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Tracking of occurring degradation processes and comparative assessment of winter pasture lands in Azerbaijan

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Abstract:

The study presents the results of soil assessment based on bonitet value scale of winter pasture lands in Azerbaijan. The basic and total bonitet scales are developed. Soils of Jeyrancol pastures received the highest average score of 61, whereas for Kur-Araz lowland the bonitet scores were calculated as 56 respectively. The average weighted score of all winter pastures in Azerbaijan equals 56 which indicates that pasture lands in the country are in need of improvement and protection based on scientific recommendations

Keywords: assessment, fodder lands, bonit, winter pastures, soils, desertification, fodder plants

INTRODUCTION

The winter pastures of Azerbaijan are very diverse due to their natural and geographical conditions and vegetation. First of all, it is connected with the climatic conditions of our republic. Areas where natural forage crops are spread include seasonally used summer and winter pastures, meadows and year-round village lands. The lands of this category have some differences in their legal status. Thus, summer and winter pastures are kept in the state ownership and are granted to individuals and legal entities for short-term and long-term use.Meadows and agricultural lands were kept in the municipal

property by public use. The total area of feed areas is 3,396,400 hectares, or 39.3% of the total area of the country. Of these, 113,400 ha are covered with meadows, 1460,000 ha with winter pastures, 589.5 ha with summer pastures and 1,233,400 ha in rural areas. In total, the total area of summer and winter pastures in Azerbaijan is 2049,500 hectares, which is able to feed 2 million animals at optimum size without damaging the natural structure of plant formations and maintaining its reproduction capacity. Given that some of our pastures are temporarily under the control of the Armenian invaders, and there are about 8 million large and small horned animals in our republic, this led to overloading of summer and winter pastures.

One of the most useful plants in winter pastures is annual grasses. Plants which are included in the family of cereals are always well developed in early spring and produce green fodder. There are the annual cereal grasses are relatively small in the composition of the green grass cover that emerges in the spring in winter pastures located in foothill areas. Annual cereals, hard darnel, south dranel, Iranian dranel, east jerusalem and jerusalem. It is more common in winter pastures. Apart from the annuals, perennial grasses are also important in the formation of winter grasses. For example, tight meadow-grass, sinae meadow-grass, onion meadow-grass etc. It is one of these herbs. Different wormwood species, which are typical for wormwood pastures, are also important in the formation of winter grassland grass cover. Several species and diversity of alfalfa and opium poppy are also considered to be very common in some grassland areas. There are bush and ephemeral plants are developing as the black saline, halostachys, potash plant bushes, sea blite, itsegek etc., which are formed a mixture cover in salty deserts. The vegetation cover is widespread, as well as winter grass, which is halostachys, saltwort bushes, salsola. In the winter pastures of the Republic, semi-desert vegetation is more prevalent than desert cover. Semi-desert plants differ in their nutritional quality because they differ from desert-type plant species due to their development, living conditions, botanical structure, chemical composition, biological and economic characteristics. As a rule, the main feed stock of semi-desert pastures are ephemeral. [1]

Studies show that along with the erosion processes in winter pastures of the republic (Jeyranchol, Kura-Araz) and mowing areas, salinization, swamping, and flood have accelerated their degradation.

Figure 1.Orthophoto imagery of erosion processes in winter pastures

Approximately 201,000 hectares, or 15% of the area under feed, has been subjected to salinization, swamping and flooding, and thousands of hectares have been illegally plowed into habitats and the process of desertification has accelerated.

Figure 2.Orthophoto imagery of degradation and desertification in winter pastures

Violation of ecological balance in arid provinces has slowed economic activity in recent years, seriously affecting the biodiversity of landscape complexes and, thus, creates conditions for the desertification process. At the same time, because the natural complexes of arid areas have an unstable structure, the change of one of the natural components here has a major impact on others. [2,3]

In modern conditions, a group of researchers view desertification as a process of change and others as a result of the

process of change. As a process of change, it is understood as a gradual decline in the biological productivity of arid and semi-arid ecosystems, and as a result of the change, desert conditions are created.

