Journal of Life Sciences & Biomedicine, vol. 3(76), No 2, p. 159-169 (2021)

Preparation of soil maps and ecological assessment maps of soils of the territories of Azerbaijan liberated from occupation

G.Sh. Mammadov[1], D.R. Ahadov[2], Z.R. Mammadov[2]

[1]Presidium of Azerbaijan National Academy of Sciences, 30 Istiglaliyyat Str., Baku AZ1001, Azerbaijan
[2]Institute of Soil Science and Agrochemistry, Azerbaijan National Academy of Sciences, 5 M.Rahim Str., Baku AZ1073, Azerbaijan
***For correspondence:** garibmammadov1@gmail.com; d_ahadli@mail.ru; zamanmammadov81@gmail.com*

The article describes the qualities of common soils in the Karabakh region. The state of soils before and after the occupation has been comparatively studied. Agroecological features and proposals for the further use of the region's soils are given. The agroecological features of soils were studied for more efficient use in the future and proposals were indicated. Agroecological zoning and environmental assessment was carried out on the basis of geographic information systems. Also, an altitude model of the Lesser Caucasus, soil maps, appraisal and environmental assessment have been prepared. In addition to general maps, these maps are compiled for each area.

Keywords: *Karabakh region, ecological assessment, agroecological features, agriculture, soil maps, GİS*

INTRODUCTION

The glorious and victorious Azerbaijani Army under the leadership of the President of the Republic of Azerbaijan, Supreme Commander-in-Chief Ilham Aliyev liberated our lands, which had been occupied for 28 years, during the Second Patriotic War, which lasted 44 days.

The liberated lands of Karabakh in the price cadastral zoning of Azerbaijan belonged to Mil-Karabakh, Arazboyu, Lachin-Gubadli, Daghlig Karabakh valuable (cadastral) regions and the total area is 12.22 thousand square kilometers (table 2). The Karabakh region of our country covers most of the Lesser Caucasus region (81.5%), which is one of the 5 physical-geographical regions. The Lesser Caucasus physical-geographical region, in turn, is divided into 4 agroecological regions.

In all times and in all countries, land is the first blessing. Mankind's entire existence has been established on earth. Land protection, conservation and increasing fertility is one of the most important tasks in low-land countries such as Azerbaijan (Mammadov, 2002; 2003).

MATERIALS AND METHODS

Guidelines for the preparation of interactive electronic soil maps and maps of ecological assessment of soils at a scale of 1: 100000 (Mammadov et al., 2020) were mainly used in the writing of the article.

The results of large-scale soil studies carried out by other researchers show that in the mountainous part of the Karabakh region, primitive mountain-meadow, mountain-meadow soddy, mountain-forest meadow, mountain-meadow dark, mountain-meadow black, mountain-forest brown typical, mountain-forest brown carbonate, mountain-forest brown typical, mountain-meadow steppe, mountain-forest brown cultivated, gray-brown mountain dark, mountain-forest brown leached, mountain-forest brown steppe, mountain-chestnut dark soils, and in the plain part the following types and subtypes were found: chestnut ordinary, chestnut long-irrigated, meadow-chestnut, gray, dark gray, gray typical, gray irrigated, gray meadow-brown, floodplain meadow (alluvial meadow), chestnut dark soils.

http://dx.doi.org/10.29228/jlsb.35
Available online 30 December 2021

RESULTS AND DISCUSSION

Large-scale soil surveys were conducted in the Lesser Caucasus, as well as in the territories of our liberated regions from the 1940s to the 1990s, and soil types, subtypes, genera, species diversity were identified. Soil maps and soil quality maps have been compiled for each farm and district. In conducting soil researches M.E.Salayev (1966), M.E.Salayev, A.K.Zeynalov, E.F.Sharifov (1965), M.P.Babayev (1967), Sh.G.Hasanov (1965, 1978), E.F.Sharifov (1984), A.O.Suleymanov (1986) and G.Sh.Mammadov (2002, 2003) are great. Agroecological zoning of Azerbaijan, including the lands liberated from occupation, ecological assessment of lands on the basis of GIS was carried out (Salayev et. al., 1965; 1966; Babayev, 1967; Hasanov, 1978; Sharifov, 1984; Suleymanov, 1986) (Fig. 2, Fig. 3, Fig. 4).

Employees of the Department of Agroecology and Soil Valuation of the Institute of Soil Science and Agrochemistry of the National Academy of Sciences of Azerbaijan under the leadership of Academician G.Sh.Mammadov, a map of soils and ecological assessment of soils was compiled for Kalbajar, Lachin, Shusha, Khojaly, Khojavend, Gubadli, Zangilan, Jabrail, Fizuli and Aghdam districts (figure 1) (Ministry of Defense of the Republic of Azerbaijan, 2020; Mammadov et al., 2021) (Table 1).

