their floristic composition and reseeding with valuable fodder plants and the establishment of artificial pastures with species of *Festuca pratensis*, *Trifolium repens* and *Lolium perenne*, increases their fodder value, if the grazing is well managed for a good use of plant resources.

The methods of efficient use of plant resources through grazing, allow the improvement of forage assimilation through the good practices of:

- continuous grazing, which involves the uninterrupted use of a grazing area by sheep of different categories, for a long period of time, the number of which can be adjusted to the growth of the vegetation of the pasture to meet the requirements of the sheep;
- rotational grazing, which involves grazing only in certain periods interspersed with breaks to allow the pasture to regenerate using:
  - grazing on plots, in which the grazed area is adjusted according to the daily feed requirements of the sheep category;

- preferential grazing, in which milk lambs have access to a separate pasture area, of better quality;

- "leaders and followers" grazing, in which the pasture is grazed first by the group of sheep with higher requirements, leaders (lactating sheep) and then by the group of sheep with lower requirements, followers (barren sheep).

Based on research undertaken in professional sheep farms, specific methods were used in this scientific approach to analyze the efficiency of nutrition systems, depending on the production system (Gruia, 2006). The research aimed to find the most optimal solutions for managing nutritional resources and administration methods according to availability, season, quantities, and the possibilities of balancing them in rations through:

### 1. Nutrition control according to the forecasted production in accordance with the biological potential of sheep.

For a good assimilation of the feed in the production system in the stable, under economical conditions, we propose the administration of mowed green feed, depending on the category and age, 1.1-2.2 kg/day for lambs, 3.1-4.0 kg/day in the youth over 6 months and 7.1-8.5 kg/day in the adult sheep because on the meadows in the farm area, the production of green mass in the ungrazed and repeatedly mowed meadows achieved 2.2 tons/hectare S.U. compared to those grazed with loads of 2 UVM (large cattle units) per hectare where 2.18 tons/hectare of SU were achieved and at 4 UVM/ha and above, thanks to overgrazing, 1.50 tons of SU/hectare were achieved, because sheep exert a negative impact on meadows where the nutritionally valuable species, *Trifolium repens* mixed with *Lolium perenne*, predominate. The controlled administration of the amount of feed, in the stable, presents economic advantages, which reflect on the achieved production indicators:

- increases the degree of consumption of mowed green fodder to 80.1-85.2% compared to 70.1-77.3% if this fodder is consumed by grazing;
- the spread of diseases is prevented;
- the entire production of green mass is efficiently utilized through less selective consumption.

For efficient meat production in fattening young, single feed rations should have the following percentage composition 67.00% fibrous forage (40% hay and 60% roughage), 18.00% silage, green mass, and 15.00% corn cobs. The deer will be supplemented with concentrated fodder and a protein-mineral-vitamin supplement to balance the ration and ensure the salt requirement through lumps of salt for licking. In order to reduce the pressure of the sheep through overgrazing, the load on the plant resources on the meadows will be reduced of sheep in the case of those meadows that have productions of green mass below 5 tons/hectare.

Good nutritional practices also contribute to the improvement of feed assimilation by sheep both in the barn and on the pasture. Because lactation plays a fundamental role in the nutritional intake of sheep: lactating sheep consume much more than other sheep. However, a highly variable correlation between feed intake and milk production was observed:

- the ability to assimilate food after calving does not automatically lead to an increase in milk production;
- the lactation period is the phase in which the sheep mobilize fat reserves to satisfy increased nutritional requirements.

The good nutritional practices should not provide for the estimation of feed assimilation capacity during the lactation period of the sheep, but should take into account through the nutrition systems:

- the physiological tendency to mobilize fat reserves in the first months of lactation;
- restoration of fat reserves later.

The best and safest method of controlling nutrition according to the forecasted production of Turkana sheep is the management of mowed green mass and well-managed grazing on rich permanent pastures, because the sheep can have access to a feed of superior quality in terms of nutritional principles, which can be easily assimilated.

