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**Международный научно-образовательный электронный журнал
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ФИО автора(-ов): *Tumar Saparova*

3rd year student, Oguz han Engineering and Technology

University of Turkmenistan

Название публикации: «GROWING POPLAR TREES IN TURKMENISTAN AND PREVENTING SOIL SALINIZATION»

Abstract

Soil salinization is a major environmental challenge limiting agricultural productivity in Turkmenistan, affecting over 60% of irrigated lands. This review explores the role of poplar tree cultivation as an agroforestry practice to mitigate soil salinization and improve environmental conditions. Poplar species, known for their rapid growth and tolerance to semi-arid conditions, have been increasingly used in Central Asia for windbreaks, erosion control, and soil improvement. This paper discusses the ecological benefits of poplar plantations, irrigation techniques adapted to reduce salt accumulation, and the potential integration of poplar agroforestry for sustainable land management in Turkmenistan.

Introduction

Turkmenistan's arid climate and extensive irrigation practices have led to widespread soil salinization, severely impacting crop yields and the sustainability of agricultural land. Excessive irrigation without efficient drainage causes waterlogging and salt accumulation near the surface, creating hostile soil conditions for conventional crops. Given the ecological and economic implications, there is an urgent need to implement nature-based solutions such as afforestation and agroforestry to restore degraded soils and improve water management. Poplar trees (*Populus* spp.) show promise due to their adaptability, tolerance to salinity, and ecosystem services such as windbreaking, soil stabilization, and carbon sequestration.

Ecophysiology and Growth Characteristics of Poplar Trees

Poplars are fast-growing, deep-rooted trees that can access groundwater, helping to lower the water table and reduce waterlogging. Their ability to tolerate saline soils varies among genotypes, with some hybrids showing higher survival and growth rates

on saline substrates. Poplars also contribute to microclimate moderation by providing shade and reducing wind velocity, which in turn decreases evaporation and salt accumulation on the soil surface. Furthermore, these trees can uptake certain salts and nutrients, thus influencing the soil salinity balance over time.

Irrigation and Soil Salinity Management

Effective irrigation management is crucial for preventing soil salinization in poplar plantations. Modern techniques such as drip irrigation combined with periodic movement of irrigation lines prevent the formation of highly saline zones. Studies have shown that irrigating poplars with treated water or leachate requires careful monitoring of salt accumulation in soil and leaf tissue to maintain tree health. The use of freshwater blending and scheduled leaching after irrigation helps control salt stress in poplar plantations. Additionally, ridge cultivation combined with drip irrigation has demonstrated significant reductions in soil salinity with high seedling survival rates in arid regions comparable to Turkmenistan.

Applications in Turkmenistan

In Turkmenistan, efforts to plant poplar trees are part of broader ecological initiatives aimed at combating desertification and preventing soil salinization. Poplars are planted as windbreaks along fields, roads, and irrigation channels to reduce wind erosion and improve soil moisture retention. Collaborative projects involving environmental organizations and government agencies promote the use of native and introduced salt-tolerant tree species, including poplars, to restore degraded lands. These plantations also provide economic benefits through timber and fuelwood production while enhancing biodiversity and soil health.

Conclusion

Poplar tree cultivation represents a viable strategy for mitigating soil salinization and waterlogging in Turkmenistan's irrigated lands. Their ecological role in water table management, salt uptake, and microclimate regulation makes them valuable in agroforestry systems designed for arid and semi-arid environments. Integrating poplar plantations with advanced irrigation practices and salinity monitoring can improve land

productivity and environmental sustainability. Continued research and adaptive management are essential to optimize these systems under local conditions.

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