



Forage Sources For Ruminants In Bulgaria

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Summary

The paper is a brief overview of climate and forage sources of feed for the ruminants – cattle, sheep and goats in Bulgaria. Main sources for grazing and hay making in spring-summer season are the natural pastures, and for feeding rack are the preserved forages – haylage and silage from forage cultures, which are grown on arable land. Natural pasture swards occupy 1/3 from the agricultural area in Bulgaria. They consist of natural species, which are well adapted to the local conditions, but their yield is low. They are suitable for extensive stock-breeding and to obtain healthy food of animal origin. The sown pasture swards in Bulgaria take a small share, but more and more farmers show interest for establishment of artificial pastures near the farm. The big cattle breeding farms rely mainly on hay and haylage from alfalfa, and maize silage. Feeding in most of them is on rack in the cattle-shed all year round. In the paper are given data for the composition of a natural sward in the mountain and foothill pastures in Bulgaria. Attention is paid on main grass-feed sources such as the alfalfa, peas and vetch, waste rough forage, as well as maize for silage and some new technological methods for silage making.

Introduction

The available forage sources in each country predetermine the way of animal breeding and their feeding. They have differentiated in a direct dependency on the climate characteristics of the region. The climate in Bulgaria, which is situated in the South-Eastern Europe, is moderately continental with clearly expressed four seasons. The average January temperature is about zero (from -2 to +2°C and to -10°C in the mountains), the average July temperature – 19-25°C (to 10°C in the mountains). The average annual rainfalls are 450-600 mm in the flat parts and up to 1300 mm in the mountain ones, and in the period of active vegetation (April-September) – respectively from 200 to 400 mm. Droughts are frequent phenomenon, especially in the second half of summer, but there are also exceptions, as was the case in the present 2014. In comparison with the climate in the central and northern Europe, the Bulgarian is more unfavourable for even growth and development of grass verdure during the vegetation period. Therefore in order to produce forage it is counted both on natural swards and forage species grown on arable land.

The principal forage sources in Bulgaria are mainly the natural meadows and pastures, supplemented by shrubby-like and tree vegetation, and some perennial and annual forage cultures, grown on arable areas, as well as waste rough forages. The systems, which are practised for breeding of sheep, goats and cattles, are directly dependent on the available forage resources. In Bulgaria, sheep and goats are grazing throughout the grazing season. For this purpose are used pastures and meadows in the flat and mountain regions in the country. The period of grass withering in summer coincides with gathering of grains and stubbles are used for pasture. In winter feeding is on rack mainly with hay or cornstalks and other waste rough forages, supplemented with grain, pumpkins, beetroot etc., and in big farms are used silage of maize and hay. Cattles from small farms are on pasture in summer season, and in winter are used feeding racks with preserved forages – hay and silage. Cows from big farms with 100-300 and over 300 cows are fed all year round on rack. Main sources of forage in our country, besides pastures, are maize for silage, alfalfa, mixtures of peas and vetch with cereal etc.

Pastures

According to data of Ministry of Agriculture and Food, the total area of agricultural land occupies about 50% from the territory of the country. The arable lands, which include in crop

rotation the temporary meadows with grasses and legumes, represent 64-65% from the used agricultural area during the recent years (Table 1).

Table 1. Areas with agricultural purpose in Bulgaria, ha

Areas	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013
1. Areas with agricultural purpose	5 785 686	5 725 663	5 709 773	5 666 336	5 648 206	5 490 113	5 492 891	5 486 572	5 481 222	5 258 809
2. Usable agricultural area	5 330 489	5 264 521	5 190 053	5 116 220	5 100 825	5 029 585	5 051 866	5 087 948	5 122 983	4 995 111
3. Arable land	3 262 797	3 128 210	3 089 531	3 057 740	3 060 543	3 122 516	3 162 526	3 227 237	3 294 685	3 462 117
4. Permanently swarded areas (PSA) and meadow-fruit tree gardens	1 805 711	1 904 016	1 876 392	1 842 141	1 828 865	1 719 028	1 701 990	1 678 308	1 646 993	1 381 049
	31,2%*	33,2%	32,9%	32,5%	32,4%	31,3%	31,0%	30,6%	30,0%	26,3%

Note: * PSA % from the whole agricultural area (4:1)

Permanently swarded areas – productive meadows, high-mountain pastures, swarded surfaces with low productive potential (grasslands and rangelands) and meadow-fruit tree gardens cover 30% from the usable agricultural area. In comparison with some neighbouring countries such as Greece, Macedonia and Serbia, the share of pastures in our country is lower (Kirilov et al., 2006). In Serbia pasture areas represent 38%, in Greece –

43%, and in Macedonia – 58% from the area with agricultural purpose (Tomić et al., 2006).

During the last two-three years, a tendency has been noticed for a decrease of areas with pastures and meadows and conversion into arable land (Table 1). The decrease of pastures in 2013 was by 23.5% in comparison with 2004. The main reason for this was that the farmers received greater subsidy for arable area than for grazing area.

