ECOLOGICAL RESEARCH CENTER "ENVIRC"

CHARACTERISTIC OF ECOSYSTEMS OF ARCHAEOLOGICAL EXCAVATIONS AREA IN TALGAR BASIN ("ORMAN" SITE)

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Executors

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1.Introduction

In 1996 the employees of NGO "Envirc" and Institute of Soil Science MS-AS RK conducted complex researches on the key site of archaeological excavations in a region of Orman village.

Geomorphologist-cartographer Y.G. Evstifeev, pedologist-geographer K.M. Patchikin and pedologist G.N. Yakunin participated in the work. General management and consultations were executed by Y.G. Evstifeev.

The researches were conducted in two plans:

a) detailed, concentrated directly on a key site of archaeological excavations with leveling of profile and series of deep soil sections by range of the profile;

b) Drawing up a large-scale (1: 10 000) map of ecosystems of the territory, covering the most typical landscapes, representative to the site of archaeological excavations.

The main purpose of researches was attempt to reveal main processes of development of the territory under effect of natural and anthropogenic factors, give a valuation of a present condition of region's ecosystems.

The tasks of researches included following questions:

1. Characteristic of morpho-genetic and physical-chemical properties of soils and their changes depending on a relief, revealing of possible violation of soil profile in places of archaeological material concentrating and comparative valuation of violated soils relatively about standard (virgin) ones.
2. Characteristic of main components of ecosystems - relief, soils, vegetation, undersolum and creation of ecosystems' map on the territory of 3.6 ha.

The present researches are in essence a continuation of similar work conducted in 1995, and the "Orman" site is close by natural conditions to "Talgar-3" site. Therefore in order to prevent recurrences, where it is necessary, references to the report of 1995 are given.

2.Geographical-geomorphologic characteristic of "Orman" site.

The territory of archaeological excavations site "Orman" is in 10 km on E-S-E from Talgar city in the south part of Soldatskaya Schel on absolute marks 1450-1670 m above sea level. The site adjoins directly to Zailiysky Alatau range, Zhuman mountains (Fig. 1). Zailiysky Alatau in this part has the most complex and high (up to 5000m) Talgar mountain unit, which in many respects determines peculiarity of geomorphologic, climatic and hydro-geological conditions of adjoining territories.

Soldatskaya Schel locality represents an intermountain valley with a system of mountain rivers and brooks (Soldatskaya Schel, Besagash, Krasilnikova), formed in low-quaternary time. The description of its general geographical-geomorphologic conditions is indicated in the report for 1995 on "Talgar-3" site, therefore we shall below stay only on features of orographic structure of the territory directly on the "Orman" site. Main elements of a relief of the territory and their relationship with natural complexes are well shown on map of ecosystems of the site (see map of ecosystems).

Fig. 1 A site of Soldatskaya Schel locality adjoining to Zailiysky Alatau range.

A site of a intermountain valley, where archaeological excavations were conducted, represents high, largely broken inclined valley, situated between the rivers Besagash and Soldatskaya Schel. The valley, getting nar-

row and increasing high-altitude marks to the south-east, gradually form the smoothed, not clearly expressed premountains, merging with low parts of advanced Zailiysky Alatau range.

Low mountains, within the limits of an investigated territory, in base are predominary formed by granites and granitoides. Solid rocks in the low parts of mountains on the slopes of northern expositions are blocked by dwarf cover of friable loessial deposits, and on the southern slopes the radical rocks frequently occur on a day time surface and the soil-vegetable cover forming occurs on a thin mantle of rough eluvial-deluvial deposits. Slopes of low mountains are steep high dissected, and divide parts are, as often as not, flat leveled, that testifies about different time of development of a relief of a territory. Smoothed residual surfaces, being relict of earlier stages of exogenous alignment, were involved in processes of the newest orogenesis and were raised upwards. Strong dissection and significant steepness of slopes, even in low mountain parts, emphasize "youth" of a relief and activity of present adjustment movement of earth's crust.

Premountains in a described region are not clearly expressed. They stretch towards mountains in a kind of not wide band and represent high residual-accumulative-erosional bordering of the mountain slopes, consist of loessial loams. Significant inclines of a surface and easy pliancy of rocks, forming premountains, promoted their strong erosional dissection. To the north premountains gradually change into an intermountain valley.

The intermountain valley, being an area of development of young accumulative type of a relief, is different on genesis, as finds reflection in its morphological shape. In present relief of a valley forming the main role newest tectonic movements, determined ratio of denudation and accumulation processes, have played.

Western and south-western part of a valley up to Soldatskaya Schel river are consist of thick layer of loessial loams and represent separate remnant sites of united inclined flat in former time, dissected by a network of deep cut erosional valleys. Remnant sites are extended on incline of a district from NW to SE and have leveled, sometimes with flat not deep elongated cavity, surface.

Erosional forms of a relief are diverse by origin, but in the majority are stimulated by economic human activity. As an example gulch, located to the north-east of excavations site (ecosystem 29, see map of ecosystems) and formed by a channel of irrigation system acting during long-time can be taken. A channel, executed in natural ground, at present is cut into loessial deposits on a depth about 5 meters. Gulch has steep slopes. The

bottom and bed are in loessial deposits, but in the bottom pebble and stones with diameter of 10 cm are occurred, possibly they were transported there during intensive floods up to 2-3 kms from water intake of Soldatskaya Schel river. On the site besides gulches, there are ravines with fixed slopes, elongated cavities, steep boards and bottoms of which to the present time already well sodded by vegetation, and loessial deposits is transformed by soil-development processes. Some of them pass on highest (command) marks of a district and, as appear, were formed on a place of old irrigation channels, on which the water moved from foothills to the bottom parts of a valley. Erosional forms of a relief, not connected with anthropogenic activity, have more inclined slopes, often asymmetric form of cross profile. They can begin as in foothill, as flat parts of a valley, and then smoothly form the lower levels of a valley or join with ravines with fixed slopes of former or present irrigation channels.

East part of a valley within the limits of a site represents a present cone of dejection of Soldatskaya Schel river. The relief of a debris cone is flat, faintly inclined, with shallow cut gentle hollows of flow, which are sometimes used as channels for bringing up of water to the fields of irrigation. The valleys of branched off from the main river bed and flowed here brooks are weakly expressed and not deep cut. The cone of dejection is consisted of rough proluvial material, is thus observed sorting out of it the further one gets from mountains. In a top part boulder-pebbly deposits prevail, in the middle one pebbly with separate boulders material is accumulated, and in the bottom gravel-pebble deposits prevail. It should be noted, that the deposits of a present debris cone were accumulated on the earlier, probably Pleistocene's, alluvial-proluvial deposits, filling the large part of intermountain valley. Last ones were blocked by loessal loams, which in the north part of a site contact with modern cone of dejection and were diminished. Here Quaternary deposits are situated the most closely to a surface of soil. The thickness of overlapping loams does not here exceed one meter, and further on incline of a district to the north-west normally increase.

Flat relief in a central part is broken by deeply cut bed of Soldatskaya Schel river. Its valley is not wide, has steep, sometimes steep coasts without expressed terraces. Terraces may be observed only in bottom, near bed, part.

Thanking to anthropogenic activity, relief of an intermountain valley within the limits of archaeological excavations site has undergone for a historical period essential changes. First of all here it should be noted the dense deeply cut gulch-ravine network. Its formation is connected with necessity of transportation of water to irrigation fields, located on leveled sites with

more fertile soils, the forming of which occurred on loessal rocks. Channels, situated along incline of a district, have strongly washed away loessal ground weakly sustainable to a water erosion. Deep beds, produced by channels, changed basis of erosion and stimulated strengthening of natural processes of denudation with formation of a secondary network of gulches. Traces of modern irrigation system, as acting, as abandoned, occur in all territory of a site. During planting of wood and fruit cultures, as well as for alignment of sites under irrigation, terracing of slopes and the leveling of a surface of fields was rather often applied (fig. 2).