**2. Good practices of using available resources based on a nutrition guide** (Neagu et al., 2002; Neagu et al., 2007). The best practices for the use of pasture resources, in the exploitation of sheep on pasture and a new exploitation system, through the administration

of mowed fodder, which will reduce the pressure on the plant resource, are:

- the development of sheep farms integrated in the production of fodder in agricultural crops;
- the use of pastures for the production of fodder resources by mowing;
- well-managed grazing to maintain a balance regarding the productive capacity of the pasture and the load of sheep per hectare;
- transition to ecological agriculture;
- the cultivation of fodder plants on agricultural land and the management of mowed green mass;
- maximize profits from raising sheep in the open air and managing sufficient amounts of mown green mass according to planned production;
- improving the floristic composition of meadows by administering phosphorus fertilizers for the development of leguminous species that fix nitrogen;
- the use of organic fertilizers to increase the production of green mass of meadows.

These systems of best practices regarding the use of available resources cannot be effective without the development of integrated farming systems by combining:

- the production of crops to ensure the need for green mass, nutritional needs;
- the management of the exploitation of sheep in the open air, with the management of the green mass mowed in association with concentrates;
- sheep farming systems for the production of milk - meat through good nutritional practices, the culture of fodder plants can be integrated with the growth and exploitation of sheep, to create jobs throughout the year and additional income, the purpose being multiple;
- ensuring the additional and complementary relations of the professional sheep farm for the use of by-products of one component of the agricultural system as input for another;
- maintenance of soil fertility;
- obtaining a maximum profit per surface unit;
- improving ecological diversity;
- a high-performance management system in the management of available plant resources and of potential production is the nutritional balance with growth processes in lambs, youth, rams and ewes. No matter for what purpose this system is practiced, engineering genetics

correlates nutritional needs with the productivity of the natural environment.

Although the researches mostly address only the management of the farm resources, we believe that an improved management of the use of the available plant resources is required based on the best management practices that provide for:

- plotting and fencing pastures- for the efficient use of plant resources;
- the location of grazing areas near the farm;
- decontamination of grazing areas;
- avoiding contact with other animals.

Improved grazing and rotation management can reduce the area of pastures, integrated grazing and feeding systems, the use of manure to fertilize meadows enriches plant production, the palatability and nutritional quality of green mass, possibilities to cultivate pastures with other crops and hayfields can be converted into habitats naturally, contributing to the rehabilitation of the natural environment.

**3. Balancing rations according to economic efficiency** (Nicholson, 1994). Seasonal productivity of pastures can contribute to increasing the efficiency of fattening by balancing feed rations with concentrates according to production specialization and reducing the negative impact on the environment. The rations will be balanced in such a way as to ensure:

- grouped calvings in February a good correlation between the nutritional requirements on the milk production cycle and the feed produced naturally after the lambs are weaned at 42 days;
- staggered calvings through hormonal stimulation of estrus and feeding with estrogenic fodder that ensures the continuity of production, the alignment of production with natural processes and involves the implementation of an approachable farm nutritional management for any production system and type of exploitation;
- preserving the benefit of prolificacy and saving surplus lambs used for meat production by using milk substitutes in lamb rations. For one liter of sheep's milk substitute, 1000 milliliters of cow's milk, 40 grams of egg melange and 60 grams of milk powder with the chemical composition of:

- dry substance - 20.45%;
- crude protein - 14.80%;
- crude fat - 3.87%.

Administered in the feed of lambs regardless of the natural or artificial lactation system from day 8, the requirement being supplemented with combined feed (1.05 UN and 141.8 grams of digestible crude protein/kg (PBD) and the energy-protein ratio of 134.38 grams PBD/UN the following results were obtained:

- at 14 days, naturally breastfed lambs achieved an average weight of  $10.90 \pm 0.60$  kg;
- artificially breastfed lambs  $11.10 \pm 0.33$  kg average weight.

