# HABITAT SUITABILITY ANALYSIS OF THE STARCH-RICH SAGO PALM USING SATELLITE-DERIVED DATA AND A SPECIES DISTRIBUTION MODEL

Meriam M. Santillan[1*], Jojene R. Santillan[2]

[1] *Division of Geodetic Engineering, College of Engineering and Information Technology, Caraga State University, Ampayon, Butuan City, Philippines; Tel: +63-85-3412296; E-mail: mmsantillan@carsu.edu.ph*

[2] *Research Laboratory for Applied Geodesy and Space Technology, Training Center for Applied Geodesy and Photogrammetry, University of the Philippines, Diliman, Quezon City, Philippines; Tel: +63-2-9818500 ext. 3147; E-mail: jrsantillan@up.edu.ph*

**ABSTRACT:** In the Philippines, the commercial utilization of sago palm (*Metroxylon sagu*) as a significant source of starch that can be converted into flour, lactic acid and ethanol, are increasing. Along with this comes the need to determine the location and distribution of these palms, and to ascertain which areas are suitable for its mass propagation. In this paper, we utilized satellite-derived datasets and a species distribution model in finding areas in Visayas and Mindanao, Philippines that are suitable to plant sago palms. The locations of existing sago palm stands were detected from ALOS AVNIR-2, Envisat ASAR and WorldView-2 satellite images through a combination of supervised classification and manual image interpretation. From a database of confirmed sago palm stand locations, samples were randomly taken for habitat characterization and suitability analysis. Biophysical and bioclimatic characteristics of the actual sago palm habitats were determined through GIS overlay analysis with the different biophysical and bioclimatic data layers that included elevation, slope (both from SRTM DEM), soil texture, and WordClim - a set of 19 global climate layers depicting temperature and precipitation. Basic statistical analysis was then conducted is to explore the ranges of biophysical and bioclimatic values of the sago palm habitats in Visayas and Mindanao which could then assist in understanding the characteristics of these habitats. Habitat suitability analysis consisted of two steps: finding suitable areas based on biophysical characteristics, and finding suitable areas based on bioclimatic characteristics. The results of both steps are raster grids, with pixel resolution of 1 hectare. Each pixel is coded as 0 for "not suitable" and 1 for "suitable". The final suitability map is then obtained by multiplying the two raster grids. The degree of suitability (low, medium, high, very high, excellent) is determined based on bioclimatic characteristics. The elevation and slope ranges as well as soil texture characteristics derived from the analysis and from the sago palm literatures are then used to limit the sago palm habitat suitable areas as a first step in the suitability analysis. In Step 2, a species distribution model called BIOCLIM was used with the 19 WorldClim layers as inputs to find those areas where sago palms can grow in a manner that they could tolerate temperature (hotness and coldness) and precipitation (dryness and wetness). Results of the analyses indicate that sago palm habitats in Visayas and Mindanao Philippines are

located in areas with low elevation (average of 37 meters and ranges from 2 to 437 m. above mean sea level), with slopes ranging from 0 to 31%, and with clayey soils. On the other hand, the results of BIOCLIM model indicate that around 390,073 hectares of lands in Visayas and 128,443 hectares in Mindanao have high, very high and excellent suitabilities for sago palms to grow. Our next step is determining whether these suitable areas have existing land-uses (built-up areas, agricultural lands, and protected areas) as well as determining if these areas have favorable conditions for sago palms to be propagated at plantation scale (e.g., nearness to roads, water sources).

**KEY WORDS:** Sago Palm, Habitat Suitability Analysis, Remote Sensing, Philippines.