American University of Central Asia

LAND DEGRADATION IN KYRGYZSTAN

Combating land salinization in Kyrgyzstan
Desertification and Drought Day 2020

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Salinization in Drylands

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- Most commonly in drylands the salinity levels are always high and evenly dispersed due to this salinity levels the plant cultivated are usually tremendously affected. Normal plants cannot grow in soils with high salinity levels.

- Dryland salinity is a natural process for soil, just like other processes such as wind erosion. Salinity degrades land by an increase in soil salt concentration in the environment, watercourse or soil in not irrigated landscapes, being in excess of normal soil salt concentrations in dryland regions.
- Also there is effects of human activities on the salinity levels in drylands.

Source: https://knowledge.unccd.int/publications/salinization-drylands

Typical salt affected soils (Solonchaks)

Soil Profile of Solonchak (Chott el Djerid, Tunisia)

- **Solonchaks** are the soil in which a large amount of salts (mainly sodium salts such as sodium chloride and sodium sulfate) have been accumulated. Typically, the soil surface is covered with precipitated white salt that have risen by capillary action from the lower layer with water. Due to excessive accumulation of salt, ordinary plants (Glycophyte) cannot grow, this selects only for halophytes (plants with strong salt tolerant and/or high salt preference). Solonchaks are artificially (secondary) formed when groundwater level rises due to poor management of irrigational system, the process of soil salinization has been a serious cause of soil degradation for over 6,000 years in irrigated farmlands of the world. (Sadahiro YAMAMOTO)

Typical salt affected soils (Solonets)

- **Soronetz** have been known to possess low salt concentrations due to salt leaching in the winter/rainy seasons, but the subsoil has a dense columnar structure that is tightened due to the influence of sodium ions. Most of them contain free sodium carbonate and show strong alkalinity levels (pH> 8.5). The productivity of Solonetz is low due to poor permeability of the sub-soil, insufficient thickness of surface layer and its strong alkalinity. The application of calcium salts is an proper means of improving for the efficacy of Solonetz.
- (Sadahiro YAMAMOTO)

Soil Profile of Solonets (Kalmykia, Russia)

Stop the degradation of Kyrgyz lands!

- Small, but very proud Kyrgyzstan, always suffered from a lack of pasture, water, and forest land. Although for the Kyrgyz, these are sources of life and the future, no one wants to take care of them at their own expense in Kyrgyzstan.
- Kyrgyzstan is really approaching the borders of an environmental disaster. Desertification and land degradation, soil erosion and salinization, pollution of natural landscapes - such is the current bleak picture in the sphere of nature management of the republic. In recent years, soil fertility has declined significantly, some species of flora and fauna have disappeared.