Relief (earth's plasticity) played an important role in the formation of soils in the liberated territories. Under the influence of the basins of the Bargushad, Hakari, Tartar, Araz and other rivers, and the mountain ranges of the Lesser Caucasus, various mosaic soils were formed in these areas. Soils are formed in 0-4000 meter horizons from dry subtropics to alpine and subalpine belts (Mammadov et al., 2016; 2020a; 2020b).

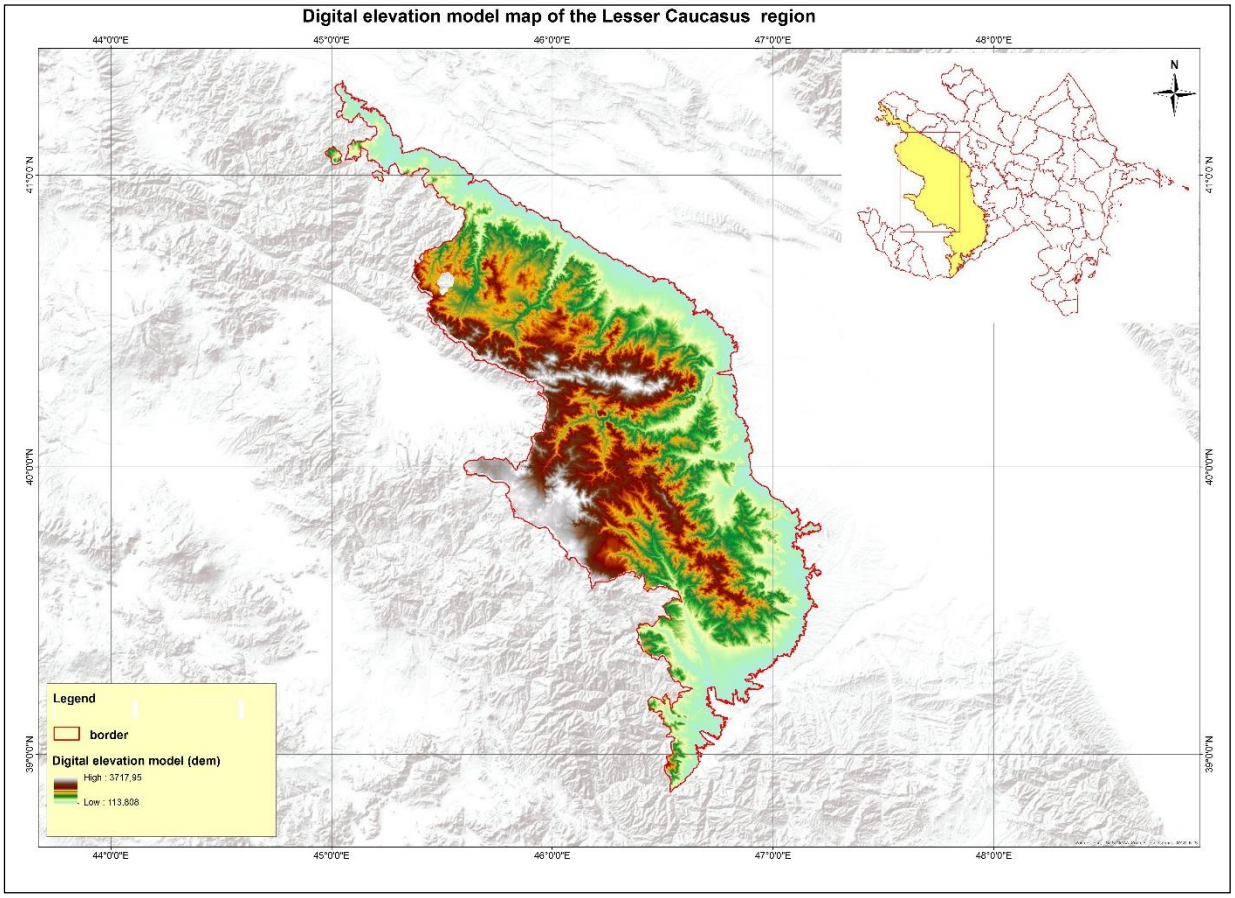

Fig. 1. Digital elevation model of the Lesser Caucasus region

Table 1. Types and subtypes of soils in the liberated territories and their main bonitet scale

Soil types and subtypes	Bonitet scale of soils										
	Districts										
	Aghdam	Aghdara	Jabrail	Fizuli	Khojavend	Khojaly	Gubadli	Zangilan	Kalbajar	Lachin	Shusha
Mountain-forest brown leached	100	94			100	93		99	88	93	96
Mountain-forest brown steppe	82		78								
Mountain gray-brown ordinary	75	75									
Mountain chestnut dark	77			81		72					
Ordinary chestnut	95	90	71	100	95						
Chestnut long-irrigated	92		86	86			90	90			
Meadow chestnut	80	63	92	70	67	62					61
Gray typical	78			82							
Gray irrigated	79			83							
Gray meadow	81										
Floodplain meadow (alluvial meadow)	75	70	70	79	75	70	74	74	66	65	72
Mountain meadow primitive		20							20	20	
Mountain meadow soddy		100							93	91	
Mountain forest meadow		92							91		
Mountain forest brown typical		98				96			92		
Mountain gray-brown light		50					45			45	
Mountain forest brown typical			94		100	94	100	100	89	94	98
Mountain forest brown cultivated			100			100					
Mountain gray-brown dark			86	86	86		84	81	77	77	75
Mountain gray-brown ordinary			78	78	75			74			
Chestnut dark			84				99	99			
Mountain forest steppe					86	80				80	96
Mountain forest brown carbonate						97					100
Mountain-forest brown steppe						75					
Mountain meadow dark									100		
Mountain meadow black									95		
Mountain-forest brown loess-like										89	
Mountain-forest black										100	

