MASTERAL THESIS ABSTRACTS

On Anti-Symmetric Matrices, Spatial Autocorrelation and their Application in Remote Sensing

Kabita Bade Sherstha

The first order spatial autoregressive (SAR) process based on the rook definition of contiguity is considered for remotely sensed data. In order to obtain estimates of spatial parameters in the SAR process, the determinant of the spatial matrix, which is anti-symmetric, is determined and some consequences of anti-transpose operation are derived. Finally, on the basis of these results, the classification rule for identification of crops in remotely sensed data is discussed.

Area Frame Construction Utilizing Geographic Information System

Gandhi Pawitan

Construction of area frames suitable for spatial sampling as applied to agricultural surveys by utilizing Geographic Information System is considered. The study area covers the municipalities of Cavinti, Liliw, Luisiana, Magdalena, Majayjay, and Pagsanjan which span an area of 32860.49 Ha. The land use categories considered are grain crops, oil crops, grassland, shrubland, woodland and special land use, with proportion 9.9%, 54.4%, 1.1%, 18,7%, 12.9% and 3.1%, respectively.

The process starts by generating a digital form of the municipalities map sheets delineating barangay boundaries. The next step is to perform spatial analysis, wherein the barangay boundaries map and the land use map are overlaid. The overlaid map represents an area frame, where the area units are polygons constructed on the basis of land use and barangay boundaries. The attributes of each of the polygons are stored in a database which can be modified to include auxiliary attributes needed for specific sampling procedures.

The methodology developed can be used as a basis for automating area frame construction utilizing Geographic Information System and for designing area sampling procedures.

Estimating Genetic Parameters Using Variance Components Models and Simulated Data

Carmela C. Janagap

Twelve different populations each with different combinations of number of sires, dams, and number of progenies per family are simulated and the genetic parameter called heritability (h^2) is estimated. These populations employ a nested hierarchical experimental design. Each of the population is forced to be unbalanced by introducing mortality levels from 5% to 50%. The major objective of this study is to compare the effects of combinations of sires and dam and number of progenies (will be referred as breeding structure) on h^2. Secondly, this study determines the effect of mortality (unbalancedness) on the estimated h^2. The VARCOMP procedure of the SAS System is employed in computing the variance component estimates for sire and dam, all declared as random effects in the model. For balanced data, Type I option of VARCOMP is used while the Maximum Likelihood option is implemented for the unbalanced data. The third objective of the study is to determine and compare the effect of sex, a fixed effect in the model, on the estimated h^2. It is shown that h^2 estimates are likely to be affected by the breeding structure and the number or percent loss of data (mortality). Sex effect is found to stabilize h^2 estimates when introduced into the model especially for large populations.

Estimating Change in Total in the Philippine Labor Lorce Survey

Aireen L. Indab-Guzman

In the Philippines, labor force statistics are gathered through the conduct of the quarterly Labor Force Survey (LFS). It is a panel type of survey which provides up-to-date information on current labor force characteristics such as employment and unemployment, and the changes that have occurred over time. The rotation procedure being employed results in 75% matching of units between quarters. At present, the estimator of the change in total over time being used is just the simple difference of the design-based estimates. However, the presence of the overlap induced by the rotation provides opportunities for developing a better estimator.

This study develops estimators of change in total using the LFS rotation scheme and compares the estimators developed with the one currently being used.

Two possible estimators of the current total and consequently, of the change in total are considered. These are the estimators based on matched units and composite estimators. These estimators are compared with the current LFS estimators on the basis of unbiasedness and their variance.

Results show that estimators based on matched units are unbiased but less efficient when estimating the current total since it has a larger variance. For estimating change, it provides a more efficient estimator than the LFS estimator when there is a high correlation between matched units.

On the other hand, the composite estimators are shown to yield biased estimates. The bias results from the use of a regression form of the estimator in the matched portion of the composite estimator. However, sufficiently large gains in estimating the total and the change in total result with the use of the developed composite estimators for the appropriate value of the weights and for large values of the correlation coefficient between matched units.

Statistical and Economic Analyses of Data from On-Farm Trials for Technology Verification

Do Van Xe

Important agricultural technologies generated from experiments conducted in research stations need to be verified in farmers' fields because the environmental conditions in research stations are not expected to be the same as those in the farmers' fields. While methodologies for data analysis for technology-generation trials are well defined, those for technology-verification trials are not.