http://www.ca-portal.ru/article

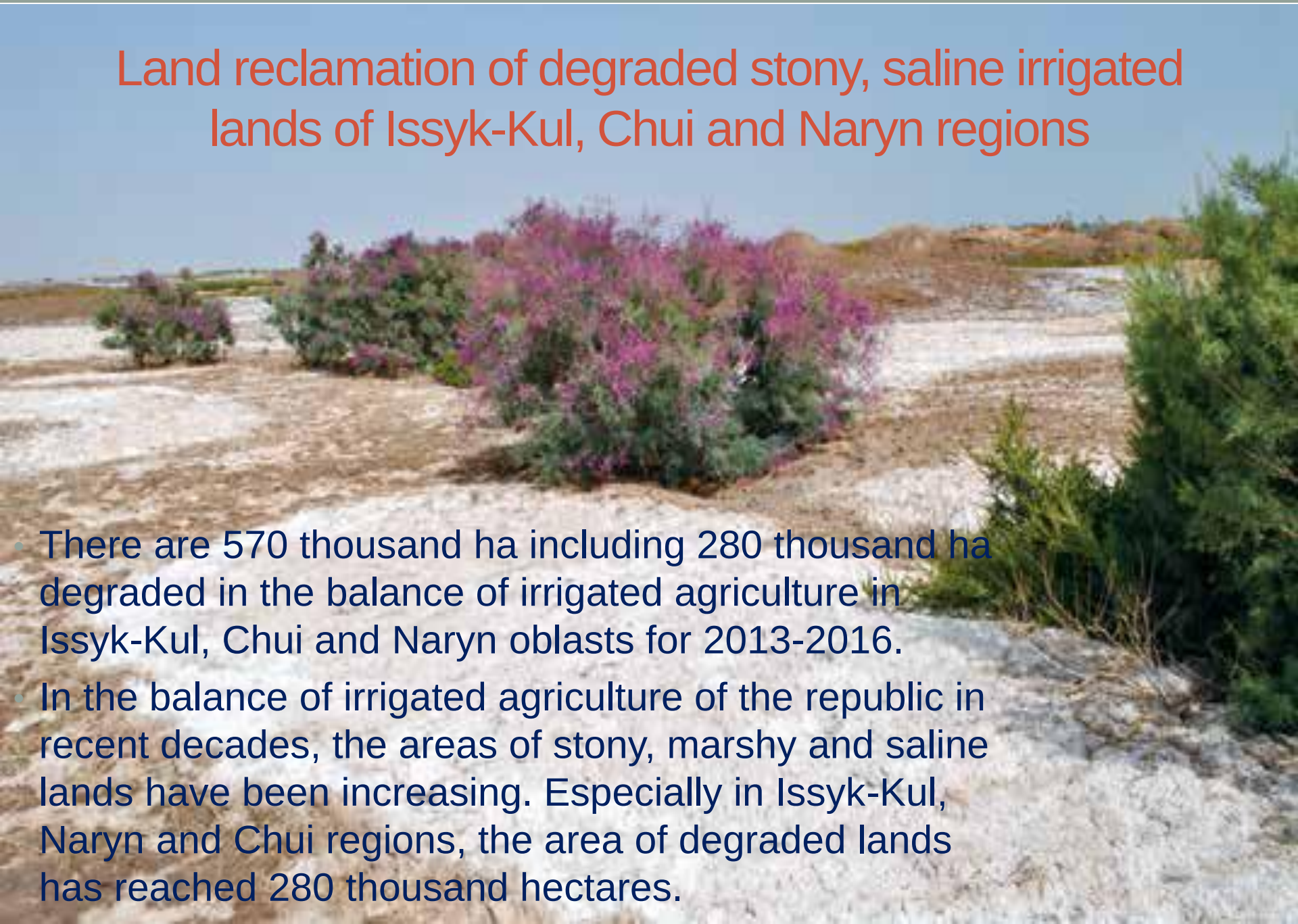
The Quality of Land Resources of Kyrgyzstan, %

- The total area of land prone to erosion is 6435 thousand ha. Of these, arable lands - 770 thousand ha, pastures - 4546.7 thousand ha, hayfields - about 87 thousand ha. Water erosion, which also leads to pollution of water sources, covered 54 thousand hectares of arable land. Soil salinization caused by irregular and irrational irrigation has removed 80 thousand hectares of agricultural land from circulation.

- According to the land cadaster, a total area of varying degrees of saline lands is 1170.4 thousand ha in the republic. The area of wetlands is growing due to malfunctioning of collector-drainage networks. The area of alkaline soils is 469 thousand ha. Stony soils occupy 3808 thousand ha, including strongly stony soils - 836 thousand ha.

