

Economic Profitability of Fodder Production for Young Cattle Fattening

Slavica Arsić, Nataša Kljajić, Predrag Vuković

Institute of Agricultural Economics, Volgina Street 15, 11060 Belgrade, Serbia
e-mail: slavica_a@iep.bg.ac.rs

Abstract

Although Serbia is a country with favorable, developed agricultural region, there are areas that are not suitable for an intensive farming production because of their pedologic structure. Those areas still can be used for cattle (ruminants) feeding and breeding. They are especially suitable for fattening cattle in cow-young cattle system and fattening of young cattle, where good results have been achieved. This system of cattle breeding on pastures and meadows represents an extensive and cheaper beef production and is mostly related to those areas.

The aim of this paper work is to point to the possible use of meadows and pastures as basic and cheapest fodder in the production of fodder. In order to enable stable and economic milk and meat production and breeding progeny, it is necessary to pay attention to the production of quality bulk fodder and concentrate. It is also necessary to create standards for nutritive value of bulk fodder which would be required on farms and households. That is the most important condition necessary in achieving rational concentrate mixture use and lowering food cost and therefore achieving the production which would be more economical.

Key words: *fodder production, bulk fodder, fattening of young cattle, economic production*

JEL Classification: *Q10; Q13; Q19*

Introduction

Modern cattle breeding production is followed by an intensive fodder production on natural meadows and pastures and by roughage production and the production of concentrate mixture. Fodder food represents products of plant, animal and mineral origin produced naturally or industrially and its purpose is to be used as food for domestic animals.

Regarding its origin, chemical structure and energetic values there are:

Fodder food of plant origin or:

1. Animal feed of animal origin or: milk and dairy products, secondary products in meat-packing industry, dog pound products, secondary products in fish canning and processing industry, yeast and other sources of protein.
 - bulk food like: green food, dry bulk food, silage, fodder food (root-like, potato-like and other juicy fodder);

- concentrate mixtures like: grain fodder (grains, grain of leguminous plants and oil plants);
 - products from secondary industry (flour-milling industry, oil industry, sugar industry, alcohol industry, starch industry, fruit and vegetable processing industry etc.).
2. Mineral-rich animal feed like: table salt, calcium-rich animal feed, phosphorous-rich animal feed, calcium-phosphate-rich animal feed;
 3. Animal feed additives (microelements, vitamins, antibiotics, fat, urea, preservatives, colour, fragrant and other);
 4. Industrially produced roughage mixtures which can be: complete, additional or superconcentrates and premixtures.

The production of green bulk animal feed could be realized on natural and artificial lawns, as well as on ploughed fields.

Natural lawns are areas covered with plants growing wild (perennial Papilionaceae). The return and quality of green fodder on natural lawns are not satisfactory. The most favorable natural lawns' use is pasture during summer, when fattening of young cattle can have an increase up to one kilogram per day.

Artificial lawns (meadows) are created by sowing perennial panicle grass (Cat grass - *Dactylis glomerata*, Tall fescue - *Festuca arundinacea*, Timothy grass - *Phleum pratense*, Meadow fescue – *Festuca pratensis*, Arrhenatherum elatius and Creeping Red Fescue – *Festuca rubra*) and Papilionaceae family (Luzerne, Fabaceae Red clover – *Trifolium pratense* L., Bird's foot trefoil – *Lotus corniculatus* L. and White clover – *Trifolium repens*). Meadows are used for pasture (during summer) and for producing hay. Bulk fodder is used green or conserved.

Green roughage plants are Field peas, Fodder beet, Soybean, Lentil, Peas, Vetch, Oilseed rape, Fodder kale and Cabbage. Drying is the oldest way of preparing bulk animal feed. Mowed green mass could be dried on the ground, devices, waves or small coils.

Grain straw and leguminous straw are used as straw and other dry voluminous animal feed containing high percentage of raw cellulose and low concentration of energy and being low digestible. Among juicy and watery voluminous animal feed, root-like and potato-like are used, since they are carbohydrate animal feed poor in mineral ingredients.

Grain animal feed (corn, barley, wheat, broomcorn, rye, oats, millet) are used as germ, or as components in concentrate mixture.

The biggest problems in improvement of animal feed quality appear because of poor biocenose, insufficient quality agrotechnical measures and often regular conservation methods.