After weaning at 42 days, both categories of lambs were exploited in the barn, their rations were balanced according to performance, physiological and growth requirements, 1.02 UN, 115.50 grams PBD/gram and the energy-protein ratio of 113.23 PBD/UN and 200 grams of alfalfa hay.

During the fattening period from 42-70 days, the lambs that were fed naturally with mother's milk during the lactation period achieved average daily weight gains of 200.30-271.42 grams and those artificially breastfed 215.70-342.20 grams, contributing to the achievement of the best growth, and the combined feed administered in the feed from the age of 8 days. Balancing fodder rations according to production category and age regardless of the stable or pasture management system, improving grazing management and pasture rotation:

- reduce the area of pastures;
- integrated grazing and feeding systems improve feed conversion indices and contributes to obtaining large daily increases in weight, over 300 grams;
- the use of manure enriches plant production;
- rotation, optimization of herds depending on the degree of supportability of the meadow and its use of unique forages improve the palatability and nutritional quality of the green mass.

## RESULTS AND DISCUSSIONS

For a good consumption, without losses, measures are required to ensure a good feed assimilation through the implemented production system and obtaining productions:

-as close as possible to the genetic value of the herd;

-economical through the price of the resources used in the rations:

In this regard, for stable operation, we propose a set of good practices for quantitative forage with mowed green mass to avoid wastage by category of sheep:

- lambs according to weight category: 1.0-2.0 kg;

-youth over the age of 6 months 3.0-3.8 kg;

-adult sheep 6.5-8.0 kg.

The good practices of controlled quantitative administration of the mowed green mass, in the stable system, present the following economic advantages for professional farms, with implications on the indices through:

- stimulation of consumption, due to the freshness of the administered fodder;
- increasing the degree of assimilation through mowed management to over 85% compared to grazing which does not exceed 58.0-76.0%;
- sanitary-veterinary control of specific diseases, transmitted by: parasites, viruses, bacteria;
- efficient utilization of green mass resources;
- avoiding the selective consumption of fodder plants in the case of grazing.

These good feeding practices in sheep production in the stable system are more efficient because almost the entire amount is consumed due to the fact that needs can be correlated with expected productions, unlike unmanaged grazing where sheep are selective and prefer only certain varieties of plants depending on development the stage of consumes only certain parts of the vegetal plants carpet. Simultantly feeding the lambs in the barn from 8 days of age with combined feed and increasing amounts of alfalfa hay from 200-500 grams contributes to:

- achieving good economic results, weights of 18.30-24.70 per 42 days;
- weights of 30-37.5 kg at 70 days;
- consumption of 250-550 grams of combined feed.

In uncontrolled grazing there is a waste of fodder resources, the sheep preferentially consume the plants from the floristic composition of the meadow only in proportion of 75-77%.

The production of milk in sheep exploited on pasture, increases per surface unit along with the growth rate of herds to the maximum bearable value, the amount of vegetable mass, after which it decreases, negatively influencing the efficiency of exploitation on pasture. Reducing the pressure of grazing on the vegetal carpet by improving the management of production systems, using staggered calving, is an alternative with beneficial effects on the vegetal carpet, through soil rotation and the multiple possibilities of restoring the vegetal mass. The use of meadows sown with white clover mixed with *Lolium perenne* at 12.5 cm or 25 cm spacings brings production increases of 20-22%, growth determined by the development of secondary and tertiary stolon mass and Phyto mass production and obtaining average milk production per lactation of 77.92+2.99 kg in the Turcan breed exploited on such meadows without the intake of concentrated feed during lactation.

In the case of free-range exploitation, in different production systems, the consumption of green mass through pasture varies between 58.0-76.0% due to:

- the floristic composition of the meadow;
- the maturity degree of the plants;
- the vegetation period and the amount of dry matter.

