IMPROVEMENT OF THE AGROLANDHAFT STRUCTURE DUE TO THE CULTIVATION OF PERENNIAL GRASSES ON ERODED SOIL

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Abstract

As it is known, natural steps are not just a value of forage production. Most of them occupying an intermediate position between arable land and water areas and the especially dense branch network, they have a high conservation role in agricultural landscapes: they protect the soil from erosion, the riverbanks of the rivers from clogging and channel destruction. However, forests also serve as a second powerful natural bio filter surface factor of water and soil, in fact, they form the quantity and quality of water resources in Ukraine. The purpose of the paper is to highlight the phytocenotic agricultural ecological bases and the agrotechnical basis for the formation of high productivity grass mixtures, their fertilization and their management.

Key words: forage, productivity, grass mixtures

Negative attitude towards soil nature, which has taken place for decades, intensive agricultural systems based on chemical substances have led to significant soil degradation, disturbing the ecological balance of agricultural ecosystems, determining the quality of agricultural products, contaminating radionuclides, heavy metals, carcinogens, pesticides, various chemicals. An alternative to this groundless attitude is the development of environmentally friendly agricultural systems that eliminate all problems of agricultural chemicals based on intensive agriculture.

The successful solution of the problem of growth in milk and meat production is only possible by creating a strong feed base, offering a complete and high quality variety of animal feed. With the increase of cereal production, the implementation of measures to intensify the field of forage production plays an important role in creating a forage base belonging to natural pastures. They often form the main feedstock for cattle during the summer season and are an important source of production of various types of cheap feed.

According to the improvement of technology and the use of natural pastures, they are able to provide 5.0-7.0 t / ha, and through irrigation - 10.0 t / ha of nutritional units. However, the productivity of natural pastures in the region until recently is too low (1.0-1.2 t / ha nutritional units). All of this leads to a lack of feed, adversely affecting the animal feed base. Especially by the very high share of arable land feed, in most cases, based on the high energy technology and cheap herbal feed sources in the production structure, especially in the energy and environmental crisis, the production of animals is reduced.

MATERIAL AND METHOD

The researches were carried out in 2014-2016 on the field of forage research of the ASA Institute of Forages and Agriculture in Cernăuți Ukraine. Black soil of slightly hydrolysed calcined chernozem, 0-30 cm of arable layer, was found to contain 13-14 mg nitrogen, mobile phosphorus forms - 9-10 mg, exchangeable potassium - 16-18 mg / 100 g, soil pH salt extraction - 6 5. Fertilizers (ammonium nitrate) introduced in spring, in the first and second mowing. Climatic conditions during the vegetation period (months IV-IX): precipitation, mm - in 2014 - 367.8; 2015 - 347.2; 2016 - 624.4; air temperature, ^{0}C - in 2014 - 18.4; 2015 —18.9; 2016 - 17.7

RESULTS AND DISCUSSIONS

Plow land, which is 2 times larger than normal (Merejco A.I., 1985, Polișciuc V.V., 1984 Rossolimo L.L., 1977), has an increasingly negative impact on the ecological situation not only in this region, but also in general in Ukraine, in particular regarding the reduction of water

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content in relation to the territory, sedimentation and pollution of the reservoirs.

Land reclamation works by creating long lasting mixtures with high water and soil protection carried out not only on meadow land, but also on agricultural land, especially in the rivers in the environment area is one of the most important tasks of the agricultural science and practice.

This underscores the need to study patterns of meadow fodder plants and to develop practical measures to create them, by efficiently using the genetic potential of plant resources, especially perennial leguminous and herbs, as well as using modern technologies for care and their use, including their structure and functioning in the autotrophic block.

From the study of the natural characteristics of the meadow ecosystems, the development of the scientific bases of the creation and rational use of the natural pastures has been carried out through many research experiences in our country and abroad (Andreev Lugovedenie N.G., 1971, Bogovin A. V., 1968, Kutuzova A.A., 1986, Kurgac V.G., 2006, Macarenco P. S., 1991, Minina I.P., 1970, Tomre R., 1974, Zurn F., 1972).

