

## Ph.D. DISSERTATION ABSTRACTS

### **SPECIES DIVERSITY MEASUREMENT FOR LOGGED-OVER DIPTEROCARP FOREST IN THE PHILIPPINES UNDER DIFFERENT CUTTING REGIMES**

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The impact of the jack-knifing procedure as a tool to correct the bias of the usual estimation procedure for species diversity was studied through simulation. A test population using available data on the relative abundance of the different species in four forest stands under the seed tree method in the logged-over dipterocarp forest was used to draw samples to compare the relative reduction in bias of the jackknifed estimates from sample-based estimates of the three diversity indices, namely, species richness, Shannon's index and Simpson's index.

Jackknifing resulted in the substantial reduction of bias and although it led to an increase in variance, the mean square error was considerably reduced.

Tree species diversity measurement was also studied using the concept of intrinsic diversity ordering to compare the plant communities in forest stands that were logged under different harvesting regimes, namely, selective logging, clear cutting and seed tree method. Data on the frequency of the different tree species found in the dipterocarp forest along the coast of Surigao del Sur in the Philippines, were used to calculate the relative abundance vector of the tree species.

Results reveal that the jackknifing procedure provided a useful method for reducing considerably the bias of the estimates when relative abundance data are based on samples rather than complete enumeration.

The patterns exhibited by the diversity profiles of the three forest stand communities are consistent with biological trends and clearly indicate the dynamic nature of plant diversity of the dipterocarp forest under different cutting regimes.

Jackknifing also led to a decrease in the points of intersection of the different profiles, and thereby, ironing out the inconsistencies in the ranking of the forest stand communities using the different diversity indices and the diversity profiles. While results from testing the points of intersection of the different profiles suggest the non-existence of an apparent intrinsic diversity ordering, this does not discount the fact that the jack-knife remains as a valuable procedure for bias correction.

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# STOCHASTIC MODELING OF PHILIPPINE WEATHER DATA

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Weather data are very important for agricultural planning and other related activities. However, a weather station may not always be established in every location. Thus, weather data estimation is needed when either one or both of the following problems are involved: (1) estimating weather data for a location without a gauging station, and (2) forecasting weather of a location with a weather station.

Stochastic modelling of Philippine weather data using the geographical variables (longitude, latitude, and altitude) and time was applied to deal with those problems. Inclusion of these four variables allowed for the spatial and temporal estimation of weather data. The derived stochastic model was used to generate synthetic weather data such as monthly averages, weekly values, or daily sequences. A multivariate polynomial multiple regression model for monthly data was determined to account for the spatial and temporal variabilities, and then the covariance properties were used to disaggregate monthly weather data to weekly values.

Determination of the multivariate polynomial multiple regression model involved: (1) postulating a class of possible models; (2) screening of candidate models; and (3) diagnostic analysis and validation of the selected model.

The fitted models passed the multivariate and screenings based on the Wilks' Lambda, F and t tests. The models were also found adequate for predicting weather data given values of some geographical variables and time. When used in conjunction with the disaggregation models for the Philippine weather data, they are also shown to be reasonably reliable for the estimation of weekly weather data given the estimated monthly weather values.

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