Roughage mixture is made by mixing wheat, secondary products from Food Industry, Alfalfa flour, mineral ingredients and vitamins. There are *complete* roughage mixtures, *additional* roughage mixtures (super concentrates) and *premixes*.

Complete roughage mixture contains all necessary ingredients and represents the whole food portion. According to the Regulations for Fodder Quality for fattening of cattle up to 250 kg roughage mixtures must contain: at least 14% of proteins, up to 130% of water and up to 12 % of raw celluloses. Roughage mixtures for fattening of cattle more than 250 kg must contain: at least 12% of protein, up to 13 % of moisture, up to 15 % of celluloses and up to 8 % of ash.

Additional roughage mixtures or super concentrates contain all necessary ingredients in high quantities, but they represent an addition to energy animal feed.

Premixes contain vitamins, mineral ingredients, additive and antibiotics and also represent an addition to complete and additional roughage mixtures.

Feed Intended for Fattening of Young Cattle

There are mostly 3 types in technology of fattening of young cattle and those are: intensive fattening up to 400 kg, fattening of cattle up to 450 kg and fattening of cattle up to 500, 550 to 600 kg. An intensive fattening of young cattle in hilly and mountainous region is not recommendable because it is being done mostly by using concentrates and less by using low quantities of bulk animal feed.

Fattening of young cattle whose weight is over 450 kg to 550-600 kg is more extensive. Because the older animal is, the greater is the weight at the end, in other words – it has more time for longer and more extensive feeding with bulk animal feed. It is natural that feeding will be based on pasture during summer and grass silage and hay during winter. In order to achieve the desired growth increase during fattening, the concentrate is used as an additive in bulk animal feed in this phase of fattening. Because of the share of larger quantities of bulk animal feed, young cattle reach the weight up to 450 kg later in life, in contrast to the extensive fattening, where there are larger quantities of concentrate used.

There are great possibilities for cheaper beef production by using larger quantities of quality bulk animal feed, silage above all. There is a growing need for this type of production because using larger quantities of concentrated animal feed, although the quality is higher and fattening faster, results in higher production costs. Therefore, the share of bulk animal feed in fattening of cattle is growing nowadays and is recommendable. Bulk animal feed used in modern intensive beef production must reach higher quality, in other words must have higher content of protein and energy. Basic part in semi-concentrated animal feed in plains and some hilly regions takes silage of the whole corn plant, which should be given unlimitedly, and concentrated mixture which should be given in limited quantities. The share of concentrate in this type of semi-concentrated fattening is various: 50-70% in dry ingredients and the remaining part (30-50%) are nutritious ingredients from bulk animal feed. This kind of feeding with biggest possible share of bulk animal feed being the cheapest source of energy enables an increase from 1000 to 1200 g per day. If fattening technology changed, by using larger quantities of animal feed, fattening of young cattle would cause change in final weight of fattened cattle and orientation towards older young beef made of older head of cattle (18-24 months old) with more weight.

Feeding of fattening young cattle is based on unlimited semi-concentrated food portions, maximally using food produced on households.

Regular feeding of fattening young cattle is based on knowing the needs of cattle regarding nutritious ingredients and knowing nutritious values of animal feed. Meals for fattening young cattle must be: sufficient regarding quantity, balanced regarding nutritious ingredients, various, tasty, voluminous enough and easy handling. Related to the needs, the things that are important are: portion size, energy value expressed by nutritional value, quantity of digestible proteins and quantity of Ca, P, NaCl and Mg.

Animal Feed Standards

Knowing the need of young cattle regarding nutritious ingredients, as well as knowing the nutritious values of animal feed, will enable making portions of food (quantity of food for 24h) which will satisfy the needs. To determine the need for nutritious ingredients and establish nutritional value of animal feed represents the base of rational domestic animals feeding. Food is especially important in livestock production since it is necessary to determine production orientation and technological measures on time and apply them during the production of bulk animal feed.

The portions of food should contain nutritious ingredients necessary for enabling vital functions (growth increase): carbohydrates, fat and proteins. In addition to this, mineral material: hormones, ferments, antibiotics etc. are also significant for animal organism and they are stimulating for livestock production.

The so-called restrained portion of food, that satisfies the needs of animals regarding nutritious ingredients necessary for life, and production portion of food, which enables the desired meat production with its nutritious ingredients, are being standardized.

