


## PECULIARITIES OF REGULATION OF THE FUNCTIONING PROCESSES OF ANTHROPOGENIC LANDSCAPES IN AZERBAIJAN

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In various natural landscapes of Azerbaijan creation of systematic regulation of the agro-irrigational, cultivated-crop and dry-farming-agricultural landscapes is of tremendous significance. Many questions of appropriateness of formation, functioning, regulation of the anthropogenic landscapes in various regions of Azerbaijan have already been studied in practice. It mainly concerns the irrigational regions of the republic, where in most areas land-reclamation situation is unfavourable, and this makes it impossible to conduct rational planning of formation of various anthropogenic landscapes.

**Keywords:** natural landscapes, anthropogenic landscapes, land-reclamation, agro-irrigational pumps, cultivated hydromorphic soils, agro-irrigational horizons.

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In various natural landscapes of Azerbaijan creation of systematic regulation of the agro-irrigational, cultivated-crop and dry-farming-agricultural landscapes is of tremendous significance. Many questions of appropriateness of formation, functioning, regulation of the anthropogenic landscapes in various regions of Azerbaijan have already been studied in practice. It mainly concerns the irrigational regions of the republic, where in most areas land-reclamation situation is unfavorable, and this makes it impossible to conduct rational planning of formation of various anthropogenic landscapes.

Functioning of the anthropogenic landscapes is a long and very complicated process covering great complex of concerted measures, related to land-reclamation, engineering, agro-technics, forestry, ecology, sanitary-hygiene etc.

As a result of analysis of the humus, mechanical composition, water-physical and chemical properties of different soils, and as well as the subsoil and the river waters of Kur-Araz, Samur-Davachy, Lankaran, and Gusar sloping plains the main tendencies of formation and development of the agro-irrigational, dry-farming-agricultural, residential-cultivated landscapes and their connection with practically unchanged surrounding landscapes were established. For this purpose we compiled some large-scaled landscape maps of anthropogenic loads, where we have singled out 132 variations of different levels of the course. When pointing out separate

units of landscapes we took into account some complex ecological conditions, in particular granular-metric compositions, filtration ability of soils, the level and the degree of mineralization of subsoil waters, capacity of agro-irrigational pumps, artificial separation of the surface, character of the cultivated crops. The little units singled out by us allow us precisely estimating the ecological condition of the particular territories. It also gives us a chance to determine the natural potential of the anthropogenising geosystems of separate regions of Azerbaijan.

The qualitative and the quantitative data of various landscapes division reveals not only the ecological differentiations of territories, but also the economic potential of a particular natural region, i.e. functioning of the landscapes, without which in general it would be impossible to rationally organise and specialise the farmer economy, carry out the land-reclamation measures, plan the particular areas, determine the amount of used mineral and organic fertilizers, choose the cultivated crops etc. As a result of field or laboratory research the following was established: in order to create the ecologically steady landscapes in highly developing regions of Azerbaijan it is necessary to determine the anthropogenic load, i.e. the degree of the anthropogeny of particular regions and the separate morphologic and typological units of natural landscapes. Determination of the anthropogeny coefficient of (K3) natural landscapes has great significance for defining the

positive and negative consequences of changes happening in the natural regions.

The researches show that anthropogenization (Ka) of separate kinds, sub-kinds and types of Kur-Araz landscapes of the lowlands and other plains of Azerbaijan in connection with the development of new territories is always increasing.

In the irrigation oases and in the residential landscape areas of the South-West and the South-East parts of the Mughan plains, and the North and the North-Western parts of Shirvan plains Ka is going up to 0.86-0.91. But the average index of Ka on separate types of landscapes never goes higher than 0.80. In central parts of Mughan and Mil, and in the Eastern part of Shirvan plain in coastal zones of the Caspian Sea Ka makes not more than 0.01-0.10. In general in more than 50% of types of landscapes of Kur-Araz lowlands, Gusar slope plains, and in Lankaran plain Ka goes up to 0.80, but approximately in 20% it is below 0.10 (Gobustan, South-Eastern Shirvan, Ajinohur-Jeyranchel).

In the strongly anthropogenized complexes some stable and rich agro-landscapes are usually formed and functioning. In Garapagh, Mil, Mughan and the Shirvan plains dry-desert, bearded, cereal, ephemeral, motley grass complexes acquire some hydromorphic signs under the influence of irrigation and phytomelioration.

In the old irrigational areas of conical and inter-conical conical depressions of the rivers of Turyanchay, Geychay, Girdmanchay, Tartarchay, Khachinchay,

Garachay instead of the light-chestnut, grey-land, grey-land-meadow and other soils some cultivated-hydromorphic soils are functioning. In agro-landscapes together with the single-types of agrocenoses secondary negophile and holophyte associations grow, and clover can be found everywhere.

