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REPORT ON THE KURA-ARAKS EXPEDITION OF THE USSR SOIL INSTITUTE

The Kura-Araks expedition of the Soil Institute, Academy of Sciences USSR, has finally concluded the regional soil-improvement investigation in the entire Kura-Araks depression, which had been in progress since 1946. Later, stationary investigations of the hydrophysical properties of soils and observation of the water-salt regime will be conducted.

The Kura-Araks depression, covering a territory of approximately 2 million hectares, is a most unusual area. In amount of heat and sunlight it is one of the best regions of the USSR. Even types of cotton which require very hot weather will grow here. Nearly half the region consists of salty soil, on which only halophytes will grow. Therefore, soil improvement and economic utilization of the region for further development of socialistic agriculture in Azerbaydzhan SSR is an obvious necessity.

The aims of the expedition were to determine the reasons for the saltness of the area, to find methods of eliminating it, and also to establish measures for soil-improvement in the depression. Azerbaydzhan scientific research organizations (Institute of Agrochemistry and Soil Studies of the Academy of Sciences Azerbaydzhan SSR, Azerbaydzhan Institute for Hydrotechnology and Melloration, the Azerbaydzhan Scientific Research Institute for Agriculture, and Azvodproyz (planning organizations) were invited to participate in the project. All research work was carried out in close cooperation with the workers of local experimental stations, particularly with the Mugan' Experimental Soil-Improvement Station, and also with agricultural specialists. The expedition used a wealth of material from local scientific research and economic institutions, and research material from previous studies.

The Kura-Araks depression, once bottom of the ancient Caspian Sea, now lies 28 meters below sea level. Its unusually high saline content stems from a combination of unusually unfavorable factors -- tectonic geomorphological, pedological, and climatic. In addition to salts left from the old Caspian Sea, salts have accumulated continuously in the ground and topsoil because

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the greater part of the depression has no drainage. All surface and ground waters entering this region disappear almost entirely by evaporation and transpiration, which during the summer season amounts to 4,000-20,000 cubic meters per hectare, which naturally increases the salt concentration in the ground and topsoil.

The ground waters of the Kura-Araks depression frequently contain as much as 80-120 grams per liter of soluble salt even at a depth of about 100 meters. This high concentration is very harmful to both cultivated and wild plants.

The expedition investigated the Sal'yansk steppe, Southeast Shirvan', Southern, Central, and Northern Mugan', the Mil'skaya steppe, and part of Northern Shirvan'.

The entire territory was covered by the investigation. In all areas, the expedition investigated soil types, degree and chemistry of their saline content, depth of salinity, mineral content of ground waters, relation between ground water, soil processes and salinity, possible run-off or stagnation of ground waters, relation between salty ground waters and surrounding regions, etc.

The investigations made it evident that the soil cover of the older parts of the Kura-Araks depression has remained unaffected by the process of salinification. Although the saline soils lack to a certain extent the readily soluble salts which are harmful to plants, they do have unfavorable hydrophysical properties (fine structure), resulting in low fertility. The expedition investigated methods of increasing the fertility of the dark, strongly alkaline salts of the depression. Field and laboratory experiments were conducted to determine the effect of root systems of wild and cultivated grass and of various agrotechnical methods upon the strongly alkaline soils. The laboratory experiments showed that the meliorative action of grass roots is highly effective in improving these soils.

Simultaneously, soil solutions of highly fertile, improved soils were studied to determine the best medium for root systems of cultivated plants, and especially to establish the most favorable concentrations of soil solutions for cotton. In addition, the mechanism of salt accumulation in soils and ground waters, and the exchange of salt between topsoils and the levels were clarified by a study of the dynamics of soil solutions. A detailed study of interaction of salt deposits of surface and deeper salt-bearing levels is necessary to organize the problem of desalinification of soil with the help of the Dokuchayev-Kostychev-Vil'yams agrotechnical system.

Special laboratory experiments were begun with dyed salt solutions in models of the soil and subsoil. These experiments demonstrated the elimination of salt deposits from various depths by means of different drainage systems, the influence of various sources of readily soluble salts upon the process of their accumulation in soils and ground waters of the depression, the influence of various hydrotechnical constructions upon the state of highly mineralized ground waters at deep levels, and thus helped in designing the most effective drainage systems and melioration constructions.

The model tests organized by the expedition were filmed and will be shown to soil improvement and hydrotechnical specialists engaged in planning work.

The data of the studies and the preliminary conclusions were immediately turned over to planning organizations for utilization in preparing technical plans for improvement of the region.

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The first results of the expedition's studies have already been utilized in the preparation of irrigation and soil-improvement projects in northern Mugan'. Subsequently, plans for the rest of the depression will be prepared. The entire plan for soil-improvement and irrigation of the depression will be drawn up by planning organizations before completion of the Mingechaur dam, which is to store the waters of the Kura and Araks rivers at present flowing into the Caspian Sea without being utilized for irrigation purposes.

The expedition is studying the valuable experience of the Mugan' Experimental Soil Improvement Station. The drainage method used by this station to remove salt from the marshes was extraordinarily successful. Complete desalinification of salt marshes and the creation of a flourishing oasis were accomplished over an area of 700 hectares. For several years, this oasis has produced gardens, vineyards, and large crops of valuable commercial plants. This experiment bears witness to the tremendous potentialities in the Kura-Araks depression for the application of soil improvement complexes which have been developed by Soviet science and socialist agriculture.

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