The needs of young cattle being fattened are formed and expressed in many different ways and sometimes only different schemes and instructions. Animal energy requirements are mostly expressed in starch values or oats nutritious units, although there are other systems for estimating nutritive values of fodder. Standards for fattening young cattle are expressed in netto energy for meat production (NEM), and size depends on weight and daily growth increase, as shown in Table 1.

Table 1. The needs related to energy (NEM) for fattening of male young cattle of mixed breed

Body weight Kg	Daily growth increase kg	NEM
200	1000-1200	29,5 - 32,6
300	1000-1200	40,4 - 44,2
400	1000-1200	49,7 - 54,3

Source: Stolić Novica, Milinko Milenković, *Fattening of young cattle*", Kruševac, 2000.

Protein requirements are also standardized in various ways in some countries, regarding quantity as well as the way of expressing, mostly like digestible raw proteins. The requirements of minerals are expressed in minimum and maximum quantities and balanced during the preparation of a portion of food mostly with Ca, P, Na Cl and Mg.

The requirements of vitamins, although significant, are small regarding quantity and haven't been studied enough. However, vitaminization of animal feed became a part of standard technological procedure in roughage mixtures production and that way avitaminosis and hypovitaminosis are being prevented.

Cattle constantly need water, because water represents the largest part of the body. 60% in average at adult heads of cattle and 45-48% at young cattle. Cattle are taking water through food or being watered, as well as releasing the so-called metabolic water. The feeling of thirst appears at animals when body weight becomes 1% less because water has been lost. In any case it is best that young cattle being fattened always have water at their disposal (automatic watering places).

Using stimulating material (stilbestrol, terramycin and other) during fattening resulted in favorable effects in growth increase, as well as in making use of food.

The requirements expressed in nutritive values (NV) for restrained portion of food are shown in Table 2.

Table 2. Nutritive values (NV) for restrained portion of food

Weight of cattle kg	NV	Weight of cattle kg	NV	Weight of cattle kg	NV
60	1,2	160	2,2	350	3,7
80	1,4	180	2,4	400	4,0
100	1,6	200	2,6	450	4,3
120	1,8	250	3,0	500	4,6
140	2,0	300	3,3	550	4,9

Source: Stolić Novica, Milinko Milenković, *Fattening of young cattle*", Kruševac, 2000.

The Economics of Fattening

Before orientation towards fattening of young cattle it is important to find out first if fattening is economical. The economics of fattening is determined by many factors, first of all by the price of calves. If the quality of input material for fattening is better, the price will be higher. The value of animal feed is also important, because its share in the costs of fattening is 70 - 80%. Therefore the producers who have larger quantities of bulk animal feed on their households reduce these costs.

The costs of working labour have up to 10% of growth increase value in the costs of production. These costs are determined by building amortization, purchase of fattening material, as well as the costs of cattle treatment, machine and device repairing etc.

It is necessary to determine: balance of cattle purchase and slaughter, herd turnover, food requirements, production results.

The economics of fattening is measured by the relation between natural food consumption and the achieved growth increase. In order to determine limits up to which daily food quantity per fattening head of cattle should be increased, it is necessary to determine the relation between consumed nutritive units and the achieved growth increase. (Table 3).

The requirements expressed in nutritive units per one kilogram of growth increase (*Belić, 1985*) are shown in Table 3.

Table 3. Nutritive units per one kilogram of growth increase

Age expressed in months	NU	Age expressed in months	NU
1 – 2	2,0	10 – 11	3,4
2 – 3	2,2	12 – 13	3,7
4 – 5	2,5	14 – 15	4,0
6 – 7	2,8	16 – 17	4,4
8 – 9	3,1	18 - 19	4,7

Source: Stolić Novica, Milinko Milenković, *Fattening of young cattle*”, Kruševac, 2000.

Although the economy of fattening mostly depends on consumed quantity of cheaper animal feed, especially silage, it is not recommended to use silage too much, because even though greater use of food is achieved, fattening effect is reduced because fattening period is extended.

The fattening of cattle could be completely based on quality silage. Silage of whole corn is mostly used in fattening and it is also important the possibility to use silage of various secondary products in agriculture and food industry like: heads and leaves of sugar beet, marc, green nutshell, beet noodles and all in quantities up to 10 - 30kg daily. Albuminous animal feed, first of all soybean middlings and sunflower middlings must be added to these portions of food with silage, or to replace part of middlings with urea, because of lower costs of food portion.