At the irrigated massifs, mostly in non-sewage lowerings and hollows, where the subsoil waters are near the surface (more than 1.5 m) and have weak outflow, noticeable remoistening, salinization, saline accumulation occur. This later increases the hydromorphisation of the agro-landscape, but on the naturally drained areas, mostly on foot-hill slopes of plains, where the soil has high filtrating ability, stable agro-landscapes with powerful agro-irrigational horizons are forming.

On the areas of Kur-Araz plains the land-improvement conditions sharply change from west to east: there goes intensification and irrigation of landscapes on the semi-desert landscapes of the Shirvan plains, so in this very direction the coefficient of anthropogenization is decreasing from 0.53-0.65 to 0.17-0.33, but in Mughan-Salyan it ranges from 0.77-0.86 to 0.01-0.03.

Cutting of the Tugay forests leads to worsening of soil draining, and appearing of the secondary brushwood of reed mace, rush, tamarisk etc. On the deserted areas of the pre-Kur stripe from Karpikand and up to the town of Shirvan as a result of the changing radiation balance and the direction of soil-forming processes wormwood, elm and ephemeral complexes could be formed. For future preservation of the relative balance in the structure of the pre-Kur Tugay forests it is necessary to decrease the anthropogenic load on the particular natural region and increase the forest-rehabilitating and forest-protection measures.

All-round analysis of the modern irrigated landscapes of Azerbaijan shows that in conditions of modern commercial use in unstable intra-zone, meadow-swamp, wood-shrub complexes, on semi-deserts and on less-productive dry-steppe pastures and ploughed-fields we can notice the decreasing natural

potential and worsening of natural structures, manifested in formation of numerous small-contour modifications of landscapes of the anthropogenic origin. That is why the local anthropogenic transformations have to be promoted to creation of the optimum control over the natural-economic systems.

The analysis of land-reclamation conditions of the irrigated regions of the Kur-Araz lowlands shows that the land-reclamation conditions here are extremely unfavourable, and that rather large areas have saline soils of the heavy mechanical structure with low filtration properties. Among the anthropogenic factors which worsen the land-reclamation situation we can mention the poor condition of the irrigation sets, poorly planned irrigation areas, excessive extent of uncoated canals etc.

After analysing some experimental data, the condition of heat and moisture-providing, the character of surface flows, chemical composition of underground waters, lithological composition, filtrating properties and salinization of soils, mineralization and the depth of bedding of the subsoil waters, as well as the peculiarities of economic use, some large-scale maps of optimisation of the Kur-Araz landscape lowlands were compiled.

There were given some recommendations on preventing the undesirable hydro-reclamation measures, phyto-reclamation, protecting the valuable complexes, and increasing the efficiency of the agro-landscape usage etc.

On the irrigated regions of Azerbaijan, mostly on the Kur-Araz lowlands stable agro-physical properties of soil and high fertility can be found in the areas under the perennial plantations, mostly orchards. It can be planned by accumulation of some organic substances in them, by some powerful development of biomass. Especially in foothills and deserts, in naturally drained areas where the soil has rather high filtrating ability, peculiar agro-irrigating horizon is formed. The thickness of this horizon is determined not only by the natural-economic conditions, but by the remoteness of irrigation of course. The research shows that on the basic agro-landscapes of Mughan, Mil, Shirvan

and the Garabagh deserts the most favourable conditions as to the formation and development of the ecologically stable agro-complexes were created on non-saline soils (the level of subsoil waters – 1.5 mm) within the content of water-tight macro-aggregates (more than 0.255 mm) – about 60-80%, micro-aggregates (less than 0.25 mm) – about 30-40%, within the moisture-holding capacity (from maximum molecular to the field) – about 1.0-1.5gr/sm<sup>3</sup>. In irrigated conditions in order to improve and regulate agro-physical properties of the soil and to increase the efficiency of melioration of the saline and brakish soil of the heavy mechanical composition, it is necessary to increase water-proof properties of the soil, ability to collect and preserve the soil moisture by means of cultivating the saline areas during their physical maturity and washing-out of saline areas, to create the system of field-protecting forestry zones and reasonable soil-ploughing, to regulate introduction of mineral and chemical fertilizers, to initiate wide anti-erosive measures and chemical melioration directed against the salinization of soil.

At present, poor productivity of the semi-desert, dry-desert, xerophytic-shrub pastures cannot meet the requirements of modern distant cattle-breeding. In connection with the sharp drop of productivity of valuable fodder crops and growth of the amount of weed and the poisonous vegetation on winter pastures of Shirvan, Mughan, Mil plains, and Ajinohur-Jeyranchel low-hills the urgent necessity appears to create a complex of melioration measures (harrowing, sowing valuable fodder plants, exterminating weed and poisonous crops, cleaning stones etc.).

On the strongly saline pastures of Shirvan, Mughan, Mil plains, and in the South-East of Shirvan the productivity of grassland is about 1.2 c/ha or less. By creating the drainage systems and carrying out the washing of 20-25000 c/ha seriously salinized pastures it is probably possible to increase productivity by 2-3 times. At the expense of improvement of the swamped areas in Mughan, Salyan, Shirvan and Mil plains it is possible to expand the territory of the existing low meadow and the meadow pastures up to 35-40 thousand ha, but the productivity

in future can reach 10-15 c/ha and more. It would of course be reasonable to expand the cattle-breeding economy, mainly, horned-cattle. Within the Kur-Araz lowlands separate categories of landscapes were distributed by the degree of the anthropogeny of particular territories. These categories differ from each other by the level of functioning and the current economic load.