Table 2. Changes in number of cattle and buffalos in Bulgaria, in thousands in number

	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012
Cattle, total	728,30	671,58	621,80	628,27	602,06	564,90	539,56	544,46	557,64	526,11
including milk cows	378,20	368,72	347,75	350,14	335,89	314,67	296,76	308,17	306,84	288,75
Buffalos, total	7,9	8,0	8,2	8,2	9,0	9,2	8,2	9,2	9,9	9,2
including buffalo-cows	4,5	4,1	4,7	4,8	5,2	5,3	5,0	5,4	6,3	5,7

Table 3. Changes in number of sheep and goats in Bulgaria, 2003-2012

	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012
Sheep - total	1598556	1692255	1602255	1635410	1526392	1474845	1400252	1367987	1454617	1361545
including ewes	1278759	1351212	1314391	1296181	1233441	1198110	1135482	1093009	1173200	1085175
Goats - total	725308	718117	608426	549076	495484	429834	360822	356334	341362	293639
including goat-mothers	592572	578504	505895	450559	406064	355187	303116	278033	272859	236056

Typical for Bulgaria and the countries of the Balkan Peninsula is the municipal or state property of pastures and grasslands and their use from all animal owners in the settlement. Grazing as a way of breeding of cattle and sheep has a favourable influence over qualitative and health indicators of milk and milk products (Elgersma et al. 2006; Mihailova et al. 2003). Milk of cows, which are fed with green forages or grazing, in comparison with those using feeding racks with preserved forages, contains greater amount of conjugated linoleic acid, which is supposed to have an anti-cancer effect (Elgersma et al. 2006). The fatty acids composition in milk of sheep, which are grazing, according to Mihailova et al. (2003) varies in summer months depending on the change of sward composition. In studies of Gerchev (1998) on sheep bred on a

mountain pasture at the altitude of 1400 m and 400 m, however, it was found that the influence of atmosphere conditions over the milk productivity at high mountain pastures was greater in comparison with the influence of sward composition and its variation.

Yields from our natural pastures were low, from 1600 to 3000 kg hay ha⁻¹ (Table 4). Similar yield data from natural pastures are also reported by Stoycheva (2014). According to Papanastasis (1999) in Greece the yields were below 1500 kg/ha and in case of 1 mm additional rainfall, the yield of natural swards in Northern Greece increased by 2 kg/ha. Low yields from natural swards are characteristics for the regions with moderately continental climate (Peeters and Kopec, 1996; Porqueddu and Maltoni, 2004).

Table 4. Yields from natural pastures, kg/ha (Kirilov and Todorova, 2004)

Type of pasture	1989-1991r	1994-1996r	1999-2001r
Chrysopogon gryllus	2522	2560	2342
Agrostis capillaries- Festuca fallax	3561	3138	2997
Nardus strikta	1967	2249	2182

In the natural swards, in our country, are predominant the grasses (Table 5). The share of legumes in natural swards is low – from 2 to 8% (Kirilov and Todorova, 2004; Ali, 2010). Stoycheva (2014) stated a higher share of legumes, up to 12% in natural swards. The low share of legumes in natural swards causes lower protein nutrition, as the legumes have higher content of protein. This disadvantage in the natural swards is avoided in the creation of artificial ones – sown pastures, where

the proportion between grass and legume components is regulated and the pasture grassland has a higher nutritional value (Stoycheva, 2014). Suitable grasses for the conditions of Bulgaria, in the creation of artificial swards, are those that are created and appropriate for our climate conditions, cultivars of cock's foot, Bromus, fescue, wheat-grass and ryegrass (Katova, 2007; Katova 2009; Katova, 2011), and of legumes – sainfoin, birdsfoot trefoil, white and subterranean clovers etc. (Vasileva (2014), Vasileva and Vasilev (2012).)

Table 5. Botanical composition of swards (after Ali 2010)

Type of grass	Foothill	Mountain	High mountain
Legumes	6,83	6,63	4,22
Grasses	80,31	80,39	65,78
Forbs	12,89	12,98	30,00

Stoycheva (2014) obtained from 26% to 42% more milk from sheep grazing in sown (artificial) pasture sward in comparison with the amount of milk from sheep grazing on natural sward and the difference is the greater, the more prolonged the time for grazing is during the milking period. Grazing in natural swards in initial stage of growing of grasses is a way for the animals to obtain forage with a high content of protein and with a higher nutritional value.

The composition of natural swards is different and depends on the location, altitude and season (Todorova et al. 2003). In mountain and foothill pastures of Bulgaria, the most widely spread are swards on the base of *Chrysopogon gryllus* L., above 500-700m., *Agrostis capillaris*/ *Festuca rubra* 1000-1200 m and above 1200m dominates *Nardus stricta* (Kirilov and Todorova, 2004). With decrease in number of sheep, goats and cattle in the country (Table 2 and 3), and because the mountain pastures are not grazed fully, in the last two decades in Bulgaria is intensified the spread of fern and other shrub-like vegetation such as *Paliurus spina-christi* Mill., *Juniperus oxycedrus* L. and *Continus coggygia* Mill.