Free grazing on natural or artificial meadows is an essential part of sheep's life and the herd must be optimized and protected from the action of toxic plants that have adverse effects on health, with effects on food assimilation and health status. Changes in farm management, production specialization, reproductive control through hormonal stimulation and pushing calving in February allow farmers to take advantage of the free nutrients available on pasture and natural hay. Grazing control methods are intended to avoid negative impacts on the pasture by:

- well-managed grazing according to the development of the vegetative mass and the optimization of livestock;
- controlled grazing.

Well-managed grazing on fenced plots preserves vegetation and helps restore the vegetation if good practices include:

- an optimal number of maximum 4 UVM/ha of meadow;

- avoiding overgrazing by increasing the number of UVM;
- rotation on plots after a period of 35 days;
- fertilizing plots and irrigating dormant ones;
- the use of new managerial practices:
  - a. the use of breeds with a high degree of feed assimilation;
  - b. increasing the feed conversion capacity;
  - c. the use of microorganism that favors the fermentation of feed before ingestion.

The efficient use of food resources, the efficient management of production planning according to the state of vegetation of pastures, fodder and cereal crops, will reduce the total costs of maintaining production throughout the year. These changes of a managerial nature are: coordinating the accumulation of body mass with the maximum productivity of the meadows, the use of breeds that efficiently exploit the vegetative mass, the staggering of calving according to the evolution of the vegetative mass and the stimulation of lactation to reduce costs per kilogram of meat produced. For stable operation considered the most efficient in the assimilation of resources, if it is economically managed, we recommend, through good nutrition practices, the administration of single chopped fodder for fattening, composed of the following percentage parts: fibrous 66.00%, silage 18.5%, corn 15.5%. The rations must be supplemented for balance with amounts of concentrates and vitamin-protein-mineral supplements, as well as lumps of salt for licking and drinking water will be provided at discretion.

In the case of intensive grazing of sheep in professional farms, to reduce the effects of overgrazing, good production practices must provide for:

- reducing the impact on environmental factors through risk management measures;
- optimizing the load of sheep according to the nutritional value of the vegetal carpet and its regeneration possibilities of the natural or artificial vegetative mass;
- the use of meadows that produce at least 6 tons of green mass per hectare for obtaining meat on pasture.

Taking into account these wishes, we recommend the implementation of new good nutritional practices for professional sheep farms of the Turcana breed in Arad County:

- a. extensive exploitation managed on pasture;
- b. a new system of modern sheep exploitation, through the management of mowed fodder, which will reduce the pressure on the plant resource, through:
  - the development of integrated sheep farms;
  - fodder production in agricultural crops;
  - production of green mass on pastures by mowing;
  - well-managed grazing to maintain a balance of vegetative mass-number of animals/ha;
  - transition to ecological agriculture;
  - the cultivation of fodder plants with high productions of vegetative mass;
  - maximize profits by controlling food quantities;
  - improving the management of meadows;
  - administration of phosphorus fertilizers to increase the proportion of nitrogen fixing vegetables;
  - controlled use of organic fertilizers.

This best practice system cannot be effective even if professional sheep farms have implemented the best integration management of milk or meat production, without the development of integrated farming systems that combine:

- the production of green mass with the consumption needs and the economic results predicted according to the genetic value of sheep;
  - the production management methods in operation according to the new system implemented with the module administration of green mass supplemented with concentrates for energy and protein balancing of rations, for expressing the genetic value of the biological material as close as possible to its potential.
- By implementing this new system of intensive exploitation of sheep through good nutritional practices implemented in production, the culture of fodder plants can be integrated with intensive exploitation, using human resources with a high degree of qualification throughout the year and additional income, the purpose of this integrative process being of:
- o ensuring additional and complementary relationships, for the use of secondary products of one component of the agricultural system as input for another;
  - o maintenance of soil fertility;

- protection of natural environmental factors by reducing environmental risk;
- obtaining maximum profit per hectare;
- improving ecological diversity;
- preservation of floristic biodiversity.