### **The poor untapped categories of landscapes**

These are within the Kur long-mane plains and lowlands, Western-Central Mughan, Northern and Eastern parts of South-Eastern Shirvan, at the cones of a great river drifts and in the inter-conical lowlands of the Shirvan plains etc. (Budagov, Garibov, 1980). This category of landscapes takes about 10% of all the lowland territories. Currently they are developing at a natural regime; they are weakly affected by people. In most cases anthropogenic influence here has some episodic character (cutting woods, shrubs, posturing of cattle and etc.). Within this category a certain group and the variation can be distinguished by the degree of violation.

### **Irregularly used natural-anthropogenic categories of landscapes**

These cover weak indented, strong indented, washed away, degraded, wormwood, wormwood ephemeral, kengiz, different grass-ephemeral, and other pastures of Mughan, Mil, Shirvan and Garabagh plains (Garibov, 1986). They cover over 30% of all the lowland territories. These complexes preserve their natural structure rather well. Anthropogenic influence is considerably weak, and can be reduced to irregular posture use. In connection with the development of the distant cattle-farming in most cases some anthropogenic influence has the seasonal character. In winter and spring these complexes receive maximum anthropogenic loads, but in summer the anthropogenic influence (cattle posture) is almost absent.

### **Intensively used (transformed) landscapes**

These include dry-farming lands, agricultural and agro-irrigational

lands, cultivated plantations and other complexes. They widely expand along the rivers of Kur, Araz, Akusha, Geychay, Turyanchay, Tartar etc. and along the huge canals (Upper-Shirvan, Upper-Garabagh, Azizbayov, Central Mughan etc.). In conditions of irrigation the landscapes mostly depend on the degree of artificial moistening. This factor alone is determining the main tendencies of evaluation of oasis landscapes.

During the past 25 years the territory of the intensively used landscapes of Kur-Araz lowlands has increased by 2.5 times, while the territory of irregularly used landscapes has considerably diminished. Due to the favourable conditions and rich soils these categories have long ago developed lands, and this leads to formation the strong anthropogenic-natural, dry-desert, semi-desert and low-meadow swampy landscapes. The anthropogeny coefficient (K3) of separate kinds of landscapes is about 0.8-0.9 (Garibov, 1986).

The agro-landscapes which have been regularly used since the moment of their formation are changing into the functioning system under the regular influence of a man. Annual ploughing, rooting out, irrigation, organic and the mineral fertilizers, hay-mowing of agricultural plants etc. renovate the artificial phytocenosis and create a powerful agro-irrigational horizon (0.5-1.5m), but also lead to undesirable processes like the irrigational erosion, secondary salinity and swamping (Garibov, Ismayilova, 2007).

In unfavourable land-reclamation conditions of the Kur-Araz lowlands under the influence of the drainage, washing-out and irrigation, as well as the road, transportation, and town-planning works within the intensively used agro-landscapes some secondary naturally-anthropogenic landscapes are formed. By the morphologic and typological signs this reminds some primary dominant landscapes, which used to exist here before the opening (secondary swamps, meadow swamps, saline lands etc.). In irrigated oases of Shirvan, Mughan and Mil plains the areas of their distribution have never exceed 30-50 ha being always under the control of a man. In connection with some land-reclamation

measures they often change their own areas. In drained (mostly open) areas these complexes have most completely disappeared.

In highly anthropogenized (Ka, 0, 80) dry-deserts, arid-rare-woods, forest shrubs, semi-deserts, landscapes of foothills, lowlands and low-mountainous regions of Azerbaijan under the influence of irrigation, ploughing, and phyto land-reclamation diriment variations of agro-anthropogenic origin are formed. Development of natural elements of landscapes more or less continues only in narrow stripes near canals and rivers. Here on wavy, hilly, strongly-dismembered plains the chestnut, grey-land, meadow, grey-land-meadow, grey-brown and other soils acquire hydromorphic signs, and some powerful agro-irrigational horizons are formed.

It was established that changes in the regime and character of subsoil waters in adjacent agro-landscapes of Mil, Mughan and the Shirvan plains lead to the transformation of natural landscapes. On the ancient irrigated parts of cones of carryings out and the inter-conic lowerings near the rivers of Turyanchay, Geychay, Girdmanchay, Tartar, Aghsuh, Kendelenchay etc. the soils are artificially moistened and strengthened thereby the hydromorphization of landscapes takes place. On the grey-soil, grey-soil-meadows, light-brownish, grey-soil-brown and other soils the cultural-hydromorphic soils are formed; together with the single-type agrocenoses the secondary weed plants are developing consisting of negophile and the halophile associations.

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