Pre-occupation landscape

View of arable lands during the occupation

Fig. 2. Photos released by the Ministry of Defense of the Republic of Azerbaijan

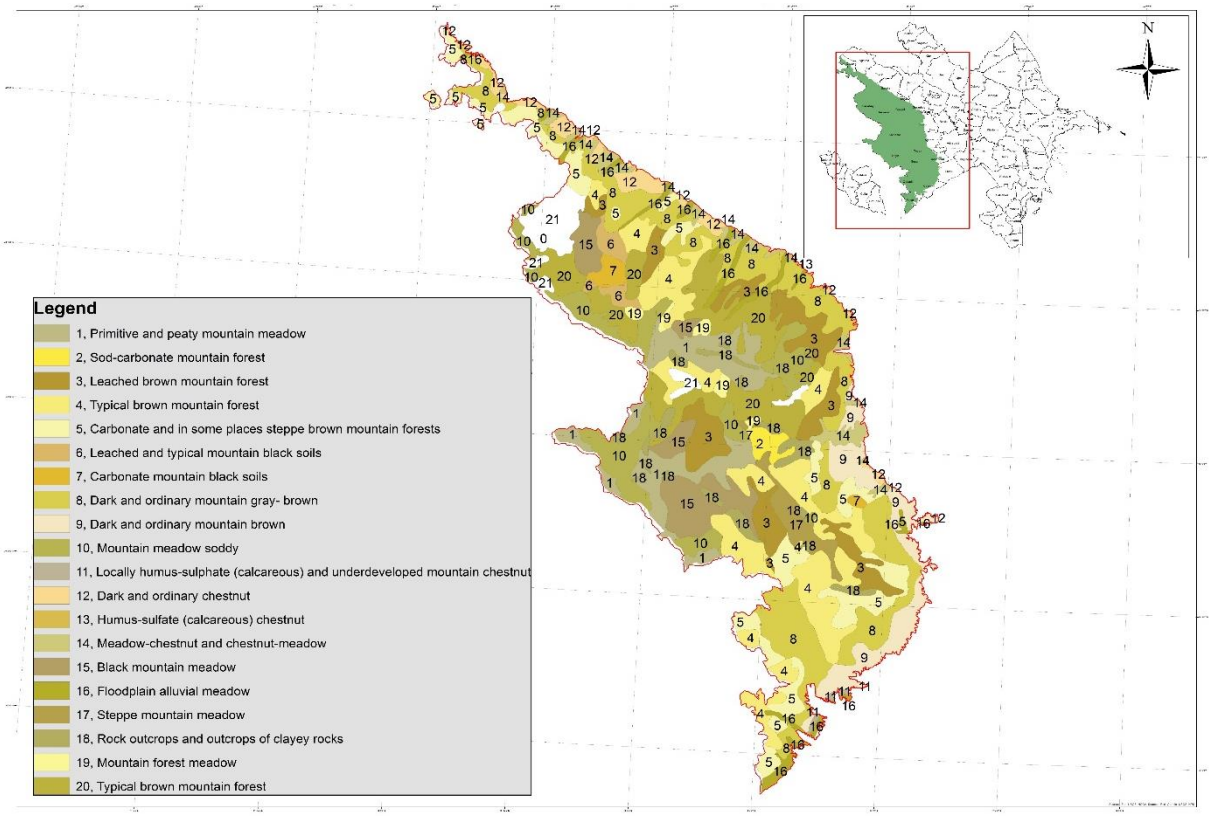

Fig. 3. Solil map of the Lesser Caucasus physical-geographical region

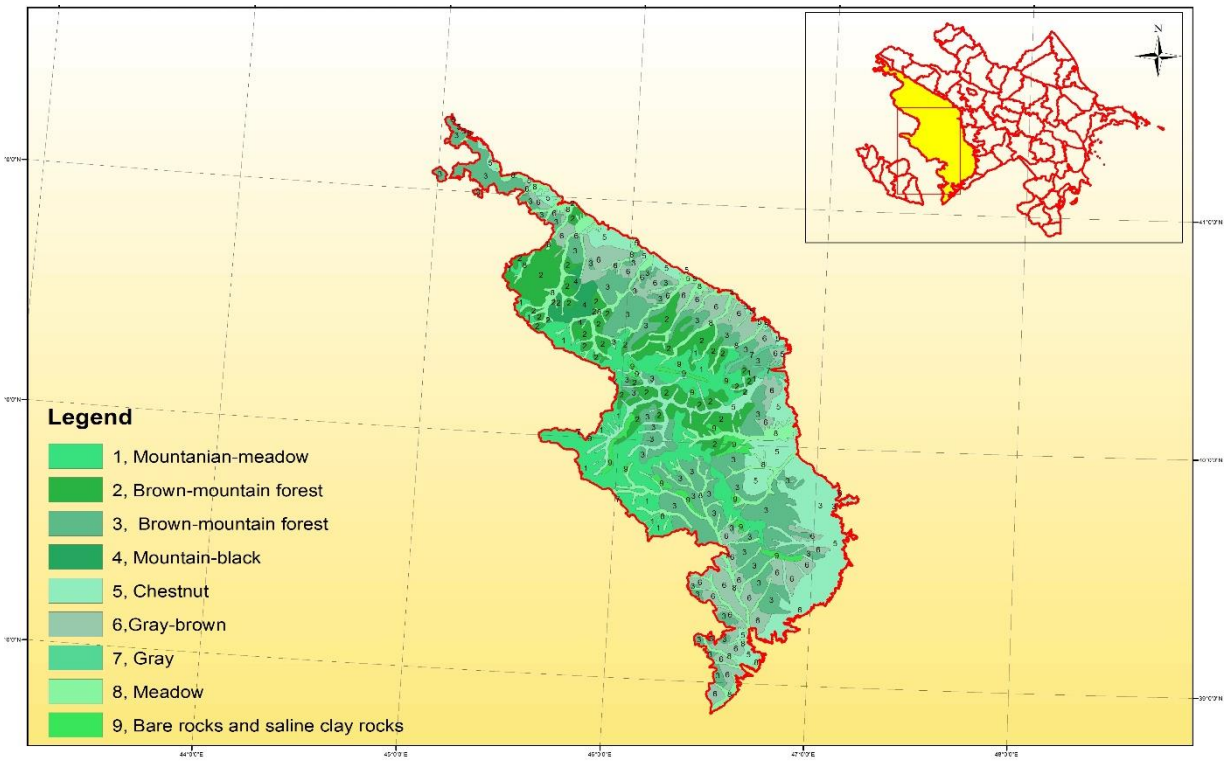

Fig. 4. Solil map of ecological assessment of the Lesser Caucasus physical-geographical region

Table 2. Distribution of liberated lands by natural and economic areas

№	Districts	Total area, ha	Including					
			arable land	perennial plantings	hayfields	pastures	backyards	other lands
1	Jabrail	104.497	20.501	7.243	24	23.154	789	52.776
2	Fizuli	67.649	23.428	10.376	444	25.541	1.059	6.801
3	Kalbajar	198.972	6.327	10	7.571	75.600	753	108.711
4	Gubadli	78.812	14.956	850	631	17.192	454	45.729
5	Lachin	182.603	14.167	245	4.682	69.319	720	93.970
6	Zangilan	72.550	7.801	2.667	607	22.873	412	38.590
7	Gazakh	7.663	1.575	-	-	1.947	168	3.973
8	Sadarak	781	7	-	-	709	15	50
9	Upper Karabakh	440.372	80.601	15.138	4.177	82.013	3.042	225.401
Total:		**1.153.899**	**169.363**	**36.529**	**18.136**	**318.348**	**7.412**	**576.001**

Fig. 5. The situation of the villages before occupation and the current appearance of villages

The results of large-scale soil studies carried out by other researchers show that in the mountainous part of the Karabakh region, were found mountain-meadow primitive, mountain-meadow soddy, mountain-forest meadow, mountain-meadow dark, mountain-meadow black, mountain-forest brown typical, mountain-forest