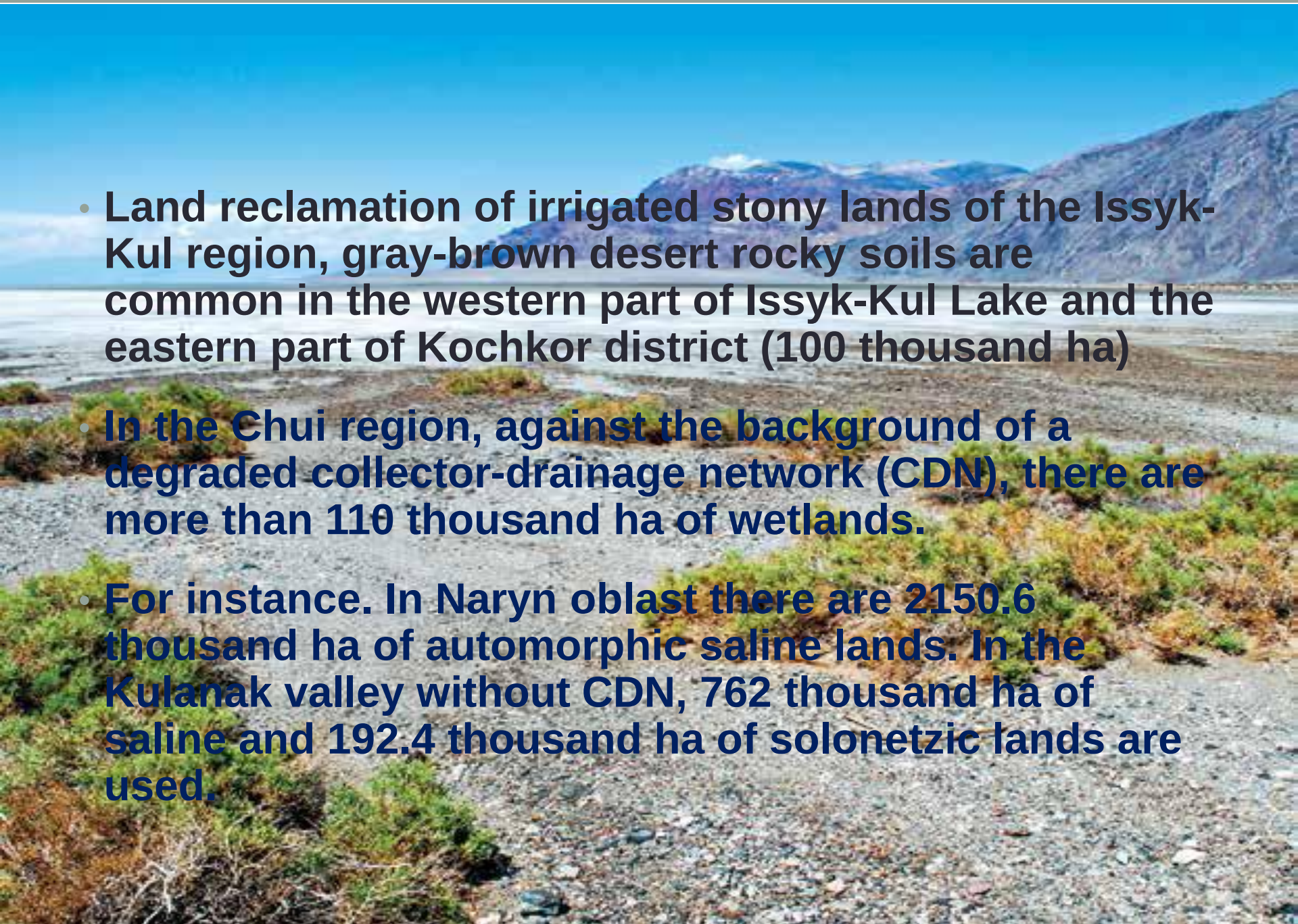
https://www.open.kg/about-kyrgyzstan/kyrgyz-economy/agriculture/229-zemledelie-zemelnye-resursy.html

Land reclamation of degraded stony, saline irrigated lands of Issyk-Kul, Chui and Naryn regions



- There are 570 thousand ha including 280 thousand ha degraded in the balance of irrigated agriculture in Issyk-Kul, Chui and Naryn oblasts for 2013-2016.
- In the balance of irrigated agriculture of the republic in recent decades, the areas of stony, marshy and saline lands have been increasing. Especially in Issyk-Kul, Naryn and Chui regions, the area of degraded lands has reached 280 thousand hectares.

- **The degradation occurred as a result of insufficient funding for land reclamation systems. As a result, reclamation systems are degraded by 40-60 percent. According to this, a decline in crop yields by 40-50 percent. In this regard, there was a need to develop alternative farming, irrigation and drainage, social and economic measures to improve the degraded land.**
- **The diversity and complexity of natural irrigation and drainage and climatic conditions in Kyrgyzstan formed a complex of saline and solonetzic, stony, boggy soils and eroded lands both in the agricultural zone and on pastures, within the absolute heights of 400-4000 m above sea level.**
- **The area of saline and solonetzic soils in Kyrgyzstan is 3,787.5 thousand ha, including in the agricultural zone, 773.8 thousand ha and in the pasture zone, 3006.3 thousand ha.**



- Land reclamation of irrigated stony lands of the Issyk-Kul region, gray-brown desert rocky soils are common in the western part of Issyk-Kul Lake and the eastern part of Kochkor district (100 thousand ha)
- In the Chui region, against the background of a degraded collector-drainage network (CDN), there are more than 110 thousand ha of wetlands.
- For instance. In Naryn oblast there are 2150.6 thousand ha of automorphic saline lands. In the Kulanak valley without CDN, 762 thousand ha of saline and 192.4 thousand ha of solonetzic lands are used.