Fig. 2. Crop ofalfalfa on a planned surface on technogenic-transformed chernozems leached.

In the site there is a system of dirt roads, including partially improved passes, during construction of which bridges were constructed, was leveled and added by rubble-stone-pebbly material road-bed. On a territory of the site there are abandoned human settlements, from which the stone bases, holes, embankment, remains of gardens, as well as local irrigation channels has remained. Besides there are traces of temporary stock-breeding camps and apiaries.

Modern cone of dejection, especially its central part, is under significant pasture load. The natural complexes are here strongly violated, pasture

degradation with formation of the new linear forms of a microrelief is widely distributed.

Physical-geographical and bioclimatic conditions of archaeological excavations site for a foreseeable historical period can be considered favorable for ability of people to live, that was marked already in the report for 1995. Wild fruit forests and berry brakes are here widely distributed, in direct affinity on the slopes of foothills coniferous forests grow. The territory is rich by water sources. Soils have high productive potential. Climatic conditions are soft and optimum for development of biota. All these facts permit to assume, that the development and settling of a territory could take place a long time ago. Depending on a degree of development of a community culture the traces of its stay can be coincide to various parts of intermountain valley. Earlier settlements could gravitate towards low mountain massifs with fruit-berry brakes and places for hunting on wild animals. The traces of agriculture, especially irrigation, could appear closer to more leveled flat surfaces with fertile soils and in direct affinity to water sources.

3.Laws of soil cover forming

The researched "Orman" site, located in a top part of Soldatskaya Schel locality, places in limits of belt of wild fruit forests, herb-grass steppe meadows and xeropetrophyte meadow steppes, which is formed in central part of Zailiysky Alatau from 1350 (1400) up to 1600 (1650) m. above sea level.

The soil cover of the site is formed pursuant to laws, connected with character of the district relief of, expositions of slopes, structure and properties of undersolum, determining intensities and tendency of soil development processes and influencing on physical-chemical properties and morphological structure of soils. The main laws of natural complexes forming are indicated on map of ecosystems composed during field research, and their content is shown in legend (Appendix). The principle of mapping are described in the 1995 report.

Significant quantity of precipitation (600-650 mm), prevailing over evaporation, results in occurrence of descending currents of a moisture, leaching a profile of soils from easy soluble salts and blowing away them of soil profile out of limits. Fine silt and clay mineral particles are also blown away. As a result leached soils are formed with differentiation of a profile by silt and clay, the maximum of which coincided with depths of 85-100 cm. It concerns to all types of soils, occurred on the site.

Forest chernozem-like soils are formed on steep slopes of low mountains (where are allocated as mountain-forest chernozem-like), on the slopes of ravine with fixed slopes, gully and boards of river valleys on thick loessial loams, as well as on present cones of dejection on alluvial-proluvial boulder-pebbly deposits.

The vegetation is represented by shrub wild fruit forests (Malus sieversii, Crataegus sp., Sorbus tianshanica, Armeniaca vulgaris, Cotoneaster multiflora, Rosa platyacantha, Berberis heteropoda and other), sometimes with Populus tremula, under canopy of which herb layer (Delphinium iliense, Thalictrum collinum, Senecio nemorensis, Dactylis glomerata, Bromus inermis) is well advanced (Fig 3).

Soils, formed on homogeneous loess loams, are characterized by thick humus horizon (A+B=90-120 cm)*, under which horizon leached from carbonates and easy soluble salts (BC^L) with numerous iron-humic wall for-

* For genetic horizons indication following signs are used: A-humic-accumulative, B-transitive humic, BC-transitive to undersolum, C-undersolum.
Upper indeces means: L-leached, s-soddy, p-ploughed, c-carbonated
Lower indeces indicate sybhorizons.

mations is allocated, which sharply changes by carbonate-illuvial (C^c) with the contents of calcium carbonates up to 15-25 %. Below it not changed, also carbonated, loess loam places. In more detail the characteristic of mountain-forest chernozem-like soils is indicated in the report for 1995.

Forest chernozem-like soils place in a top of a present cone of dejection in south-east part of a considered territory, where they are formed on rough

Fig. 3 Wild fruit forests on mountain-forest chernozem-like soils

gravel- and boulder-pebbly alluvial-proluvial deposits under wild grass apple light forest of park type (Fig. 4). They differ by strong stoniness and low deep of a profile and are submitted by predominary xeromorphic and embryonic genera.

The biggest distribution on a researched territory *chernozems leached* have received. They are formed, as a rule, on homogeneous loess loams of various thickness, less often on alluvial-proluvial rough deposits.

Chernozems leached normal take high leveled surfaces covered by a thick cover of loess deposits. Being valuable agricultural lands, they practically completely ploughed up. Virgin soils were saved only on boards of the rivers and ravines with fixed slopes, as well as there, where their ploughing up is impossible because of conditions of a relief. Vegetation of virgin soils

is submitted by herb-grass steppe meadows in a structure of which meso-phyte

Fig. 4 Apple light forests on a present cone of dejection

grasses (Dactylis glomerata, Elytrigia repens, Agrostis gigantea, Poa sp.), meadow (Geranium collinum, Plantago major, Vicea cracia) and steppe (Origanum vulgare, Hypericum perforatum, Achillea millifolium) herbs (Fig.5) prevail.

Soil are characterized by thick high humic profile (Fig. 6). In difference from forest chernozem-like soils smooth reduction of quantity of humus with a depth is observed. For virgin soils characteristically the availability of dark-gray, sometimes with cinnamonic hue a humus-accumulative granular horizon (A=30-40 cm) in a top of which soddy, with a plenty of grasses roots horizon (A_1^s=8-10 cm) is allocated. Humus-accumulative horizon is replaced by gray-brown or gray-dark-brown cloddy transitive horizon (B=50-60 cm) directly under which horizon heterogeneous colored dark or darkish-brown with numerous iron-humic wall formations on cracks and sides of structural particles leached from carbonates and easy soluble salts (BC^L=15-40 cm) horizon places. This horizon very sharply goes into whitish-yellow-brown puddled carbonate-illuvial horizon (C^c=30-80 cm)

with numerous veins and speeks of carbonates, which, in turn, changes into not changed by soil development processes loessal rock.

Fig. 5 Herb-grass steppe meadow on chernozems leached

Chernozems leached developed have received the most distribution on the researched territory. They take high leveled surfaces covered by loess loams. The part of these massifs is irrigated, part is used in dry agriculture (Fig. 7).

The development of soils does not change radically a general direction of soil development process, but is certainly reflected in separate morphological parameters and physical-chemical properties. As a whole developed soils have morphological shape, characteristic for virgin chernozems leached. As a result of ploughing up on a surface of soils there is the new horizon, in which soil mass from completely violated soddy horizon and top of horizon A_2 is hashed. Ploughing horizon acquires qualitatively new properties, which promote deeper seeping of soils by a moisture and strengthening of processes of leaching. The thickness of leached depth of ploughed soils is increased up to 140-150 cm, and purely the horizon of leaching can reach one meter.

Ploughed soils are characterized by considerably lower stocks of organic substance, than their virgin analogues, that is connected with several reasons. First of all, it is water-erosional processes, actively represented on

slope sites. Under their influence from friable ploughed horizon, not fixed by vegetation, during snow thawing and storm rains the most thin fertile soil particles are blown away. In the processed surface horizon processes of oxybiotic microbiological decomposition of organic substance amplify. Besides from soils, used in agriculture, annually irrevocable alienation with a crop of main elements of feeding occurs, a source of which is organic substance of soil.

During agricultural use of a territory a lay-out (artificial alignment) of the fields was as often as not was conducted. In this case technogenic-transformed soils are formed (Fig. 2). Such soils, though and bear common features of initial virgin soils, can have the most diverse combination of morphological attributes and physical-chemical properties.