brown carbonate, mountain-forest brown typical, mountain-meadow steppe, mountain-forest brown cultivated, gray-brown mountain dark, mountain-forest brown leached, mountain-forest brown steppe, mountain-chestnut dark soils, and in the plain part the following types and subtypes: chestnut ordinary, chestnut long-irrigated, meadow-chestnut, gray, dark gray, gray typical, gray irrigated, gray meadow-brown, floodplain-meadow (alluvial-meadow), chestnut dark soils (Mammadov, 2019; Mammadov et al., 2019).

During the occupation, 7 categories of soils that existed in Karabakh were destroyed. The occupiers violated the legal regime and the purpose of the land and used the soil only for agriculture, including for the cultivation of narcotic plants.

As can be seen from the table 2 the quality of soils in the liberated areas is high and they mainly belong to the group of excellent and good quality. Bonitet points are calculated according to the results of grading surveys of cereals, grapes, fruit crops, winter and summer pastures (Fig. 2).

Before the occupation, the area of land categories was as follows:

1. Agricultural soils - 336 742 hectares. The most recent information on these soils (1992) is presented in table 2. The occupiers committed extreme violations on these lands and used them to grow crops, especially narcotic plants. During the occupation period, the main drug trafficking took place on the territory of Karabakh. Due to this, 30% of the grain needs of the Armenian Republic were satisfied (Fig. 2 and 6).