Such modern sheep meat and milk production systems are also proposed by Integrated Farming System which suggests four categories of integrated farming systems that can be used according to the environmental conditions of the area in which is located the professional farm, of which only one (system B) includes sheep, which have a high degree of adaptability to the new exploitation system and ensure income throughout the year.

Good nutritional practices regarding the provision and administration of food to sheep depending on the specialization of production, also contribute to the improvement of their assimilation both in the stable and on the pasture. Because lactation plays a fundamental role in the nutritional intake of sheep: lactating sheep consume much more than other sheep. However, a highly variable correlation between feed intake and milk production was observed:

- the ability to assimilate food after calving does not automatically lead to an increase in milk production;
- the lactation period is the phase in which the sheep mobilize fat reserves to satisfy increased nutritional requirements.

For these reasons, it is stated that the good nutritional practices should consider through the management methods of nutrition:

- the physiological tendency to mobilize as many fat reserves as possible;
- restoring reserves after weaning or during pregnancy.

We believe that for large and medium-sized professional sheep farms, the most effective and safest managerial method for improving assimilation is:

- a. administration of mowed green mass;
- b. grazing on permanent meadows, for access to quality green mass under the nutritional ratio and assimilation index;
- c. the grazing management methods used;
- d. good grazing practices:
  - continuous grazing, through the uninterrupted use of a grazing area;
  - grazing by rotation, to restore the pasture.

We propose the implementation for professional farms, depending on the age category, of the following types of rotational grazing for meadows sustainability:

- grazing on fenced lands, where the area where grazed is adjusted according to the daily needs of the sheep category;
- preferential grazing, where lambs have access to better quality pastures;
- "leaders and followers" type grazing, in which the sola is grazed by leaders (lactating sheep) with higher requirements and then by followers (barren sheep) with lower needs.

## CONCLUSIONS

In order to maintain the sustainability of pastures and reduce the pressure of different categories of sheep on plant resources, we recommend for professional farms, new ways of good nutritional management practices both for the exploitation system in stables and on pastures, for the production of meat and milk. In this sense, it is proposed to manage the feed mowed at the manger, which reduces the pressure on the pasture and contributes to the development of integrated farms in the production of food in agricultural crops which have in their composition *Trifolium repens*, *Lolium perenne* and from pastures through mowing, but also through economically well-managed grazing, in order to maintain a balance it is at least 5 tons of green mass per hectare at 4 UVM, between the capacity of pasture production and sheep load per hectare. Obtaining sufficient productions, 2.5 tons per hectare of dry matter (SU) or over 6.0 tons of vegetative, mass to ensure the nutritional needs of sheep can only be achieved by improving the floristic composition of *Trifolium repens* and *Lolium perenne*, of the meadows and increasing their nutritional value, stimulating fertilization with phosphorus fertilizers for the development of nitrogen-fixing species or with organic fertilizers for increasing the production of green fodder.

Good nutritional practices, such as the use of ruminal symbionts, which break down the feed and make it easily digestible when fed with single feed in the stable, the selective breeding of sheep according to the production system, with good assimilation capacity and good

conversion indices, the use in the pasture composition of plants with high digestibility *Trifolium repens* or *Lolium perenne* and the use of chopped fodder, implemented in professional sheep farms will contribute to the improvement of feed assimilation because there is a positive correlation between the intake of nutrients and the milk and meat productions achieved regardless of the production system. The most reliable method of improving feed assimilation is the administration of the green mass mowed at the manger and well-managed grazing on the permanent meadows. The grazing methods well managed and by rotation, controlled with plot grazing, preferential, or leader and follower grazing proposed to improve sheep productions in professional farms, allow the improvement of feed assimilation, through good nutritional grazing practices at the maturity of plant resources, continuous grazing and rotational grazing, with its three types that involve grazing in periods interpose with breaks to allow natural recovery or artificial of the vegetal carpet of the pasture.

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