ANTHROPOGENIC TRANSFORMATION OF NATURAL LANDSCAPES IN THE SOUTH-EASTERN SLOPE OF GREATER CAUCASUS

A.Z.Hajiyeva

Azerbaijan State University of Economics
AZ 1001, Baku, Istiglaliyyat str. 6

Annotation.The paper deals with the use of pastures in the south-eastern slope of the Greater Caucasus, used as hayfields. These areas are characterized by the spread of intensive cattle breeding. The use of the territory as both winter and summer pastures intensifies the transformation of natural landscapes. In August of 2012, the assessment of such transformation was implemented in 8 sample areas, located in the meadows of steppe landscapes to the south-east of Demirchi village at 1400-1500 meters above sea level.The work includes tables reflecting amount of phytomass in the summer pastures and hayfields of the study area and also the intensity of physical-geographical processes going in the landscapes. Corresponding analysis is implemented as well.

Pasturing is a form of the extensive land use and considered to be one of ancient fields of economic activities. Complexes of pasture and hayfield mostly bear seasonal character and are typical for summer- and winter pastures. The studied area, i.e. the south-eastern slope of the Greater Caucasus is also used in summer and winter seasons and includes the complexes where pasturing activities were led since the very ancient times.

Organic substances of animal origin like meat, fat, skin, wool, milk products are regarded as 'repeated biological products' (Kurakova, 1983). The related primary and following (repeated) productivities of landscapes typically are equal in the natural conditions. In this connection, regular grazing in pasture landscapes may lead to the reduction of not only primary products but also secondary products. Regularly conducted pasturing may be responsible for the considerable loss of mineral elements of nourishment in the composition of soil each year [6].

The study area is south-eastern slope of the Greater Caucasus (Figure 1).

Figure 1. The study area

Analysis. The protection and increase of productivity of landscapes of pasture provides the efficient use of natural base of forage. Over 80% of the vegetation cover of summer pastures of the study area is composed of perennial pastures. The botanical composition, the forage value and the efficiency of the vegetation cover is defined by the variety of groups of the local flora, as well as such factors as relief, climate and soil conditions [1].

The big role of leguminous plants in the shaping of vegetation cover of summer pastures also should be noted. It was revealed that the botanical structure of summer pastures in the study area includes more than 50 kinds of leguminous plants, and most of them are perennials.

Leguminous plants in particular affect the productivity of summer pastures. Certain sorts of plants play significant role in the prevention of probable erosional processes in the mountain meadows since their roots are much complex. In the highly inclined mountain slopes, these plants prevent the degradation of surface of soil cover due to the influence of rainwaters as well as other factors.

In the study area, the transformation of Alpine meadows happens also due to the impact of settlements. There are a number of settlements in this territory although these summer pastures and their surroundings are characterized by keenly cold winter and therefore are unfavorable in terms of living. The valley of Girdmanchay is stretched at 1600-2200 m of elevation. Many settlements here like Lahij, Ahan, Namazgah, Madrasa, Mudri, Nanij, Julyan, Zarnova, Gandov along with the villages of Burovdal, Zarat, Gandahar, Damirchi, Zarat-Kheybari, Archiman, located in the valley of Pirsaatchay negatively affect the summer pastures, and are responsible for their transformation [3].

The conduction of certain agrotechnical measures is very necessary to improve the quality of surface of summer pastures. These measures include the followings: the combating of various weeds and also poisonous and harmful plants; the cleaning of meadow areas from stones and shrubberies; the destruction of hearts of emergence of deceases and

places where insecticides are concentrated; the sowing of seeds of certain grass plants in order to enlarge vegetation areas; the keeping pastures in unused form for certain period in order to increase fertility [4].

Concerning the study area it also should be noted that the widespread of summer and winter pastures in some cases may lead to the rise of environmental risks and dangers in landscapes. Since the probable landscape and environmental risks and dangers are typically vulnerable to the impacts beyond the structural and functional peculiarities of natural complexes, this anomalies may take place considerably due to anthropogenic impacts and their intensities [1].

The analyses carried regarding winter pastures reveal that the lowest productivity by unit of forage are observed in the mountain semideserts (1,2-1,8 centner/hectare), the mountain arid steppes (1,7-2,1 centner/hectare) and xerophyte shrubberies (2,0-2,8 centner/hectare). Summer pastures in the study area have relatively higher productivity (3,2-5,1 centner/hectare).