Currently, large-scale land management plans are being prepared, the boundaries of natural and economic zones are being clarified.

Fig. 6. Soils out of agricultural turnover

2. The lands of settlements are only 5 592 hectares, of which 1709 hectares are occupied by residential buildings of townspeople, and 3668 hectares - land for state development. The entire housing stock in cities, towns and villages was destroyed. All houses, schools, hospitals, factories were demolished, and useful building materials were taken to Armenia (Fig. 5).

During the recovery period, it is planned to renew all settlements and provide the population with comfortable housing, reconstruct the old infrastructure. For the first time, smart cities and villages will be created in these regions of Azerbaijan. In the category of land of settlements, it is necessary to take into account projects of reconstructed settlements, the laying of road transport lines and telecommunications.

3. The regime for the use of **industrial, transport, communications**, defense and other categories of land was not respected. The entire transport and communication system was destroyed.

On behalf of the head of government, the restoration of infrastructure has begun here. For example, the construction of Tartar-Sugovushan, Fizuli-Shusha roads, the construction of an airport in Fizuli and the construction of an airport in Kalbajar in the future. All these works should be taken into account when determining the boundaries of this category of land.

4. The soils of the specially protected areas are 43947 hectares. Garagol State Natural Reserve (240.0 hectares), created on the territory of Lachin region, acted in the direction of protecting rare species of fauna. Rare breeds of animals such as brown bears, wolves, roe deer, wild boars, jackals, badgers and mountain goats were protected here. On the territory of the Zangilan region - the state reserve Basitchay (107.0 hectares), Lachin (21400.0 hectares), Gubadli (20,000.0 hectares) and Arazboyu (2200.0 hectares) reserves, where oak, maple, hawthorn, wild rose, juniper, sycamore, poplar, as well as trees and shrubs listed in the Red Book, which are rare specimens of flora. In these territories, the protection of plane trees with a diameter of one meter, a height of 30 m and over 300 years old and rare vegetation of Tugay forests is organized.

5. Forest fund - 246187 hectares. The forests were also subjected to Armenian vandalism. On the other hand, these forests were cut down for fuel and large open fields were formed. These fields were mainly used for the cultivation of narcotic plants.

As a result of cutting down about 25-30% (54 thousand hectares) of forests and exporting them to Armenia as building materials, processes of severe water and wind erosion occurred on forest soils.

Table 3. Ecological parameters of territory.

Soils	ECOLOGICAL PARAMETERS OF SOIL																						Point	Farm location
	H	P	∑T	BİP	MD	HUM-US	pH	waq	GR					E				s						
									g	h.c	m.c	l.c	q	e	l.e	m.e	h.e	s	l.s	m.s	h.s		
Mountain-meadow	2000	1200-1400	1000-2000	1.60	0.60	6.4	4.3-6.3	78	-	-	-	-	-	1.0	0.8	0.6	0.3	-	-	-	-	89	Summer pastures
Brown mountains and forests	800-1200	800-900	2500-3000	1.50-1.90	0.45-0.60	2.9	5.1-7.2	76	0.8	0.9	1.0	0.89	0.6	1.0	0.8	0.5	0.2	-	-	-	-	87	Forest (Hornbeam, beech)
Brown mountain-forest	2000-1200	550-700	3000-4200	1.80-2.30	0.25-0.45	3.0	7.0-7.5	78	0.8	0.9	1.0	0.89	0.6	1.0	0.7	0.5	0.2	-	-	-	-	85	Forest (Oak)
The mountain is black	500-1600	500-1600	3800-4500	2.10-2.70	0.28-0.30	3.9	7.0-7.5	70	0.8	0.9	1.0	0.89	0.6	1.0	0.9	0.5	0.3	-	-	-	-	100	Cereals, Potatoes
Chestnut	300-500	300-450	3800-4400	1.80-2.20	0.20-0.25	3.0	7.5-8.2	48	0.8	0.9	1.0	0.89	-	1.0	0.6	0.4	0.2	1.0	0.91	0.64	0.56	60	Grapes, grains, Winter Pasture
Gray-brown	200-550	400-500	3800-4400	1.70-2.20	0.20-0.25	2.8	7.5-8.2	71	0.8	0.9	1.0	0.89	-	1.0	0.7	0.5	0.3	1.0	0.91	0.64	0.56	63	Grapes, grains, Pomegranate, Winter Pasture
Gray	Up to 150	200	4200-5600	0.8-1.80	0.10-0.15	1.6	8.4-8.9	26	0.78	0.6	1.0	0.73	-	1.0	0.6	0.4	0.2	1.0	0.73	0.63	0.42	66	Grain, Cotton, Winter Pasture
Gray-brown	Up to 100	350	4600	0.8	0.10-0.15	1.0	8.7-9.0	22	0.78	0.6	1.0	0.73	-	1.0	0.7	0.4	0.3	1.0	0.73	0.63	0.42	42	Pomegranate, Olive, Grapes,
Meadow	100	250	4400	0.8-2.0	0.10-0.15	1.7	7.4-8.6	40	0.36	0.91	1.0	0.89	0.6	1.0	-	-	-	1.0	0.86	0.60	0.55	63	Cotton, Winter Meadow
Pebble river beds	It stretches from the Alpine zone to the lowlands along the mountain river beds																							
Bare rocks saline clay rocks	Geological derivatives																							

