IX.A.3. On Estimate of Production and Environment Relations Using Statistical and Numerical Methods

A.K. Vasisht
Senior Scientist, Division of Agricultural Economics, LARI, New Delhi - 110 012

There is a vast diversity of Statistical and numerical methods in agro-ecological research. These methods differ as per their relevance to (a) sets of observational data, (b) numerical characterisation and comparison of environments, and (c) interactions between experiment and environment. There is a distinction between field experiments in which factors are controlled, and environmental studies in which the variables are not controlled. The two most important factors in production-environment relations are climate and soil variability.

Statistical methods in the analysis and interpretation of experiments with controlled factors were developed to meet the needs of agricultural science. Since then statistical methods have proliferated in fields other than agriculture including mathematics, engineering, mining and social sciences. As automatic data recording, including remote sensing, and computing capability have advanced, it has become possible to apply these methods to experimental anu environmental problems of agriculture. Various statistical methods are employed in analysis of experimental data sets. These methods include Regression analysis, Analysis of Variance, and Discriminant Analysis as they are based on common assumptions and are directionally predictive. On the other hand, environmental data are generally collected as a series of continuous observations in time (such as climatic observations) or space (such as soil measurements) or both, the main numerical methods used to describe such series are Autocorrelation, Fourier and Spectral Analysis, which are studies of periodicity. The seasonal nature of agricultural environments require the use of these methods but they have been little used so far. There are some methods which are available for combining experimental and environmental data sets. These include Cluster Analysis, Principal Component Analysis, Canonocal Correlations and Factor Analysis, which are descriptive in nature. Principal Component Analysis or other multidimensional scaling techniques might be more useful in agricultural studies, but their applicability in one area does not always follow the same pattern in another.

Many new methods of characterising environments have been discussed in this paper. All these methods have some advantages and disadvantages. The statisticians and agricultural scientists all contribute to resistance to these new methods. Whatever the reasons for the present situation there is no doubt an opportunity for new methods to be applied in experiments and in tire extrapolation of information between locations and environments.