ГЕОГРАФИЯ И ГЕНЕЗИС ПОЧВ

IISTI: 68.05.31

DOI:10.51886/1999-740X_2025_3_5

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REGARDING THE MATTER ON PROTECTION OF THE SOIL GENOFUND OF AZERBAIJAN

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Abstr0act. Considering that a soil genofund of Azerbaijan on presence of various types (mountain-meadow, mountain-meadow-steppe, mountain-forest yellow earth, mountain-forest brown, mountain-forest brown, meadow-steppe, grey-brown, grey earth and meadow-grey earth, etc.) with the morphological, physical and chemical and biological features as it is known are formulated. The protection of these unique natural resources is relevant for soil scientists in Azerbaijan. The aim of the research - to study virgin and anthropogenically modified individual types of soils, to identify changes that have arisen in the genetic horizons associated with agrocenoses. The deluvial deposits are characteristic of foothill zones. According to the granulometric composition is gravel- clayey -loamy, high-carbonate. The ratio of physical sand [>0.01 mm] to physical clay [<0.01 mm] is 0.6. Proluvial deposits are adapted to the lower part of the apron. According to the granulometric composition - medium and heavy loamy, carbonate. Characterized by a higher sand fraction (41.2 ± 0.55%), the ratio of physical sand to physical clay-1.9. In the meter-thick layer of irrigated soils, the granulometric composition is slightly loamy, the content of the silt fraction -28.3±1.08–31.8±0.83%, physical clay – 63.0±1.8–65±1.1. This is 4–6% (dry steppe zone) and –3.5% (semi-desert zone), respectively. Depending on the nature of the irrigation relief, a comparative increase in clayey (4.7%) and light clayey (5.2%) granulometric composition is observed in irrigated soils. In the granulometric composition changes between the light loamy, and light clayey (20.6%) mode (57.7%) in the virgin meadow-grey soils, then it becomes from irrigative loamy to heavy clayey (mode 60.6%). An upper part of profile is considerably humificated: 1.19 g/cm^3 – changing coefficient is 6.88% (dry-steppe zone) and 1.30 g/cm3– changing coefficient is 3.78% (semi-desert). The virgin zonal soils of arid subtropics are rich in humus. An average statistical quantity of humus in 0 – 25 cm layer is 2.5 – 2.8% in the dry-steppe, 1.6–2.0% - in the semi-desert zones. Humus gradually rises (newly irrigated---> irrigated--->ancient--->irrigated) in the process of collecting agro-irrigation reserves, formation of reserve organic matter in the soil.

Keywords: soil genofund, soil types, granulometric composition, humus, genetic layers.

INTRODUCTION

In various ecological conditions, characteristic types of soils (mountain-meadow, mountain-meadow-steppe, mountain-forest yellow earth, mountain-forest brown, mountain-forest brown, meadow-steppe, grey-brown, grey earth and meadow-grey earth, etc.), with the morphological, physical and chemical and biological features as it is known are formulated. Presence for each type of soils of specific characteristics as a matter of fact reflect evolution of these soils in their dialectic unity with environment. It is necessary to cancel very important detail which is connected with an eco-geographical area of each type of soils.

Along with environmental conditions development of these soils passes at active participation biological (vegetation, live organisms) factors with which is connected about their fertility and ability to form a biomass. Fundamental questions of soil formation, were engaged not only classics of soil science B.B. Dokuchaev [1], but also their followers – N.M. Fridland [2], V.R. Volobuyev [3], V.A. Kovda [4].

Preservation of virgin soils probably only in not broken biogeocenoses. The Primary goal which should be solved at creation of system of soil standards is finding-out of their close interrelation with nature protection actions reference natural biogeocenoses (reserves, national parks).

For maintenance of stability of reference soils preservation not only soil formation factors, but also developed evolutionary interrelations between separate soil differences is necessary. Usually, such structure of a soil cover is characteristic for regions, extreme on a theme or to other ecological factor (to temperature, humidity, humus, etc.) where insignificant heterogeneity of the factor conducts to essential change of properties of soil.

Thus, at allocation of the basic standards of soils, for the basic unit suggest to accept a province it is soil - geographical or it is soil - ecological division into districts. As additional standards suggest to allocate also soil differences high taxonomic level taking positions with ecological conditions changing in a certain direction, soil creation processes and properties [5]. The problem of protection of soils is actual for soil scientists of Azerbaijan.

Research work on studying of soils of separate regions is done. These researches were based on main principles of classical soil science. Thanks to the system approach, and also the theoretical analysis of the received results it was possible to classify republic soils, to make their systematization according to the international requirements [6-8], studying of geographical distribution of soils [3, 7, 9, 10]. The essential importance was got by studying anthropogenesis - the changed soils. In this context it was rather studied the virgin and irrigated cultivated analogues of separate types of soils, and the arisen changes in genetic horizons connected with creation agrosenoz [11, 12] were specified.

