

## THE NECESSITY OF LAND RECLAMATION IN ARTSAKH REPUBLIC

**Zhirair M. Mirzoyan**

Shushi University of Technology  
35/12, Naberejnaya 3<sup>rd</sup> alley, Stepanakert, RA

[mirzoyan.als@gmail.com](mailto:mirzoyan.als@gmail.com)

ORCID iD: 0000-0001-9667-7582

Republic of Artsakh

### **Abstract**

The problem of land protection and increase of fertility in Artsakh Republic has been and still remains relevant, especially due to the deterioration of the land condition and the general anthropogenic decline. Today, more than ever, it is necessary to implement complex organizational-economic and technical measures aimed at improving the hydrological, land and land-climatic conditions which will enable to effectively utilize the limited land resources of the Artsakh Republic excluding the impact of accidental and unpredictable negative processes on the soil, plants and the environment.

Land reclamation in Artsakh has certain peculiarities. It is considered as the main measure for land improvement and should be the basis of the economic development of the country.

*Key words:* water, river, irrigation, land resources, environment, agriculture, drainage.

### **Introduction**

Describing the general directions of problems related to land reclamation in Artsakh, it should be noted that recently there has been a change in the fundamental principles in the world from the protection of the environment to the control of biochemical processes. And this generally means that the growth of food production must be accompanied by the implementation of complex measures aimed at food security. The problem is extremely complicated, especially in countries like our country where the utilization of traditional methods of natural resource are still widespread.

According to the UN Food and Agriculture Organization, it is necessary to increase food production by 2030 which implies a sharp increase in cultivated and irrigated land, especially in South America, Africa and Asia. The number of cultivated lands in other areas will decrease. The decrease in cultivated land in developed countries is explained by the small land resources, overproduction of agricultural products and the need to improve the ecological situation. This doubtlessly will have an impact on our region.

The further increase of arable land in the world will be possible only through deforestation, which, according to environmentalists, is unacceptable, for it endangers the existence of the biosphere. And it is not only about the natural resources that are utilized for food production, they also are of economic importance. The rest of the world natural resources will be endangered, first of all, the biodiversity, which will be followed by a significant global climate change.

The sharpest increase of irrigated areas in the world was recorded during 1950-2000. At the same time, the growth of a number of irrigated areas in developed countries stopped in the 1980s, which is explained by the overproduction of food and the need to reduce the impact on the environment.

The solution to the problem of prevention the improvement of land quality and the decline of its qualitative features is inseparably linked and conditioned by the correct implementation of ameliorative measures. The results of the study show that the yield of agricultural crops in non-ameliorated lands, which make up 2.5 per cent of the agricultural land is lower than 40-70 per cent, which in turn causes large-scale economic damage.

Before the start of the 44-day Artsakh war, the land balance of Artsakh Republic was 1180.3 thousand hectares of which irrigated lands were 14.7 thousand hectares or 1.2 per cent of the total land balance. 577.3 thousand hectares or 48.9 per cent of the land balance are agricultural lands of which only 14.4 thousand hectares or 2.5 per cent are irrigated. The agricultural land amount was as follows: 134.3 thousand hectares of arable land or 23.26 per cent of the agricultural land amount, perennial plantations - 7.6 thousand hectares or 1.3 percent, grasslands - 34.5 thousand hectares or 5.97 per cent, pastures 362.3 thousand hectares 62.57 per cent and other lands 38.6 thousand hectares or 6.9 per cent.

In consequence of the war the agricultural land fund was reduced by 471.8 thousand hectares or 81.7 per cent. 105 thousand hectares of agricultural lands remained under the control of Artsakh of which 34.5 thousand hectares or 32.9 per cent are arable land (less than 100.0 thousand hectares or 74.3 per cent less than the pre-war index), 2.6 thousand hectares or 2.4 per cent are perennial plantations (less than 5 thousand hectares or 66 per cent less than the pre-war index), 54.6 thousand hectares or 51.9 per cent pastures (less than 307.7 thousand hectares or 85 per cent less than the pre-war index), 2.9 thousand hectares or 2.8 per cent of grasslands (about 31.5 thousand hectares or 91 per cent less than the pre-war rate), and 10.3 thousand hectares or 9.8 per cent of other lands (less than 28.3 thousand hectares or 73 per cent less than the pre-war index).

