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MODERN PROBLEMS AND RATIONAL USE METHODS OF ARID SOILS IN AZERBAIJAN (AS AN EXAMPLE OF JEYRANCHOL)

Abstract. The problems in dynamical changes assessment occurring as a result of mutual impact of the available state, natural and antropoghenic factors in Azerbaijan arid soils have been paid attention, but the scientific groundings have been based on our perennial soil investigations in Jeyranchol at the global desertification problems context in the article.

Key words: degradation, arid, semiarid, deflation, erosion, semihumid, exodynamic, salinization.

Introduction. Beginning before 70th years of the XX century the salinization process occurring in the world is discussed at a standart of the General Assembly sessions UNO and the fight measures against it are analyred on the basis of special researches at a global scale. As it is known that desertification happens as a result of two mutual influences – natural and antropoghenic factors. This effect is appearad to different degrees in al the regions and natural districts of the earth. A comparison changes depending on the geographical zone. So, the natural factors prevail over an antropoghenic factor in some zones, but the antropoghenic factor prevails over a natural factor in the other zones. According to the calculations the world agriculture loses 16 milliard dollars as a result of the soil productivity loss in a year [3].

The problems of swamping, salinization, loss of the pasture areas and unirrigated soils productivity include the desertification process in soil. We come to such a conclusion that desertification process intensively occurs in the arid, semiarid and semihumid climatical areas on the basis of the perennial soil researches and visual observations. So, the ecological situation of these zones indicate itself in biological productivity decrease and this happens under an influence of the natural factors and human's farming activity. G. Dregne (1976) evaluates desertification as a joint effect process source of the aridity and human's farming activity in arid, semiarid and sometimes semihumid ecosystem [6]. This process like a landscape degradation shows itself in plants optimalization disorder, productivity reduction, change of biomass, macro and microfauna, flora difference an soil cover disorder. These cases change man's life mode and create dangers in a future work [5].

The antropoghenic factor possesses an effect force to some or other degree besides natural factors in a desertification process of the environment.

The followings enter the principal factors causing desertification process in arid soils of Azerbaijan:

- degradation of plant cover and soil cover eroding as a result of the human's incorrect farming activity;
- acceleration of the deflation process as a result of unrational use from agriculture under the unirrigated condition. Not considering natural characters of soil cover;
- not keeping a comparison between cattle-breeding and plant-growing;
- forests cutting as a result of not meeting the population's need for heat;
- perishment of soil and plant cover in the various technogen landscapes;

- disorder of the plant and soil cover as a result of the incorrect arrangement of the water sources in the winter pastures;
- not keeping an irrigation norm during the soils irrigation and conseguently;
- happening of secondary salinization and alkalinity process;
- cultivation of soils possessing thin layer because of the soil resources shortage;
- lately carrying the fertile soils of the semiarid and semihumid zones to the large cities.

Research object and method. The research object stretches from north-west to south-east involving a zone more than 200 000 hectares in the north-west part of Azerbaijan. The geographical coordinates are 45°45'14.1" east length and 41°20'52.1" north width, 45°39'28,8" east length in the south, 47°7'48" north width in south, 45°6'3,6" east length in the west and 41°20'24" north width in the west, 46°31'58,8" east length in the east, 41°57'46,8" north width in the east. Two observation and example grounds have been selected in the research object. The first observation and example grounds are in the zone of the Girzan dwelling station on the left bank of the Kur. The geographical coordinates of this station are 45°40'37,7" east length and 41°7'40,35" north width in the south, 45°40'52" east length and 41°7'44,07" north width in the east, 45°41'51,9" east length and 41°8'30,6" north width in the north, 45°41'18,8" east length and 41°8'10,4" north width in the west.

An absolute height from the sea level of the first observation and example grounds varies by 220 m and 370 m. A problem of the influence of the modern geomorphological processes and antropoghenic activity an soil cover from the coordinates towards north direction to the low upland was paid attention (figure 1).

Figure 1 –
Characteristic soil cuts place
of the first observation and example gorund

Figure 2 –
Characteristic soil cuts place
of the 2nd observation and sample ground

The second observation and example ground is taken as a continuation of the first one. The geographical coordinages of the station are 45°40'30,3" east length and north width in the south, 45°42'10,8" east length and 41°8'54,81" north width in the east, 45°40'32,8" east length and 41°9'32" north width in the north, but 45°40'98,18" east length and 41°9'98,7" north width in the west. The zone consists of weak inclined plain at 370-380 metres from sea level (figure 2).

