

# SPATIAL SUITABILITY ANALYSIS FOR SITE SELECTION OF VINEYARDS USING BIOPHYSICAL MODELS AND COMPUTATIONAL INTELLIGENCE

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## ***Abstract***

Developing a sustainable agricultural production system and acquiring the full potential of land resources requires employing land-use assessment. This entails knowledge of the climate, soil, and topography of the area of interest. There is a great potential for Growth and development of grapes (*Vitis vinefera* L.) in the Pacific North West region of the United States. However, there are few studies that have focused on the development of a comprehensive spatial suitability system. The main objective of this study was to develop a spatial site selection system that can help select suitable areas for grapevine cultivation.

Several bio-climatic indices such as Growing Degree Days (GDD), Frost Free Days (FFD), Huglin Index (HI) were calculated for a period of 30 years using daily weather data obtained from the University of Idaho Gridded Surface Meteorological dataset. The soil data were obtained from the gSSURGO dataset and several properties such as soil depth, pH, available water holding capacity (AWC), and drainage class were extracted for the study area. The topographical data were obtained from the National Elevation dataset. The data were then reclassified using fuzzy logic and the soil, weather, and topographic suitability maps were developed. The final vineyard potential scores were obtained by combining the soil, weather, and topographic suitability. The potential scores had a range from 0 to 1, where 0 pertains to non-suitable areas and 1 refers to optimal sites. Consequently, the vineyard potential score for the vineyards that have been established in the state of Washington were obtained from the Crop Scape land cover maps and used as a measure of evaluation.

The spatial site selection system was able to classify the study area to 10 different regions based on their vineyard potential. The evaluation results indicated that 84% of the vineyards that are already established in the study area have a vineyard potential score ranging from 0.91 to 1. Another 15 % had a potential score ranging from 0.8 to 0.9. The results of this study can help decision makers, growers, and others with conducting a more precise land-use assessment for grapevine production.

***Keywords: Terroir, wine, viticulture, spatial suitability, zoning***