### **Conflict setting**

The solution of the problem is possible with more intensification of crop production and more efficient use of land. Back in the 60s, it was considered that the increase in production was possible due to the use of chemicals in agriculture. But the world is gradually rejecting that idea and switching over to organic. And the problem of lack of land resources is solved by enlarging irrigated land, using the latest technological methods of crop cultivation, and, of course, by improving the quality of land.

The development of agricultural production and the preservation of the ecological balance of the environment in Artsakh are the main preconditions for economic growth and social progress. The setting and solution of this problem is mainly connected with the development of land reclamation, which is a system of socio-economic, organizational-economic and engineering-technical measures aimed at radical improvement of soil fertility indicators in unfavorable climatic and hydro-geological conditions and sustainable increase of crop yields.

### **Research results**

Land reclamation applies only to agricultural lands or landscapes. Reclamation includes irrigation (irrigation, supplement of soil moisture in dry climate conditions), drainage, snow

storage, plastering of saline soils, flooding, strengthening of gorges, planting of forest areas. The need for land reclamation, the nature of application, the type and the impact on the growth and development of agricultural crops, indicators of soil fertility depending on climatic, soil and hydro-geological conditions changes as a result of which the total area of fertile land expands and the crop yield increases.

In order to steadily increase the yield of agricultural crops in Artsakh, it is necessary to study and to assess the irreplaceable and complex impact of various factors on the development of plant life. Certain socio-economic, technological and natural factors affect the fertility of land and crop yields.

Each natural factors such as light, water, air, heat, nutrients etc. need to have a different impact on crop yields and the environment, but water is the only factor that can regulate the influence of others.

According to academician A.N.Kostyakov, the main task of land reclamation is such management of the biological-hydro-geological cycle of water and chemical elements in nature, as a result of which the hydro-geological cycle will tend to the minimum and the biological one to the maximum [1]. In order to achieve this goal, it is necessary to solve the land reclamation problems not only in terms of meeting the requirements of the crop, but also to take into account the indicators due to which the ameliorative regimes of the “ground water-soil-plant-air” system develop effectively and become favorable.

The whole set of reclamation problems can conditionally be divided into two groups. The first includes the analysis of soil formation and land reclamation processes and as a result the necessity of land reclamation is substantiated. The second one is the development of technologies and methods for the complete management of the biological-hydro-geological cycle of water and chemical elements. The problems of the first group have a history of nature development where studies are carried out under the laws of matter - energy change. The solution of problems of the second group is logically based on the expediency of biological-hydro-geological management of water circulation and chemical elements.

Large-scale works have been carried out in Artsakh over the years to build and expand irrigation systems as a result of which the total area of irrigated land has reached 14.7 thousand hectares. Most of the arable lands in Artsakh are located in such a relief zone where a mechanical water supply is needed for irrigation. This means that reclamation through irrigation is more expensive in our country, compared with gravity irrigation performed in a number of countries.

The elements which determine the soil fertility in natural conditions are often in conflict, for example, in Artsakh. Aeration conditions of the soil and the availability of different types of nutrients become worse in excessively moist soils, heat emerging to the lower layers of the soil decreases, anaerobic processes are activated and, as a result, the soil becomes super-wet and swampy. In such soils, the inflow of moisture exceeds the outflow and the groundwater has a relatively high location. As for a insufficiently humid zone, where the opposite process takes place, the moisture output exceeds the input and conditions are created for the development of anaerobic processes. As a result, organic matter decomposes, heat conductivity of the soil decreases, the temperature rises, the density of the soil solution increases and the soil salinity process begins. All these factors become the basis of development of the soil and water erosion.

From the point of view of the impact on the soil and plants, the types of hydraulic engineering, forestry, chemical and agro-technical reclamation can be distinguished in the Republic of Artsakh.