Fig. 6 Chernozem leached normal

Chernozems leached xeromorphic and embryonic take a present cone of dejection, sometimes blocked by embryonic cover of loess loams. Vegetation on them is represented by herb-grass meadow steppes. They differ by low thickness and strong stoniness of a profile. As far as a cone of dejection are formed by boulder-pebbly deposit, ploughing up of them is impossible and their massifs are used as pastures. As a result the surface frequently violated by a cattle, and natural vegetation is transformed because of pasture degradation (Fig. 8).

Fig. 7 Agricultural lands on chernozems leached developed slightly eroded

Fig. 8 Chernozems leached embryonic on a cone of dejection under anthropogenic transformed vegetation

4.The characteristic of soils of "Orman"

The site of a prospective location of settlements of people, on which in 1996 archaeological excavations were conducted, is located in 600 m on NNE from Orman settlement on a field under sawing of a wheat. The field is limited from the west and east by dry, overgrown with vegetation ravines with fixed slopes, and on the north and north-east by deep gulch, formed by acting irrigated channel. This territory represents an inclined flat site of an intermountain valley, dissected by gentle erosional elongated cavity, linked up on the north with gulch. A depth of elongated cavity is about 2.5 m.

For finding-out of the character of archaeological finds distribution on the area of the surface and in a vertical thicker of soil-ground, as well as possible changes of soil development process, connected with human activity , soil-geomorphological profile by extent of 95 m was made. On a profile, crossing an erosional elongated cavity from the west to the east, on a main elements of relief four soil sections were made, in which genetic horizons of soils were allocated and described in details and the samples for analytical determination of main physical-chemical properties were selected. The scheme of cross soil-lithological profile of "Orman" site is indicated on Fig.9. The thickness of the genetic horizons, depth of occurrence of native rock, arrangement of description points of the archaeological excavations, characterized by soil sections and form of a surface of the site by results of detailed leveling are reflected there. Besides outside the site two more sections were made. One under natural virgin vegetation as reference, describing the soil without traces of former and present economic human activity. Second one - on technogenic-violated soils on a planned field with plantings of Picea schrenkiana. The location of sections is shown on the map of ecosystems.

Section 1. In 500 m to NNE from Orman village. Altitude is 1530 m. It's made on gentle (10°) western slope of incline.

Vegetation: grass-herb steppe meadow (Dactylis glomerata, Helictotrichon pubescens, Brachypodium pinnatum, Geranium collinum, Hypericum perforatum, Althaea litvinovii, Senecio nemorensis, Ligularia macrophylla, Origanum vulgare, Achillea millifolium), Density of sward 100%, height of 1-1,2 m.

Depth 205 cm, A+B=35 cm, carbonate effervescence from 49 cm

0-10 A_1^s Dark-gray, fresh, friable, but connected by rootlets of plants, granular, medium loamy.

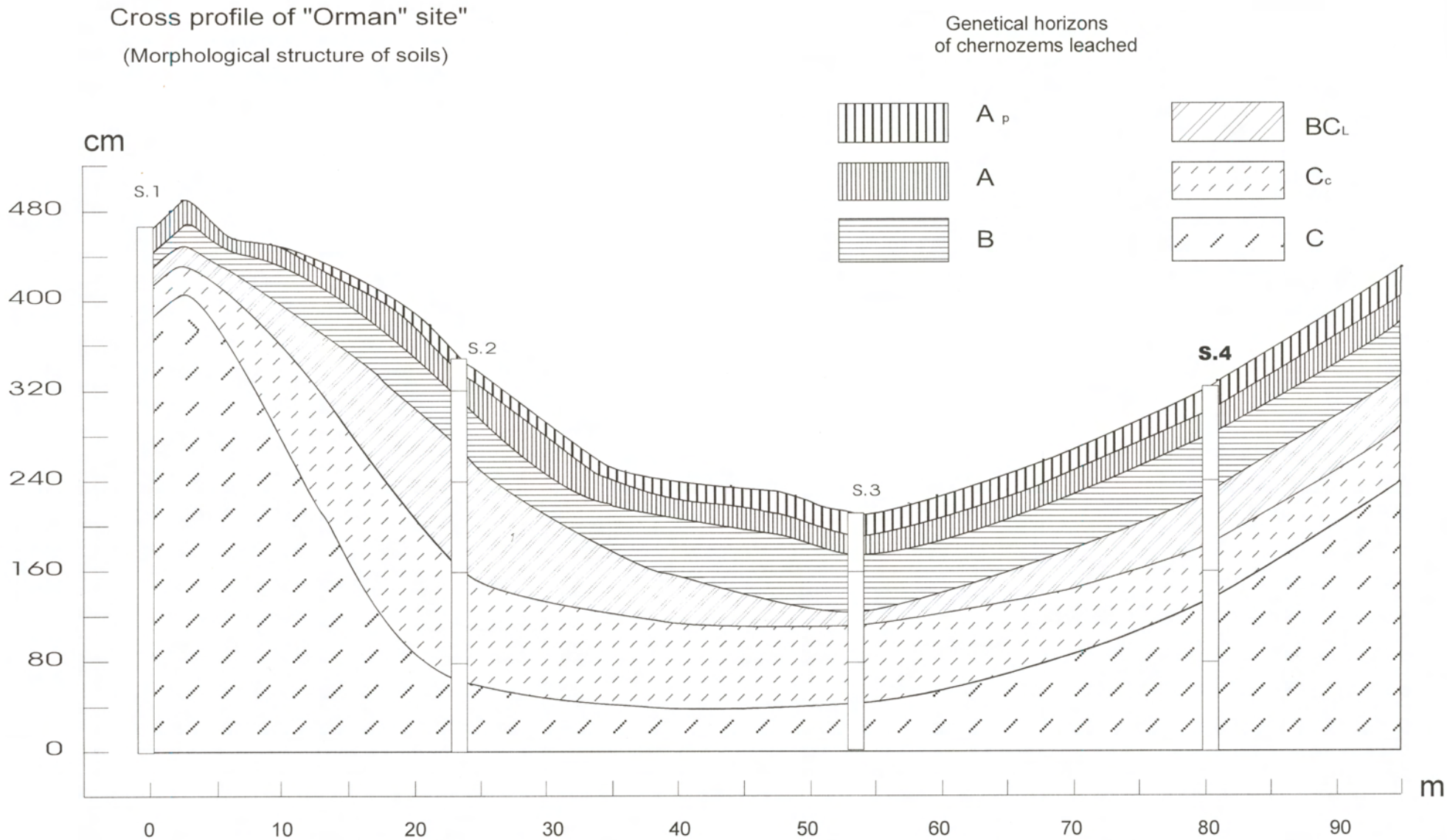

Cross profile of "Orman" site"
(Morphological structure of soils)
Genetical horizons
of chernozems leached
A p
A
B
BCL
Cc
C
cm
480
400
320
240
160
80
0
S.1
S.2
S.3
S.4
m
0
10
20
30
40
50
60
70
80
90

Fig.9

10-22 A_2 Dark-gray slightly brownish, fresh, slightly puddled, rootlets', granular, medium loamy.

22-35 B_1 Gray-brown, fresh, puddled with small quantity of rootlets, medium loamy.

35-49 BC^L Brown, weakly humidified, puddled with insignificant quantity of rootlets, silty-small-lumpy, medium loamy.

49-82 $C_1{}^c$ Whitish-yellow-brown with rare white veins of carbonates, humidified puddled, small-lumpy-silty, medium loamy.

82-bottom C_2 Yellow-brown with numerous white veins and speeks, in the bottom part medium loamy.

Name: chernozem slightly leached severely eroded medium humic medium loamy on loess loam.