Azerbaijan on the to climatic parameters and ecological conditions essentially differs from many regions of the world. Here there are almost many natural complexes with characteristic (endemic) soils, a biodiversity and economic activities of the person. Protection of these unique natural riches is a nation-wide problem. The law of Azerbaijan has collected in itself all stored experience of scale work in the field of land management and land tenure. In documents “Soil code of the Republic of Azerbaijan” H.A. Aliyev accepted under the direction of the president on August, 8th, 1999 it is said that it is necessary to create conditions for rational use of the earths and their protection, restoration and increase of fertility of the earths, preservation and environment improvement.

Environments of soils extended in the republic are available such types which are dominating, and during too time there are soils the limited area of distribution. But having the essential importance, both for formation native, and for development in these regions of various agricultural production.

To soil museum created at the Institute of Soil Science and Agro Chemistry, NASA special mission after protection of soil and other biological resources, and also carrying out among the population scientifically - informative lectures, seminars, demonstration of the collected material [7, 13].

The scientific novelty of the research lies in the study of the geographical distribution of soils, the establishment of dominant and limited types of soils in the soil environments of the Republic.

The aim of the research is to study virgin and anthropogenically modified individual types of soils, to identify changes that have arisen in the genetic horizons associated with agrocenoses. This is the scientific interest and relevance of these studies.

MATERIALS AND METHODS

The object of the research is the soils of the foothills and plains of the dry subtropical zone of Azerbaijan (Piedmont sloping plain, 0.7-1.0º, Piedmont sloping lowland, 0.5-1.0º). The research methods are comparative-geographical (geographical patterns of distribution of these soils by granulometric composition, gypsum and salt by genetic horizons) and comparative-analytica.

On the plots, soil sections were laid (the number of profiles in the arid dry-steppe zone – 36 and in the semi-desert zones - 26), a morphological description was carried out, soil samples were taken from the genetic horizons [14, 15]. In soil samples, the granulometric composition was determined by the pipette method (N.A. Kachinsky in preparation for the analysis of the soil by the pyrophosphate method according to S.I. Dolgov and A.I. Lichmanova), the content of gypsum and salt - according to E.B. Arinushkin [16]. The statistical processing of the obtained data was carried out according to B.A. Dospekhov [17].

RESULTS AND DISCUSSION

In various ecological conditions, characteristic types of soils are distinguished (mountain-meadow, mountain-meadow-steppe, mountain-forest yellow soils, mountain-forest brown, mountain-forest brown, meadow-steppe, gray-brown, gray soils and meadow-gray soils, etc.), which, as is known, have their own morphological, physicochemical and biological features. The presence of specific characteristics for each type of soil essentially reflects the evolution of these soils in their dialectical unity with the environment [18-20]. Climate, along with parent rocks, plays an important role in soil formation. Due to the large number of soil types common in different zones of Azerbaijan, we will provide information about climate in the dry subtropical zone, (table 1).

Table 1- Average annual climate indicators [21-23]

Station	Temperature, ^{0}C	Total radiation, ccal/cm^2	Radiation balance, ccal/cm^2	Precipitations, mm	Evaporation, mm	Fertility coefficient	Dryness coefficient (according to Budakov)	Quantity of temperature higher than 10^{0}C
Absheron	13,6	130	51,3	200	1064	>1,0	0,25	4800
Aghjabadi	14,0	-	-	310	-	0,30	3,20	4424
Yevlakh	14,4	129	45,5	278	1139	0,24	4,09	4410
Kurdamir	14,5	134	47,1	341	1034	0,23	3,03	4410
Goychay	14,0	-	-	433	930	0,47	2,14	4410
Imishli	13,8	131	47,1	265	990	0,27	3,73	4347
Aghstafa	13,1	127	47,5	400	-	0,38	2,70	4300
Beylagan	13,8	-	-	345	-	0,42	3,32	4221
Aghdam	13,2	133	45,7	460	848	0,54	1,84	4033

The soil-forming rocks in these regions are represented by the newest Quaternary, mainly loose, deposits, which are products of the weathering of sandstones, limestones, calcareous marls, quartz porphyrites, basalts, Lower Cretaceous granodiorites, quartz diorites, rocks belong to the 3th period.

Chalk loamy-gravelly, clayey-loamy alluvial, and proluvial-deluvial sediments and sandy rocks are found etc. (table 2).

Table 2 - Average statistical indicators of the granulometric composition in the soil-forming rocks, %

Soil-forming rocks	Size of particles, (mm)						
	1-0,05	0,05-0,01	0,05-0,001	<0,001	<0,01	> 0,001	<0,01mm
Deluvial	8,9+1,14	29,3±0,91	66,4±1,22	24,7±1,32	62,0±1,45	38,0±1,37	0,61
Proluvial	20,0±2,57	27,3±2,67	58,9±3,15	20,9±0,64	50,6±2,15	49,4±1,6	0,98
Alluvial	40,0±0,55	24,3±2,42	45,0±2,35	15,0±2,30	34,7±1,81	65,3±2,76	1,88

Deluvial deposits are adapted to the foothill zones. And they are represented by the granulometric composition with gravel-clayey-loamy, high calcareous and more or less well- sorted materials.