In case of hydro-engineering reclamation, the increase of soil fertility is achieved by changing their water regime (irrigation, construction of dams, drainage systems, etc.). The amount of water supplied to any crop is different, it is directly related to a number of criteria, such as the type of plant and the agro-technical and climatic conditions of the area. Irrigation is the main factor influencing soil hydro-physical, physical-mechanical and biological properties, ground microclimate and physiological characteristics of the crop. It is unacceptable to consider irrigation only as moisture supplied to agricultural crops. The amount of water absorbed by the plant is conditioned by the water permeability of the soil, which in turn depends on the mechanical and chemical composition, structure and density as well as the size of the soil pores and nature.

Improvement of soil due to forestry amelioration (moving sands, steep slopes, gorges, etc.) is achieved by planting woody or grassy vegetation on the soil.

In chemical reclamation soils are improved by the introduction of lime, gypsum, sodium chloride, sulfuric acid, synthetic rubber, tomoslag and phosphate rocks. A variety of pesticides are used to control weeds in adjacent fields and polymeric materials are used to reduce filtration from aquatic bodies and large canals.

In agrotechnical amelioration, soil fertility increases with the right choice of plow depth and direction, soil deepening and plow combination with deep furrows, mountain ranges, installation of steep slopes, mulch, snow retention etc.

In order to ensure the efficiency of irrigation, it is necessary to unconditionally include quantitative and qualitative changes of other factors and to create conditions for their complete regulation and management as in certain agrotechnical and climatic conditions of Artsakh, when crops are provided with heat, light and nutrients, the amount of irrigation water is increased. It may decrease if the other factors remain unchanged in the first period when there is a growth in yields.

Irrigation should be organized in such a way that there is no surface and ground waste of irrigation water as in this case it is possible not only to lose water and nutrients but also to increase groundwater level, soil wetting, salinization and swamping.

In order to improve the positive impact of irrigation water on the physical characteristics of the cultivated land in the Artsakh Republic, it is necessary to choose the right irrigation equipment and irrigation regime for the water affects the microbiological processes running in the soil.

Experimental studies in Artsakh prove that the conversion of ammonium salts in water into plant-absorbed nitrates is possible when the soil moisture is 60 per cent of full moisture content. During irrigation, the humidity of the topsoil (0-30 cm) is 80-90 per cent of the total moisture content, after which it begins to decrease due to evaporation and this change affects other factors.

Irrigation water has a significant effect on the chemical properties of the soil. The amount of nitrates in the soil is conditioned by the method of irrigation. The study revealed that in the case of irrigation with stagnation there is a significant loss of nitrate nitrogen while in the case of furrow or drip irrigation it remains almost unchanged due to capillary dampness.

Land reclamation of an agricultural land is especially complicated in the Republic of Artsakh. Reclamation takes into account the interests of many sectors of the national economy: agriculture, forestry, fishing, energy, utilities, health etc.

Taking into account the current state of Armenia and Artsakh, the blockade of the railway, the scarcity of local ameliorators and financial resources, etc., the electro-amelioration method can be considered a promising direction for the amelioration of the saline-alkaline land of the Ararat Valley [2].

There are many ways to ameliorate saline soils which allow to reduce the norms of washing water, duration of washing and norms of chemical ameliorators while solving environmental problems. Electromelioration is one of the new and effective technologies for land improvement. The process of electroamelioration runs under the combined influence of two electrokinetic forces – electroosmotic and electrophoretic. The electroosmotic force is the result of the attraction of cations by the anionic surface. The simplest model of this process proposed by Gui and Chapman assumes that ions can be considered as separate charges that are located close enough to the surface of the capillary according to the Boltzmann distribution pattern. The Gui-Chapman model, however, does not take into account the effect of ions firmly attached to the surface. Such ions must be separated from ions that move freely. Such ions must be separated from ions that move freely. In fact, instead of using the  $Y_0$  potential, the movable and fixed ions' potentials can be used. The separation of these potentials is called the Stern model which divides the double electric diffusion layer into two separate parts, fixed and movable, located approximately at the distance from the surface equal to the radius of the hydrated ions. The potential decreases by a curvilinear connection between the surface and the Stern layer and can be determined experimentally. For the silicon surface which is typical of soil systems, the potential value is 40 mV when the ionic strength of the aqueous solution is 0.01 mol / l and the pH is 8 [3].