Arid covers all forms of desertification degradation in climatic zones and results in the reduction or destruction of the biological potential of soils, as well as the decline in living conditions.

As a result of the economic activity of people, the area of natural vegetation has not only decreased, but also the structure of the vegetation cover has changed dramatically. Thus, in many areas that were planted, plowed and then empty, weeds and low-quality plant cover were formed and developed in large numbers. The vegetation cover of the area consists mainly of desert and semi-desert vegetation.

Desert vegetation is generally located at an altitude of 100-150 m above sea level, starting at an absolute height of 20 m below sea level. The lands of such areas have been saline to varying degrees. The semi-desert vegetation is mainly found in sloping plains and valleys. Their absolute height ranges from 100 m to 200 m above sea level. Most of the plant life forms in the desert zones are made up of shurbs, semi-shurbs and annual ephemeral and ephemeroids.

Desert phytosinoses are dynamically associated with the main valley plants in the ecological typological relationship and form a transition to semi-desert forms. The transition of desert phytosinoses to semi-desert is usually associated with a decrease in salinity, rising of area, prevalence of wormwood, as well as ephemeral plants. The transition to semi-desert areas of desert formations is mainly due to the transition to saline and wormwood-saline plants. [6]

Desert vegetation corresponds to different variations of saline deserts, which are also derived from different types of saline grass, as well as from other xerophytes, xerophore and xerophytes. [7]

One of the salty forms of the plain is the Khalili desert. Between the salty deserts, the saltwort desert creates a view. Wormwood-saline deserts are also spread in the area, with various variants – wormwood saltwort, wormwood salsola and others more noticeable.

The irreversible change in soil and vegetation cover and loss of biological productivity of arid lands can lead to complete destruction

of the potential of the biosphere in the extreme cases and desertification of the area.

Therefore, the ecological problems of fodder fields, summer and winter pastures and meadows require a broader approach.

Introduction

Currently, environmental aspects of protection and use of natural resources are well studied, and the preference is placed on nature conservation and development of efficient and rational resource use programs and projects. Methodological bases of the procedure for assessment of quality properties of soils, hence "bonitirovka", were developed by V.V. Dokuchayev and N. M Sibirtsev[2]. Furthermore, G.Sh. Mammadov evaluated soils of pasture lands of the western part of Mill lowland by employing the principles of agro-ecology [3].

The land, as the main value of Azerbaijan peopfc. must be registered, guarded and used effectively. The main means in this field are realization of the state landcadastre.

Author considers and analyses problems which appear in the reflect of reform - new form of land property, a number of new users and farmers, participation of the foreign juridical and physical persons in the land relations of Azerbaijan and complication the land relations, the rising of the meaning of land cadastre and its regulated and managing functions.

These measures have been started from : -. economical estimate of the land in the 30-s years of the last century and formed in 70-80-s years.

After acquisition the sovereign by Azerbaijan main attention have paid to the forming of the juridical and scientific and theoretical problems of the land-cadastre service bases and to problems of rebuilding of the land cadastre services in a new economical conditions.

There also given detail information about the management rules of the land-cadastre measures in the foreign countries.

The values of the bonitet (i.e. units of measurement of the bonitirovka scale) scale for pasture lands are developed with consideration of climatic conditions of a location. Ecological-bonitet groups provide an overall indication of biological productivity of soils and comparative advantages of pasture lands.

According to G. Sh. Mammadov, the indicators of natural soil characteristics should be taken as assessment criteria for bonitirovka process of pasture lands [4]. These indicators strongly correlate with productivity of fodder crops. The bonitirovka of soils is followed by an assessment of fodder lands, which in turn builds a basis for quality assessment of pastures.

Later on, based on bonitirovka of soils and quality assessment of fodder lands, an economic assessment is undertaken which creates a platform for conducting works on land cadastre in the country.

Author deeply considers problems ofthe land cadastre (estimate) regions, ofthe lands, economic estimation and identification ofthe land norms and analyzed specification of the land cadastre measures in the frame of district.

In the article author reflects some problems concerning of the practical execution of the land reform in Azerbaijan republic and the meaning of the main measures which must be realized in a near future.