The powder fractions predominated among the fractions of the granulometric composition, the ratio of physical sand [<0,01mm] to physical clay [<0,01mm] is equal to 0.6 (table 2).

Proluvial deposits are adapted to low part of the plume. They are calcareous, medium and heavy loamy in granulometric composition.

Alluvial sediments develop in the valleys, in the ancient cones of the river floats, dry ravines. A mixture of gravel, sand and clay stratums are found in their cross-section.

These deposits are characterized by the higher sand fraction which is 41.2 ± 0.55 % , and sometimes it becomes more, a ratio of physical sand to physical clay is 1.9 in comparison with the previous empty deposits.

As it is known, the soils are characterized with the definite appearance and special morphological structure. V.V. Dokuchayev gave a method of study of composition and characters of genetic layers from legal land profile on a scientific basis for the first time.

The morphogenetic analyses which were performed with the purpose of clarifying the modern and ancient features of soil profile help to learn soil, its establishment date, evolution of soils in the modern and cultivated zone.

The agricultural work in soils the soil morphology fundamentally changes, radical genetic changes are created in soil during prolonged irrigation.

Indexation of genetic layers by the Institute of Soil Science named after V.V. Dokuchayev was carried out on the basis of the system of genetic symbols of soils.

The parameters obtained on the basis of generalized and statistic study of numerous field investigations of typical sections describe main types of morphological structure of dry-steppe and semi-desert zones and virgin, rain fed, irrigated arid field (table 3, 4).

The soil profile allows to describe a quantity from virgin soils to highly cultivated thick agro-irrigation floats in various stages of the evolution.

In order to get an average value of morphological parameters of soil profile, statistically homogenous granulometric formations in the main rocks, heavy loamy and light clayey sections were tested.

Table 3 - Average statistical morphological indicators of soils in the arid dry-steppe zone

Indictors	Virgin	Rainfed	Newly irrigated	Irrigated	Anciently irrigated
Thickness of layers, cm: A-Aa	34,7±0,70	37,1±1,00	42,6±1,23	51,5±1,10	66,8±2,19
AO	3,2±0,40	-	-	-	
A1' A1'p-A1'a	18,5±0,71	19,3±0,42	25,6±0,66	26,1±0,45	27,2±0,57
A1"-A1"p-A1"a	14,8±0,55	17,8±0,80	17,2±1.05	24,2±0,64	25,2±0,57
A1"' a	-	-	-	-	20,3±1,31
Agro-irrigation	-	-	-	-	99,8±4,47
Depth with carbonate, cm	39,0±1,28	46,7±2,36	65,4±2,35	97,1±2,40	-
Layer formation in depth, cm: Gypsum	102,7±3,38	104,6±2,44	113,4±7,68	145,5±6,30	-
Salt	153,1±7,36	159,2±6,26	-	-	-

A statistical analysis of the main morphological indicators allows to get a correct average value of genetic layers (density) of the new soil for solution of the real problem, to show a change rate of the profile in a process of soil cultivation.

An average quadratic inclination (S=4-12 cm), and relative error (P=4-10%) can be considered an average value. This confirms correctness of the obtained average value.

Table 4 - Average statistical morphological indicators in the soils of the semi-desert zones

Indicators	Virgin	Newly irrigated	Irrigated	Anciently irrigated
Thickness of layers, cm: A-Aa	31,5±1,51	40,1±1,64	51,1±1,16	64,0±1,75
Ad	4,4±0,52	-	-	-
A1' A1'a	15,8±0,99	25,8±0,42	23,9±0,56	25,9±0,49
A1"A1"a	15,0±1,01	13,1±0,93	21,2±0,64	21,7±0,92
A1"'	-	-	-	25,3±1,25
Agro-irrigation Ai	-	-	-	8±3,56
Depth with carbonate, cm:	41,9±3,81	46,1±2,31	75,1±2,38	-
Depth of the layer formation, cm: Gypsum	67,1±5,50	96,7±6,40	139,1±6,89	149,9±9,39
Salt	70,3±5,96	109,3±3,99	131,2±6,87	-
Gley	161,0±7,27	157,5±7,35	63,7±9,94	75,9±5,25

The soil-forming rocks are mainly modern gypseous calcareous deluvial loessial clayey for virgin, rainfed and irrigated soils.

Granulometric composition of agro-irrigation layers (density 100-200 cm) is mainly light clayey in the irrigation-accumulative soils during irrigation with river waters.

Though a source of irrigated waters is various, a composition of dependent floats entering the area is the same silt fraction (33-34%), and physical clayey (72-73%).

Sometimes increase of these values is observed (about 20-25 cm and 20-30%), it is related to decrease of loss or displacement features of the morphological indicators of soil.

Consequently, an average quantity can express general objective laws in cultivation process. The prolonged and systematic irrigation is a reason for strong change of agrophysical features in the zonal soils.

