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Chapter

Performance of Forage Crops and Grass Mixtures in Kosovo

Sali Aliu, Imer Rusinovci, Shukri Fetahu and Dukagjin Zeka

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Abstract

Grasslands represent a land-use which is effective and has great economical importance in the European agriculture. Grasslands these are important and effective sources of energy and proteins for ruminants, and combine high yields stability by draught resistance with low tillage operations and pesticide after use leading to good environmental conditions. Furthermore, good management practice in grasslands provides high potential of carbon sequestration in soils, resulting in climate change mitigation. Based on actual data, the meadows and pastures cover 224410.83 ha of total surface of the Kosovo; moreover there, just a particular of these surfaces are distinguished clearly as meadows or pastures. The most important forage crops which are dominant in our country include plants from *Poacea*e; this botanical family is divided into long, medium, and low herbs. Medium and long herbs are the best suited for mowing and silage or drying for sanitary preparations, while short herbs are very suitable for grassland. The most important of fodder or plants in Kosovo are: (*Medicago sativa* L.) alfalfa, red clover (*Trifolium pratense* L.), white clover (*Trifolium repens* L.), etc. Legumes are of great importance for the creation and development artificial grasslands and very valuable mulching surfaces that produce very high yields that are not only useful for silage, but also for drying.

Keywords: grasslands, legumes, Kosovo, distributions, nutritive values, diversity

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1. Introduction

Forage crops and pastures provide the bedrock to sustainable agriculture. Grasslands cover about 70% of the world's agricultural area. They have a crucial role in terms of food production and in the delivery of ecosystem service such as water supplies, biodiversity and carbon sequestration. The grasslands of the world face a range of challenges from climate change including the effects of elevated atmospheric carbon dioxide, increasing temperatures, changes in precipitation regime and higher concentrations of ground level ozone [1]. Forage are defined as the edible parts of plants, other than separated grain, that provide feed for grazing animals or that can be harvested for feeding [2]. Forage plants provide humans with valuable ecosystem services, for example, they feed an estimated 1.5 billion cattle, 1.2 billion sheep, 1 billion goats and 0.2 billion buffalo around the world—supplying meat, milk and 33 other commodities [3]. Forages play a critical role of herbivores in nutrition, and are the foundation of most livestock rations. Nutritional requirements vary among types and classes of grazing animals; thus, what constitutes "high quality" forage for one animal may be "low quality" forage for another. For example, a dry cow will not require the same quality forage as a lactating cow [4].

Livestock production can convert non-edible crops such as the forages into human food, with sustainable intensification possible when the system inputs and outputs are balanced [5]. Forage from grasslands is used to feed livestock and globally represent 26% of the land area, and 70% of agricultural area [6]. Forage crops consist in front of usually in grasses (*Poaceae*) or herbaceous legumes (*Fabaceae*) and some other botanical families. Bulky feeds are also termed forage and are produced from grass, cereal and legume cropping as described above, such as alfalfa, *Lolium* spp. or a mixture of the two. This forage can be provided to animals directly through grazing pasture land or in a processed form, such as hay (where water content is >15%) or dried (pelleted) biomass [7]. Due to the relatively recent forage cropping compared to other agricultural plant species, there were few improvements before 1900. Recently, agricultural trends and the global economic importance of forages, lead to cultivars have been bred by bred cultivars. These improvements are helped by many closely related wild populations which are potential for developing of new lines [8]. Most desirable improvements are increasing dry matter yield, crop durability and diseases resistance to particularly by pathogenic fungus and nematodes, dry matter digestibility, and nutritional content of this tissue. Arguably the greatest improvements have been made in breeding of *Medicago* spp., *Trifolium* spp., *Lolium* spp. and *Festuca* spp. [7].

1.1 Importance of forage and pastures in Kosovo

Actually Kosovo has around 1.9 million resident inhabitants, which mostly lives and works in urban areas. Last 20 years the Kosovar's society faced dramatically changes, lot of rural areas are abounded and consequently the arable lands and animal farms also, but these areas are not use as meadows neither as pasture now.