But both exodynamic and soil processes occur in different directions in these stations.

The eight-element model on surface profile was constructed on the left bank of the Kur river considering the modern geomorphological state, soil and exodynamic processes (figure 3).

The soil sections characteristic for the soil processes analysis have been applied, the thorough morphological discriptions have been performed in these sections and the soil parameters have been studied by the following method and ways in the soil samples taken on genetic layers: absorbed bases (Ca^{++} - Mg^{++}) by Ivanov's method; calcareous calsimeter – by Scheibler method; pH (in water solution) by potensiometer; granulometric composition by Kachinsky's method.

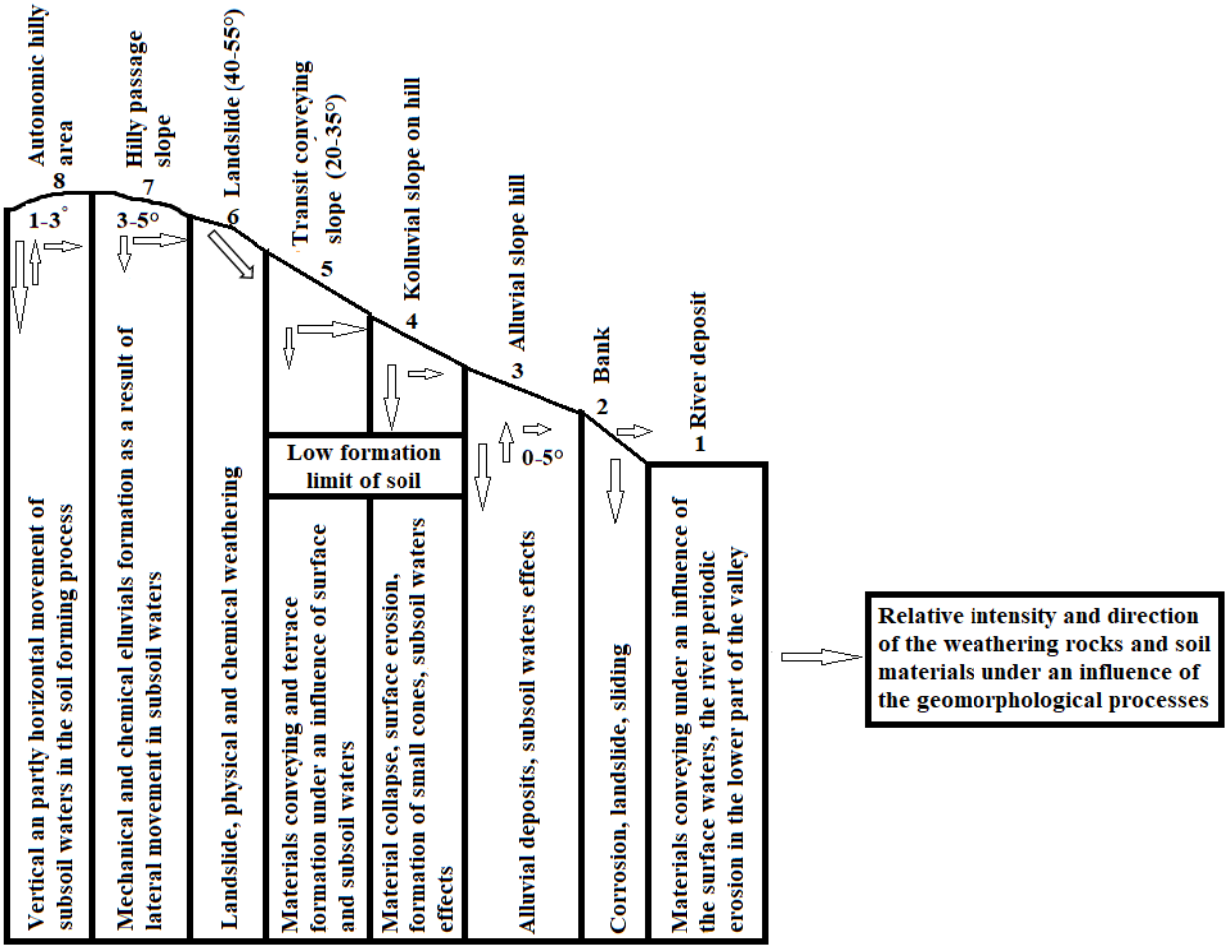

Figure 3 – Eight-element model on Jeyranchol massive of the left surface in the Kur valley