Table 4. Agroclimatic features of the liberated territories

Agroclimatic features / Soil types and subtypes	Average annual air temperatures	Average annual minimum absolute temperatures in	Average annual minimum air temperature	Average annual maximum absolute temperature	Average annual soil temperature	Amount of temperature above 10 degrees	Average annual relative humidity, %	Annual amount of precipitation, mm	Annual possible evaporation, mm	The amount of annual snow-covered days	The number of days with annual hail
Mountain meadow primitive	10,0	-14	-21	36	12	3086	65	641	780	49	3,3
Mountain meadow soddy	10,0	-14	-21	36	12	3086	65	641	780	49	3,3
Mountain forest meadow	10,0	-14	-21	36	12	3086	65	641	780	49	3,3
Mountain meadow black	7,4	-18	-25	34	10	2263	72	696	376	65	6,8
Mountain meadow black	7,4	-18	-25	34	10	2263	72	696	376	65	6,8
Mountain meadow dark	7,4	-18	-25	34	10	2263	72	696	376	65	6,8
Mountain forest brown leached	7,4	-18	-25	34	10	2263	72	696	376	65	6,8
Mountain-forest brown steppe	8,4	-14	-22	32	10	2591	72	711	597	54	4,2
Mountain forest brown typical	8,4	-14	-22	32	10	2591	72	711	597	54	4,2
Mountain forest chestnut typical	8,4	-14	-22	32	10	2591	72	711	597	54	4,2
Mountain forest brown cultivated	8,4	-14	-22	32	10	2591	72	711	597	54	4,2
Mountain meadow steppe	10,9	-12	-20	37	13	3408	69	587	751	31	4,1
Mountain forest brown carbonate	10,9	-12	-20	37	13	3408	69	587	751	31	4,1
Mountain-forest brown steppe	10,9	-12	-20	37	13	3408	69	587	751	31	4,1
Mountain forest brown loess	10,9	-12	-20	37	13	3408	69	587	751	31	4,1
Mountain gray-brown dark	13,2	-11	-18	39	-	4168	66	486	920	18	0,8
Mountain gray-brown ordinary	13,2	-11	-18	39	-	4168	66	486	920	18	0,8
Chestnut ordinary	13,2	-11	-18	39	-	4168	66	486	920	18	0,8
Chestnut long-irrigated	13,1	-10	-17	40	16	4116	69	458	848	13	1,4
Meadow chestnut	13,1	-10	-17	40	16	4116	69	458	848	13	1,4
Gray typical	13,1	-10	-17	40	16	4116	69	458	848	13	1,4
Gray irrigated	13,1	-10	-17	40	16	4116	69	458	848	13	1,4
Gray meadow	13,3	-13	-21	41	17	4246	66	467	966	25	1,0
Floodplain meadow (alluvial meadow)	13,3	-13	-21	41	17	4246	66	467	966	25	1,0
Chestnut dark	13,3	-13	-21	41	17	4246	66	467	966	25	1,0

For the production of parquet, especially relict rare tree species were deliberately cut down. As a result, the soils became steppe. It will take decades to plant and grow forest trees in these areas.

6. The total land area of the **water fund** was 19,800 hectares. Reservoirs and hydroelectric power stations of Sarsang and Sugovushan are of great importance here. The water fund also includes parts of the Bargushag, Khakari, Tartar, Araz rivers, as well as other small rivers and lakes. For a long time, the Armenian occupiers did not allow the use of these reservoirs, and therefore there was a constant shortage of water in the adjacent areas.

7. The area of land of the **reserve fund** previously amounted to 3083 hectares. However, the area of these lands has increased significantly due to various defensive structures, fortifications, trenches, built by the Armenians on suitable lands during the occupation. On these soils, it is necessary to carry out reclamation studies to determine the area. Then it is necessary to take measures to return these soils to agricultural use. In parallel with this, large-scale studies of soils on the lands of the reserve fund should be carried out and the fertility of the territory should be assessed (Fig. 6).

First of all, it is necessary to restore the legal regime, to clarify the areas and boundaries of land categories. At the same time, the new reconstructed infrastructure should be taken into account in the master plans that will be developed for the restoration of urban and rural settlements. Large-scale

land-use plans should be developed for each administrative region and municipality. To ensure the implementation of all these works, it is necessary to immediately start land surveying work, determine the area of soil categories, target purposes and conduct land surveying field work in order to clarify the boundaries.