Author created the article accordingly to textbooks structure and cited very interesting facts, diagrams, concrete analytical materials concerning of the natural, economic and juridical situation of lands in Azerbaijan.

Several methodological guides on bonitirovka were compiled and were later employed to conduct bonitirovka of winter pasture lands of Jeyrancollowlands.

Methodology

The basis of economic and cadastral valuation is the assessment of land quality. The assessment of land quality is the acquisition of a complex characteristic of the land according to the level of their fertility and productive capacity on the basis of standard characteristics of the land according to individual characteristics (granulometric composition, erosion, salinity, excessive moisture, stony, etc.).

The quality of the land is estimated by indicators:

- suitability for use under different types of agricultural lands;
- assortment of agricultural crops that can be grown on the land;

- the level of normative productivity of crops and natural grass;
- the level of standard costs for cultivating and harvesting crops, for maintaining soil fertility.

The assessment of land quality is based on information on the natural features of lands (properties of soils, climate, relief, natural vegetation, etc.), which is contained in soil, geobotanical and other surveys and surveys, as well as in other sources.

Based on this information, the possibility of using land for various types of agricultural land (plowland, perennial plantations, hayfields, pastures) is studied and the level of land fertility is estimated.

Of the parameters characterizing the agrochemical state of the arable layer, indicators that vary greatly in space and time (acidity, mobile forms of phosphorus and potassium) are excluded.

At the same time, it is understood that the corresponding agrochemical indicators of the arable layer of soils are optimized to the normative level by zonal technologies of growing agricultural crops. The main criteria for assessing the quality of land - economic. The calculated net income for the cultivation of agricultural products is a criterion for the suitability of land for agricultural production, and its value is a criterion of the level of land fertility.

Economic methods make it possible to quantify the quality of land according to the above-mentioned quality criteria (potential crop yields, crop cultivation costs, etc.), and in their totality. For integrated integrated assessment of land quality, a complex indicator is used - the grain equivalent.

The need to take into account the range of crops in calculating the indicator of the quality of land is explained by the inadequate ratio of different crops to the fertility of soils. The most demanding are technical crops, especially potatoes and sugar beet, the least - annual and perennial grasses. Cereals occupy an intermediate position.

Assessment of land quality is carried out simultaneously for two types of use - for arable land and for natural forage lands. Estimation of lands by the effectiveness of their use under natural fodder lands defines the minimum acceptable estimate of their

quality. Of the two mentioned above estimates, the one above is taken.

The availability of such information helps administrations of various levels to effectively manage land resources, take decisions on the allocation and protection of the best and most valuable lands, develop state programs for land reclamation, improve soil fertility, support agricultural producers, determine the most profitable directions for investment in agricultural production.

Assessment of land quality is also necessary to solve specific tasks of land-use planning of rational land use - optimal placement of crops, formation of crop rotation, identification of low-productive land, transformation of arable land into less intensive types of land, measures to improve soil fertility, and more specific farming.

Complex indicators of land quality can be used to determine the price of land, rent, lending on land and other transactions with land as real estate.

Mathematical-statistical method of the materials collected for the study is necessary in soil surveys, especially when determining soil-specific diagnostic indicators. There is a need for mathematical and statistical methods to verify the reliability of a large number of analytical materials during the comparative assessment of the soil, ie, when it is being valued.

The system of mathematical and statistical analysis of soil indicators is important for the later stages of the survey, when investigating soil valuation and monitoring and establishing environmental soil fertility models. In the following stages of the study, the accuracy of the internal soil diagnostic parameters is important for the stages of the bonit works when selecting the exact criteria for the soil assessment.

For the purposes of bonitirovka of soils, the assessment criteria are chosen among soil diagnostic indicators .

These indicators include but not limited to humus content, total nitrogen, phosphorus, and total sum of base cations. Considered altogether, these indicators have a sufficient effect on quality differences of fodder lands. The criteria indicators are determined for the following soil layers: 0-20 cm, 0-50 cm, 0-100 cm, which makes it possible to assess various layers of soil solution separately.