Results and discussions. The research object is geomorphologically complex, possesses unlike relief characters. Here the soil cover exsposes to different exodynamic processes depending on relief. These processess accelerate aridity rate in the zone. So, the intermountain plains mostly expose to wind erosion, while landslide and erosion process intensively go on the slope. The destructive-winnowing activity of the strong winds in the spring and summer months causes disappearing of the surface fertile layer of soil [4].

The soil processes possess a great effect force in ravine-gorge erosion development of Jeyranchol. So, the atmospheric sediments solve gypsum combinations in soil structure, wash them out in the vertical and horisontal directions, complicate the relief, accelerate soil degradation and intensify aridity [2].

The exodynamic processes change some indications of soil cover and agricultural importance of soil reduces.

Provision of the fodder plants with nutrients deteriorates because the surface fertile layer of the soil is covered by the materials which are brought with the wind erosion.

A direction and intensity of the soil-formation process changes depending on modern geomorphological state in the first observation and example ground. Though the human's farming activity is weaker than the second station in the first research zone an effect of the natural processes in superior. The Kur river effect is very stronger in the first, second elements of the given model. These soils have been formed on the basisi of alluvial deposits and under an influence of the local factors. The soil layer covered at 80-1.150 cm depth on profile of the soil cut is met. The third element of the model is on the alluvial slope hill and inclination varies by 0-5°. A flow of the subsoil waters towards the river deposit happens in a horizontal direction, besides vertical infiltration and evaporation of the atmospheric precipitations. These soils expose to surface erosion as a result of the elementar irrigation. Humus is 2,0-2,5 %, total nitrogen is 0,18-0,20 % on the surface accumulative horison of the soil. A guantity of physical clay is 50,4 %, but silt

fraction is 27,6 % on the upper horison. Totality of salts and dry residue towards depth rises according to the results of the total water weight analysis. This index is more higher in plaxes (plains).

The fertility parameters vary towards decrease in comparison with the soil monitoring conseguences performed for a half century before us.

While moving away from the Kur river-bed, the subsoil waters level reduces and colluvial slopes start. Here the soil formation processes goes weakly. The soil processes are disordered under an influence of the transit floats. The floating materials create liitle cones. The floating and settling materials are very poor from a food supply standpoit, they are mainly clayey rocks. The gypsum guantity is more than 20-25 % in these rocks structure.

The fifth element is a transit conveying slope of the materials. Here the exodynamic process goes rather intensively. The landslide material expands around under the gravity and weathering influence. The exodynamic processses intensify the desertification process under the arid climatic condition in the zone. Collection of the landslide materials and more inclination create small displacement areas in the zone. Here the relief inclination changes by 20-35°. The soil processes direction often changes because of exogenic processes dynamism elevation.

The sixth element is a zone where an exodynamic process goes intensively. This zone plays a border role between the transit area with an autonomic area. The inclination changes by 40-55°. All the transit areas are nourished from this element. The conveying products are mainly calcareous, gypsic and clayey rocks. The transit products conveyed as a result of the geomorphological processes affect till the first element. This effect is negative, covers relatively fertile accumulative layer and so the covered soils are founded, and an initial soil formation process starts. This process goes very slowly under the arid climate condition.

The seventh-eight element passes to the 2nd observation and example ground. These elements are the zones which will be able to lose their natural balance soon under the modern geomorphological processes influence. The zone surface is somewhat vivid, it possesses 1-3° and 3-5° inclination. Here are soil formation process occurs normally, and normal genetic layers are formed. The soil formation process occurs under an influence of the vertical and horizontal movement of waters in the autonomic vivid area. During the soil research the hygroscopic water increases from 2,27 % to 17,5 % while rising depth according to the results of the taken samples analysis. $CaCO_3$ and $CaSO_4 \cdot 2H_2O$ is washed out as a result of the atmospheric rainfalls. A mechanical structure of soil is heavy loamy on the upper genetic stratum and turns into mean loamy towards low layers.