Section 2. In 20 m from previous one on gentle (5°) slope of incline under sawing of wheat.

Depth 200 cm, A+B=85 cm, carbonate effervescence from 185 cm.

0-12 A^p Brownish-dark-gray, damp, friable with rootlets of a wheat, granular-cloddy, heavy loamy.

12-38 A_2 Dark-gray brownish, fresh, puddled, cloddy with coprolites heavy loamy.

38-60 B_1 Gray slightly brownish, puddled with rare rootlets, cloddy heavy loamy.

60-85 B_2 Gray-dark-brown, humidified, puddled with whitish powdering on sides of structural particles, small lumpy-cloddy, heavy loamy.

85-103 $BC_1{}^L$ Heterogeneous colored darkish-brown with iron-humic wall formations, humidified, puddled, small lumpy, porous, heavy loamy.

103-185 $BC_2{}^L$ Brown with powdering on sides of structural particles, crude, puddled small lumpy, porous, heavy loamy.

185-bottom C^c Yellowish-brown with whitish veins of carbonates, damp, puddled, small lumpy, medium loamy.

Name: Chernozem severely leached developed thick medium humic heavy loamy on loess loam.

Section 3. In 20 m from the section 2 on a bottom of elongated cavity under self-sowing of last year's potato strongly weed infestated.

Depth 250 cm, A+B=85 cm, carbonate effervescence from 100 cm

0-18 A^p Darkish-gray, slightly humidified, slightly friable with rootlets of potato granular-cloddy, heavy loamy.

18-33 A_1 Dark-gray, fresh, slightly puddled with rare rootlets, granular-cloddy, medium loamy.

33-68 B_1 Dark-gray with brownish hue, slightly humidified, slightly puddled, cloddy with grains of caprolites, medium loamy.

68-85 B_2 Brownish-darkish-gray, damp, slightly puddled, cloddy, heavy loamy.

85-100 BC^L Heterogeneous colored, on main bright dark-brown background numerous iron-humic more dark, damp, puddled, small lumpy, heavy loamy.

100-165 C^c Yellowish-brown with numerous white veins, crude, puddled, small lumpy, medium loamy.

165-bottom C_2 Analogue of the previous, but with more rare veins of carbonates.

Name: Chernozem slightly leached developed thick medium humic heavy loamy on loess loam.

Section 4. In 25 m from section 3 on gentle western slope of incline under sowing of a wheat.

Depth 230 cm, A+B=92 cm, carbonate effervescence from 140 cm.

0-18 A^p Darkish-gray, fresh, slightly friable with rootlets of a wheat, granular, medium loamy.

18-42 A_1 Brownish-darkish-gray, fresh, slightly puddled, granular-cloddy, medium loamy.

42-73 B_1 Dark-gray, humidified, puddled, cloddy with a dust, medium loamy.

73-92 B_2 Brownish-dark-gray (on cut dark-brown glossy), humidified, puddled, small lumpy-cloddy, heavy loamy.

92-123 BC_1^L Dirty-brown, damp, puddled with small quantity of wall formations, small lumpy, clay textured.

123-140 BC_2^L Heterogeneous colored, on main brown background numerous iron-humic more dark wall formations, humidified, puddled, small lumpy, heavy loamy.

140-190 C_1^c Yellow-brown with whitish carbonate veins, moist, puddled, heavy loamy.

190-bottom C_2 Analogue of the previous, but with smaller quantity of carbonates.

Section 5. In 900 m to NE from the edge of Orman village. Altitude 1520 m. Is made on gentle northern slope of high ramnant surface formed by loess deposits.

Vegetation: herb-grass steppe meadow (Dactylis glomerata, Poa stepposa, Elytrigia repens, Agrostis gigantea, Plantago major, Vicia cracca, Achillea millifolium, Origanum vulgare, Hypericum perforatum, Rubus idaeus, Cichorium intubus, Geranium collinum, Althea litvinovii, Artemisia dracunculus, Crepis tectorum, Senecio nemorensis). Density of sward 100 %, height from 70-80 up to 100 cm.

Depth 255 cm, A+B=92 cm, carbonate effervescence from 122 cm

0-10 A_1^s Dark-gray cinnamonic, fresh, slightly puddled, strongly penetrated by roots of grasses, granular, medium loamy.

10-37 A_2 Dark-gray slightly cinnamonic, fresh, slightly puddled rootlet's granular-cloddy, medium loamy.

37-65 B_1 Black-gray with cinnamonic hue, fresh, puddled with rootlets, cloddy, heavy loamy.

65-92 B_2 Gray-dark-brown, fresh, puddled with rootlets, cloddy, heavy loamy.

92-115 BC_1^L Dark-brown, fresh, more puddled, than previous one, small lumpy, heavy loamy.

115-122 BC_2^L Heterogeneous colored. The main background dark-brown with iron-humic wall formations on cracks, humidified, puddled, small lumpy, heavy loamy.

122-210 C_1^c Yellowish-whitish-brown, moist, puddled with numerous whitish veins, small lumpy, heavy loamy.

210-bottom C_2 Darkish-brown with insignificant quantity of carbonate veins, moist, puddled, heavy loamy.

Name: chernozem leached thick medium humic heavy loamy on loess loam.

Section 6. In 300 m to the north-east from the edge of Orman village on a high leveled planned surface with artificial plantings of Picea schrenkiana.

Depth 110 cm, A+B=66 cm, carbonate effervescence from 80 cm.

0-10 A_1^p Gray dry compact with rootlets, granular-cloddy, medium loamy.

10-20 A_2^p Darkish-gray slightly brownish, compact ,cloddy, heavy loamy.

20-49 B_1 More dark than previous one, fresh, compact, cloddy, heavy loamy.

49-66 B_2 Brown-dark-gray, fresh, small lumpy, heavy loamy.

66-80 BC^L Heterogeneous colored. On main brown background black-brown iron-humic wall formations, small lumpy, heavy loamy.

80-bottom C^c Yellowish-light-brown with whitish veins and grains, small lumpy, heavy loamy.

Name: chernozem slightly leached developed technogenic-transformed not in big depth small humic heavy loamy on loess loam.

The indicated morphological descriptions of sections testify about belonging of all described soils to subtype of chernozems leached. Main morphogenetic parameters, characteristic for this subtype are indicated in chapter 2. The most brightly and completely they are followed in the profile of virgin soils (section 5).

Humic horizons of virgin soils differ by dark-gray tones of coloring, significant thick (more 90 cm) at the high contents of organic substance (Tab. 1). In distribution of humus sharp transition from humus-accumulative horizon (6.5-8.0 %) to transitive humic one (3.0-3.5 %) is observed. Deeper the decrease occurs more gradually. Contents of a gross nitrogen well correlates with total quantity of organic substance and has the same tendency of changes, but in less sharp form. Therefore rather wide in humus-accumulative horizon carbon:nitrogen ratio gradually decrease.

Capacity of exchange, by a sum of absorbed cations, of described soils low and is defined in the top horizons, mainly, by organic colloids, and in bottom - by mineral. It is the highest in humic horizon A. In transitive horizon "B", in connection with sharp reduction of humus quantity, its size is reduced, and then is again increased up to 20-23 mg-equ(ivalent) / 100 grams of soil in leached horizon (Tab. 1), where the contents of clay particles grows up to 21-22 %, against 2-7 % in top horizons (Tab. 2), and the quantity of humus is on the contrary reduces. The soil absorbing complex is saturated by cations of calcium and partly magnesium. Changing aluminum and hydrogen are contained in insignificant quantities. In all horizons, except carbonated, slight hydrolytic acidness and high degree of base-saturation is marked.