Based on actual data, the meadows and pastures cover 224410.83 ha of total surface of the Kosovo; moreover there, just a particular of these surfaces are distinguished clearly as meadows or pastures. Last agriculture census found that 65099.00 ha are meadows, 11724.27 ha pastures and 147587.56 ha are not clearly defined [9]. But these surface are used in alternate manner depends to farmers need. Trends of the immigration within or outside the country are quite high and lot of smallholders abandoned agriculture and farming. The number of small ruminants is decreasing year to year, which is affecting pastures disuse, and reduction of other ruminants has impact of the low use of meadows. Moreover, the cities extension and new infrastructure development is playing a huge impact on privation of agriculture land in general. In 30 years Kosovo has lost around 37000.00 ha of meadows and pastures. The largest areas with grasslands are in the mountains of Sharr, Bjeshkët e Nemuna, and Bjeshkët e Deçanit [9] (**Figure 1**).

Pastures are preferential to other animal feed resources, as having high nutritional value, and good taste, meeting nutritional requirements of herbivorous (cattle, sheep, goats, horses, etc.). Animals that feed on pastures have better health because they are daytime in the fresh air and other influence in health [10, 11]. Therefore, this also has an impact on the productivity and fertility of animals, are cheaper meals and there is no need to invest in food preparation, Plots in which grazing is continuously improved has an impact on the grazing quality. The fresh green forages dominate the humidity and this varies depending on the plant stage and ranges from 60 to 80%. Also, the dry matter obtained from new plants has high nutritional value as well as protein over 20%, and often brings up to 25% in dry matter. The amount of protein largely depends on the botanical composition where leguminous plants are dominant. Different factors affect forage crops, i.e., the botanical composition, plant botanical development, type and quality of land, climate, technology of grazing utilization (melioration, fertilization, grazing, etc.).

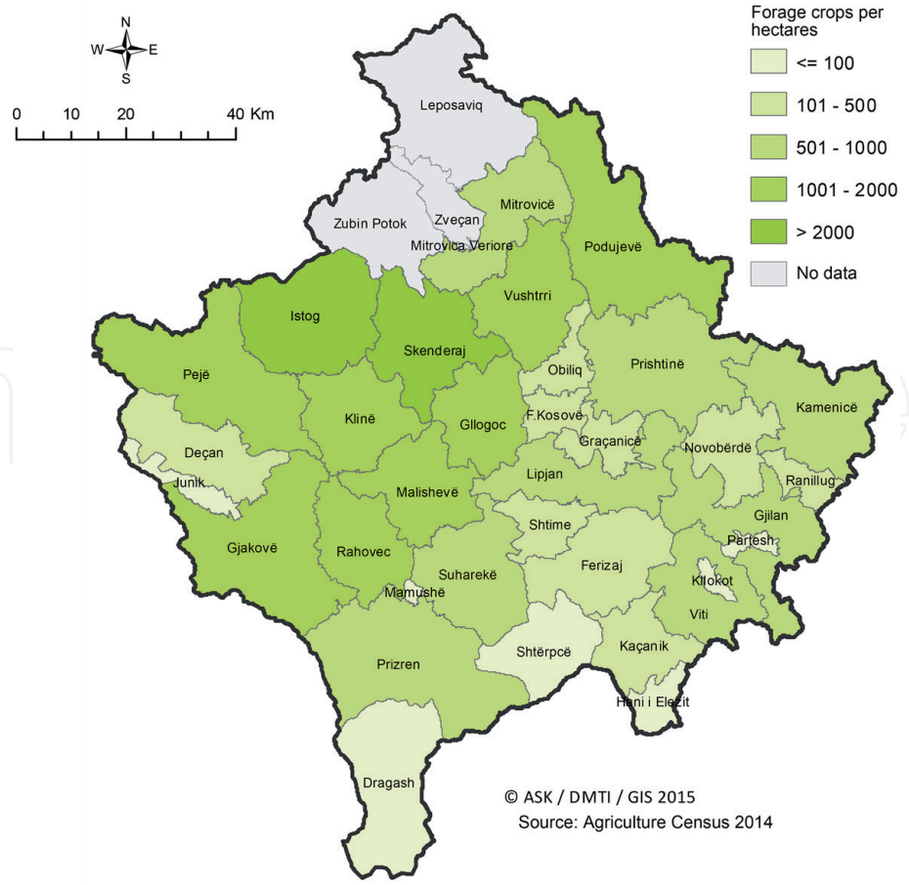


Figure 1.
Surfaces with forage crops in Kosovo [9].

