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The impact of climate change on agriculture in Khorezm region

Khalmuratov Rajabboy Uktam uglu

Geography teacher at Yangibazar Specialized Boarding School

Abstract

This thesis analyzes the impact of climate change on agriculture in the Khorezm region. The region's arid continental climate, high temperatures, changes in precipitation, increased water demand during the growing season, and water resource shortages directly affect the sustainability of agricultural production. Especially in the conditions of Khorezm, which is highly dependent on irrigated agriculture, climate change is an important factor affecting the productivity of cotton, grain, rice, vegetable and melon crops, soil salinity, and the efficiency of irrigation systems. The study develops proposals to reduce the negative impacts of climate change on agriculture, effectively use water, improve agrotechnology, and strengthen climate adaptation measures.

Keywords

climate change, Khorezm region, agriculture, temperature, precipitation, water resources, irrigated agriculture, salinity, productivity, adaptation.

Introduction

Today, climate change is having a significant impact not only on natural geographical processes, but also on agriculture, one of the most important sectors of the economy. Globally, rising temperatures, changes in the spatial and seasonal distribution of precipitation, an increase in extreme weather events, and increased pressure on water resources threaten the sustainability of agricultural production.

Uzbekistan, and in particular the Khorezm region, is one of the regions that is strongly feeling the impact of these processes. The Khorezm region is located in the lower reaches of the Amu Darya River, and due to the peculiarities of its natural conditions, agriculture relies mainly on artificial irrigation. The low amount of precipitation in the region and high evaporation greatly increases the importance of irrigation water in crop production.

The intensive use of agricultural land, high demand for water resources, and widespread soil salinity in the Khorezm region may create additional environmental and economic problems under climate change. As a result of increasing temperatures, crops will need more water during the growing season. This will require more efficient use of available water resources.

Therefore, studying the impact of climate change on agriculture in the Khorezm region, identifying its main risks and consequences, and developing adaptation measures is one of the urgent scientific and practical issues.

Main part

Climatic factors are of great importance for agriculture in the Khorezm region. The relatively long growing season of the region allows for the cultivation of heat-loving crops. However, high temperatures and lack of humidity in the summer months increase the need for crops for water. These processes are expected to intensify as a result of climate change.

Rising temperatures can have two effects on agricultural crops. On the one hand, a relatively early rise in temperature in the spring can accelerate the start of vegetation processes. On the other hand, excessive summer heat can increase physiological stress in plants and lead to a decrease in yield. High temperatures, especially during flowering and grain or fruit formation, have a negative impact on crop quality.

One of the most important consequences of climate change in Khorezm is the increased demand for water resources. As temperatures rise, evaporation increases, making it more difficult to maintain moisture in cropland. Determining irrigation standards and irrigation periods on a scientific basis is of great importance for the future efficiency of agriculture.

Cotton growing is one of the most important agricultural sectors in the region. Although cotton is a heat-loving crop, it requires sufficient water and favorable agro-climatic conditions for its high yield. Excessive temperature increases, droughts, and interruptions in water supply can negatively affect the development of cotton.

The influence of climatic factors is also significant in grain production. While the temperature regime in the winter and spring months is important for winter wheat, high

temperatures during the formation and ripening period of the crop can lead to a decrease in yield. Therefore, in the future, it is an important task to adapt the varietal composition of agricultural crops to the changing agroclimatic conditions of the region.

Rice, vegetables, melons, and fodder crops are also grown in Khorezm region. Although the water requirements of these crops vary, they are all closely related to climate and water resources. The introduction of water-saving technologies is especially important in areas where water-intensive crops are grown.

Climate change also affects soil processes. A large part of irrigated land in the Khorezm region is affected by salinity. High temperatures and increased evaporation can accelerate the process of salt leaching from the soil. Inefficient irrigation and drainage systems exacerbate this problem.

Increased soil salinity negatively affects the growth and development of agricultural crops. In saline soil, it becomes difficult for plants to absorb water and nutrients. As a result, productivity may decrease, and the suitability of some cultivated areas for agriculture may decrease.

From this perspective, one of the main tasks in adapting to climate change should be not only to increase the amount of irrigation water, but also to increase the efficiency of water use. Technologies such as drip irrigation, sprinkler irrigation, concreting or piped irrigation channels, and laser leveling can help reduce water losses.

In addition, it is necessary to adapt agrotechnical measures in agriculture to climatic conditions. Optimizing crop planting dates, using drought- and heat-resistant varieties, maintaining soil moisture, using organic fertilizers, and developing crop rotation will help reduce climate risks.

The main impacts of climate change on Khorezm agriculture

Climate factor	**Impact on agriculture**
Increase in air temperature	Evaporation and crop water requirements increase
Drought intensification	Productivity may decrease
Change in precipitation patterns	Instability of moisture supply
Water shortage	Pressure on irrigated agriculture increases

Climate factor	**Impact on agriculture**
Increased evaporation	The risk of soil salinization increases
Extreme heat	Heat stress increases in plants
Change in the growing season	Planting and harvesting times change

A territorial approach is important to ensure the sustainability of Khorezm agriculture in the face of climate change. Natural conditions and water supply are not the same in all districts of the region. Therefore, when placing agricultural crops, it is necessary to comprehensively take into account soil, water, relief, salinity level and agro-climatic indicators.

The use of modern GIS and remote sensing technologies also provides great opportunities for agriculture to adapt to climate change. Satellite data can be used to monitor changes in crop vegetation, moisture, salinity, and land cover. Based on such data, it becomes possible to identify areas at high risk of water scarcity or salinity and determine appropriate measures.

Conclusion

Climate change is one of the most important factors directly affecting the future development of agriculture in the Khorezm region. Rising air temperatures, increased evaporation, changes in precipitation patterns, and increased demand for water resources create additional challenges for irrigated agriculture.

The main risks of climate change in the Khorezm region include water scarcity, increased soil salinization, heat stress of crops, and reduced yields of some agricultural crops. However, there is an opportunity to reduce the impact of these risks through modern agrotechnologies, water-saving irrigation systems, and climate-adapted agricultural policies.

In the future, rational use of water resources, widespread introduction of water-saving technologies, selection of heat- and drought-resistant crop varieties, prevention of soil salinization, improvement of collector-drainage systems, and development of a monitoring system based on GIS and remote sensing will be of great importance in the development of agriculture in the Khorezm region.

In general, the consistent implementation of climate change adaptation measures starting today will ensure the sustainability of agricultural production in the Khorezm region, the efficient use of water and land resources, and strengthen food security.

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