The reaction of water suspension in soddy horizon of soils is neutral, in the horizons of leaching is a little shifted into the part of aciding, and in carbonate horizon and soil development rocks - alkaline (Tab. 1). Described soils are leached from carbonates on the depth, exceeding the thickness of humic horizon. Their maximum, reaching 25 %, is marked in carbonate-agric horizon (Tab. 1). Soils are leached also from easy soluble salts. Their sum on the whole profile does not exceed the 100-th shares of a percent (Tab. 3).

Table 1

Chemical and physical- chemical properties of chernozems leached

N of section	Depth of sample, cm	Genetic horizon	Humus, %	Total N, %	C:N	$CaCO_3$, %	Exchanging cations, mg-equ/100 gr							pH water	Hydrolytic acidness, mg-equ on 100 gr	Level of bases %
							Ca^{+2}	Mg^{+2}	Na^{+}	K^{+}	Al^{+3}	H^{+}	Sum			
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17
5	0-10	A^{s}	7.92	0.392	11.7	-	19.70	2.90	0.48	0.05	0.00	0.05	23.18	7.0	2.18	91.4
	15-25	A_2	6.37	0.326	11.3	-	18.30	2.40	0.18	0.61	0.17	0.03	21.69	6.6	3.36	86.6
	45-55	B_1	3.48	0.189	10.7	-	15.90	2.90	0.18	0.21	0.41	0.02	19.62	6.7	3.19	86.0
	70-80	B_2	2.90	0.166	10.1	-	15.40	2.90	0.18	0.10	0.33	0.03	18.94	6.8	2.86	86.9
	95-105	BC_1^{L}	2.70	0.148	10.6	-	16.40	3.40	0.18	0.10	0.33	0.02	20.43	6.8	2.18	90.4
	115-122	BC_2^{L}	1.16	0.070	9.6	1.34	20.20	2.40	0.18	0.06	0.08	0.03	22.95	7.1	1.51	93.8
	150-160	C^{c}				24.54								8.8		
	240-250	C				15.42								8.7		
2	0-10	A^{p}	6.37	0.261	14.2	-	20.70	2.40	0.17	0.18	0.00	0.03	23.48	6.8	2.18	91.5
	15-25	A_2	6.18	0.255	14.1	-	16.80	1.40	0.35	0.13	0.17	0.03	18.88	6.8	3.02	86.2
	40-50	B_1	2.89	0.142	11.8	-	15.90	1.40	0.18	0.10	0.25	0.03	17.86	6.7	3.02	85.5
	65-75	B_2	1.84	0.098	10.8	-	16.40	1.00	0.18	0.06	0.33	0.02	17.99	6.7	2.69	87.0
	90-100	BC_1^{L}	1.11	0.070	9.2	-	14.40	3.40	0.18	0.06	0.33	0.03	18.40	6.9	2.02	90.1
	130-140	BC_2^{L}				0.82								7.0		
	190-200	C^{c}				11.12								8.6		

Continuation of table 1

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17
3	0-10	A^p	5.41	0.226	13.9	-	16.80	1.90	0.23	0.17	0.33	0.02	19.45	6.3	4.87	80.0
	20-30	A_2	5.60	0.234	13.9	-	16.40	1.40	0.18	0.17	0.25	0.03	18.43	6.1	5.71	76.3
	40-50	B_1	2.70	0.123	12.7	-	14.20	1.30	0.18	0.06	0.50	0.03	16.27	6.5	3.86	80.8
	70-80	B_2	1.93	0.095	11.8	-	13.80	1.00	0.18	0.06	0.25	0.03	15.32	6.8	2.69	85.1
	85-95	BC_1^L	1.06	0.084	7.3	0.82	15.40	2.40	0.18	0.06	0.17	0.02	18.23	7.2	2.02	90.0
	120-130	BC_2^L				18.53								8.8		
	240-250	C^c				14.19								8.7		

Table 2

Granulometric compound of chernozems leached

N of section	Depth of sample, cm	Content of fractions , percents per absolutely dry soil									Munsell color (dry probe)
		Size of fractions, mm									
		Stones	Sand			Dust			Silt	Physical clay	
		> 3	3-1	1.0-0.25	0.25-0.05	0.05-0.01	0.01-0.005	0.005-0.001	<0.001	<0.01	
5	0-10	no	no	no	12.3	49.4	12.8	23.5	2.0	38.3	10YR 3/2
	15-25	no	no	no	12.7	42.4	16.9	20.5	7.5	44.9	7.5YR 2/2
	45-55	no	no	no	10.0	41.1	11.5	22.2	15.2	48.9	10YR3/2
	70-80	no	no	no	14.6	37.4	12.3	15.5	20.2	48.0	7.5YR 3/2
	95-105	no	no	no	28.7	22.3	13.9	13.8	21.3	49.0	7.5YR 4/1
	115-122	no	no	no	5.9	44.8	13.8	13.1	22.4	49.3	7.5YR 5/6
	150-160	no	no	no	9.3	45.9	13.1	15.1	16.6	44.8	10YR 6/4
	240-250	no	no	no	7.1	53.4	13.6	12.2	13.7	39.5	10YR 5/6
2	0-10	no	no	no	3.8	47.6	20.2	14.9	13.5	48.6	10YR 3/1
	15-25	no	no	no	6.2	46.4	13.6	19.0	14.8	47.4	10YR 3/1
	40-50	no	no	no	13.6	38.1	15.8	14.1	18.4	48.3	10YR 2/2
	65-75	no	no	no	25.9	25.1	10.7	16.9	21.4	49.0	10YR 2/3
	90-100	no	no	no	14.9	35.5	15.6	8.9	25.1	49.6	7.5YR 4/3
	130-140	no	no	no	7.4	46.4	11.6	11.5	23.1	46.2	10YR 4/4
	190-200	no	no	no	21.5	43.0	13.0	9.5	13.0	35.5	10YR 6/4
3	0-10	no	no	no	8.0	46.7	13.8	17.9	13.6	45.3	7.5YR 3/2
	20-30	no	no	no	8.7	48.1	15.8	13.5	13.9	43.2	10YR 2/2
	40-50	no	no	no	10.0	42.1	14.7	15.6	17.6	47.9	10YR 2/2
	70-80	no	no	no	3.5	45.3	14.0	15.2	22.0	51.2	10YR 3/3
	85-95	no	no	no	10.4	40.3	15.3	11.5	22.5	49.3	10YR 4/6
	120-130	no	no	no	14.0	47.6	8.2	14.2	16.0	38.4	10YR 6/4
	240-250	no	no	no	9.5	53.8	6.3	15.4	15.0	36.7	10YR 6/4

Table 3

Water soluble salts in chernozems leached, %%/mg-equ

N of section	Depth of sample, cm	Sum of salts, %	Alkalinity: Total in HCO_3^-	Alkalinity: From normal carbonates in CO_3^{-2}	Cl^-	SO_4^{-2}	Ca^{+2}	Mg^{+2}	Na^+	K^+
1	2	3	4	5	6	7	8	9	10	11
5	0-10	0.052	0.034	0.000	0.001	0.000	0.006	0.000	0.000	0.007
			0.56	0.00	0.03	0.01	0.30	0.08	0.04	0.18
	15-25	0.014	0.007	0.000	0.003	0.000	0.001	0.000	0.000	0.001
			0.11	0.00	0.08	0.01	0.05	0.08	0.04	0.03
	45-55	0.011	0.007	0.000	0.001	0.000	0.000	0.000	0.000	0.001
			0.11	0.00	0.03	0.01	0.00	0.08	0.04	0.03
	70-80	0.011	0.005	0.000	0.001	0.002	0.000	0.000	0.000	0.001
			0.08	0.00	0.03	0.04	0.00	0.08	0.04	0.03
	95-105	0.005	0.002	0.000	0.001	0.000	0.000	0.000	0.000	0.001
			0.03	0.00	0.03	0.01	0.00	0.00	0.04	0.03
	115-122	0.009	0.007	0.000	0.000	0.000	0.000	0.000	0.000	0.001
			0.11	0.00	0.00	0.00	0.00	0.00	0.04	0.03
	150-160	0.084	0.029	0.000	0.004	0.031	0.010	0.008	0.000	0.001
			0.48	0.00	0.11	0.64	0.50	0.66	0.04	0.03
	240-250	0.082	0.027	0.000	0.004	0.032	0.008	0.009	0.000	0.001
			0.44	0.00	0.11	0.66	0.40	0.74	0.04	0.03

On mechanical structure, according to using classification*, chernozems leached belong to heavy loamy (Table 2). From native rocks - loessal loam - they inherited absolute prevailing of large dust among particles, formed soil thickness, and complete absence of skeletal fractions by the size of more than 0.25 mm. At the same time contents of physical clay in soil profile, except for surface soddy horizon, well above, than in soil development rock, that testifies to activity of soil weathering. Decreasing of thin particles in the surface horizon is connected with processes of a surface erosion and suspensional carrying of them to the deep into soil profile.