Animal feed must satisfy basic requirement to contain fodder with higher energy concentration. In extensive fattening that fodder are withered grass silage (30-35% of dry material (DM)) and pasture. If the silage is of poor quality or classic, moist (not withered), small quantity of hay must be added which will enable sufficient daily consumption of dry material from bulk fodder.

The requirements within an intensive fattening of cattle, for an average daily growth increase of 1000g, expressed in nutritive units and digestible raw proteins are shown in Table 4 and for the daily growth increase of 1200g in Table 5.

Table 4. The requirements expressed in NU and digestible raw proteins for daily growth increase of 1000g

The weight of cattle kg	NU	Digestible raw proteins per 1NU
120 -180	4,0	500
180 – 250	5,1	600
250 – 350	6,2	700
350 – 400	7,5	800
400 - 500	9,0	850

Source: Stolić Novica, Milinko Milenković, *Fattening of young cattle*”, Kruševac, 2000.

Table 5. The requirements expressed in NU and digestible raw proteins for daily growth increase of 1200 g

The weight of cattle kg	NU	Digestible raw proteins per 1NU
120 – 150	4,3	140 – 160
150 – 200	5,5	110 – 130
200 – 250	6,5	90 – 100
250 – 300	7,5	80 – 90
300 – 350	8,3	70 -80
350 – 400	9,2	65 – 75
400 – 450	10,0	60 – 70
450 - 500	10,6	55 - 65

Source: Stolić Novica, Milinko Milenković, *Fattening of young cattle*”, Kruševac, 2000.

The required quantity of proteins in dry material in relation to the weight of cattle is:

- for head of cattle from 120-250 kg it is required 14-19% of protein (in average 16% in total, or 14,4% in mixtures);
- for head of cattle from 250-350 kg it is required 12-15% of protein (in average 13% in total, or 11,7% in mixtures), and
- for head of cattle from 350-450 kg it is required 11-14% of protein (in average 12% in total, or 10,8% in mixtures).

For the production of “baby beef” fattening it is very important to have high quality mixtures with the same components, considering that it represents whole portion of food. Mixture could be made on the farm, with components made on one's own land which would certainly result in cheaper food and therefore cheaper production.

The requirements for an average daily growth increase of 1200g in “baby beef” fattening are shown in Table 6.

Table 6. The requirements expressed in NU and digestible raw proteins for daily growth increase of 1200g for “baby beef” fattening

The weight of cattle kg	NU	Digestible raw proteins per 1NU
180	4,7 – 6,3	450 -550
225	5,8 – 7,4	550 -640
270	7,0 – 8,4	640 – 720
315	8,0 – 9,3	720 – 770
360	8,7 – 10,1	770 – 860
400	9,2 – 10,5	770 - 860

Source: Stolić Novica, Milinko Milenković, *Fattening of young cattle*”, Kruševac, 2000.

The requirements of minerals and vitamins for fattening of young cattle are shown in Table 7.

Table 7. The requirements of young cattle fattening related to minerals and vitamins

Weight of cattle kg	Ca, gr	P, gr	NaCl, gr	Caroten mg
120 -180	20	15	15	50
180 – 250	25	18	20	70
250 – 350	30	20	25	90
350 – 400	35	25	35	120

Source: Stolić Novica, Milinko Milenković, *Fattening of young cattle*”, Kruševac, 2000.

Conclusion

Long-term strategy for cattle breeding and change in breed composition, together with adequate fodder are some of the basic pre-conditions for high quality meat production.

Three major factors in every successful livestock production are:

- favourable genetic potential;
- favourable ambient and
- food.

The most important factor is feeding with correct balance of mixtures, made of high quality raw material, while quality and origin are being controlled.

If there is no access to animal feed at competitive prices, it is very difficult to achieve competitiveness of meat production. In the production of grains and oleaceous plants which represent the base for livestock production, Serbia is extremely competitive and it also has quality natural pastures. However, pastures should be available through infrastructure and improved by fertilization and additional sowing and the production of concentrated fodder made of grains and oleaceous plants should be balanced and improved by quality additional mixtures. In the chain from input to concentrated fodder, the price is being extremely increased, so many producers make mixtures on their farms instead of buying them, successfully or not.

Insufficiently exploited possibility to use pastures and produce bulk food and silage is one of characteristics of the production in Serbia, especially in cattle breeding and sheep raising production. It is necessary to encourage producers through agricultural policy measures and educational programmes to reduce costs of production by using food which must be primarily based on pastures in summer and quality bulk animal feed (hay and silage) in winter. Far more significant involvement of experts is also necessary, regarding amelioration of mountain pastures, artificial meadow creation and the production of roughage for silage and hay preparation, as well as improvement in technology of the production of food used during winter period, which would make food more profitable for producers.