V.A. Kovda [4] indicates that an application of cultivation in the dry-steppe and semi-desert condition improves water-physical features of virgin soils, rises their waterproofing, waterpenetration, ability to retain moisture reserve in soil. A great attention is paid to change of agrophysical characters of the cultivation process in foreign references.

The heavy loamy granulometric composition is characteristic for virgin soils of the dry-steppe zone of A-layer. On average < 0.01 mm – 56.7+1.18% (table 5).

Table 5 - Average statistical data of the granulometric composition in the soil

Soils and number of cases	Average depth, cm	Fraction<0,01mm,%				Fraction<0,001mm,%				Siltness degree, %
		x	**s**	v	s_x	**x**	**s**	**v**	s_x	
Dry-steppe zone										
1	2	3	4	5	6	7	8	9	10	11
Virgin, 36	0-25	56,7	6,76	11,93	1,18	24,2	5,99	24,81	1,04	43
	25-50	64,3	5,36	8,34	0,93	28,6	5,01	17,45	0,88	45
	50-100	60,8	5,21	8,58	0,85	25,4	4,80	18,91	0,68	42
	100-200	58,0	12,17	21,00	2,33	20,4	6,37	31,21	1,23	35
	200-300	56,9	9,79	17,21	2,95	20,6	8,40	40,65	2,53	36
Irrigated, 36	0-25	57,6	4,64	8,04	0,80	25,8	1,71	6,60	0,30	45
	25-50	59,2	7,38	12,45	1,25	27,7	5,41	19,54	0,92	47
	50-100	58,7	8,47	14,42	1,26	26,7	5,52	14,42	0,82	45
	100-200	53,8	11,00	20,40	1,59	24,3	2,93	12,06	0,42	45
	200-300	47,9	11,14	33,21	2,76	16,6	6,63	40,01	1,65	37
Anciently Irrigated, 36	0-25	63,0	6,66	10,60	0,97	29,2	7,71	26,12	1,12	46
	25-50	65,4	7,30	11,15	1,10	31,8	5,51	11,15	0,83	49
	50-100	64,7	7,90	12,21	0,98	30,6	7,58	27,74	0,94	47
	100-200	59,4	10,64	17,81	1,40	26,0	5,29	20,34	0,70	44
	200-300	57,4	9,29	16,17	1,73	23,0	5,21	22,62	0,94	40
Semidesert zone										
Virgin, 26	0-25	55,0	7,44	13,54	1,69	19,7	5,82	29,58	1,34	36
	25-50	59,2	6,26	10,58	1,48	22,0	4,16	18,90	0,95	38
	50-100	52,4	11,45	21,86	2,50	21,8	5,35	24,52	1,17	42
	100-200	47,9	8,88	18,54	1,89	19,5	5,55	29,28	1,18	41
	200-300	50.8	4,88	9,63	1,73	19,3	3,01	15,61	1,06	38

Table 5 (continued)

1	2	3	4	5	6	7	8	9	10	11
Irriga-ted, 26	0-25	59,6	7,48	12,55	1,21	27,4	4,83	17,60	0,77	11
	25-50	59,9	10,49	17,52	1,58	28,0	5,86	20,96	0,88	47
	50-100	58,8	9,68	16,48	1,21	26,0	8,12	31,23	1,01	46
	100-200	58,0	11,58	19,96	1,31	25,1	4,57	18,24	0,53	44
	200-300	56,1	14,28	25.44	2,52	23,3	7,33	31,40	1,30	43
Anci-ently Irriga-ted, 26	0-25	60,3	13,71	22,76	2,89	25,8	9,63	37,41	1,61	43
	25-50	63,0	7,09	11,25	1,18	28,3	6,47	22,84	1,08	45
	50-100	62,4	12,57	20,15	1,58	26,6	8,85	33,27	1,11	43
	100-200	59,5	16,37	27,54	1,75	26,4	8,83	33,45	0,96	44
	200-300	59,3	14,73	26,14	2,15	26,8	11,96	44,64	1,74	45

A quantity of notable claying particles < 0.01 mm is noted in the middle part (25-50 cm) of profile. The high dispersion fraction is 45% of physical clay, this confirms clay of the same profile. A composition of virgin soils in the semi-desert zones is lighter than the virgin soils of the dry-steppe zone, and claying of the profile is weak. It is known that a granulometric composition of the initial zonal soils aggravates during irrigation. The soil composition in the condition changes under the influence of multi-factor irrigation and the source of irrigated waters, antiquity of irrigation, gathering of irrigation floats depend on their lithological composition.