In a vertical profile of chernozems leached the low nature redistribution of soil particles, connected with processes of a descending current of soil solution is observed. It is evidently expressed in accumulation of particles of various size by layer. The maximum of large silt particles is concentrated in surface soddy horizon. Dust average, blowing away from the top horizon, accumulated in the horizon "A_2" on a depth 10-37 cm. Small dust fractions are moved even more deeply - to the horizon "B_1" on a depth more than half-meter. On the biggest depth in soil profile fine silt particles are blown away. A maximum of silt accumulation is watched in transitive to soil development rock leached horizons on a depth up to 120 cm. The

* N.A. Kathchinsky. Physics of soils. Part 1. Moscow, 1965, 362 p.

most quantity of physical clay, reflecting general content of all thin granulometric fractions is coincided with these horizons.

Thus, the distribution of thin mechanical elements in vertical soil profile, connected with their suspensional transference, well illustrates and marks leading soil development process, proceeding in chernozems leached.

Relief of archaeological excavations site, as was already marked earlier, heterogeneous, therefore for the characteristic of soil cover and soils sections on its different elements - slopes of erosional elongated cavity and bottom were made (Fig. 9). On the basis of their morphological descriptions and analytical data the characteristic of distributed here chernozems leached developed is given, their properties are compared with virgin analogues and internal distinctions, determined by their situation in relief are emerged.

Developed soils, as was already marked, have a morphological profile and set of attributes, as a whole not goes out of properties limits, characteristic for subtype of chernozems leached. The main distinctions are observed in a degree and depth of humusness and leaching of soils.

Loosening of a surface layer and destruction of natural vegetation change character of receipt and transformation of substances and energy in soils, that in the majority of cases has negative results for them. Destruction of vegetation sharply decrease the quantity of organic remnants arriving in the soil, being main source for maintenance of energy of microorganisms' vital activity and formation of humus substances of soil. In this case microorganisms are compelled to use humus already accumulated and fixed in soil, decomposing it up to the simple mineral forms, easy accessible by agricultural plants. Together with a crop irrevocable alienation of released elements of feed, especially nitrogen, occurs and, as a result, progressive decrease of soil humusness occurs.

Another reason of humus contents decrease in developed soils is strengthening of water erosion processes. During intensive precipitation and especially snow thawing, saturated by a moisture friable, not fixed by roots of the plants soil mass easily give way to sheet erosion, transient on steep sites in the linear forms. Thus from soil mass the most fine particles, impregnated by humus substances, are blown away. In our case the blowing away of fine earth out of limits of the site is executed along elongated cavity to gulch, formed by acting irrigation channel. Therefore developed soils of the site contain considerably less humus, than their virgin analogues (5-6 % against 8), at the same its distribution on a vertical profile. Besides, humus there reach considerably smaller depth.

In virgin soils on a depth of one meter 2.7 % of humus is contained, and in developed ones quantity close to this is observed on the depth about half-meter (where only 1.1 % of organic substance is contained) (Tab. 1).

Developed soils are distinguished among themselves by the contents of organic substance, that is connected with their situation in relief of a district. Soils in a bottom of elongated cavity has it lower (5.4 %), than soils of incline slopes of elongated cavity (6.4 %). It, perhaps, is connected with that in negative forms of a relief the processes of blowing away and accumulation of substance proceed more intensively. It is not excluded, that it is connected also with specific features of soil forming in this elongated cavity.

Ploughing up of the surface horizon of soils promotes more deep penetration of a moisture into soil depth and strengthens processes of leaching. The thickness of leached from carbonates and easy soluble salts horizon in such soils can reach one meter, and bottom border of leaching displace up to 140-185 cm against 120 cm at virgin soils. Exception make soils, placed in the bottom of elongated cavity.

Soils in a bottom of elongated cavity have well expressed thick humus horizon, appropriate to given subtype, but at the same time their leached horizon, at comparatively not deep placing (85-100 cm), has only 15 cm. Discrepancy between thickness, depth of placing of leached horizon and conditions of soil development is observed here. Soils in elongated cavity receive additional superficial moistening, as a result of which more deep wetting and leaching, than at soils on slopes and basin divides, should occur. But it is not marked in nature. It is possible to assume, that it is connected to certain stages of forming of relief and soils in the site.

At the initial stage starting leveled or slightly dissected surface, with formed there soil, was strongly eroded. In erosional elongated cavity soil profile was completely blown away (difference of depths, even at present more than 250 cm). This stage was rather short-term and intensive and probably connected to any sharp change of basis of a erosion.

Then a new stage of soil forming in quieter erosional conditions began. Elongated cavity was filled by blown away from it slopes fine earth, partially by humus containing material. Especially intensively this process could occur on ploughed up soils during snow thawing. Soil mass of ploughed horizon, saturated by a moisture, loosened and not fixed by plant roots, could be moved by sheet diminution to lower part of elongated cavity from slopes. This process could be rather close to solufluction by its mechanism. Besides, the filling of elongated cavity by soil mass could occur also at insignificant leveling works. Proceeding from this it is possible to assume, that leached horizon in soils of elongated cavity at present is still on the beginning stage of forming, that is why is not enough brightly expressed.

Profile of soil, distributed on steep basin divide, between deep ravine with fixed slopes and erosional elongated cavity on the site looks also weakly formed developed . Here in the top part of steep slope covered by natural vegetation, inverted to ravine with fixed slopes, first section of a cross pro-

file of the site is made. From its description it is visible, that humus horizons have darkish-gray with brownish hue coloring. It testifies about low content of organic substance there. The thickness of humus horizon reaches only up to 35 cm, whereas at virgin soils, distributed on leveled sites and at developed ones it makes 85-95 cm. Leached horizon of described soils places close to the surface (35-49 cm) and has small (14 cm) thickness. Such characteristic testifies, that soil, formed in a top part of slope of ravine with fixed slopes, has all morphological attributes, characteristic for chernozem leached, but it's strongly eroded and slightly leached, with embryonic humus horizon. Description of soil section, condition of a surface of described soils, well soddiness of the top horizons permit to declare, that water-erosional processes here at present are not advanced, and soil keeps traces of the last stage of their much higher activity. In soil whole set of soil horizons is observed, but they still are not enough well expressed, that certificate about relative youth of soil development process. Thus, it is represented to us, that attributes and properties, described for soils of tops slopes (section 1) and bottom elongated cavity (section 3) supplement one another and are stacked in the uniform scheme of a relief's and soil's developments of a territory, that in any measure can explain finding of archaeological material on considerable depth - 50-60 cm.

On a territory of the site on fields, used in economic circulation, artificial leveling of a surface was applied. It is always accompanied by considerable violations of soil cover. The occurring transformations are non-uniform in the space. From positive elements of a relief, as a rule, cutting of a part of the humic horizon, and in negative - it burring by relocatable mass occurs. Therefore technogenic-transformed soils can have a wide range of fluctuations of soil attributes and properties. At archaeological excavations on a field with pine planting soil with partially cut soil profile, in which carbonated undersolum places already on a depth 80 cm, was discovered by soil section N 6. The search of archaeological of the objects in this places is considerably hindered, as they can be moved on considerable distance, dispersed and buried on great depth.