Forages play basic role in Kosovo's beef cattle and milk industry while also enhancing crop diversity, wildlife habitat, and soil ecosystem services.

1.2 Distribution of pastures and forage crops in Kosovo

Meadows (14%) and pastures (30.2%) occupy significant land parts in Kosovo and they are very important source of fodder for feeding the livestock and protecting soil from against erosion [10, 12, 13]. Plants from *Poaceae* family are the basic forage crops which are dominantly in Kosovo. This group of herbs is divided into long, medium, and low herbs. Medium and long seeds are best suited for mowing and silage or drying for sanitary preparations, while short herbs are very suitable for grassland. In this group of plants many years old herbs are of great economic value, because they represent basic green foods in meadows, and artificial meadows. Intensive meadows and pastures can be found on over 2000 types of herbs [14]. *Trifolium* spp. has different distribution according as administrative region of the Kosovo. Peja's region covers the largest surface with *Trifolium* spp., or 34% of total areas 2084.50 ha (**Figure 2**) followed by Prishtina and Mitrovica regions.

In some extensive pastures highlighted about 200 species per 1 ha. This kind of herbs has high energy value. Moreover legumes which are also key components which were the participation of this group the pastures, where the participation of this group significantly increases the nutritional value of pastures. Legumes greatly contribute in creating and developing artificial grasslands and higher valuable mulching surfaces that produce higher yields that can be used for silage by drying. The most important types of fodder plants in Kosovo are: alfalfa (*Medicago sativa* L.), red clover (*Trifolium pratense* L.), white clover (*Trifolium repens* L.), Italian ryegrass

(*Lolium multiflorum* L.), bird's-foot trefoil (*Lotus corniculatus* L.), red fescue (*Festuca rubra* L.), etc. Surface of 15010.77 ha in Kosovo is cultivated by alfalfa. This specie covers 40% in regions of Prishtina and Prizreni, followed by Peja and Mitrovica region (**Figure 3**).

The *Poaceae* is the fourth largest family of flowering plants after the *Orchidaceae*, the *Compositae* and the *Leguminosae* [15]. One of the reasons for growing species in mixtures is getting a high nutrient feed with a balanced nutrient compounds [16]. Even in the natural meadows, a very large number of perennial legumes have been added, which add to the value of pastures. Their number in pastures and meadows is nearby 100 different types. Analyzing the floristic composition pointed clearly mainly of mesophilic with elements of xerophilic plants conditioned by relief shape and soil type. Mixture meadows are present in all sides of the country, but the largest surface, of total surface 6689.22 ha, is in Prishtina region or 32% whereas