However, many fundamental questions regarding the creation of grasslands in the climatic conditions of forest steppe in western Ukraine have not been studied. The technological methods of their creation are energy consuming, taking into account the ecological, biological and phytocenotic factors, including potential species and new varieties of legumes and grasses, methods of forecasting and managing the performance of the cultivated grass since the improvement of their structural and functional organization. of the doses and proportions of fertilizers, irrigation and use of cenoses with great preservation properties of sown grass and introduction. For natural grasslands used for intensive cultivation, there must be slopes of more than 3°, flood zones and non-productive soils. Conditions for the supply of fodder grass for livestock thus significantly improve them.

According to the experimental data of the ASAU Institute of Fodder and Agriculture, meadows with mixtures of leguminous and grass of grass are preferred, because in the first years of use of forage plants a good harvest can be obtained, without nitrogen fertilizers and to increase the yield of protein. 1.5 times.

In our studies leguminous (red clover, alfalfa and others) accumulate an amount of biological nitrogen equal to 120-180 kg / ha nitrogen annually *(table 1*).

In order to prolong the harvesting period of the grass in optimum terms in each mowing period for 20-25 days, to improve the quality of the forage and the more efficient use of the labor force and the technique for the harvesting of the forage, grass mixtures should be sown with different maturation periods.

Scientific data from the Institute of Forage and Agriculture of the National Academy of Agricultural Sciences of Ukraine indicates that when the slopes are sown with four components: two leguminous and two grasses, they are more durable and more productive, they grow well in different weather conditions and on different soils. In the first 2-3 years, the grass contains at least half of the leguminouss, when the development is weak of one or two components, the grasses that have been preserved form a normal grass composition *(table 1)*.

Not taking into account the rapid development of the nitrogen fertilizer industry, the need for partial replacement of mineral nitrogen in meadows with the biological one increases for the following main reasons: 1) Nitrogen fertilizer production is a costly process (9 times as expensive as the symbiotic one of the leguminous plants) (Mișustin E.N., 1979); 2) the introduction of high doses of mineral nitrogen to produce a large harvest is dangerous for the environment (Sotnicov S.V., 1983); 3) the production of nitrogen fertilizers on meadows, especially in Ukraine, is insufficient.

Creating a mixture of herbs with a high content of legumes - is one of the most promising for the intensification of grasslands in Ukraine. Partial replacement of the mineral reserves with the symbiotic nitrogen reserves is an important reduction of the energy consumption, whose weight in the cereals mixes of intensive type often represents half of the total costs (Bogovin A., 1993, Kurgac V.G., 2006).

The arid conditions of 2015 have had a negative effect on the yield of herbs and, as a result, a large harvest is obtained only in the first crop.

The same trend was observed in the collection of nutritional units, digestible protein and exchange energy.

So, together with effective measures to solve the economic problem of increasing the production of cheap herbal feeds and improving them, a prominent place also occupies the creation of specially cultivated pastures instead of the degraded natural and degraded agricultural lands, especially on slopes, and soils with dangerous erosion in the agrolandhaft area. This is due to the fact that meadow crops play an important role, being in the danger zone of erosion; they fulfill their role of high conservation in agricultural

landscapes, are specific biofilters that maintain surface runoff and, due to their high absorption, act as reservoirs.

Table 1

Productivity of different types of multiannual grasses used as hay (2014-2016)

Mixtures	Harvest, green mass, t/ha				Harvest on 1 ha			
	Years			average	Dry subst, t	Nutrit. units,t	Digestib protein, t	Exch energy GJ/ha
	2014	2015	2016					
1. Cereal mixture - *Bromus inermis Leus* (12 kg / ha) + *Festuca pratensis Huds* (9) *Phleum pratensis Huds* (2) + *Arrhenatherum elatius* L (3)	16.4	6.3	228	152	2.83	2.13	0.269	2.83
2.Grain mixture + N45	25.0	14.3	28.0	20.2	3.75	2.81	0.356	3.75
3.Grain mixture + N90	32.5	26.0	31.5	27.0	5.02	3.77	0.477	5.02
4.Grain mixture + N180	42.5	29.7	37.5	32.9	6.12	4.59	0.582	6.12
5.Mixture of cereals (50% of the full norm) + *Trifolium pratense L* (I2 kg / ha)	45.0	30.4	38.8	38.1	6.86	5.56	0.750	7.13
6.Grain mixture (50% of full norm) + *Lotus corniculatus L* (5 kg / ha)	40.0	14.6	17.0	23.8	4.05	3.24	0.443	4.21
7.Mixture of cereals (50% of the full norm) + *Trifolium repens* (10 kg / ha)	32.0	19.2	18.2	23.2	4.16	3.33	0.455	4.32
8.Grain mixture (50% of full norm) + *Medicago. sp* (10 kg / ha)	45.0	27.4	421	38.1	6.50	5.25	0.845	6.50
9. *Medicago. sp* (20 kg / ha)	46.0	23.5	56.9	42.1	7.16	5.73	0.988	7.16
10. *Trifolium pratense L* (20 kg / ha)	45.0	46.0	32.5	41.1	6.99	5.59	0.783	7.27
DA - 0.95 t/ha	1,12	1,43	1,3					

