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Graduate School

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Thesis Submitted for the degree of Master of Science in Range Management

The Relationship Between Different Stages of Succession and Ecosystem Supporting Services in Arid Rangelands (Case Study: Shams Abad Rangelands-Iranshahr)

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Biodiversity affects the provision of ecosystem services over time and space. This study was conducted to find out how to regulate the relationship between biodiversity and support services in the dry rangeland of Shams-Abad, Iranshahr. A random sampling design was used for sampling in the initial, middle and final stages of the succession. The studied area had the *Calligonum* species, and succession stages were determined based on the age of the plant species. 10 plots of 50×50 m^2 were used for sampling the vegetation cover and support services. In each plot, three transects of 50 m were done along both sides and in the middle of the plot to estimate the canopy cover of plant species using the line intercept technique. Species richness was determined by calculating the total number of plant species and Shannon and Simpson diversity index by calculating the relative cover of each plant species. To measure support services, three factors of soil permeability, stability and organic matter were considered. The double cylinder method was used to determine the amount of water penetration into the soil in each plot, and the Emerson soil test was used to determine the stability of the soil. In this study, soil organic matter was considered as the main feature of soil nutrients cycle. Soil samples were taken from a depth of 30 cm in each plot. The total support services based on the standardized services of the ecosystem were obtained from the sum of the relative support services. Detrended Correspondence Analysis was used to find relationships between succession stages and plant species, and plant species were classified based on their life forms to determine types of plant performance. In this study, structural equation model was used to analyze data and investigate direct and indirect relationships of biodiversity indicators and ecological succession in support services. The different stages of succession, support services, diversity and species richness were analyzed using one-way analysis of variance in the form of completely randomized design. The least significant difference (LSD) test was used to compare the data (95% probability level). The results showed that with the passage of time, the vegetation cover, density, richness and species diversity increased significantly (P<0.01). The highest percentage of vegetation cover, density, richness and diversity was observed at the end of the succession phase. The results showed that support services increased with increasing species diversity along with ecological succession gradients. Structural equation model showed that succession, species diversity, dominance of functional types and vegetation are the most important support services in arid ecosystems. Organic matter with species diversity had the highest correlation coefficient (0.96). Due to the fact that the rangeland was planted tree species, this growth form had the largest share of plant composition in the initial, middle and end phase of succession. The results showed that there was no significant relationship between the vegetation of the dominant species in the succession stages and support services (P>0.01). In general, afforestation with native plants and succession of vegetation can play an effective role in preserving the environment in degraded lands and increasing ecosystem support services.

Keywords: Secondary Succession, soil Infiltration, Vegetation Cover, Ecosystem Stability, Soil Organic Matters