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## **THE PROBLEM OF THE SOIL EROSION IN KAZAKHSTAN**

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### **INTRODUCTION**

Soil erosion is agriculture’s enemy: a major environmental threat to sustainability and productivity, with knock-on effects on the climate crisis and food security. The term "soil erosion" covers a wide range of physical and chemical influences, such as the removal of soluble substances, chemical changes, destruction due to frost or rapid temperature changes, erasure by wind charged with dust.

#### **Why Is Soil Erosion Such a Big Problem?**

Soil is a natural resource that people do not think is exhausting, but in fact, is a fragile product of millennial formation. The top layer of soil, which is closest to the surface of the earth, contains the necessary nutrients for crops. It is this layer of soil that is threatened by wind and water erosion [4].

This is a global problem. The soil is destroyed faster than it is formed, as a result of which the land becomes unsuitable for agriculture. Considering that by the middle of the century, the population may reach more than 9 billion. Proper management of land resources is not only a necessity but also the key to the prosperity of mankind.

#### **Soil erosion statistics in Kazakhstan**

According to scientists, wind erosion will affect agricultural productivity in Kazakhstan by about 25.5 million hectares.

The largest areas of washed away soils as part of agricultural land are in the South Kazakhstan region - 958.7 thousand hectares, including 232.9 thousand hectares in arable land. In Almaty and Mangystau regions, there are 802 thousand hectares of washed-away soils as part of agricultural land, 473.1 thousand hectares in Aktobe, 424.9 thousand hectares in East Kazakhstan, and 352.6 thousand hectares in Zhambyl region [2].

The main arrays of soils exposed to wind erosion as part of agricultural lands are found in the Almaty region - about 5 million hectares, including 64.8 thousand hectares in arable land, Atyrau -3.1 million hectares, South Kazakhstan - 3.1 million hectares, Kyzylorda and Zhambyl regions - about 3 million hectares each, in the Pavlodar region -1.5 million hectares. ha, of which in arable land - 445.7 thousand[2].

Types of soil erosion  
Soil erosion is divided into two types, namely, natural soil erosion in the fields and accelerated.

These two types differ significantly in flow rate [5, 6]. Natural soil erosion is characterized by a long process and can last from two to seven millennia.

Anthropogenic factors, in particular irrational human agricultural activity, significantly accelerate the degradation process up to 10-30 years [5]. The main factors here are improper work with fields, excessive amounts of fertilizers, uncontrolled grazing, drainage of swamps, improper cultivation and irrigation of land.

Different types of soils undergo physical, chemical, and biological changes. The key elements accelerating degradation are the following: water and wind [6].

Wind erosion of the soil occurs when wind gusts lift small particles from the surface of the field and expose it [1]. The thickness of the layer being removed from the earth's surface and the rate of erosion depend on the strength of the wind. Very strong dust storms can blow away a layer of earth for many kilometers and turn fertile land into a desert.

Water erosion of the soil is caused by precipitation, which forms water flows and has the property of washing away earth particles. Blurring can be created very quickly [7]. At first, as a result of precipitation, small wormwood with water is formed, but later it can reach the size of a quarry.

One of the reasons for the negative changes in the climate is that a large amount of heavy precipitation can directly affect soil erosion. As a result of heavy rains, areas with weak vegetation and roots are particularly vulnerable to rain flows, so here the depletion of fields will be inevitable. Wind erosion occurs due to wind gusts; mostly wind poses a serious threat because the soil is dry and therefore sensitive to changes.

#### Combating soil erosion

Currently, various technologies and solutions to the problem are used to protect the soil from erosion. The main ones are such as crop rotations (alternation of crops and fallows in time and on the territory or only in time), providing soil protection, the creation of meadows on largely washed away slopes [3].

The planting of plants according to certain schemes contributes to the protection of land from wind erosion. When protecting against wind erosion, crop rotations with short rotations provide significant results. Perennial grasses sown in strips prevent such erosion. The effect is also provided in the case when pure pairs alternate with row crops.

In the presence of erosion, all the methods mentioned above are used together. But to them are necessarily added such as processing slopes with plane cutters in the direction across the slopes.

Of course, a good effect is provided by hydraulic structures. An even more effective method of protection is the device of agroforestry soil protection complexes.

Soil erosion can also be slowed down by the following means:

- planting of trees, grasses, and shrubs that protect the territory from winds, washouts and prevent acidification
- crop-rotation (alternation of different crops in the fields) with short rotation and rejection of vapors
- the use of modern field processing systems
- refusal of excessive processing of fields, especially dry soil

- regulation of cattle grazing on pastures
- use of the CTF system (system of controlled movement of equipment across the field)
- control of illegal deforestation
- cover crops to prevent soil erosion

It is clear that most of these events bring additional costs to the owners of the land. However, it should be remembered that the consequences of soil erosion also negatively affect the yield of fields, and, consequently, their profitability, so it is important to try to prevent this phenomenon. Due to erosion and the failure to take measures to prevent it, the development and spread of the country's economy are causing enormous damage. The potential fertility of soils decreases, chemical, and agro-physical properties deteriorate, biological activity decreases. As a result, the yield decreases and the quality of agricultural products deteriorates. The effectiveness of

chemicalization is also reduced.

Erosion processes are present in literally every region. According to forecasts, due to the lack of soil protection measures, annual losses due to flushing can reach 7 billion tons of soil [2]. Soil erosion leads to the weathering of humus and disruption of the ecological balance, which in the future may lead to an ecological catastrophe.

#### Conclusion

The intensity of erosion in the modern era is generated by direct or indirect consequences of anthropogenic origin. The first should include extensive plowing of land in erosion-hazardous areas, especially in arid or semiarid zones. This phenomenon is typical for most developing countries.

According to the forecast of the Institute for the Observation of the State of the World (New York), at the current rates of erosion and deforestation by 2330, the fertile land on the planet will be reduced by 960 billion tons, and forests - by 440 million hectares [5].

In this work, a special place is given to measures of protection against erosion processes. To do this, you need to start with a detailed study of the physical and geographical conditions and the economy of a particular area or economy.

Thus, in order to successfully combat soil erosion on lands engaged in agricultural production, a comprehensive system of measures is needed that allows the use of all possible agrotechnical, water-regulating, forest-reclamation and other means.

Taking into account all the above information, it is necessary to understand that soil erosion is not just an active change in soils, but a whole tragedy for all mankind. This fact should accelerate awareness of the scale of the problem, which in the future should increase the effectiveness of combating soil erosion.

#### **List of used literature**

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