Characteristic feature in Bulgaria is the use of stubbles after gathering of cereal cultures, such as wheat, barley, maize, sunflower etc., because of withering of sward and insufficient grazing in summer. Similar practice is also observed in other countries of the Mediterranean region.

Highly productive cows need forages of higher nutritional value and the natural rangelands and pastures are not suitable for their feeding. The need of rough forages is provided mainly by growing of forage cultures on arable lands, which have a tendency for decrease, which corresponds to the tendency of decreased number of sheep and cattle in our country (Table 2 and 3).

Sown Forages

Alfalfa is a traditional forage culture for Bulgaria and the countries from Southern Europe and it is one of the main sources of protein for ruminants. Soil and climate conditions, especially in the flat part of the country, are favourable for its cultivation. Alfalfa uses water more efficiently than grasses. In time of drought, the alfalfa uses six times less water than ryegrass and other grasses per unit of fixed carbon (Woodward and Sheehy, 1979) and in similar conditions it gives two to three times higher yield than the perennial ryegrass and other pasture grasses (Douglas, 1986). Most often it is used as hay and less as haylage.

In Bulgaria, areas with alfalfa cover the largest share of the lands, which are sown with forage species (Kirilov, 2000), and almost all small

owners and large farms rely on it for hay making. Areas with alfalfa in our country are 81.2 thousand ha in 2013, with an average dry mass yield of 4281 kg/ha (Ministry of Agriculture and Food, 2013).

Usually without irrigation are obtained 3-4 cuttings from it during the year, and with irrigation they are 5-6. From an environmental point of view, the alfalfa with its deep root system and its ability to fix the atmospheric nitrogen needs small amounts of fertilizers and improves soil fertility. It is a good predecessor of cereals and maize, and it is a desired species in crop rotations.

Maize for silage as forage species with high energy nutrition – one FUG (food units for growth) or FUM/kg (food units for milk) DM, very good silage making and suitability for mechanized breeding, remains the most desired in intensive animal breeding (Pflimlin and Todorov, 2003; Wilkins and Kirilov, 2003). Conditions, in Bulgaria and Serbia, which are situated in the so called "maize belt of Europe", are very good for growing of maize for grain and for silage. Temperature sums are suitable for growing of both early and late maize cultivars from the group of 700-800 according to FAO. In favourable years or by irrigation, the yield exceeds 25 000 kg DM ha⁻¹ (Kirilov, 1999).

In drought conditions is observed an increasing interest towards use of sorghum and sorghum-sudangrass hybrids for silage (Zhelyazkov and Naydenov, 1993a, b; Krachunov, 2005; Slanev, 2006; Legarto, 2000). Areas of maize, for silage in the past 20 years, have decreased dramatically and today they are 31.6 thousand ha, and the average yields for the country are unsatisfactory, 15000 kg/ha. Especially popular in recent few years in Bulgaria is the technology for maize silage making in polyethylene sleeves. With this technology the cut silage mass is delivered with special machines in polyethylene sleeves with a diameter of 3 m and length of 75 m, which hold 300 tons of silage.

Along with the positive nutritional and silage qualities and high yield potential, maize cultivation is related also to some negative influences over the environment. As such are emphasized that in maize growing the area remains for a long time without a vegetation cover during the year, which exposes it to wind and water erosion. Maize, as intensive forage species, needs abundant fertilizers with nitrogen and phosphorus, which leads to contamination of water sources. Weed protection of maize and pests requires the use of large amounts of herbicides and insecticides.

Peas and vetch are often used forage species, especially in mixtures with barley or other cereals (Sachanski and Kirilov, 1988, Kirilov A., 2004). The advantages of these legume annual species is that they use the moisture in spring and give reliable

yields on the background of the global warming and the more frequent droughts and have good nutritional value (Kirilov, 1990, Kirilov, 2000).

Because of insufficient grazing in some Balkan countries, such as Turkey for example, the government has passed a law to subsidize the cultivation of forage species (Semerci et al. 2006). Due to this policy, the forage production in the region of Edirne (The European part of Turkey) has increased two times during the recent years with an average increase by 3.7% for whole Turkey. Waste rough forages, such as straw, cornstalks or heads of sunflowers, are often used for feeding of sheep, goats and cattle, which are bred in rural yards of farmers. They are a sign of extensive stock-breeding, but they are a way of survival for some families in rural regions.

Conclusion

Natural pastures together with shrub-like vegetation will have a main role also in the future for providing sheep and goats with forage. Grazing will be seen as a part of the means for maintaining of biological diversity and balance in nature and preservation of environment from pollution.

On the background of global warming, forage species, which will more efficiently use the winter moisture, which give high yields and quality of forage will be preferred.

The extensive use of forage resources will be preserved for breeding of sheep and goats and the production of organic and healthy milk and meat products, especially in small farms.

In providing the ruminants with highly qualitative forage, alfalfa and maize for silage will preserve and probably expand their place and importance especially under irrigation conditions, and the mixtures of peas and vetch with cereals will be relied on for providing of forage balance in farms under more dry conditions.

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