Although the idea of electroamelioration is well known in reclamation soil science, it has not been widely used in production due to the imperfection of many methodological problems. Analyzing the existing scientific works, S.V.Sahakyan and A.V.Simonyan come to the conclusion that there is a number of shortcomings in the sphere of electroamelioration [4].

1. The electrodes are located at a great distance from each other.
2. The electrodes were exposed to excessive electrical currents.
3. Mineralized water was used in the soil washing process.

The large distance between the electrodes makes it possible to reduce the number of electrodes by increasing the tension of the electric field. It is known that the process of electroamelioration is a process of electrolysis during which a voltage of not more than 5 V is applied, otherwise, electricity is wasted inefficiently on water degradation and soil heating. This leads to a rise in price of this technology and pushes it out of practical use. On the other hand, the use of demineralized water during washing reduces the current, which not only prolongs the reclamation period, but also leads to the degradation of microaggregates, soil dispersion, which reduces the filtration rate, and reduces the washing intensity. The increase of electricity can be done in two ways: reducing the distance between the electrodes and increasing the electrolyte concentration during washing. Reducing the distance between the electrodes can be done by applying the local amelioration technology. In this case, the distance between the electrodes can be reduced to a few centimeters. Electricity can also be significantly increased also by increasing the electrolyte's concentration, which can be

achieved through the use of highly mineralized water or solutions of various mineral salts. These measures allow to reduce the voltage up to 5-6v and to reduce electricity losses [4, 5].

Agriculture is one of the strategic branches of the economy of the Artsakh Republic and the living standards and well-being of our population depend on the pace of its development. According to the many challenges of a rapidly changing world, it is essential to fully ensure the country's food security. And this is possible only with the conduct of high-quality agriculture and the latter is directly dependent on land reclamation.

### Conclusions

On the basis of the performed analysis we can arrive to the conclusion that land reclamation in Artsakh Republic has certain peculiarities. As the main mission of land reclamation is its long term positive impact on land quality, it is considered as a capital measure for land improvement; it should be the basis for the development of the national economy.

It is necessary to develop a program of long term land reclamation and soil preservation measures, which should be the basis of complex measures in the field of agriculture, especially in the field of crop production.

Preservation of chemical, physical and biological structures and sequential improvement of agricultural land in Artsakh should become a priority requirement for agriculture. Areas, where soil salinization, swamping or degradation are observed, need special programs to restore land importance and increase fertility in a short period of time in order to put them under intensive cultivation.

### References

1. Kostiakov A.N. Amelioration fundamentals (1960) //M: Selkhozgiz, 1960.- 621p.
2. Sahakian S., Torossian S. Effect of soil solution concentration on electroosmotic transport of the soil water (2003) //Yerevan, Agrogitutiun, 2003, N6.- p. 251-257.
3. Global Environmental and Social Monitoring (2004) //Proceedings of the First International Thematic Workshop held in Vienna, Edited by Lee C., Schaaf T., UNESCO, Paris, 2004.- 163 p.
4. Sahakyan S.V., Simonyan A.V. Problems of acceleration of land reclamation processes (monograph) (2011) //Yerevan State University of Architecture and Construction, Yerevan, 2011.- 163 p.
5. Sahakyan S.V., Simonyan A.V. Application of electro-melioration method in the sphere of improvement of saline-alkaline soil (2011) //Yerevan State University of Architecture and Construction, Yerevan, 2011, N3(21).- p. 3-10.