Bioenergy assessment of perennial herbs. Human productive activities in agricultural production, as in other fields, are reduced to the processes of energy conversion by various technologies. At the same time, the energy consumption per unit of production increases significantly. Numerous experimental data suggest that, at the current level of agricultural development, in order to increase the productivity of crops 2 times, it is necessary to increase 4-10 times the total energy costs (Klapp E., 1961, Kirilesco O.L., 2012).

In the production of fodder, on the value of the energy consumption, the crops and their relation in the structure of the sown surfaces, the optimization of the rotation system of the placement crops, depending on the soil and the environmental conditions and the distance from the production centers to the distribution spaces, have a significant importance, within the soil fertility restoration culture.

In the growth of perennial grasses, the energy exchange efficiency per hectare ranged between 28.3-72.7 GDj *(table 1)* and was the lowest during the sowing of the grasses without fertilization; the most expensive for growing perennial herbs is the technology that uses the introduction of N_{180} to perennial grasses, energy per hectare has been growing 32.3 GDJ. Natural energy was used at the sowing of alfalfa and clover and in mixtures with grass grasses *(table 2)*.

The energy efficiency rate here is 5.24 - 4.24, while in pure grass seed sowing is 1.89 - 4.26. Thus, each total mega joule of energy spent for the cultivation of alfalfa, clover and grass mixtures, makes it possible to obtain energy yields 27.6 - 41.0% higher than when planting herbs in monoculture. Similarly, the technology and the reimbursement of the total costs of the exchange energy in the crop varied *(table 2)*.

Under acute energy shortages, high and unstable prices for agricultural machinery and fertilizers, the evaluation of the efficacy of feed production technologies and separate processing methods should be based on energy equivalents, which together with the traditional economic method makes it possible taking into account the energy that accumulates in the culture, as well as the living energy. It must also become one of the main factors in shaping the price policy in the field of feed production.

Table 2

The bioenergetics efficiency of perennial herbs in 2014-2016

Mixtures	Total energy consumption		Coefficient of energy efficiency	Energy consumed at 1 production center, MDj	
	GDj / ha	in oil, kg/ ha		nutrition units	digestible protein
1. Cereal mixture - *Bromus inermis Leus* (12 kg / ha) + *Festuca pratensis Huds* (9) *Phleum pratensis Huds* (2) + *Arrhenatherum elatius L* (3)	6.95	139	4,26	246	2583
2.Grain mixture + N45	15.9	318	2,36	566	4466
3.Grain mixture + N90	25.2	504	1,99	668	5283
4.Grain mixture + N180	32.3	650	1,89	704	5550
5.Mixture of cereals (50% of the full norm) + *Trifolium pratense L* (l2 kg / ha)	13.6	272	5,24	245	1813
6.Grain mixture (50% of full norm) + *Lotus corniculatus* L (5 kg / ha)	11.1	222	3,79	343	2410
7.Mixture of cereals (50% of the full norm) + *Trifolium repens* (10 kg / ha)	10.7	214	4,04	321	2352
8.Grain mixture (50% of full norm) + *Medicago. sp* (10 kg / ha)	15.3	306	4,24	267	1810
9. *Medicago.sp* (20 kg / ha)	14.5	290	4,93	254	1467
10. *Trifolium pratense L* (20 kg / ha)	14.2	284	5,11	254	1814

In the production of fodder, on the value of the price policy in the field of feed production

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