In August of 2012, the relevant assessment was carried out in 8 sample areas, located in the meadows of steppe landscapes to the southeast of Demirchi village at 1400-1500 meters of altitude in order to define the amount of phytomass in the summer pastures and hayfields, as well as the intensity of physical-geographical processes happening in the landscape.

The geographical distribution of landscapes, classified for anthropogenic load and transformation grade is reflected on Figure 2.

The first small square of observation was selected in the northern slope of river valley. The surface of this square is flat and stairs-form. The inclination is 32º, and the absolute altitude is 1400 m, while the geographical location includes 40º51'38" north latitude and 49º05'43" east longitude. The relative altitude from the bottom up to the upper edge is 14 m. Light clayey and brown-colored forest soils are spread under phytocenosis, composed of various grasses and grainy plants (Table 1).

The second square of observation was selected in the southern slope of the valley. The geographical location is represented as 40º51'37" north latitude and 49º05'41" east longitude. The inclination here makes up 29º, while the surface is flat and characterized by the availability of uprising microforms stretched in parallel to the valley. The erosion processes are observable as well. The vegetation cover is represented by various sorts of grass, milk-weed plants, thyme etc., whereas the grade of vegetation cover makes up 75-85% and the altitude is 7-13 sm.

Table 1

Productivity of summer pastures and hayfields of meadow-step landscape in the medium mountains of south-eastern part of Greater Caucasus (at the right bank of higher stream of Pirsaatchay River)

Name of facies	Absolute location and absolute altitude, m	Inclination of slope, degree	Grade of vegetation cover	Height of vegetation, cm	Total amount of phytomass, g/m², 100%		of which: Surface		Underground	
					wet	dry	wet	dry	Wet	dry
Northern slope	40⁰51'38"n.lat.; 49⁰05'43"e.long.; 1400m	32	95	12-21	996,4 / 100	539,8 / 100	198,4 / 18,5	97,2 / 17,9	868,1 / 81,3	446,4 / 81,9
Southern slope	40⁰51'37" n.lat. 49⁰05'41" e. long.; 1400m	29	81	7-13	1095,2 / 100	581,3 / 100	90,1 / 8,1	33,6 / 6,1	1042,7 / 92,0	539,6 / 94,2
Bottom of valley	40⁰51'29" n.lat. 49⁰05'38" e.long.; 1350 m	5	92	14	934,6 / 100	491,5 / 100	111,6 / 10,9	43,9 / 9,0	89,39 / 88,9	414,9 / 90,8

Table 2

Classification of landscapes for anthropogenic load and transformation grade

No	Level of anthropogenic transformation	Anthropogenic transformation in point	Type and category of land use	Territory area, sq.km	Percentage in total area
1	Very high	4-5	Industry, transport, city, settlement, quarry, degraded lands, etc.	525,9	6,5
2	High	3-4	Water-intensive irrigational planting, courtyard sown areas, plantation, irrationally used pasture, hayfield	1800,2	22,4
3	Medium	2-3	Perennial sown areas, systems of recreational resources	1195,6	14,9
4	Weak	1-2	Hayfields, limitedly used forests and pastures	4052,9	50,5
5	Very weak	1	Special protected territories and unused areas	452,0	5,6