Using data from On-Farm trials for Technology Verification (OFT-TV) conducted in 42 farms in 4 provinces of the Philippines during the crop year 1985-1986, the following analytical procedures are evaluated for their appropriateness in analyzing data from OFT-TV:

1. ANOVA and paired t-test: to compare the responses from the improved technology and from farm practices.
2. Association analyses (including the simple scatter diagram, ANOVA with partitioning sum of squares, and correlation analysis): to explain the variation in "gaps" (difference between the improved technology and farmers practice) among test farms.
3. Cluster analysis: to identify the "recommendation domain" for the improved technology.

The response parameters examined in this study include rice yield, net profit, and Marginal Benefit Cost Ratio (MBCR). Meanwhile, some problems encountered are:

1. Measurements of soil characters were based on "composite sample", combined over several farms. Thus, the usefulness of the correlation analysis between "gaps" and soil characteristics is limited.
2. In Laguna, all non-numeric explanatory variables (such as land type, landscape, soil series, topography, and soil texture) except drainage, have only one value for all farms. In Cavite, all non-numeric explanatory variables have only one value. In these two target areas, the association analysis cannot be applied.
3. In Cavite, the number of test farms is only 5. Hence, no test of significance for "gaps" is applicable in this target area.

The overall results indicate that the following two main objectives of OFT-TV: (i) to verify the superiority of an improved technology to that of farmer's practice in a target area; and (ii) to explain variation in the levels of superiority across farms can be answered through

judicious application of one or more of the above procedures. In addition the author recommends that; (a) for important explanatory variables related to soil characteristics, composite samples over farms in a target area should not be used; and (b) the number of test farms in each target area should not be less than 7.

The Index of Vulnerability to CPP-NPA-NDF Insurgency: An Application of Multivariate Statistical Techniques

Cyril P. Cusi

This study tries to extract the contributing factors to Philippine communist insurgency. It explores the relationship between the various determinants of development and predicts the vulnerabilities of the provinces to CPP-NPA-NDF insurgency. Seventy (70) conceptually relevant vulnerability indicators broken down into the six contributing factors to local insurgency with significant bearing on province development are examined.

Correlation and the multivariate statistical techniques of cluster, discriminant and principal component analyses are used in identifying development gaps and the levels of vulnerability of the country's 75 provinces to local communist insurgency. Correlation analysis is used in reducing the number of technically and substantively valid vulnerability indicators from 70 to 51.

Cluster analysis is used in classifying the provinces into three specified homogenous groups (i.e., not critical, less critical, and critical CPP/NPA base areas), using the indicators of internal armed conflict.

Stepwise discriminant analysis is used in identifying the most important attributes that differentiate the three specified CPP/NPA critical groups. / The results show that 28 vulnerability indicators significantly distinguish the three groups. The number of indicators however, is further reduced to 21.

Principal component analysis is used to determine the vulnerability hierarchy of the provinces to CPP/NPA/NDF insurgency.

An Evaluation of Chicken Statistics Based on the Rice and Corn Survey

Raul C. Orongan

This study evaluates the estimates produced by the Bureau of Agricultural Statistics (BAS) for chicken production in the country by evaluating the biases of chicken production estimates from the Rice and Corn Survey (RCS) relative to the 1991 Census of Agriculture and Fisheries (CAF). Three provinces were selected in this study, namely: Nueva Ecija, a major rice producing province; South Cotabato, a major corn producing province, and Nueva Vizcaya, a non-major rice/corn producing province.

Results show that the least percentage difference between the CAF and RCS chicken production estimate is lowest for South Cotabato. This indicates the possibility that chicken production in corn producing provinces could be derived from the RCS.

Two predictor variables are obtained from the RCS in constructing a model for chicken production in Nueva Ecija and South Cotabato. These predictor variables are the total land area planted to rice/corn and the quantity produced per hectare.

A sampling design is proposed for future surveys in chicken production. The design utilizes the provinces as the domains of the study and the barangays as the ultimate sampling units, with the sample barangays systematically selected from the arrayed municipalities in the province. All households in the sample barangay are automatically included in the sample.