IMPROVEMENT OF NATURAL GRASSLANDS IN TAJIKISTAN

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Abstract. *The article presents methods to improve the productivity and floristic composition of natural grasslands used as transition pastures in Muminabad district, Tajikistan. In this region livestock is moving annually from winter pastures to summer pastures. The number of the animals implied in this transition is 3 million heads. The author carried out the botanical surveys of the experimental plots with the aim of comparing their modification. Before selecting the experimental plot and set the experiments there has been determined the vegetation of the pasture, considering floristic composition and consumption of natural vegetation. In order to determinate the yield of fodder crops there was sowed sainfoin (Onobrychis viciifolia), alfalfa (Medicago sativa) and a mixture of these legumes with meadow fescue (Festuca pratensis). Before sowing the seeds, the surface of the soil was treated with a Chinese two-wheel tractor (15hp). Sowing of fodder crops carried out in spring time, beginning of February 2018. For the obtaining of fodder crops yield there were used mineral fertilizers as ammophos (N-12P_2O_5-52) and carbamide (NH_2)$_2$CO. Experimental field has a total area of 1800 sq. meter, which was 20 sq meter for each plot. The results of our research showed that the highest yield were obtained from legume – grasses mixture, respectively 7.9 t/ha for sainfoin mixture with meadow fescue..*

Key words: pastures, natural grasslands, fodder crops, sainfoin, alfalfa, meadow fescue.

INTRODUCTION

Tajikistan is a mountainous country in Central Asia. Total area of the country is 143,1 thousand sq. km which is 93 percent is covered by mountains. Arable land represents only 7 % of the total territory of the country. Relief of the Republic is represented by formations from the altitude of 300 meters to 7495 meters above the sea level. The total area of pasture land of Tajikistan in the year 2017 is 3.8 million hectares, almost 29 % of the total land area of the country (*Statistical Book*, 2017). In Tajikistan pastures are divided in: winter pastures, spring and autumn pastures, summer pastures and year-round pastures according to the seasonality of use during the year. The improvement of natural grasslands occupies a special place in ensuring food safety of the country and decrease the poverty level of the population. However should be noted that in the world two thirds of the milk and meat is produced from the pasture feed. In last years in the country occurs the degradation of the pastures mainly due to overgrazing. The average productivity of pastures is 0.2–0.3 tons of fodder per hectare, with forager valuable plant species among 30 % and 65 %. (JUMABAEVA, *et. al.,* 2017).

The main reason of the unsustainable livestock development and feed production is the lack of quality and balanced feed (IVANOVA., *et. al.,* 2012). Modern condition of feed production restrains the further development of livestock. The solving of the feed problem will allow to the livestock to reach a high efficiency level. One of the factors of creating sustainable system of feed production is the development of a comprehensive program for the development of the farming system at regional and national level to have the force of law (LARETIN. *et al.* 2013).

Legumes were used only slightly, but in the last thirty years, large-scale studies on the inclusion of legumes in mixture with grasses (*Poaceae*) stands gave encouraging results (Tampere, 2013). Sainfoin is one valuable source of vegetal protein. The species has high fodder productivity potential, it does not cause tympanitis to the livestock, it has productive longevity, good seed production, is more resistant to drought compared with red clover (Trifolium pratense) and alfalfa (Medicago sativa). This is a high-yielding fodder crop, it has been highlighted by numerous researches and results of production trials (KASHEVAROV. *et al* 2013). Alfalfa is more productive, but it is possible to sow it only in fields free of weeds. Starting from the second year of life, alfalfa is able to form high-yields of fresh fodder, respectively 40-50 t/ha with high nutritional value (IVANOVA.,. *et.al*., 2012).

Vegetation is one of the key factors affecting soil erosion in semiarid environments. The evaluation of the influence of sainfoin and alfalfa on soil erosion can provide important information regarding soil and water conservation. In this case we have selected for research 1800 sq. meter of degraded pasture of the Muminabad district located in the eastern part of Khatlon province. Muminabad District is a mountainous area in the south-west of Tajikistan. Like many other areas of the country, this area faces with severe degradation of the vegetation and soils due to the unsustainable use of the pastures.