5.Conclusion

Researches, conducted on cross profile and in "Orman" site in general, permit to make following conclusions:

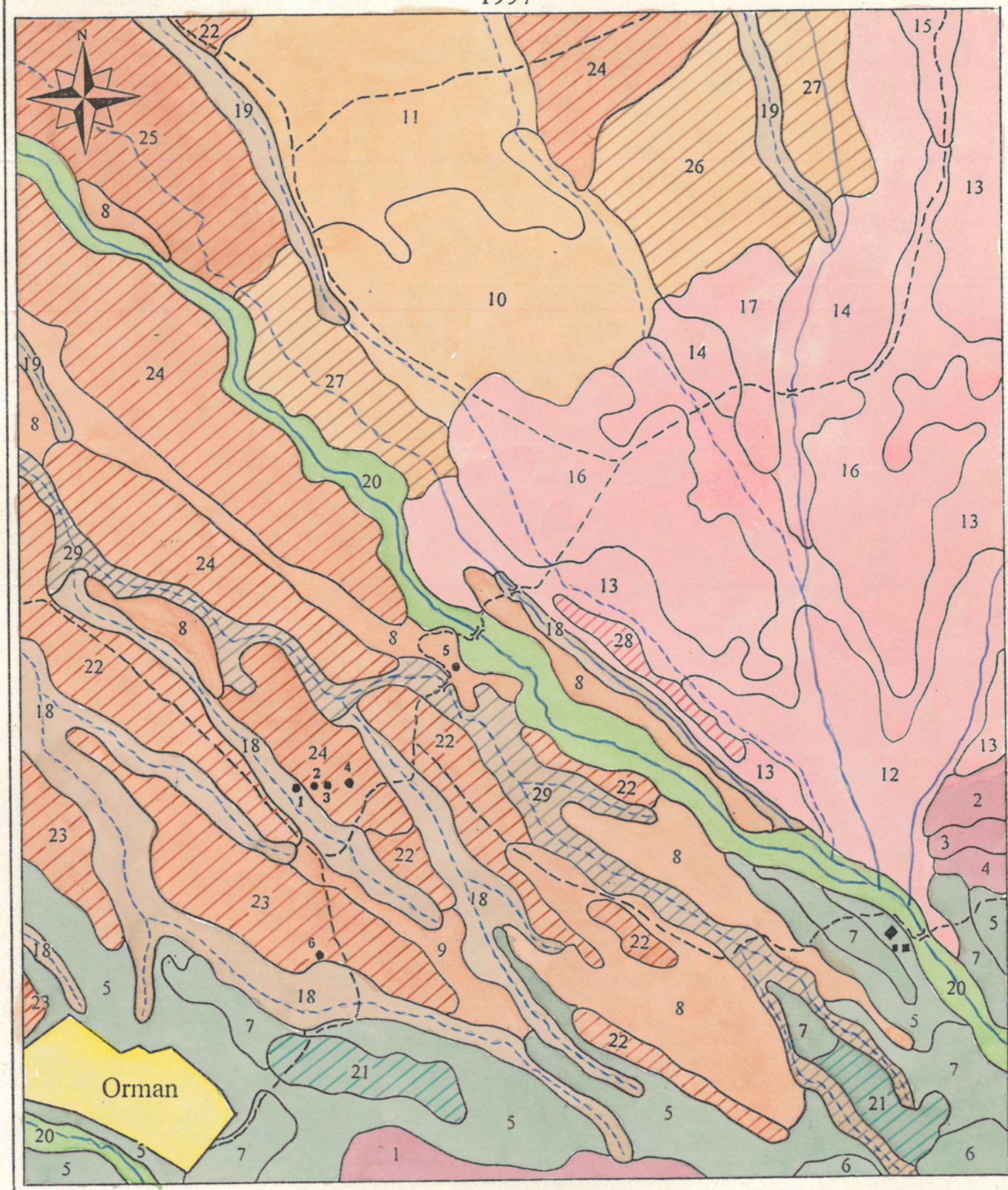
1. The described territory was for a long time subjected to as natural (exogenic), as anthropogenic influences. Among the first ones on the one hand accumulative processes - accumulation of alluvial-proluvial material in the valleys of the acting rivers, loess rocks of aeolian origin, forming the foothills, on the other hand erosional, causing to dissection of the territory and blowing away of material prevailed. Erosional processes amplify due to past and present human activity. It is ploughing up, creating of irrigation channels, cultural plantings. The part of the territory was artificially planned (leveled) by mechanical moving of soil-ground. As a result ecosystems of fruit forests, herb-grass steppe meadows and meadow steppes on forest chernozem-like soils and chernozems leached to the present time largely transformed and transformed by human economic activity were formed.
2. Archaeological material, found out in a soil profile had been moved from environmental (upper) territory. Considerable depth (40-60 cm) can be explained by that after its blowing away from slope of erosional elongated cavity, within the limits of which the profile was made, processes of deposit of fine earth material, arriving from the above territory, occurred. Simultaneously soil development process proceeded. As a result of a long-duration time soil profile, characteristic for chernozems leached, had time to develop and the inclusions (crocks) have been buried on some depth. Besides, an opportunity of artificial movement of the upper layer of soil from the divide part of the slope of elongated cavity to its lower part in time of planning the territory.
3. Site of archaeological excavations have to be chosen not occasionally, but in accordance with soil-geomorphological conditions. It means that it's necessary to conduct predominary soil-geomorphological survey in order to learn the question of origin, development of the territory, opportunity and conditions of soil-ground movement under influence of different factors. It can make the region of search smaller, increase the probability of discovering of ancient human activity traces.

APPENDIX

Map of ecosystems of «Orman» site

Scale 1:10 000

1997



Legend

I 1-4

II 5-7

IIIa 8-9

IIIb 10-11

IIIc 12-17

IIId 18-19

IV 20

V 21-29

Designations

Legend

to the map of ecosystems of "Orman" site

Natural and natural-anthropogenic ecosystems

A. Ecosystems of wild fruit forests, herb-grass meadows and herb-grass meadow steppes belt.

I. *Ecosystems of low mountains*

1. Steep slopes of low mountains predominary of northern expositions under scrub fruit forests (Malus sieversii, Crataegus, Sorbus tianshanica, Armeniaca vulgaris, Rosa platyacantha, Berberis heteropoda) on mountain forest chernozem-like leached soils formed on shallow loessal loams, underlied by decaying granites.
2. The same with participation of aspen (Populus tremula) on concave parts of slopes on forest chernozem-like strongly leached soils.
3. High leveled watershed's surfaces of low mountains under grass-herb steppe hay meadows (Dactylis glomerata modular, Elytrigia repens, Hypericum perforatum) and fallow lands on chernozems leached formed on loessal loams, underlied by decaying granites.
4. Steep slopes of low mountains of southern expositions under herb-grass meadow steppes (Festuca valesiaca, Elytrigia repens, Artemisia dracunculus, Hypericum perforatum) on mountain meadow-steppe leached soils formed on decaying granites

II. *Ecosystems of erosional-denudational foothills*

5. Erosional-denudational foothills under light wild fruit forests (Malus sieversii, Crataegus) on forest chernozem-like soils in a combination with under grass-herb steppe hay meadows (Dactylis glomerata modular, Bromus inermis, Poa, Cichorium intubus) on chernozems leached formed on loessal loams.
6. Erosional-denudational foothills under grass-herb steppe hay meadows (Dactylis glomerata, Elytrigia repens, Agrostis gigantea, Achillea millifolium) on chernozems leached formed on loessal loams.
7. The same in a combination with light wild fruit forests (Malus sieversii, Crataegus) on forest chernozem-like soils formed on loessal loams.