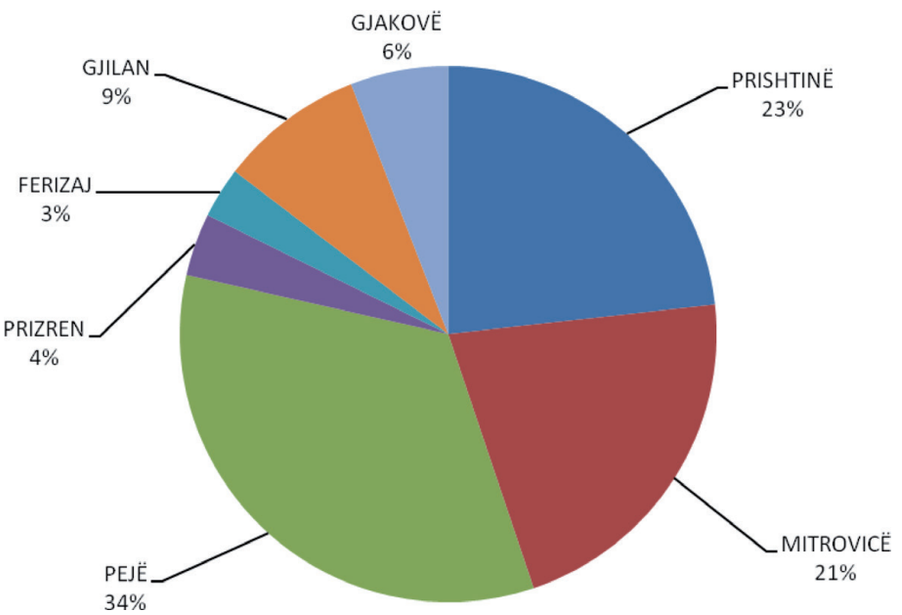


Figure 2.
Distribution of Trifolium *spp. by across Kosovo [9].*

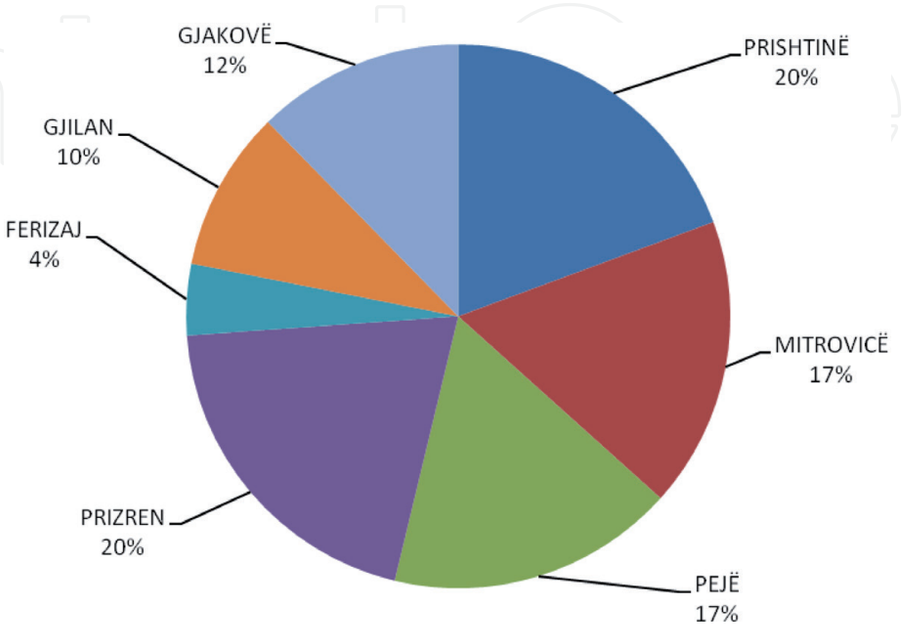


Figure 3.
Distribution of alfalfa by across Kosovo [9].

the Gjakova's region has the only 3% of surface with this forage. Distributions of the mixtures of meadows are presented in **Figure 4**.

In general, there is quality of the forage to the greater animal production response. While the concept of forage quality is fairly simple and straight forward, in reality it is rather complex. Furthermore, good management practice in grasslands provides high potential of carbon sequestration in soils, resulting in climate change mitigation.

1.3 Plant diversity of forage crops and pastures

Forage genetic resources play a very important role in food security and poverty alleviation, particularly in developing countries. Grasslands are among the largest biomes in world. Their area is estimated at and cover about 52.5 million square kilometers or 40.5% of the terrestrial area, excluding Greenland and Antarctica [2]. In the West Balkan (WB), the most important legume forage crops are alfalfa (*Medicago sativa* L.) and red clover (*Trifolium pratense* L.), which are mainly used as single N-fixation crops and rarely in mixture with grasses [17]. Alfalfa monoculture is still prevalent in Europe, where it is the backbone of organic crop-livestock systems, also significantly contributing to conventionally managed systems [18]. However, grass–legume mixtures are gaining new interest in Europe and elsewhere, owing to the energy and environmental costs associated with the synthesis and use of nitrogen fertilizers [17]. Sown pasture within arable rotations is important, mainly in temperate regions, for livestock production and fertility maintenance in rotations. Cut and carry fodder is locally important, especially for smallholders. Because mainly of the farmers in Kosovo store forage crops, i.e., Alfalfa for a longer period of time, to serve the animals as dry feed especially during the winter season.