Changes in the region's soils with the involvement of the region's lands in large-scale soil research, changes caused by anthropogenic impacts (wind and water erosion, technogenic disturbances, desertification) require scientific study. The reasons for the decline in fertility should be scientifically investigated, as well as proposals and recommendations for their restoration should be given.

Soil research will study the supply of nutrients to the soil, structure, granulometric composition and the intensity of erosion processes. These metrics are used as the basis for calculating grade scores. As part of the agroecological assessment, agroecological maps will be prepared with the study of more than 50 elements of soil, climate and relief.

Should be prepared new soil maps and quality maps of administrative-territorial districts and municipalities at the scale of 1:10000 (1:25.000 in mountainous areas).

The staff of the Institute of Soil Science and Agrochemistry of ANAS bears great responsibility for the implementation of this work. The Institute has already begun work in this direction. For this, a special laboratory has been created to conduct large-scale soil and agroecological research. All studies and cartography use modern GIS technologies. To organize the work and monitor the processes, it is planned to open a strong point of the institute in the Karabakh region.

One of the main tasks is to implement land reform in the region. Preliminary work has begun at the Institute of Soil Science and Agrochemistry to calculate land shares in points per hectare, and currently work is underway to calculate quality points for each region of the region and quality cartogram.

During the land reform, the list of people who will receive land shares and privileges should be clarified and land resources should be distributed according to forms of ownership. Once the land norms are known, the process of measuring and transferring the lands to the owners will begin. It seems to us that the experience of the Russian Federation can be used in this process. That is, in the process of settlement, as the population settles, the lands must be measured and given. It would be more appropriate to give land shares to citizens born after August 2, 1996, after they come to live permanently in Karabakh. This will be the best campaign for the population to return to their former place of residence.

Most of the soil is suitable for agriculture. Before the occupation, there were 187 thousand hectares of arable land, 46 thousand hectares of perennial crops, 18 thousand hectares of hayfields and 337 thousand hectares of pastures. The soils are especially fertile in the Arazboyu strip, Aghdam, Fizuli, Jabrail and Gubadli regions. During the occupation, as a result of the construction of fortifications, digging trenches, trenches and other defense facilities in these areas, the lands were destroyed and degraded to varying degrees. One of the important issues is to conduct reclamation research on these lands and then implement scientific and practical measures to return the lands to cultivation. This deplorable landscape is present throughout the region.

As a result of large-scale soil research conducted by the Institute of Soil Science and Agrochemistry in the pre-occupation years, quantitative assessment of soil fertility was carried out for all regions of the region and land maps and quality cartograms were compiled, agro-industrial grouping of lands was carried out.

Most of the soil in the region belong to quality groups I, II and III. Fertility was estimated at 54-100 points.

30-40 years have passed since the assessment of these soils, and as a result of the destruction of flora and fauna, strong soil degradation processes (erosion, salinization, desertification, wind and water erosion) have occurred in many places. With regard to soil fertility and structure, there have been profound and negative changes in the amount of nutrients it contains.

The agroclimatic features of the liberated territories show that various trees and shrubs can be grown here, as well as agricultural and livestock soils can be developed. The average annual temperature, rainfall, effective temperature, relative humidity and other climatic elements, as well as the restoration of irrigation systems in Aghdam,

Fizuli, Zangilan, Jabrail districts create all conditions for planting millet, peas, lentils, beans, etc., orchards (apples, pears, quince, pomegranates, dates, cherries, plums) and grape plantations, planting mulberry seedlings for the development of cocoons. In addition, in the foothills and plains there is an opportunity to grow industrial crops (cotton, corn, sunflower, soybeans, etc.). In these areas, it is possible to grow and obtain high yields from the kiwi, which is a subtropical plant. The use of waters from the Araz, Khakari and Bargushad rivers, the Sarhang and Sugovushan reservoirs will ensure high yields. There are good conditions for gardening and planting potatoes in the high and middle mountainous parts of the Kalbajar, Shusha and Gubadli regions. Soils in the lower parts of these regions can be used for agricultural purposes (Table 4).

REFERENCES

Azərbaycan Respublikasının Müdafiə Nazirliyinin yaydığı foto görüntülər (2020)

Məmmədov Q.Ş. (2002) Azərbaycanda torpaq islahatı. Hüquqi və elmi-ekoloji məsələlər. Bakı, 411 s.

Məmmədov Q.Ş. (2003) Azərbaycan Respublikasının Dövlət Torpaq Kadastrı. Bakı, 445 s.

Məmmədov Q.Ş. və b. (2021) Azərbaycanın 1:100000 miqyasında CİS əsasında hazırlanmış elektron torpaq xəritəsi.

Salayev M.E., Zeynalov A.K., Şərifov E.F. (1965) Qarabağ düzünün torpaqları. Bakı, 60 s.

Süleymanov Ə.O. (1986) Kiçik Qafqazın cənub-şərq hissəsinin eroziyaya uğramış torpaqlarının aqrofiziki xassələri və onun nizamlanması yolları. *Kənd təsərrüfatı elmləri namizədlik dissertasiyasının avtoreferatı*. Bakı, 22 s.