III. *Ecosystems of intermountain valleys.*

IIIa. Ecosystems of intermountain valleys with a thick cover of loessal loams.

8. Slightly dissected leveled surfaces under herb-grass steppe hay meadows (Dactylis glomerata, Poa pratensis, Centaurea squarrosa, Setaria viridis) on chernozems leached formed on loessal loams.

9. Inclined dissected surfaces under shrub grass-herb steppe hay meadows (Dactylis glomerata, Brachypodium pinnatum, Achillea millifolium, Rosa platyacantha, Berberis heteropoda) on chernozems leached normal and eroded, formed on loessal loams.

IIIb. Ecosystems of intermountain valleys with shallow cover of loessal loams.

10. Leveled surfaces under herb-grass steppe hay meadows (Poa stepposa, Agrostis gigantea, Achillea millifolium, Cichorium intubus) on chernozems leached shallow and xeromorphic formed on shallow loessal loams, underlied by proluvial-alluvial gravel-pebbly deposits.

11. Leveled surfaces under herb-grass meadow steppes (Festuca valesiaca, Poa stepposa, Achillea millifolium) on chernozems leached xeromorphic formed on shallow loessal loams, underlied by proluvial-alluvial gravel-pebbly deposits.

IIIc. Ecosystems of present cones of dejection of intermountain valleys.

12. Sloping cones of dejection under herb-shrub wild fruit forests (Malus sieversii, Rosa platyacantha, Berberis heteropoda) on forest chernozem-like leached embryonic and shallow soils in a combination with meadow tree-shrub brakes (Salix viminalis, Ulmus laevis, Populus nigra Rosa platyacantha,) on chernozems leached embryonic and shallow, formed on crushed stony-bouldy-pebbly alluvial-proluvial deposits.

13. Sloping cones of dejection under herb wild fruit forests (Malus sieversii) on forest chernozem-like leached embryonic and xeromorphic soils in a combination with grass-herb steppe meadows , frequently second-anthropogenic (Poa stepposa, Dactylis glomerata, Achillea millifolium, Potentila soongorica) on chernozems leached embryonic and shallow, formed on crushed stony-bouldy-pebbly alluvial-proluvial deposits.

14. Sloping cones of dejection under herb-grass steppe meadows, frequently second-anthropogenic (Poa stepposa, Dactylis glomerata, Achillea millifolium, Potentila soongorica) on chernozems leached embryonic and shallow in a combination with herb wild fruit forests (Malus sieversii) on forest chernozem-like leached embryonic and xeromorphic soils formed on crushed stony-bouldy-pebbly alluvial-proluvial deposits.

15. Sloping cones of dejection under anthropogenic-changed steppe meadows and meadow steppes (Poa stepposa, Achillea millifolium,

Ziziphora sp.) on chernozems leached embryonic and shallow, formed on crushed stony- pebbly with boulders alluvial-proluvial deposits.

16. The same in a combination with wild fruit light forests (Malus sieversii, Crataegus, Poa stepposa, Origanum vulgare, Geranium collinum, Hypericum perforatum) on chernozems leached embryonic and shallow, formed on crushed stony- pebbly with boulders alluvial-proluvial deposits.

17. Sloping cones of dejection under long-fallow lands with weed-herbaceous vegetation (Dactylis glomerata, Centaurea squarrosa, Achillea millifolium, Echium vulgare, Potentila soongorica) on chernozems leached embryonic and shallow, formed on crushed stony-pebbly alluvial-proluvial deposits.

IIId. Ecosystems of ravines with fixed slopes, elongated cavity and gulch of intermountain valleys.

18. Steep slopes of ravines with fixed slopes and elongated cavity under grass wild fruit forests (Malus sieversii, Crataegus, Dactylis glomerata, Poa stepposa, Brachypodium pinnatum, Bromus inermis, Crepis tectorum, Silene holopetala) on forest chernozem-like normal and eroded soils in a combination with tall herbaceous meadows (Delphinium iliense, Ligularia macrophylla, Aegopodium podagraria, Salix viminalis, Geranium collinum) in the bottom parts of slopes and bottoms on meadow-chernozemic strongly-leached soils, formed on loessal loams .

19. Steep slopes of ravines with fixed slopes and elongated cavity under grass-herb steppe meadows (Dactylis glomerata, Brachypodium pinnatum, Elytrigia repens, Poa stepposa, Glycyrrhiza glabra, Althaea litvinovii, Achillea millifolium), places strongly-thinning on chernozems leached normal, eroded and severely eroded in a combination with grass tall herbaceous meadows (Ligularia macrophylla, Delphinium iliense, Salix viminalis, Senecio nemorensis, Geranium collinum, Dactylis glomerata) in the bottom parts of slopes and bottoms on meadow chernosemic strongly-leached soils, formed on loessal loams, somewhere underlied by proluvial-alluvial gravely-pebbly deposits.

Intrazonal ecosystems

IV. Ecosystems of river valleys

20. High-water beds and terraces of river's valleys with herb tree shrub brakes (Salix viminalis, Populus nigra, Ulmus pumila, Populus tremula, Acer semenovii, Rosa platyacantha, Dactylis glomerata, Elytrigia repens, Menha arvensis, Geranium collinum, Trifolium repens, Plantago major) on alluvial forest meadow and meadow soils, formed

on proluvial-alluvial boulder crush stony pebbly deposits in a combination with herb-shrub wild fruit forests (Malus sieversii, Crataegus, Sorbus tianshanica, Berberis heteropoda, Rosa platyacantha, Ribes meyeri, Dactylis glomerata, Geranium collinum, Senecio nemorensis) on forest chernozem-like normal and eroded soils, formed on loessal loams, frequently underlied bouldy-pebbly deposits in walls in bottom parts.

B. Anthropogenic ecosystems

II. *Ecosystems of erosional-denudational foothills*

21. Erosional-denudational foothills under cultural plantings of apple-trees on forest chernozem-like soils and chernozems leached formed on loessal loams .

III. *Ecosystems of intermountain valleys*

IIIa. Ecosystems of intermountain valleys with thick cover of loessal loams.

22. Slightly dissected leveled surfaces under cultural plantings of apple-tree on chernozems leached formed on loessal loams .

23. High leveled, frequently planned surfaces under forestations (larch, fir-tree, pine-tree, maple) on chernozems leached formed on loessal loams.

24. Slightly dissected leveled surfaces, used for dry agriculture on chernozems leached formed on loessal loams.

25. Slightly dissected leveled surfaces, used for irrigated agriculture on chernozems leached formed on loessal loams.

IIIb. Ecosystems of intermountain valleys with shallow cover of loessal loams.

26. Slightly dissected leveled surfaces, used for dry agriculture on chernozems leached shallow and xeromorphic, formed on shallow cover of loessal loams, underlied by proluvial-alluvial gravel-pebbly deposits.

27. Slightly dissected leveled surfaces, used for irrigated agriculture on chernozems leached normal and shallow, formed on shallow cover of loessal loams, underlied by proluvial-alluvial gravel-pebbly deposits.

IIIc. Ecosystems of present cones of dejection of intermountain valleys

28. Sloping cones of dejection with cultural fruit (apple-tree, pear-tree, apricot, cherry), tree-shrub (birch-tree, elm, lilac) plantings and fallow lands on chernozems leached shallow and embryonic, formed on crushed stony-bouldery-pebbly alluvial-proluvial deposits.

IIId. Ecosystems of ravines with fixed slopes, gullies and gulches of intermountain valleys.

29. Deep cut modern irrigated and gulch network with individual plants on outcrops of loessal loams.

Designations

a - constant and temporary flows;

b - roads;

c - population points and separate constructions;

d - sections' numbers