1.4 Nutritive values of forage crops

Forage nutritive value partly depends on the available of nutrients in the plants for animals. Legumes also meet the requirement for greater self-sufficiency of feed proteins at the farm and the country levels [19]. Grass-legume mixtures are preferred over pure-grass forage stands throughout the world because they often increase the total yields of herbage and protein and offer balanced nutrition [20].

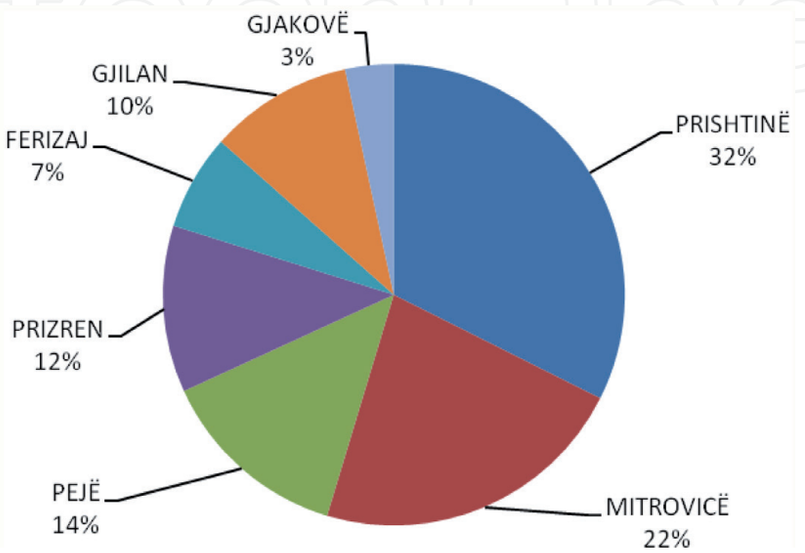


Figure 4.
The distribution of mixture meadows across Kosovo [9].

There are several grass species which could be successfully grown with legumes. Orchard grass (*Dactylis glomerata* L.) has been species of the favorite grasses for meadows in West Balkan (WB) due to its high annual forage yield and its ability to re-grow quickly after being cut or grazed. Tall fescue (*Festuca arundinacea* Sherb.), red fescue (*Festuca rubra* L.) and Italian ryegrass (*Lolium italicum* L.) are among the best forage grasses used in WB due to higher forage yield, fast re-growth and winter hardiness. In the point of view of yields (Dry Matter/ha), experiments at levels of Kosovo as well as the WB highlighted: (1) Association of Red Clover (RC) + Italian Grass (IG) was 12.0 t/ha DM; (2) Bird's-foot trefoil (BT) + Red Fescue (RF) 7.4 t/ha DM; (3) While the only Red Fescue (RF) provided 8.8 t DM [17]. As far as the nutritive values are concerned, combining RC + IG resulted in 11.38% Crude protein (CP) 33.90%, Crude Fiber (CF), 64.85% Neutral Detergent Fiber (NDF) and 38.19% Acid Detergent Fiber (ADF). The only Red Clover (RC) showed 10.69% CP, 33.32% CF, 72.63% NDF and 37.14% ADF [17]. The protein content (PC) is a quantitative trait and several studies have pointed out that there are a great number of genes involved in its control [21]. However, it is a challenge to manage the mineral supply of ruminants fed on grassland, because mineral concentrations in the herbage are influenced by a number of factors including species composition of the sward [22].

2. Conclusions

Forage genetic resources play a very important role in food security and poverty alleviation, particularly in developing countries. The distribution of plant species and their frequency differed from a location to another in Kosovo. Meadows (14%) and pastures (30.2%) are a significantly in Kosovo and appeared to be the key resources for feeding livestock and protecting the soil from erosion. Definitively forages play an important role in Kosovo's beef cattle and milk industry while also enhancing crop diversity, wildlife habitat, and soil ecosystem services.

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