

## Problems of Irrigated Farming in Azerbaijan and Prospects of its Development

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### Abstract

This article contains a brief report on the history and actual state of agricultural science and production (including agricultural melioration, soil erosion and salinization problems, and much more, which is one of the main activities of the Institute of erosion and irrigation of the NAS of the Republic of Azerbaijan) in Azerbaijan.

**Keywords:** Agriculture; Natural Conditions

### Figure

Problems of irrigated agriculture in Azerbaijan It should be noted that due to the complexity of physical and geographical conditions and anthropogenic impact, 41.8% of lands are subject, to varying degrees, to erosion processes. Currently, the land in the Kura-Araks lowlands is heavily soiled. The total amount of saline land in the republic is about 1000 thousand hectares, although some of them are supplied with a collector-drainage network. For their washing and recovery, additional fresh water is required.

Traditionally, water-intensive crops are grown in Azerbaijan. And the water consumption per hectare of irrigated land is lagging behind water shortage, as a result of which instead of 6 - 7 watering - plants receive 2 watering.

As is known, Azerbaijan differs from all other regions in terms of climatic conditions by the fact that out of 11 climatic zones existing in nature, 9 takes place in our republic. This circumstance requires a special approach to solving the problems of agricultural production.

The situation is further complicated by the fact that rainfall in the republic is very uneven, and in some regions it is not enough to meet the needs of agricultural crops during their growing season. presence of water shortage.

Water resources of Azerbaijan make up 32.3 billion cubic meters per year, and in dry years this figure is reduced to 23.16 billion cubic meters (95% of provision). Of these volumes of water, own water resources account for 10 billion m<sup>3</sup>. As a result, the republic has only 14% of the total water resources of Transcaucasia [1-3].

Until 1990, Azerbaijan was one of the largest producers of agricultural products and the main exporters of raw cotton, tobacco, grapes, wine and vodka products, fruit and vegetable and canning products. However, after the transition to a market economy, there have been changes in the structure of cultivated areas.

Currently, in the republic, cereals occupy 1 million 50 thousand hectares - with a total yield of 2.8 million tons, mainly wheat. The area for sowing cotton in the republic has been reduced, which is subject to market conditions.

The Republic belongs to the landless countries, since per capita here there is no more than 0.2 hectares of arable land.

In Azerbaijan, besides soil erosion, there are problems associated with desertification. They are accompanied by a change in the structure of the heat balance of the region.

It is known that deserts are arid territories, practically devoid of vegetation cover and developed soil with insignificant biological productivity. Priority directions of the development of science and education Agricultural sciences Consequently, the study of desertification and the development of measures for their implementation can halt the desertification processes facing the republic.

On water issues, it is required to conduct scientific research on mountain slopes with irrigation technology, with the introduction of macro and microelements, and rational use of soil and water in the plains and foothills, and sloping lands of the Republic of Azerbaijan. On this issue, the following developments are available:

- Development and introduction of water-saving, environmentally safe equipment and irrigation technology;
- Development and implementation of highly effective means for drainage on irrigation systems;
- Development of disposal of sewage and drainage water;
- Development of measures for salinization of soil;
- Development of measures and research to prevent soil degradation;
- Development of measures to combat desertification processes.

It should also be noted that one of the most important areas of agricultural development in Azerbaijan is crop production.

Particularly important for ensuring the needs of the country's population with food products in Azerbaijan are cereals and leguminous crops. Therefore, the aforementioned crops are cultivated annually in different soil and climatic conditions of the republic, in connection with which it is required to develop an effective selection strategy for a specific agroecological region.

The successful solution of these tasks depends on the creation of widely adapted, disease-resistant, highly productive and stable genotypes of grain and leguminous crops, which primarily depends on the enrichment of the world gene pool.

Problems of salinization in Azerbaijan in past years on the area of 593 thousand hectares of irrigated land (41%) were complex ameliorative measures.

As a result of large-scale measures, drainage areas have expanded and now amount to 593 thousand hectares, which for 310,4 thousand hectares of land there is an open network of horizontal drainage. At 264, 4 thousand hectares - closed drainage and 13.2 thousand hectares - vertical drainage.

The length of the collector-drainage network is characterized by the following data: closed drainage - 10 thousand km, open drainage - 9,7 thousand km, collector of various orders - 11,6 thousand km.

Meanwhile, 43.8% of the irrigated lands, i.e. 633.8 thousand hectares are salinized to varying degrees, including 429.8 thousand hectares (68%) of the land - slightly saline, 139.8 thousand ha (22%) - medium saline, 66.2 thousand ha (0,4%) - highly saline.

Salinization of soils negatively affects the yield of agricultural crops cultivated on these lands.

Crop yields on average decrease by 23.0% - with low salinity, 47.0% - with medium salinity and 85.0% - with strong salinity. Therefore, in order to desalinate these lands, as a rule, capital washing is carried out on heavily saline sites and solonchaks, and irrigation measures with agrotechnical and agro-meliorative methods are carried out on lands with weak and medium salinity.