The composition of irrigated soils aggravates more than virgin soils under an influence of prolonged turbid river waters, (light-clayey-silty), and differs by the similarity of the profile. This is characteristic for rainfed soils. The weak loamy is noted in the one-metre layer, a composition of silt fraction is 28.3± 1.08-31.8±0.83 % physical clay is 63.0±1.8 - 65±1.1. It is accordingly 4-6% (dry-steppe zone) and-3.5% (semi-desert zone), more than virgin zonal soils. This is explained with the intensive collection of agro-irrigation floats and their heavy composition. The soils which are irrigated with the transparent qanat and artesian waters have lighter composition along the profile. The noticeable difference of the upper three-meter layer of the irrigated virgin soils is shown for a granulometric composition (table 6). Sometimes if the granulometric composition is light loamy – 52.2%, in all cases a composition of the particles (a composition mode is <0.01 mm 63.6%), then the irrigated soils are heavy loamy 51.2% - 188 (58.6%) regularly rise and a composition of the light loamy (17.9% from188) compared to (13.5%-from150). The 3-meter layer of the upper stratum formed by irrigation floats of irrigated soils (with turbid water) is light loamy-59.4%-257 by chance (composition of the particles<0.01mm-65.3%). A relative increase in loamy (4.7% in all cases) and light loamy (5.2%) is observed depending on irrigation relief in the irrigated soils.

Table 6- Distribution of physical clay (<0,01 mm) in the irrigated soils (layer 0-3 m)

Particles composition <0,01mm, %	Granulometric composition	Virgin		Irrigated		Anciently irrigated	
		quantity number	%	quantity number	%	quantity number	%
Dry-steppe zone							
0-5	Sand	-	-	-	-	-	-
6-10		-	-	-	-	-	-
11-15	Sandy	-	-	1	0,5	2	0,8
16-20		1	0,7	1	0,5	2	0,8
21-25	Light loamy	1	0,7	1	0,5	2	0,8
26-30		2	1,4	2	1,0	3	1,2
31-35	Average loamy	3	2,0	7	3,7	4	1,6
36-40		4	2,7	10	5,3	5	1,9
41-45		10	6,7	12	6,4	6	2,3
46-50	Heavy Loamy	11	7,3	15	8,0	13	5,1
51-55		14	9,3	28	14,9	24	9,3
56-60		24	16,0	53	28,3	31	12,1
61-65	Light Clayey	45	29,8	30	16,0	64	24,7
66-70		25	16,7	18	9,6	59	23,0
71-75		9	6,0	8	4,3	30	11,7
76-80	Average Clayey	1	0,7	2	1,0	9	3,5
81-85		-	-	-	-	3	1,2
>85	Heavy Clayey	-	-	-	-	-	-
Total		150	100	188	100	257	100
Mode			63,56		58,59		65,34
Semi-desert zone							
0-5	Sand	-	-	-	-	-	-
6-10		-	-	-	-	2	0,7
11-15	Sandy	-	-	-	-	4	1,4
16-20		-	-	-	-	5	1,7
21-25	Light loamy	1	1,1	1	0,4	5	1,7
26-30		2	2,2	1	0,4	5	1,7
31-35	Average loamy	3	3.3	8	3,0	6	2,1
36-40		5	5,4	12	4,6	16	5,5
41-45		10	10,9	16	6,1	22	7,6
46-50	Heavy loamy	14	15,2	25	9,5	24	8,3
51-55		17	18,5	41	15,6	25	8,7
56-60		21	15,2	51	19,4	38	13,2
61-65	Light clayey	13	14,1	47	17,9	37	12,8
66-70		4	4,3	37	14,0	31	10,7
71-75		2	2,2	10	3,8	24	8,3
76-80	Average Clayey	-	-	8	3,0	21	7,3
81-85		-	-	4	2,5	17	5,9
>85	Heavy Clayey	-	-	2	0,8	7	2,4
Total		92	100	263	100	289	100
Mode			57,67		59,57		60,64

The soils with light granulometric composition are superior in the upper and transverse part of the channels, but the soils with the heavy granulometric composition are superior in the middle and low parts of them.

This regularity is clearly seen in the bowl-shaped relief of the semi-desert zone.

In the granulometric composition changes between the light loamy (3.3 in all cases), and light clayey (20.6) mode (57.7%) in the virgin meadow-grey soils, then it becomes from irrigative loamy (3.1%) to heavy clayey (2.4%) (mode 60.6%).

Such legitimacy is characteristic for oasis soils. A quantity and aggregation rate of aggregates are calculated to create a general view about micro-aggregation and cultivation in the zone of soils of different cultivation degrees and composition of soil microaggregates [17, 24].

The calcareous and loessial loamy virgin soils are rich in water-resistant micro-aggregates as maternal rock. Their total amount was adapted to humus layer and it is 28-34% on average in the dry-steppe; 20-28% in the semi-desert zone. Sharp increase of the aggregate number is noticed in AB layer which left large traces in life activity of soil fauna. Micro-aggregation of irrigated soils depends on irrigation period, level of application of the agriculture and agrotechnics.