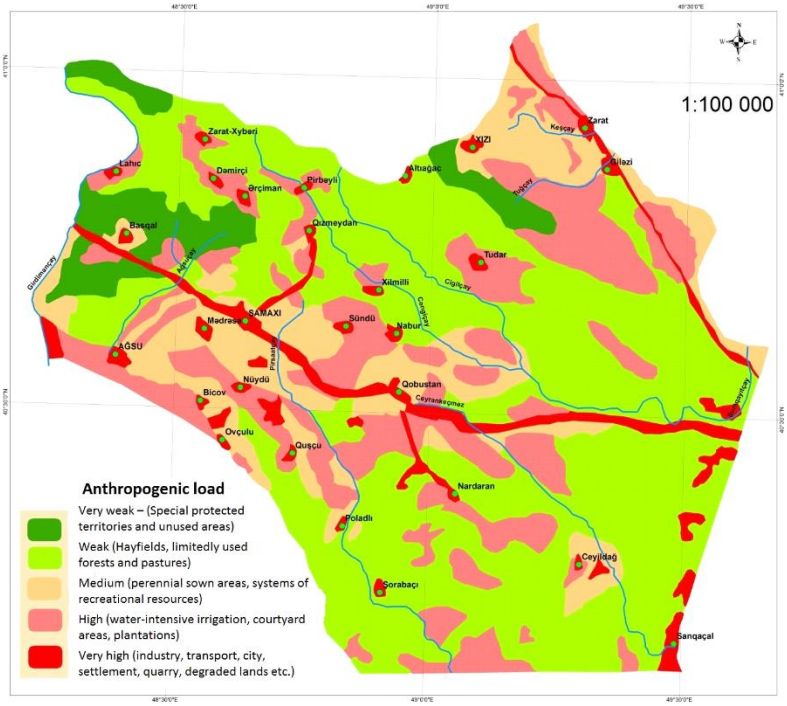

Figure 2. Anthropogenic transformation of the landscapes of south-eastern slope of the Greater Caucasus

The third square of observation was selected in the depth of river valley, where the absolute altitude is 1386 m. The geographical location is represented as 40º51'29" north latitude and 49º05'38" east longitude. The alluvial clayey soils of meadows lay under the sparse shrubberies of different sorts where the grade of spread of vegetation makes up 90-92% while the altitude is 14-19 sm (Table 1).

As the carried studies show, the total weight of wet phytomass in the middle of southern slope (surface mass plus underground mass) is 1095,2 g/m^2 (while 581,3 g/m^2 by dry weight). This figure is higher than that of the total wet phytomass of northern slope as 98,7 g/m^2 as much (as 41,5 g/m^2 as much by dry weight), whereas in relation to the bottom facies the difference is as 160,6 g/m^2 as much (higher at 89,9 g/m^2 by dry weight). This is seen on Table 1.

As Table 1 reflects, the total amount of phytomass does not sharply differ by the studied facies. However, regarding some facies, the high difference is observed by total amount of underground and

surface portions of all phytomasses. Thus, in the northern slopes which are covered by various sorts of grainy plants, the productivity of surface part of wet phytomass (198,4 g/m^2 by total and 97,2 g/m^2 by dry weight) is higher than that of southern slope (90,1 g/m^2 by total and 33,6 gr/m^2 by dry weight) and the bottom facies (111,6 g/m^2 by total and 43,9 g/m^2 by dry weight) by 2 times. Productivity of the underground part of phytomass is higher in the southern facies compared to others. In general, the meadow-steppe facies of medium mountain areas are favorable in terms of the accumulation of biomass. Meanwhile, the surface and the underground parts of phytomass are considerably different in relation to each other due to the variety of the inclination and the direction of slopes in certain relief forms. From this view, the relief peculiarities of the territory should be taken into account during pasturing.

The preliminary and secondary (repeated) complexes of pasture and hayfield existing in meadow and steppe landscapes of the medium mountain areas are being degraded at different grade. The proportion between the surface and the underground parts of phytomass available in these complexes are studied on 12 squares of observation. The results of this study are reflected on Table 2.

As Table 2 indicates, biodiversity of plants have changed significantly in the meadow and steppe phytocenosis since the lands were used as pasture and hayfield areas in the last 40-50 years. However, the sustainability was maintained like the table reflects.

This was available mainly due to the growth of underground part of phytomass. More exactly, the proportion of underground and surface parts of phytomass in reproductive ecosystems was increased correspondingly as 3:1 and 5:1 in connection with pasturing. As the studies revealed, the rise of the proportion of underground part of phytomass in an ecosystem leads to the growth of its sustainability.