The natural effect is higher than the antropoghenic influence in the first observation and sample ground as it is seen from our field and laboratorial research result. The weathering and landslide phenomena happening towards the Kur river valley causes reduction of the plain soils in the Jeyranchol massive year after year. These processes disturb the soil ecological balance and accelerate desertification process in the zone.

The second observation and sample ground possesses ordinary grey-brown (chestnut) soils under the autonomic condition and at 370 m height from the sea level. The inclination varies by 1-5°. For a long time these soils have been used as a winter pasture area.

These zones used for extensive cattle-breeding was available as an unprofitable farming in the economic life of the Republic. The second observation and sample ground was selected and the scientific observations were performed, the characteristic soil cuts were applied and the main parameters were analyred in the taken soil samples under the laboratorial condition during the soil researches in Jeyranchol in 2015-2016.

As a result we come to such a scientific conclusion that the farming direction can be changed towards agriculture by rationally using from the water resources of the Kur river.

While changing a farming direction in Jeyranchol, the exodynamic processes characteristic for the zone, especially the deflation and ravine erosion shouldn't be forgotten. While fulfilling the tillage works, there is a necessary need for building of the field guarding forest zones consisting of the tree and bushes characteristic for the zozne by taking umpire winds into account. A guantity of humus and total nitrogen gets reduced in comparison with the previous researches as it is seen from the analysis results of the soil sections applied in the zone. This index accordingty varies by 2,17-0,83 % and 0,18-0,070 %. Decrease of the nutrient for the last century is connected with the exodynamic process and mineralization intensity

under the arid climatic condition, moreover increase of the antropoghenic effect for last 100 years. As it is seen from the statistic information a guantity of the cattle falling per hectare was 2025 times more than a normal limit in accordance with the aridity index [1].

An amount of physical clay (<0,01 mm) rose on the upper layer in comparison with the previous years, it changes from mean and heavy loamy to mean and heavy clayey soils in the analysis indices of more soil cuts. There is a great influence of the exodynamic processes, especially wind and rain erosion on this change.

It is known from the observation on soil sections that the observing depth of carbonate reproductions reduced along the profile. The gypsum combinations and nets consisting of gypsum are found at 20-25 cm. Whereas these indices were noted at 30-50 cm depth in the previous researches. The change on Cl^- anion is weakly striking in comparison with the previous results of the total water weight analysis. But this difference is comparatively higher on SO_4^{2-} anion and Ca^{2+} cation. This is also connected with the increase of calcareous and gypsum number as a result of the desertification process intensity.

It is known during our research in the ordinary grey-brown (chestnut) soils under the irrigative and unirrigative condition in Jeyranchol in 2015, that the soil formation process was going more normally under the irrigative condition in comparison with the unirrigative condition. We can come to such a conclusion that the soil cover can be improved and the farming can be made more profitable by broadening agriculture under the irrigative condition.

Conclusions.

1. As it is seen from the field and laboratorial research result in the first observation and sample ground that a natural effect is very greater than the antropoghenic influence. The weathering and landslide phenomena occuring towards the Kur river valley cause decrease of the plain soils in the Jeyranchol massive year after year. These processes disturb an ecological balance of soil and accelerate a desertification process in the zone.

2. The change of nutrient and other parameters in the negative direction is observed in the soils in comparison with the soil monitoring results in which the soil research conseguences have been performed in the gray-brown (chestnut) soils of the 2nd observation and example ground. The soil formation process can be accelerated and the farming can be made profitable by applying irrigative agriculture in these soils.

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И. А. Кулиев, М. Ю. Халилов, И. И. Марданов

СОВРЕМЕННЫЕ ПРОБЛЕМЫ И РАЦИОНАЛЬНОЕ ИСПОЛЬЗОВАНИЕ АРИДНЫХ ПОЧВ В АЗЕРБАЙДЖАНЕ (НА ПРИМЕРЕ ДЖЕЙРАНЧЕЛЯ)

Аннотация. В статье уделено внимание вопросам современного состояния и оценке динамических изменений аридных почв в Азербайджане под влиянием совместных естественных и антропогенных факторов в контексте проблемах глобального остепнения, научное обоснование дается на основании многолетных почвенных исследований, проведенных на территории Азербайджана.

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