The number of aggregates is 20-22% and 24-25% in the rainfed condition and initial stage (newly irrigated soils) and this is 5-10% lower in the soils of the dry-steppe zone in comparison with virgin soils. (in the soils under grain). The number of aggregates in the irrigative condition of the soils under the gardens forms 32-37% in comparison with the zonal virgin soils under an influence of well-developed grass cover and it rises. But it reduces in the soils under the vineyards (40-50 years) (17-24%), and this is explained with its working at 30-40 cm depth every year. The number of aggregates is 29-31%-i.e. as it is in zonal virgin soils. Majority of microaggregates in the irrigated soil layers of modern cultivation (30-38%) is explained with the useful impact of lucerne.

A quantity of the micro-aggregate number changes in a large limit depending on agricultural activity in the irrigated soils of the semi-desert zone, the microaggregates in the highly cultivated grey-and meadow-grey soils are 25-40% and 45-50%, the saline-like hardened weakly cultivated variants vibrates by 18-23 and 22-27%. From ancient times the highly cultivated irrigative soils which are formed with agro-irrigation floats and irrigated by the turbid river waters consist of 40-45% micro-aggregates.

The deep agro-irrigation layers (ancient floats) and buried soil strata are higher than micro-aggregated virgin and newly irrigated soils. This is possible to irrigate the initial soils for a long time and to apply modern agrotechnics.

The microaggregate composition of the rainfed, irrigated meadow soils is peculiar. They are characteristic for weakness. A sum of aggregates is 25-35% in non-irrigated humus layer. 50-60% increase of aggregates are observed in the ancient irrigation floats and buried layers.

The soil density changes at a large limit with some factors (granulometric and micro-aggregate, supply of organic substantive, adopted agrotechnics, irrigation period and so on). The profile of virgin soils is distinguished with the density.

An upper part of profile is considerably humificated and it is characterized with the lower density in all cases; 1.19 g/cm^3 – changing coefficient is 6.88% (dry-steppe zone) and 1.30 g/cm^3– changing coefficient is 3.78% (semi-desert). The density usually rises in calcareous layer and it is accordingly 1.414 ± 0.025 and 1.378 ± 0.023 g/cm^3.

Density of soil-forming rocks depends on its granulometric composition.

Decrease is 1.22–1.34 g/cm^3 in the loessed loamy soils, but it sharply rises in

deluvial – aluvial high calcareous rocks – 1.60–1.62 g/cm^3 in the semi-desert zones.

The information about the field soils is grouped depending on type and zone of the irrigation period and creates imagination about change of soil density in cultivation processes.

The density over all layers (irrigation with transparent water) in the irrigated soils ishigher than zonal virgin soils (1.40 – 1.44 g/cm^3) except the ploughed soils which exposed to intensive cultivation during tilling and it regularly rises towards depth. The cultivated layer that is formed from upper one – meter agro-irrigation sediments is distinguished with the density weakness as a result of the long cultivation in irrigated soils – 1.18 – 1.37 g/cm^3. The second meter – layer differs by – 1.41g/cm with a slight increase of density (change coefficient – 9.25%, fixed great quantity – 32), this is explained with a higher saltness.

The quality of irrigation water, turbidity, the composition of the dependent particles applied to the fields every year, they are not taken into account. According to many authors an intensity of mineralization process decreases in the initial stage. A supply of organic substances reduces in irrigation, especially in the ploughing layer.

This supply rises in the cultivated soil-forming process according to the defined rules. Formation of humus profile and collection of organic substances in the arid subtropic condition are directly determined through an effect of cultivated plants, application of organic and mineral fertilizers, a quantity of manure, organic substances, irrigated waters every year.

The virgin zonal soils of arid subtropics are rich in humus. Its quantity is adapted to A1 in layer A (0–25 cm). An average statistical quantity of humus in this layer is 2.5–2.8% in the dry-steppe, 1.6–2.0% in the semi-desert zones.

Minority of humus quantity in the low layers is characteristic for these soils. An absolute amount of humus is less in the tillage layer of arid field soils which are irrigated with the waters of transparent ganat and artesian in comparsion with the virgin soils (2.3–2.6% dry-steppe and 1.6 – 1.9% in the semi-desert zones).

The mobile organic combinations expose to fragmentation during the irrigation and organic substances decrease in the soils.

Distribution of humus is enough equal in the irrigated soils in comparison with the virgin soils. Humus gradually rises (newly irrigated--->irrigated--->ancient--->irrigated) in the process of collecting agro-irrigation reserves, formation of reserve organic matter in the soil. The biological activity which is created as a result of good temperature, water regime, prolonged irrigation is a reason for it. As a result, accumulation of high humus is characteristic for development of irrigated soils under perennial cultivation and agro-irrigation floats.

A similar phenomenon is observed in other types of soils in other regions of Azerbaijan. Taking into account the above, it can be said that the expansion of protected areas is not only discussed, but also implemented in practice, the attitude of soil scientists and all those involved in the use and study of land resources has become very relevant.

CONCLUSIONS

1. Considering that a soil genofund of Azerbaijan on presence of various types (mountain-meadow, mountain-meadow-steppe, mountain-forest yellow earth, mountain-forest brown, mountain-forest brown, meadow-steppe, grey-brown, grey earth and meadow-grey earth, etc.) with the morphological, physical and chemical and biological features as it is known are formulated.