Next, the type of soil that has the highest value by soil diagnostic properties is chosen as a standard. And the level of fertility of other soil types is determined relative to the value of the standard.

Given the local climatic conditions, bonitet scores need to be adjusted. We used adjustment coefficients for climate parameters suggested by G. Sh. Mammadov and F.D. Ayvazov [5] as a product of mean annual amount of precipitation and mean annual sum of active temperatures, that is air temperatures higher than 10 °C. Thus, mean annual precipitation for dark chestnut soil varieties constitute 360 mm, for chestnut soils - 250 mm, whereas mean annual sum of active temperatures are 3800 °C and 4500 °C respectively. For soils chosen as a standard, the product of climate parameters, that is 360 x 3800 = 1368000, is taken as 1. Adjustment coefficients for other soil types are calculated relative to the product value of the standard soil.

It should be noted that the given assessment is true theoretically for baseline conditions of soils, however, under local conditions the soil fertility depends on a series of factors (e.g. erosion, salinity, cultivation, gravimetric composition, and etc). These factors are usually of local character and considered in the bonitirovka process through further adjustment coefficients. Thus, the basic bonitet scores are multiplied by corresponding adjustment coefficients to yield the total bonitet scores [6].

$$B_P = Bo^* K_3^* K_c^* KrP^*$$

where,

Bp - bonitet score of a soil variety,

B_0 - basic bonitet score,

K_3 - coefficient for salinity,

K_c - coefficient for solonetricity,

Kpp - coefficient for gravimetric composition,

Km - coefficient for soil thickness.

Results and Discussion

As seen from Table 1, soil bonitet scores decrease in zonal series (i.e. from mountainous dark chestnut soils to chestnut, light chestnut, and finally to gray brown soils).

These differences are explained through dissimilar effect of climatic factors, particularly humidity and heat supply, on productivity of pasture lands.

On the other hand, when other factors of soil fertility are taken into account, the total bonitet scores were as follows (see Table 2).

Thus, mainly the negative impact of climate becomes obvious for soils of pastures located in lowlands.

Overall, soils of winter pastures of Jeyranchol received the highest bonitet score of 61, Kur-Araz lowland - 56, respectively.

The average weighted bonitet score of the winter pastures of Azerbaijan is assessed at 56, which implies soils of the winter pastures have been exposed to degradation. Consequently, the pasture lands are in need of environmental protection and improvement based on scientific recommendations.

Table 1. The bonitet scale of soils of pasture lands with climatic correction coefficients

	Soil Types	**Basic bonitet score**	**Climatic coefficient**	**Bonitet score with consideration of climatic coefficients**
Jeyranchol				
1	Mountain dark chestnut	82	1,0	82
2	Mountain chestnut	94	1,0	94
3	Mountain bright chestnut	67	1,0	67
4	Dark chestnut	100	1,0	100
5	Chestnut	97	0,99	96
6	Bright chestnut	71	0,95	67
7	Grey-brown	68	0,82	56
Kura-Araz Lowland				
1	Chestnut	100	1,0	100
2	Bright chestnut	80	0,95	76
3	Gray-meadow	95	0,82	78
4	Bright meadow-gray	82	0,82	67
5	Boggy-meadow	98	0,82	80

Table 2. Total bonitet scores of soils of winter pasture lands

	Pasture and soils	**Basic bonitet score**	**Total bonitet score**
	Ceyranchol		
1	Mountainous dark-gray-brown	94	71
2	Mountainous-bright-brown	67	47
3	Dark-gray-brown (standard soil)	100	87
4	Gray-brown thick	97	82
5	Bright-gray-brown	71	57
6	Gray-brown	68	44
7	Boggy-meadow	61	52
	Kur-Araz lowland		
8	Gray-brown, thick (standard)	100	73
9	Bright-gray-brown	80	65
10	Serozem-meadow	95	49
11	Bright-meadow-serozem	82	48
12	Boggy-meadow	98	52

There exist several methodological guides for conducting the bonitirovka of soils of winter pasture lands. Basic and total bonitet scores were calculated along with consideration of climatic adjustment coefficients. It becomes clear that there is sufficient effect of climatic parameters on productivity of fodder lands.

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