The conducted analysis enables to remark that the productivity of summer pastures may be reduced as a result of planned or unregulated pasturing that may deteriorate soil cover in large areas. Pasturing above the norms during summer months in wavy and hilly slopes and also inclined slopes may lead vegetation cover to degradation (4). It may be responsible for the expansion of useless lands as well. In accordance with the decision of Cabinet of Ministers of Azerbaijan Republic regarding seminomadic pasturing dated to 15th March of 2000, the number of sheep per 1 hectare of pastures should be from 1 to 4 but not more. However, the number of grazing sheep in the meadows of the studied region during summer exceeds the quota by 10 times. The main reason of such situation is that the volcanic plateau of Karabagh, the largest pasture territory of Azerbaijan is under occupation. Here regarding negative impact of pasture it should be noted that the degradation of vegetation cover as well as the reduction of grass mass typically touches only useful plants whereas useless plants may develop and impede the normal development of useful sorts of plants following years (Table 3).

One of the main factors responsible for the intensification of processes of erosion and degradation in summer pastures is a premature grazing, as a result of which the tracks of domestic animals may create paths on the mountain slopes. Early pasturing in summer may result in destruction of layer of sod of soil in humid conditions. Thus, furrows may arise in places of destructed layer of sod layer after rainfalls and gradually weaken usable grass cover. Similar erosional processes may be observed over places of track shaped in mountain slopes clearly. The footprints of domestic animals may even be filled up with accumulated rainwaters during heavy rainfall, as a result of which mudflows may happen. As Table 3 indicates, the ecosystems numbered as 3 and 5 are the most degraded and characterized by the fall of productivity, i.e. the reduction of unit of forage by 1,5-2 times. The density of paths is accordingly 41-54 m and 38,6-46,7 m per 100 m^2.

Landscape- and environmental risks and dangers existing as usual due to the influence of pastures and hayfield complexes in the study area, can be grouped in 4 main systems as follows: 1.Geomorphological risks. 2.Biogenic risks. 3.Abiogenic risks. 4.Socioeconomic risks [5]. Instrumental observations and also surveys of socioeconomic character among the population were also conducted during the field studies in order to determine relevant risks. The landscapes of high landscape and environmental risks and threats may be subjected to anthropogenic overloading while their natural resource potential may be a few times lower. Since the people living in these landscapes typically are not capable to satisfy their needs at the expense of available farms normally, they are forced to be engaged in other neighbouring areas. As the results of the carried surveys show, 70-80% of the population ofMughanli and Meysari villages are not capable to satisfy their needs at the expense of local landscapes.

Table 3

The change of proportion between underground and surface parts of phytomass in the primary and secondary pasture-hayfield complexes of south-eastern part of Greater Caucasus

Ecosystem	Absolute altitude and geographical location	Grade of degradation	Phytomass reserves, gr/m²			Proportion between underground and surface parts of phytomass
			Surface part	Under-ground part	Total weight	
Limping and grainy meadows with various sorts of grass	1652 m 40°58'14"n.lat. 49°17'37"e.long.	Primary pasturing in natural conditions	1317	3154	4471	2:1
Grainy, leguminous, three-bristle and hairy plants of meadows and steppes	1635,8 m 40°58'29" n.lat. 49°17'36" e.long	Secondary pasturing	562	1531	2093	3:1
Grainy mountain meadows composed of various upright grasses	1661m 40°58'21" n.lat. 49°17'35"e.long.	Repeated pasturing	532	2496	3028	5:1

Table 4

Anthropogenic degradation arising as a result of pasturing in mountain meadow landscapes (from July to August of 2012)

Name of ecosystem	Absolute altitude, m Absolute location	Inclina-tion of slope Azimuth	Productivity by dry weight, s/ha	Unit of forage, center / hectare	Density of paths shaped after pasture, 100 m²	Grade of degradation
Meadow composed of various upright grasses	1955 40°58'18"n.lat. 49°45'14"e.long.	2-5° 225°	10,1	4,6	5,6-7,8	Weak
Mountain meadows composed of lucemes	2004 40°58'22"n.lat. 48°47'17"e.long.	10-12° 315°	11,5	5,4	4,2-6,7	Medium
Meadows composed of feather grass and other plants	1884 40°53'39"n.lat. 48°52'18"e.long.	33-35° 180°	6,5	2,7	41-54	High
Mountain meadows composed of various species of grasses	1917 40°57'23"n.lat 48°52'18"e.long.	22-25° 135°	7,1	4,2	23,5-32,4	Medium
Mountain meadows composed of juniper, thyme etc.	2118 40°56'14"n.lat. 48°51'12"e.long.	40-42° 90°	6,5	2,9	38,6-46,7	High

The geomorphological risks, available in the study area due to the pasture- and hayfield-related works, include the emergence of linear and areal erosion, landslides and hearts of mudflow, the destruction of surface flow, as well as processes of arid denudation, etc. The biogenic risks include the reduction or extinction of some species of flora, the negative changes in the areals of relict plants, the fall of productivity of phytomass, the reduction of biodiversity, desertification, etc. (2).

