Analytical Hierarchical Process Approach based Assessment of Land Suitability in the Face of Climate Change in Coconut Cultivation in Sri Lanka

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The temporal variations in rainfall and temperature, as well as soil characteristics, were investigated to confirm the spatiotemporal evolution of land suitability for coconut cultivation in Sri Lanka. Factors influencing the land suitability for coconut cultivation were identified based on literature and expert discussions. Subsequently, weights for suitability factors were obtained using the analytical hierarchy process (AHP), a multi-criteria decision-making technique. Then, land suitability maps were generated by overlapping soil maps and climatic factor maps within three-time frames, 1991-2000, 2001-2010, and 2011-2021, using ArcGIS (version 10.8) software. Results from the AHP show that the most important factors in land selection for coconut cultivation are rainfall, soil type, and temperature. The weights obtained for rainfall, soil type, and temperature were 0.24, 0.24 and 0.19, respectively. The suitability maps show that during the 20-year period from 1991 to 2021, Kurunegala, Gampaha, Colombo, Kaluthara, Galle, Matara and Kegalle districts remained highly suitable. One major district in the coconut triangle, Puttalam remained moderately suitable, while Anuradhapura and Polonnaruwa changed from low to moderately suitable in the 20 years from 1991-2021. As the suitability of coconut cultivation is shifting over time, with the changes in climate, the finding indicated that the importance of adaptation strategies and best management practices to hedge against the negative impacts of climate change in the future is a prudent way forward.

Keywords: Analytical hierarchy process, ArcGIS, Climate change, Coconut, Land suitability