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# Afforestation Effect on Soil Quality of Sand Dunes

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## Abstract

This study, undertaken in the Kapiköy sand dune area of the southern Mediterranean coast in Turkey, determined the changes in soil quality along with consequent economical revenue following 35 years of acacia, eucalyptus, and stone pine plantations on a 4,900 ha sand dune site. Significant soil phosphate (190 kg/ha) and organic matter (approx. 4%) accumulation were determined in the zones of vegetation when compared to bare sand dunes within 35 years. Moreover, the local people's incomes from timber and stone pine nut production are increased, denoting a socio-economical improvement in the quality of life. Thus, the project appraised was successful not only for its positive effects on environmental parameters but also on socio-economic aspects. Lessons learned at Kapiköy set significant guidelines for recovering degraded marginal lands in the semi-arid Mediterranean coastal zone of Anatolia. Consequently, the outcomes of this study are expected to increase public awareness of the success of the afforestation projects with evident economic viability.

**Keywords:** sand dunes, organic matter, phosphorous, soil quality, humic substances, land management

## Introduction

The degradation of natural resources has compelled governments to launch reclamation projects at affected sites for securing their resource bases. Degradation processes occur more easily and commonly on brittle environments where water, soil, and vegetation cover, along with the topography of the land, are the limiting factors [1]. These processes are at a climax on arid and semi-arid sand dunes, since dunes have low resistance against erosion, over-grazing, and cultivation due to their low water-holding capacity, insufficient plant nutrients, and the weak aggregation of particles [2]. So, commonly occurring natural events, like winds, become natural disasters when sand dunes are exploited by human interventions. The reclama-

tion of coastal sand dunes asks for long-term field experiments, as the resilience capacities of semi-arid sand dunes are significantly lower when compared to other geologic/geomorphic formations [3], which is the case for the loose textural, carbonate-rich sand dunes of the Kapiköy area. The coastal sand dunes away from population pressure generally host wide ranges of fauna and flora [4]. The lagoon on the northern margin of the Kapiköy sand dune stands for a unique example of Mediterranean coastal biodiversity. The Akyatan lagoon (S. Turkey) is of significant international importance as the habitat of valuable bird species, with 200 thousand individuals and 268 species sheltered in the delta for the winter season, along with its egg-laying sites of the rare species of sea turtles [5]. Sand dunes have also been reported to prevent salt winds from reaching inland areas [3], which most likely has been the cause of the decline in inland crop production in Kapiköy

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