Conclusion. In this work, for the first time, the laws of distribution of underground and surface parts of phytomass in the mountain geosystems, defined by the impact of the transformation of summer and winter pasture and hayfield, were studied. Beside with this, geomorphological, biogenic, abiogenic and socioeconomic risks and threats arising in the landscapes are investigated.

REFERENCES

1. Behbudov N. Economy of meadow and pasture in Azerbaijan.Azerneshr.1986. 136 p.

2. Budagov B.A., Mammadov R.M., Alizade E.K., Ismayilov M.J. et.al. Ecosocial threats to the sustainable development of the regions of Azerbaijan. Proceedings of Russian Academy of Sciences, series of geography. 2011. Vol. 4. Pp. 54-62.

3. Garibov Y.A. Optimization of natural landscapes of Azerbaijan Republic. Baku. 2012, 216 p.

4. Hajiyeva A.Z. Risks and threats emerging dueto anthropogenic transformations on the south-eastern slope of the Greater Caucasus".Journal of Agriculture and Life Sciences.2015. Vol.2. No. 1; June. Pp.173-180.

5. Ismayilov M.J., Mustafayev N.M. Features of the landslide development on the south-eastern slope of Greater Caucasus.Transactions of Azerbaijan Geographical Society. Baku. 2012, Vol. 12.Pp. 95-103.

6. Kurakova L.I. Contemporary landscapes and economic activity. Moscow, Prosvesheniye. 1983.159 p.

BÖYÜK QAFQAZIN CƏNUB-ŞƏRQ YAMACI TƏBİİ LANDŞAFTLARININ ANTROPOGEN TRANSFORMASIYASI (OTLAQ-BİÇƏNƏK LANDŞAFTLARININ TƏDQİQİ ƏSASINDA)

A.Z.Hacıyeva

Tədqiq olunan regionun otlaqlarından biçənək kimi istifadə edilməsi maldarlığın əsas hissəsi kimi qiymətləndirilir. Eyni zamanda, həm qışlaq, həm də yaylaq kimi istifadə ərazinin meşədən sonrakı çəmən, subalp və alp landşaft komplekslərinin transformasiyasını sürətləndirir. 2012-ci ilin avqust ayında Dəmirçi kəndinin cənub-şərqində 1400-1500 metr mütləq hündürlüyündə çöl landşaftlarında 8 nümunə meydançasında ölçmə işləri həyata keçirilmişdir. Məqalədə əsasən tədqiqat ərazisində yay otlaq-biçənəklərdə fitokütlənin miqdarını və landşaftda baş verən fiziki-coğrafi proseslərin intensivliyini göstərən cədvəllər və onların təhlili göstərilmişdir.

АНТРОПОГЕННАЯ ТРАНСФОРМАЦИЯ ПРИРОДНЫХ ЛАНДШАФТОВ ЮГО-ВОСТОЧНОГО СКЛОНА БОЛЬШОГО КАВКАЗА (НА ОСНОВЕ ИЗУЧЕНИЯ ПАСТБИЩНО-СЕНОКОСНЫХ ЛАНДШАФТОВ)

А.З.Гаджиева

Использование пастбищ исследуемого региона в качестве сенокосов оценивается как основное направление развития скотоводства. В то же время, использование территории в качестве зимних и летних пастбищ ускоряет трансформацию послелесных луговых, субальпийских и альпийских ландшафтных комплексов. В августе 2012 г. к юго-востоку от села Демирчи на абсолютной высоте 1400-1500 м были проведены измерительные работы на восьми эталонных участках, расположенных в пределах послелесных лугово-степных ландшафтов. В статье приведены таблицы, отражающие количество фитомассы летних пастбищно-сенокосных ландшафтов исследуемой территории и интенсивности физико-географических процессов, протекающих в ландшафтах, а также дается их соответствующий анализ.