2. It has been established that deluvial deposits are adapted to foothill zones. According to the granulometric composition, they are represented by gravel-clay-loamy, high-carbonate rocks. In

the granulometric composition, dust fractions predominate, the ratio of physical sand [>0.01 mm] to physical clay [<0.01 mm] is 0.6. Proluvial deposits are adapted to the lower part of the apron. According to the granulometric composition - medium and heavy loamy, carbonate, Alluvial deposits are developed in river valleys, on ancient alluvial fans of river floodplains, in dry gullies. Characterized by a higher sand fraction (41.2±0.55%), the ratio of physical sand to physical clay is 1.9.

3. Statistical analysis of the main morphological indicators of the genetic layers of the soil profile showed the rate of profile change during soil cultivation. It was found that long-term and systematic irrigation is the cause of a sharp change in the agrophysical properties of zonal soils.

4. In the meter-thick layer of irrigated soils, the granulometric composition is slightly loamy, the content of the silt fraction is 28.3±1.08–31.8±0.83%, physical clay – 63.0±1.8–65±1.1. This is 4–6% (dry steppe zone) and – 3.5% (semi-desert zone), respectively, which is more than that of virgin zonal soils. Depending on the nature of the irrigation relief, a comparative increase in clayey (4.7% of all cases) and light clayey (5.2%) granulometric composition is observed in irrigated soils. In the granulometric composition changes between the light loamy (3.3 in all cases), and light clayey (20.6) mode (57.7%) in the virgin meadow-grey soils, then it becomes from irrigated loamy (3.1%) to heavy clayey (2.4%) (mode 60.6%).

5. An upper part of profile is considerably humificated and it is characterized with the lower density in all cases; 1.19 g/cm^3 – changing coefficient is 6.88% (dry-steppe zone) and 1.30 g/cm^3– changing coefficient is 3.78% (semi-desert).

6. The virgin zonal soils of arid subtropics are rich in humus. Its quantity is adapted to A1 in layer A (0–25 cm). An average statistical quantity of humus in 0 – 25 cm layer is 2.5–2.8% in the dry-steppe, 1.6–2.0% - in the semi-desert zones. An absolute amount of humus is less in the tillage layer of arid field soils which are irrigated with the waters of transparent ganat and artesian in comparsion with the virgin soils (2.3–2.6% dry-steppe and 1.6–1.9% - in the semi-desert zones). Humus gradually rises (newly irrigated--->irrigated--->ancient--->irrigated) in the process of collecting agro-irrigation reserves, formation of reserve organic matter in the soil.

The work was carried out in the laboratory of genesis, geography and soil cartography of the Institute of Soil and Agrochemistry of the Ministry of Science and Education of the Republic of Azerbaijan on the topic: "Genetic diagnostics and mapping of taxonomic units of Azerbaijani soils using innovative methods (a complex topic with Soil Geographic Information Systems and Soil Cover Structure Laboratories)".