References

1. Arsić, S., (2010): “Značaj marketinškog pristupa u proizvodnji junećeg mesa i njegova ekonomska opravdanost” Magistarska teza, 2010. Zubin potok-Lešak.
2. Arsić, S., Kljajić, N., Vuković, P., (2012), *Cattle stock and the analysis of total meat production in the Republic of Serbia*, Journal, Economics of Agriculture, Vol. LIX, N^o1 (1-176), pp. 99-114.
3. Arsić, S., Vuković P., Jovanović R., (2009). *Economic Parameters for Beef Production Depending on the Fattening Breed*, International conference “Competitivitatea economiei agroalimentare și rurale în condițiile crizei mondiale”, 25-26 September 2009, Bucharest, pp. 15-20.
4. Arsić, S., Vuković, P., Kljajić, N., (2011): *Opportunities of rural development in municipalities of the Serbia-Danube region*, International Conference: Rural development policies

- from the EU enlargement perspective”. Tematic Proceeding. Međunarodna konferencija: „Politike ruralnog razvoja iz perspektive proširenja EU”. Tematski zbornik. Ečka. 8-9. September. pp. 13-21.
5. Arsić, S., Vuković, P., Kljajić, N., (2011): *Economic indicators significance fattening animals on merchandise cattle meat*, Сборник материалов международной научно-практической конференции въ, стр.144-151.
 6. Jelić, S., Jovanović, T., Nikolić, M. (2004.): “*Uloga stočarske proizvodnje u ruralnom razvoju Srbije*”, Biotehnologija u stočarstvu, 16 inovacije u stočarstvu, Poljoprivredni fakultet, Zemun-Beograd, p.301-309.
 7. Jovanović, M., Arsić, S., Potrebić, V., (2012): “*Mogućnosti za iskorišćavanje potencijala sejanih-artificijelnih travnjaka*”, *Possibilities for resource utilization artificial lawn*, str.129-135, Proceedings of research papers 2012. Vol.18. br. 1-2., Proceedings of XXVI Conference of Agronomists, Veterinarians, Technologists and Agricultural Economists Vol.18. No. 1-2 Institut PKB Agroekonomik, Beograd.
 8. Radmanović, D., Nikolić, M., Dlesk, M., (2010): “*Planinsko područje Srbije i osnove razvoja poljoprivrede*” Monografija, Izdavač: Institut za ekonomiku poljoprivrede Beograd.
 9. Вучковић, С., (1999.): *Крмно биље*, Пољопривредни факултет Земун, Бонарт.
 10. Вучковић, С., (2004): *Травњаџи*, Пољопривредни факултет Земун.
 11. Чобих, Т, Анто, Г., (2002): “*Тов говеда*”, Пољопривредни факултет, Нови Сад, 2002.

Profitabilitatea economică a producției de nutreț pentru îngrășarea vitelor tinere

Rezumat

Deși Serbia este o țară cu regiuni favorabile pentru dezvoltarea agricolă, există zone care nu sunt potrivite pentru cultivare intensivă datorită structurii lor pedologice. Acele zone pot fi totuși utilizate pentru hrănirea și creșterea vitelor (rumegătoarelor). Ele sunt potrivite în special pentru îngrășarea vitelor din sistemul vitelor tinere și îngrășarea vitelor tinere, unde au fost obținute rezultate bune. Acest sistem de creștere a vitelor pe pajiști și câmpii reprezintă o sursă importantă de producție de carne de vită în contextul unor prețuri scăzute, fiind îndeosebi legată de aceste zone.

Lucrarea de față își propune să indice posibila utilizare a câmpiilor și pajiștilor ca nutreț ieftin de bază în producția de nutreț. În scopul obținerii unei producții stabile de carne și lapte, precum și a reproducerii descendenților, este necesară supravegherea producției de nutreț și concentrate de calitate. Este de asemenea necesară crearea unor standarde pentru valoarea nutritivă a furajelor vrac necesare în ferme și gospodării. Aceasta constituie cea mai importantă cerință pentru obținerea unei utilizări raționale a mixturii de concentrate și scăderea costului alimentelor, realizându-se astfel o producție mai economică.