Бабаев М.П. (1967) Почвы и качественная характеристика земель подгорной равнины Карабахской степи. *Автореферат дис. канд. с-х. наук*. Баку, 1967, 30 с.

Гасанов Ш.Г. (1969) Почвы приараксинской полосы и их рациональное использование. Баку, 196 с.

Гасанов Ш.Г. (1978) Генетические особенности и бонитировка почв Юго-Западного Азербайджана. Баку, 219 с.

Мамедов Г.Ш., Аскерова М.М. (2019) Принципы составления почвенных, экологических и других картографических материалов Азербайджана на основе ГИС. *Международный научно-исследовательский журнал «Евразийский Союз Ученых»* (Россия, г. Москва), **№6 (63), I часть:** 17-27.

Мамедов Г.Ш. (2019) Составление интерактивных почвенных карт и карт экологической оценки почв Азербайджана на основе географических информационных систем. *«Бюллетень науки и практики»* (Россия, Тюменьская область, г. Нижневартовск), **№3:** 118-127.

Салаев М.Э. (1966) Почвы Малого Кавказа. Баку, 327 с.

Шарифов Э.Ф. (1984) Горно-лесные почвы Восточного склона Малого Кавказа. Баку, 192 с.

Mammadov G.Sh., Mammadova S.Z. (2016) Comparative evaluation of the soil fertility under tea and vegetablecuebures the Lankaran province of Azerbaijan. *"Global Journal of Agricultural Research" European-American Journal,* **4(1):** 26-39.

Mammadov G.Sh., Mammadova S.Z., Osmanova S.A. (2020) Basics of compiling interactive electronic soil maps and ecological assessment maps. *Danish Scientific Journal,* **34:** 28-34.

Mammadov G.Sh., Hasanov V.H., Mammadova S.Z. (2020) and others. Guidelines for the preparation of interactive electron soil maps and maps of ecological assessment of soils at a scale of 1:100000. Baku, 88 p.

Azərbaycanın işğaldan azad olunmuş ərazilərinin torpaq və ekoloji qiymət xəritələrinin tərtibi

Q.Ş. Məmmədov[1], D.R. Əhədov[2] , Z.R. Məmmədov[2]

[1]AMEA-nın Rəyasət Heyəti, Bakı, Azərbaycan
[2]AMEA-nın Torpaqşünaslıq və Aqrokimya İnstitutu, Bakı, Azərbaycan

Məqalədə Qarabağ bölgəsində yayılmış torpaqların ümumi keyfiyyət göstəriciləri təsvir edilmişdir. İşğaldan azad olunmuş torpaqların əvvəlki və sonrakı vəziyyəti müqayisəli şəkildə öyrənilmişdir. Bölgənin torpaqlarının gələcəkdə daha səmərəli istifadəsi üçün aqroekoloji xüsusiyyətləri araşdırılmış və təkliflər irəli sürülmüşdür. Azərbaycanın, o cümlədən işğaldan azad olunmuş torpaqların aqroekoloji rayonlaşdırılması, Coğrafi İnformasiya Sistemləri vasitəsilə ekoloji qiymətləndirilməsi aparılmışdır. Həmçinin Kiçik Qafqazın hündürlük modeli, torpaq, bonitirovka, ekoloji qiymət xəritələri hazırlanmışdır. Ümumi xəritələrdən başqa hər bir rayon üçün də bu xəritələr tərtib edilmişdir.

Açar sözlər: *Qarabağ bölgəsi, ekoloji qiymətləndirmə, aqroekoloji xüsusiyyətlər, kənd təsərrüfatı, torpaq xəritəsi, CİS*

Составление почвенных карт и карт экологической оценки почв территорий Азербайджана освобожденных от оккупации

Г.Ш. Мамедов[1], Д.Р. Ахадов[2], З.Р. Мамедов[2]

[1]Президиум НАН Азербайджана, Баку, Азербайджан
[2]Институт почвоведения и агрохимии НАН Азербайджана, Баку, Азербайджан

В статье представлены данные качества почв, распространенных в Карабахском регионе. Проведено сравнительное изучение состояния почв до и после оккупации. Изучены агроэкологические особенности почв региона и даны предложения по дальнейшему и более эффективному использованию их в будущем. Агроэкологическое районирование и экологическая оценка проводились на основе географических информационных систем. Также подготовлены высотная модель Малого Кавказа, карты почв, бонитировки и экологического оценивания. Помимо общих карт, были составлены соответствующие карты для каждого района.

Ключевые слова: *Карабахский регион, экологическая оценка, агроэкологические особенности, сельское хозяйство, карта почв, ГИС*

Nəşriyyatın direktoru: *Səbuhi Qəhrəmanov*
Kompüter tərtibçisi: *Rəvanə İlmanqızı*
Bədii tərtibat: *Şəlalə Məmməd*

Formatı 60x84 $^{1}/_{8}$
Həcmi 21,25 ç.v.
Tirajı

Ünvan: Bakı şəh., İstiqlaliyyət küç. 28