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ТҮЙІН

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ӘЗЕРБАЙЖАННЫҢ ТОПЫРАҚ ГЕНОФОНДЫН ҚОРҒАУ МӘСЕЛЕСІ

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Әзербайжанның топырақ генофонды өзінің жеке морфологиялық, физикалық-химиялық және биологиялық қасиеттері бар әртүрлі типтерден (таулы-шалғынды, таулы-шалғынды-далалық, таулы-орманды сары топырақтар, таулы-орманды қоңыр, шалғынды-далалық, сұрғылт-қоңыр, сұр топырақтар және шалғынды-сұр және т.б.) тұрады. Делювиалды шөгінділердің тау бөктеріндегі аймақтарға бейімделгені анықталды. Гранулометриялық құрамы бойынша олар малтатасты-сазды-саздақты, құрамында карбонаты мөлшері жоғары. Гранулометриялық құрамда тозаңды фракциялар басым, физикалық құмның [>0,01 мм] физикалық сазға [<0,01 мм] қатынасы 0,6-ны құрайды. Пролювиалды шөгінділер жамылғысы төменгі бөлігіне бейімделген. Гранулометриялық құрамы бойынша олар орташа және ауыр саздақты, карбонатты. Аллювиалды шөгінділер өзен аңғарларында, өзен жайылмаларының ескі сағаларында дамыған. Олар жоғары мөлшерде фракциямен (41,2±0,55%) сипатталады, физикалық құмның физикалық сазға қатынасы 1,9-ды құрайды. Топырақ профилінің генетикалық қабаттарының негізгі морфологиялық көрсеткіштеріне жүргізілген статистикалық талдау топырақты өңдеу процесіндегі профильдің өзгеру жылдамдығын көрсетті. Ұзақ және жүйелі суару зоналық топырақтардың агрофизикалық қасиеттерінің күрт өзгеруіне себеп болады. Суармалы топырақтардың метрлік қабатындағы гранулометриялық құрамы – әлсіз саздақты, лайлы фракцияның құрамы 28,3±1,08–31,8±0,83%-ды, физикалық саздың құрамы 63,0±1,8–65±1,1%-ды құрайды. Бұл тың аймақтық топырақтарға қарағанда тиісінше 4–6% (құрғақ далалық аймақ) және –3,5% (шөлейтті аймақ) жоғары. Суару рельефінің сипатына байланысты суармалы топырақтарда сазды (барлық жағдайда 4,7%) және жеңіл сазды (5,2%) гранулометриялық құрамның ұлғаюы байқалады. Тың шалғынды-сұр топырақтарда гранулометриялық құрамы жеңіл саздақтыдан (барлық жағдайда 3,3) жеңіл саздыға (20,6) (57,7%), содан кейін суару арқылы саздақтыдан (3,1%) ауыр саздыға (2,4%) (60,6%) дейін өзгереді. Тың топырақтар профилінің жоғарғы бөлігі айтарлықтай гумустанған және барлық жағдайда тығыздығы төмен: 1,19 г/см^3 – өзгеріс коэффициенті 6,88% (құрғақ далалық аймақ) және 1,30 г/см^3 – өзгеріс коэффициенті 3,78% (шөлейтті аймақ). Аридті субтропиктік тың зоналық топырақтар гумусқа бай. 0-25 см қабатындағы гумустың орташа статистикалық мөлшері құрғақ далалық аймақта 2,5–2,8%, шөлейтті аймақта 1,6–2,0% құрайды. Артезиандық сулармен суарылатын аридті суармалы топырақтардың жыртылған қабатындағы гумустың абсолюттік мөлшері тың топырақтармен салыстырғанда аз (құрғақ далалық аймақта 2,3–2,6% және шөлейтті аймақта 1,6–1,9%).

Түйінді сөздер: топырақ генофонды, топырақ типтері, гранулометриялық құрам, қарашірінді, генетикалық қабаттары,

РЕЗЮМЕ

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ПО ВОПРОСУ ОБ ОХРАНЕ ГЕНОФОНДА ПОЧВ АЗЕРБАЙДЖАНА

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Генофонд почв Азербайджана состоит из различных типов (горно-луговые, горно-лугово-степные, горнолесные желтоземы, горнолесные бурые, горнолесные бурые, лугово-

степные, серо-бурые, сероземы и лугово-сероземы и т.д.) со своими индивидуальными морфологическими, физико-химическими и биологическими свойствами. Установлено, что делювиальные отложения адаптированы к предгорным зонам. По гранулометрическому составу - гравийно-глинисто-суглинистые, высококарбонатные. В гранулометрическом составе преобладают пылеватые фракции, соотношение физического песка [>0,01 мм] к физической глине [<0,01 мм] - 0,6. Пролювиальные отложения адаптированы к нижней части шлейфа. По гранулометрическому составу - средне- и тяжелосуглинистые, карбонатные. Аллювиальные отложения развиты в долинах рек, на древних конусах выноса речных пойм. Характеризуются более высоким содержанием песчаной фракции (41,2±0,55%), соотношение физического песка к физической глине -1,9. Статистический анализ основных морфологических показателей генетических слоев профиля почв показал скорость изменения профиля в процессе обработки почвы. Длительное и систематическое орошение является причиной резкого изменения агрофизических свойств зональных почв. В метровом слое орошаемых почв гранулометрический состав - слабосуглинистый, содержание илистой фракции составляет 28,3±1,08–31,8±0,83%, физической глины – 63,0±1,8–65±1,1. Это соответствует 4–6% (сухостепная зона) и – 3,5% (полупустынная зона), что выше, чем в целинных зональных почвах. В зависимости от характера ирригационного рельефа в орошаемых почвах наблюдается увеличение глинистого (4,7% всех случаев) и легкоглинистого (5,2%) гранулометрического состава. В целинных лугово-серых почвах гранулометрический состав меняется от легкосуглинистого (3,3 во всех случаях) до легкоглинистого (20,6) (57,7%), затем от ирригационного - суглинистого (3,1%) до тяжёлого глинистого (2,4%) (60,6%). Верхняя часть профиля целинных почв значительно гумифицирована и плотность во всех случаях низкая: 1,19 г/см^3 – коэффициент изменения 6,88% (сухостепная зона) и 1,30 г/см^3 – коэффициент изменения 3,78% (полупустынная зона). Целинные зональные почвы аридных субтропиков богаты гумусом. Среднестатистическое количество гумуса в слое 0-25 см составляет 2,5–2,8% в сухостепной зоне, 1,6–2,0% - в полупустынной зоне. Абсолютное содержание гумуса в пахотном слое аридных орошаемых почв, орошаемых прозрачными артезианскими водами, меньше по сравнению с целинными почвами (2,3–2,6% в сухостепной зоне и 1,6–1,9% в полупустынной зоне).

Ключевые слова: генофонд почв, типы почв, гранулометрический состав, гумус, генетические слои.

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