MATERIALS AND METHODS

The scientific research has been carried out in the year 2018 in the southern side of the foothills from Buston village, Muminabad district, the research field being located at an altitude of 1180 metres above the sea level. Muminabad is a mountainous area in the southern Khatlon Oblast region the hills covering a great part of the territory. Nevertheless agriculture is the most important sector of income. Total area of the Muminabad district is 880.6 sq. km. The total area of pasture land of Muminabad district is 35.7 thousand hectares.

Annual precipitation amount is comprised between 900 and 1100 mm with the main rainy season between March and June. Climate of the district is continental, the maxim temperature during summer is about $+39°C$ and minimum about $-15°C$ during winter; the average temperature is $+28°C$ in summer and about zero during winter. The coordinates of the experimental plot is: latitude N 38°4'48'' and E 69°58'56'' longitude.

For fodder crops sowing there have been selected the following grasses *(Poaceae)* species : orchard grass *(Dactylis glomerata)* - variety Targyl, brome grass *(Bromus inermis)* - variety Zhalin, wheatgrass *(Agropyron)* - variety Peri., meadow fescue *(Festuca pratensis)* - variety Kyrgyzskaya.

From the legumes family *(Fabaceae)* there have been seeded the following species and varieties: sainfoin *(Onobrychis viciifolia)* - Tajik variety Istiklol and Siyahkuh; and alfalfa (*Medicago sativa*) Tajik variety Vakhsh -270 and Vakhsh-300. Before sowing the seeds, the surface of the soil was treated with a disk harrow on the depth of 4-5 cm, with a Chinese two-wheel tractor (15hp). Sowing of fodder crops carried out in spring time, beginning of February 2018.

For the improvement of soil fertility there have been applied mineral fertilizers such as ammophos (NPK) mixture 35 kg/ha active ingredient and carbamide $(NH_2)_2CO$ 25kg/ha active ingredient. The seeds of grasses were imported from the Kyrgyz Scientific Institute of Animal Industries and Pastures, Republic of Kyrgyzstan and the used Tajik seeds were received from the State Seeds Control Inspectorate , Tajikistan. The experiment was carried out

in a Randomized Complete Block Design with four replications. Total area of experimental field was 1800 sq., meter distributed in 7 variants (from those one control variants) each plot size was 20 sq meter. Sowing was made by hand, on February 2018, according with the experimental techniques requirements (Dospekhov, 1985). To determine the fresh yields, were cut the plants from 1 sq. meter in four replications from each plot. After four cuts in the experimental plot, harvested fresh fodder were weighed.

RESULTS AND DISCUSSIONS

Pastures in Tajikistan are divided in several categories according with the grazing season in winter, spring - autumn, summer and year round pastures (Table 1). In Muminabad district are three types of pastures: winter pasture, spring - autumn pastures and summer pastures.

Table 1

Pasture types in Tajikistan

Pastures	Winter	Spring-Autumn	Summer	All-year
Altitude (m a.s.l.)	500-1200	900-1500	2200-3500	500 to 1000-1200
Grazing period	November-March	March-April and September-November	June-August	All year
Days in use	120-150	100-130	80-90	310-320
Total area by 2017 year, thousand ha	675,7	701,8	2061,5	389,6
Percent of total pasture area (%)	17,6	18,3	53,8	10,2
Average yield dry matter (t/ha)	0,1 - 0,2	0,4-0,7	0,7-0,8 to 1-1,3	0,1
Distance from village (km)	0,8-1,4 to 4-5	2,2-2,8 to 30	200-500	0,5-2 to 5

Sources: Regions of the Republic of Tajikistan, (Stistical book, 2017).