### References

1. Костяков А.Н. Основы мелиорации (1960) //М: Сельхозгиз, 1960.- 621с.
2. Սահակյան Ս., Թորոսյան Ս. Հողային լուծույթի կոնցենտրացիայի ազդեցությունը հողում ազատ ջրի էլեկտրոօսմոտիկ տեղափոխման վրա (2003) //Երևան, Ագրոգիտություն, 2003, N6.- էջ 251-257:
3. Global Environmental and Social Monitoring (2004) //Proceedings of the First International Thematic Workshop held in Vienna, Edited by Lee C., Schaaf T., UNESCO, Paris, 2004.- 163 p.

4. Սահակյան Ս.Վ., Սիմոնյան Ա.Վ. Հողերի մելիորացման գործընթացների արագացման հիմնախնդիրները (մենագրություն) (2011) //Երևանի ճարտարա-պետության և շինարարության պետական համալսարան, Երևան, 2011.- 163 էջ:
5. Սահակյան Ս.Վ., Սիմոնյան Ա.Վ. Էլեկտրամելիորացման մեթոդի կիրառումը աղու-ալկալի հողերի մելիորատիվ վիճակի բարելավման բնագավառում (2011) //Երևանի ճարտարապետության և շինարարության պետական համալսարանի տեղեկագիր, Երևան, 2011, N3 (21).- էջ 3-10:

## **ՀՈՂԵՐԻ ՄԵԼԻՈՐԱՑԻԱՅԻ ԱՆՀՐԱԺԵՇՏՈՒԹՅՈՒՆԸ ԱՐՑԱԽԻ ՀԱՆՐԱՊԵՏՈՒԹՅՈՒՆՈՒՄ**

### **Միրզոյան Ժ.Մ.**

*Շուշիի տեխնոլոգիական համալսարան*

Արցախի Հանրապետությունում հողերի պահպանության և բերրիության բարձրացման խնդիրը եղել և շարունակում է մնալ արդիական, հատկապես հողերի վիճակի վատթարացման, համընդհանուր անտրոպոգեն անկման պատճառով: Այսօր, առավել քան երբևէ, անհրաժեշտ է հիդրոլոգիական, հողային և հողակլիմայական պայմանների բարելավմանն ուղղված կազմակերպչատնտեսական և տեխնիկական համալիր միջոցառումների իրականացում, որը հնարավորություն կընձեռնի Արցախի Հանրապետության սահմանափակ հողային ռեսուրսներն օգտագործել արդյունավետ՝ բացառելով պատահական, անկանխատեսելի բացասական գործընթացների ազդեցությունը հողի, բույսի և շրջակա միջավայրի վրա:

Արցախում հողերի մելիորացիան ունի որոշակի առանձնահատկություններ: Այն դիտարկվում է որպես հողի բարելավման կապիտալ միջոցառում և պետք է դրվի երկրի տնտեսության զարգացման հիմքում:

**Բանալի բաներ.** ջուր, գետ, ոռոգում, հողային ֆոնդ, շրջակա միջավայր, գյուղատնտեսություն, ցամաքորդ:

## **НЕОБХОДИМОСТЬ МЕЛИОРАЦИИ ЗЕМЕЛЬ В РЕСПУБЛИКЕ АРЦАХ**

### **Мирзоян Ж.М.**

*Шушинский технологический университет*

Проблема сохранения и повышения плодородия почв в Республике Арцах была и остается актуальной, особенно в связи с ухудшением их состояния, всеобщей антропогенной деградацией. Сегодня, как никогда, необходимо осуществление комплексных организационно-хозяйственных и технических мероприятий, направленных на улучшение гидрологических, почвенных и почвенно-климатических условий, что даст возможность эффективно использовать ограниченные земельные

ресурсы Республики Арцах, исключая воздействие случайных, непредсказуемых негативных процессов на землю, растения и окружающую среду.

Мелиорация земель в Арцахе имеет определенные особенности. Она рассматривается как капитальная мера по улучшению земель и должна стать основой экономического развития страны.

**Ключевые слова:** вода, река, орошение, земельный фонд, окружающая среда, сельское хозяйство, осушение.

Submitted on 29.11.2021.

Sent for review on 30.11.2021.

Guaranteed for printing on 28.12.2021.