Among these methods, the irrigation regime plays an important role, including the application of charge irrigation (winter and spring arts) and current washing in the non-vegetation periods. The Republic of Azerbaijan is diverse in terms of soil and climatic conditions, and here there are nine of the eleven climatic zones available on the globe. According to the nature of the reclamation measures, three categories of ameliorated lands are clearly distinguished.

Soil of alluvial origin with chloride-sodium composition of salts (NaCl predominates in salinity) and high filtration capacity. Priority directions of development of science and education Agricultural science, which is quickly released when leaching from salts, agrophysical properties of soils during washing do not deteriorate:

1. The soil of a chloride type of salinity with a chlorine content is 40 - 60% of a dense residue with a toxicity threshold of 0.2%. This soil is widespread in the Salyan Plain and Northern Mughan;
2. Soil of the sulfate-chloride type of salinity with a chlorine content of 25 - 35% in a dense residue having a toxicity threshold of 0.3%. This soil is widespread in the northern Mugani, in the South-Eastern Shirvani, in the narrow Prikurinsky Shirvani belt, in the Priarakissin valley, in the Mil'skaya Plain and in a narrow coastal strip along the Caspian Sea.

The soil of the foothill plains of the deluvial-proluvial origin with the sulfate-magnesium-sodium composition of salinity and hindered salinity, which in its initial state has unfavorable agrophysical properties, is susceptible to solonetching during washing:

1. Soil with chloride-sulfate salt composition, containing chlorine- 10 - 20% in a dense residue, having a toxicity threshold of 0.4%. This soil is widespread in the Shirvan plain, South Mugan, widely distributed in the Karabakh plain and partly in the Mil'skaya Plain.
2. Soil of sulphate type of salinity, containing chlorine - 0.10% of dense residue, having a toxicity threshold of 0.4%. The spread of this soil has developed in the Shirvan Plain, Southern Mughan, in the Karabakh plain and partly in the Mil'skaya Plain.
3. Soil of sulphate-chloride type of salinity with increased content of gypsum (NaO<sub>4</sub> 2-3%), containing chlorine - 0-10% of dense residue, having a toxicity threshold of 1.0%.

This soil is widespread in the Shirvan Plain and Southern Mugan.

The soil is of a deluvial proluvial or alluvial origin with salt salinity of the soda series, which has an alkaline renunciation of the medium:

1. The soil with soda-sulphate salinity, which has a natural solonetz content, is prone to additional solonetzation during washing, it contains soda in small amounts, the reaction of the medium is alkaline. The spread of this soil occurred in individual farms - in the Milska and Karabakh plains.
2. The soil with sulphate-soda salinity, strongly solonetzic, fused, the reaction of the soil solution is alkaline, the composition of the salts of the soda series: Na<sub>2</sub>BO<sub>3</sub>, NaCl<sub>3</sub>O<sub>3</sub>, MeNO<sub>3</sub>, the soil is highly dispersed, swells when moistened, water and salt yield is extremely low. This soil became widespread on the cone of removal of the river. Terter, in the Crabach steppe. In the organization and conduct of the current washing, the appointment of a washing standard, the depth of pre-flushing, the time of washing the soil, it is necessary to be guided by these groups of soils and washing should be carried out differ-

entially for these groups. As a result of numerous studies carried out at the experimental sites of the "Institute of Land Reclamation", specific recommendations have been developed for the improvement of saline lands with application in relation to these categories.

On lands with increased filtration capacity and chloride-sodium type of salinization, it is recommended to use "band-wise and intermittent" washing. The essence of clock-strip washing consists in dividing the row spacing by its width by 3 - 5 parts.

The strips are separated by earthen ramps with a height of 0.6 - 1.0m. Soil washing is carried out in stages.

At the first stage, the central strip is washed, on the second - the central strip and adjacent to it - the middle strip, and on the third are included the tattered stripes.

The essence of the intermittent washing is the multiple pouring of wash checks with intervals between the fillings for the time necessary to lower the groundwater in the central part of the inter-grain to a depth of 1.0 - 1.5m from the surface of the earth, and to prevent the closure of the rinsing and groundwater.

Priority directions for the development of science and education Agricultural sciences With the implementation of these technologies, uniform desalination of soils over the width of interdependence (thanks to the uniform distribution of the industrial norm) is ensured and the unproductive costs of washing water are excluded. On heavy, weakly permeable land, it is recommended to perform capital leaching differentially, depending on the lithological structure, the degree of salinity and the filtration properties of soils:

1. On lands with a filtration factor of 0.10 - 0.30 m/day. and at the required value of the washing norm - up to 10 thousand m<sup>3</sup>/ha, the capital washing is carried out in the usual way, against the background of permanent deep drainage.
2. On lands with a filtration factor of 0.10 - 0.30 m/day. and with a required washing rate of 10 - 30 thousand m<sup>3</sup>/ha, a permanent deep drainage is enhanced by additional temporary drains for the period of the capital washing.
3. On lands with reduced water permeability, with a filtration coefficient of 0.05 - 0.10 m/day. and when the thickness of the compacted upper layer does not exceed 0.6 - 0.7m and the required washing rate is less than 10 thousand m<sup>3</sup>/ha, the capital rinse is carried out against a background of permanent deep drainage with deep soil treatment before it is carried out.
4. On lands with the same filtration factor and the same thickness of the packed upper layer, as in the previous case, but with the required wash rate of 10 - 30 thousand m<sup>3</sup>/ha, the capital rinsing is carried out against a background of permanent deep and temporary shallow drainage when combined with the use of deep soil treatment before washing.
5. On lands with a filtration factor of 0.05 - 0.10 m/day. and the presence of a compacted upper stratum with a thickness of more than 0.6 - 0.7m, regardless of the degree of initial salinization of soils, a thorough flushing is carried out against a background of permanent deep and temporary drainage, combined with deep soil treatment prior to washing. Center for Scientific Cooperation «Interactive Plus».
6. On lands with especially cohesive and bare soils, with a filtration factor of 0.05 m/day. with the capacity of the upper condensed horizons over 0.06 - 0.7m, the capital washing is carried out against a background of deep permanent and shallow temporary drainage, when combined with deep soil treatment before washing and using chemical meliorants or electroreclamation.

In soda-saline soils, the main criterion for reclamation is the degree of solonetsity and the content of soda salts (normal and bicarbonate). The land is subject to chemical melioration and washing on the background of drainage.

From chemical meliorants, acidic and physiological salts, acids or neutral salts of two and trivalent metals proved to be effective.

Practically the raw-hammer gypsum (NaChCl<sub>4</sub> x 2P<sub>2</sub>ch) is a widely used preparation.

The above-mentioned reclamation methods (cycle washing, washing against the background of temporary shallow drains and deep tillage, gypsum), except for electroreclamation and chemical ameliorants, were widely used in reclamation practice, as a result of which the irrigated land areas increased year by year. These techniques were industrial and successfully implemented under the former Soviet Union. Under private ownership, their use is difficult and approaches to desalination of saline and saline lands tend to be different.

In connection with the land reform, 3,8 million hectares of the total Fund of the Republic in 8,641.5 thousand hectares remain in state ownership, 2.74 million hectares are allocated to municipalities, and 2.1 million hectares is distributed to private land users, i.e. Farmers, cooperatives, associations etc. on state and municipal lands, implementation of reclamation measures for the distribution of land at the present time due to material and technical insecurity. Priority directions for the development of science and education. Agricultural sciences are suspended and upon their resumption the above-mentioned washing technologies will continue to be implemented.

On lands, and Azerbaijan allocated to private land users, as a rule, there are slightly saline and medium saline and medium saline soils, and separate spots - strongly and very strongly saline lands.

On these lands, basically, it is necessary to perform a washing irrigation regime, water-charge irrigation and current washes, for which separate recommendations and instructions have been drawn up. The most suitable for these lands are rice crops. In addition, a technology for horizontal washing with deep furrows has been developed, which can be implemented by a privateer in his farm. In the conditions of concentration of the basic stocks of salts in the upper horizons (0.4 - 0.60 cm), as well as in fresh and slightly mineralized groundwater, it is advisable to apply horizontal washing on the background of deep furrows. Flushing should be carried out in the following sequence:

1. Are flooded with rinsing water of the furrow-through one, which are supplying, while others, being bypass, serve as a drainage rudder;
2. The interbird space is flooded;
3. The flooding of the interbreeding space continues, flooding furrows are flooded, the supply channels play the role of drainage;
4. Washing continues with the flooding of the entire area, including the channels of deep furrows. The advantage of horizontal flushing is that the rinsing process is rarely accelerated, salt removal is performed, bypassing the underlying horizons.

### Soil erosion in Azerbaijan

The study of soil erosion in Azerbaijan is of great importance, since the republic is mainly a mountainous country and all types of erosion processes are developing on its territory.

The development of erosion processes in the territory of Azerbaijan is manifested in the form of flushing, erosion, the formation of ravines, landslides, salt flows, and the formation of basins and other forms of blowing. There is also the role of inappropriate human economic activity in the use of mountain meadows, steppes and semi-deserts, unsettled surface runoff of atmospheric precipitation, and soil treatment without taking into account the flow and direction of the wind.

In different physical-geographical regions and regions of Azerbaijan, depending on the intensity of the use of the territory, the erosion processes proceed in different ways. Accelerated erosion in strong form is manifested in the mountainous and partly pre-mountain zone, wind erosion in the foothill and partial lowland zones.

The main factors causing the development of soil erosion in Azerbaijan are: unregulated grazing in the mountainous zone, its concentration without regard to pasture productivity (livestock norms), unsettled watering, etc.; in the mountain forest zone, irregular, erratic logging, grazing in the forest, improper skidding, stubbing on steep slopes for cultivation of crops [4-8].

Priority directions for the development of science and education.

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