Salt Tolerant Crops

The saline lands in the world are so large that scientists from various countries are conducting large-scale work on the cultivation of varieties of vegetable crops with genetically determined increased salt tolerance. Selection is carried out in three directions of the formation mechanisms: **(1)** - salt tolerance (changing the composition of cellular protoplasm makes it resistant to high salt concentrations); **(2)** - the ability to release salts outward, on the surface of the leaves, from where it is blown away by the wind or washed off by rains; **(3)** - breeding varieties with a special structure of roots, the surface of which is poorly permeable to salts.

https://www.avgust.com/newspaper/topics/detail.php?ID=3880

Salt Tolerant Crops, example

Industrial plantation of Quinoa in flowering and fruit maturation stages on salt affected and poor nutrient soil (Issyk-Kul, Kyrgyzstan)

- **Quinoa** is an annual cash crop from Amaranthaceae family. Biological Methods. This plant species is one of the oldest crops cultivated in the Andes (Latin America) about 5,000 years. As compared to common cereals Quinoa grains are very nutritious. Quinoa is known to be gluten-free, high in protein and one of the few plant foods that contain sufficient amounts of all nine essential amino acids. It is also high in fiber, magnesium, B vitamins, iron, potassium, calcium, phosphorus, vitamin E and various beneficial antioxidants. Quinoa is one of the world's most popular health foods. Its seeds may be consumed as human food in flour, baked products, soups, drinks, salads and breakfast cereals. Leaves and stems are used as animal feedstock for its higher nutritive value. The United Nations declared in the year 2013 “The International Year of Quinoa” due to its high nutrient value and potential to contribute to food security worldwide. (Kristina TODERICH)

Combat salinization

- But saline soil can be fixed. Physical method. The main method of reclamation of salt marshes is flushing. To do this, you must first equip the drainage on the field, then make sure that the irrigation water itself is suitable for such washing (and, incidentally, for irrigation in general), and then wash the salts with precisely calculated water norms. Check the quality of water in laboratories of the appropriate competence. Physical method - to rebuild the irrigation and tillage system. Ideal for solonetzic soils is drip irrigation with droppers of small water discharge (0.7 - 0.8 l / h). Sprinkling in this case is unacceptable, but if this season has nothing can not be changed, then you need to find a way to complement irrigation sprinklers low flow machines, watering moderate standards and be sure to carry out inter-row hoeing after each watering.

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Combat salinization

- Solonetzes (solonetzic soils) are formed under conditions of non-leaching water regime with the accumulation in the soil absorption complex of sodium (less often - magnesium) in amounts of 10 to 70% of the absorption capacity. The solonetz looks different than the solonchak.
- But salt licks can also be fixed. Chemical Method. The main method of reclamation of solonetzes is gypsum casting. Gypsum is usually applied in the autumn, so that when plowing it is evenly mixed with the entire arable layer of soil. After applying gypsum, the calcium contained in it replaces sodium (or magnesium) ions in the soil absorption complex, which are washed out to the lower horizons. The soil becomes loose and structured. Non-drying “bowls” typical of salt licks after watering and rains disappear, a thick impenetrable crust disappears, the soil becomes balanced in the ratio of air to water (with proper irrigation, of course)

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Other Mitigation and Prevention Measures

- Based on the above situation, it became necessary to monitor land and water resources, the development of modern cartographic materials on the natural reclamation of land zoning and the establishment of optimal systems and evidence-based washing and irrigation rates with economic efficiency.
- This year, the Kyrgyz Ministry of Agriculture plans to conduct an inventory of pastures.
- The ministry also sets itself “very ambitious” goals - according to the State Program for the Development of Irrigation of the Kyrgyz Republic, up to 2026 it is planned to build 46 water facilities, to improve land water supply by 51,000 ha.
- As a result of a number of measures, according to the forecasts of the Ministry, the irrigation water saving per year will be about 214 million cubic meters.
- By 2030, the state intends to achieve a neutral balance of land degradation.

THANK YOU!


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JUNE 17