The total area of pasture land of Muminabad District in the year 2017 was 35.7 thousand hectares (Statistical book, 2017). , The winter pastures and spring and autumn pastures represent 3753 hectares, about 11 % from the total pasture area (Fig. 1).
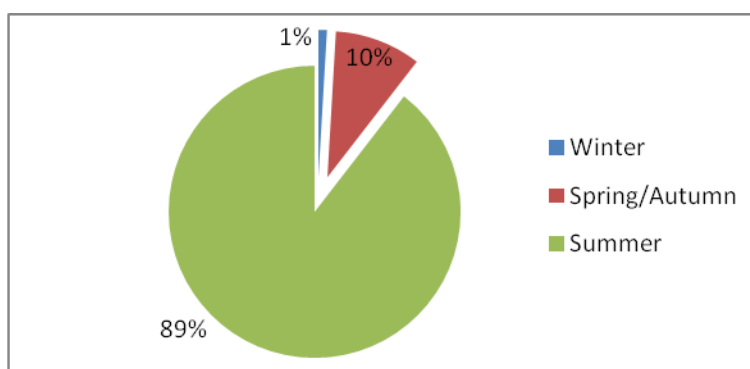

Fig. 1. Area of pasture land by category in Muminabad district
Source: Regions of the Republic of Tajikistan, Statistical book, 2017

Table 2 shows the results obtained in the experimental variants of grassland improvement with fodder crops and mineral fertilizers.

Table 2

Fresh fodder yields from the experimental variants (t/ha)

№	Variant of research	Obtained	
		Fresh fodder (t/ha)	Compared with control (t/ha)
1	Sainfoin, sowing rate 50 kg/ha	7,3	+ 5,2
2	Alfalfa, sowing rate 12 kg/ha	4,6	+ 2,5
3	Sainfoin + meadow fescue, sowing rate (50 kg/ha +12 kg/ha)	7,9	+ 5,8
4	Alfalfa + meadow fescue sowing rate (12 kg/ha/12 kg/ha)	6,2	+ 4,1
5	Natural grasslands (Control)	2,1	---
6	Ammophos (N-12P_2O_5-52) 35 kg/ha active ingredient	3,9	+ 1,8
7	Carbamide46% $(NH_2)_2CO$ 25 kg/ha active ingredient	4,1	+ 2,0

In the first harvest it was noticed that the development of the sown crops on pastures was advanced due to the accumulation of a high amount of biomass, there being evidenced the dynamics of the grasses yield linear growth, which was twice greater than the natural grassland.

Comparing the variants of fodder crops the highest yield was obtained from Sainfoin + meadow fescue mixture, respectively 7.9 t/ha that is greater than control of unimproved grasslands with 5.8 t/ha. Higher yields were obtained in the fertilization variants too. Thus, in the variant fertilised with carbamide $(NH_2)_2CO_{46}$, respectively 25 kg/ha active ingredient were obtained 4.1 t/ha fresh fodder, respectively 2 t/ha greater in comparison with the control.

However, climate change is expected to adversely affect Tajikistan's agricultural practices through changes in the regime of precipitation, temperature and carbon dioxide concentration. The review of literature shows that changes in rainfall and water resources will have impacts on crop yield, crops water requirements and income and welfare of farm families (VAHID KARIMI, *et al*., 2018).

Legumes presence in mixtures improves the quality of the forage biomass, mainly due to the crude protein content. In this way Viliana Vasileva (2018) considered interesting to follow the indicators related to the basic chemical composition of the forage biomass from mixtures of sainfoin with cocksfoot and with tall fescue after the addition of a second legume component in the mixture.

CONCLUSIONS

Increase of the productivity of animal husbandry is often associated with the implementation of advanced technologies, increase of the production of high protein feed, the balance of diets on the most important indicators, respectively energy and protein, as well as the protection of livestock. The result of the first year showed that mixture of legumes (Fabaceae) with grasses (Poaceae) was greater than control. Considering the data obtained at the first harvest, we have concluded that, use in the mountain area of highly productive forager crops for grazing, is recommended by using perennial crops mixtures of legumes (Fabaceae) with grasses (Poaceae), this increasing the pasture productivity even several times. However should be noted that, use of the mineral fertilizers also increases the yield of pastures.

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