

BOOK REVIEWS

Agricultural Statistics—A Handbook for Developing Countries by N. M. Idaikkadar, Pergamon Press, 1979, pp. xii + 139, £ 4.50.

This book is written by a former statistician of the FAO. It contains 14 chapters, 2 appendices, a list of relevant publications and an index. It covers the Methodology of Development, Agricultural Production (AP)—General Ideas, AP—Crop Yields, AP (Crops)—Area, AP (Crops)—Forecasting, AP—Livestock and Livestock Products, Index Numbers of Agricultural Production, Supply/Utilization accounts (Food Balance Sheets), Census of Agriculture, Survey and Sampling Methods, Price Statistics, Statistics for Agricultural Planning, Staff Organisation. Appendices give typical forms for seasonal collection of data on the cost of production used at sub-district level in an African country and monthly collection of data on cropped areas at sub-district level in an Asian country.

The book is based on the lectures given by the author in some Asian and African countries and especially on the course on Third World Agricultural Statistics and Survey and Sampling Methods to M.Sc. students of Agricultural Statistics at Oxford. The aims and scope of the book are: (a) to provide guidelines to those in charge of agricultural statistics in developing countries, for improving their statistics in a systematic way, to know their priorities and to have clear objectives; (b) to provide for planners, policy makers and senior statisticians a handbook on the methodology of agricultural statistics; (c) to emphasize the use of objective methods for collection of data; (d) to emphasize the importance of collecting data independent of farmers to overcome their subjective attitude to data collection; (e) to use sampling with its accompanying benefits, in data collection.

The book is written in the first instance for use in the statistics departments, ministries of agriculture and planning departments of the developing countries. Senior officers in these departments would be interested in the methodology while the juniors may prefer the practical approach. The book will be also useful for students of statistics, economics and agriculture.

The book displays a good blend of theoretical aspects of the subject with the practical experience of the author and largely deals with current agricultural statistics. The author takes the practical approach that 'no grandiose expansion of the statistical staff should be requested all at once from a Government nor a request for large funds' and that 'the process of development of statistics has to be gradual and acceptable to the government concerned'. Hence the author rightly advocates 'to give top priority for replacement of existing subjective methods that give most errors and for statistics where the country's economy is most concerned'.

The author has pointed out how the old concept of census of agriculture meaning an inventory of agriculture for the whole country at a point of time has gradually expanded in recent times and bases his discussion further on that. It is important to note as pointed out by the author that 'in developed countries, sampling primarily opens the way to savings and better accuracy while other techniques may be equally available. In developing countries, however, the use of sampling methods is sometimes the only way to collect agricultural statistics'. Statistics of prices connected with the agricultural industry are very important, but many developing countries have not accorded the compilation of meaningful and adequate price statistics the same attention as that given to other statistics such as cropped areas and yield rates. As such the discussion in the chapter on Price Statistics will be useful. Under Staff and Organisation the author discusses the aspects of selection and training, field organisation, public relations, etc.

The printing and get-up of the book is very good. The book has met reasonably well the aims and scope kept before him by the author.

V. G. TIKEKAR

Proceedings of the Ninth Lunar and Planetary Science Conference (1978), Vols. I, II and III, Pergamon Press, Oxford, Price \$ 200.

These three bulky volumes, that are a supplement of the *Geochimica Cosmochimica Acta*, constitute an exhaustive review of the investigations and current state of the art in this important topic that started with the investigation of the samples recovered from the lunar flights, but have expanded into the much wider area of structure, composition and history of the planets of the solar system.

The first volume deals with geochemical and petrogenetic studies on lunar and meteoritic samples that provide pertinent information on the crustal evolution and constraints that have to be met by any model. The second volume deals with trace elements, isotopic, radiometric, chronological and related studies that are related to the impact phenomena, soil and mare formation on the moon with other implications as well. The third volume deals with the structure and tectonics, as well as other physical properties obtained by seismic, remote sensing and other techniques that have a general bearing on the development of the inner solar system. Since all the general research groups working in this area have contributed to the conference one obtains a synoptic view of the present state of the art.

In Volume I trace element data and calculations are presented (pp. 1-119) especially on the lunar highlands and non-mare rocks with implications on the lunar origin. The

evolution of the mare basalts is treated in the next section (pp. 219-337) from general evidence. A more detailed study of the mare basalts follows with trace element correlations, isotopic data and experimental studies relating to partition coefficients of rare earths, etc. (pp. 337-547). The next section (pp. 629-773) is KREEPY (!) with chemical and radiochronological (including the new Sm-Nd method) data on the KREEP samples (i.e., enriched in K, rare earths, phosphorus etc.), that are found in the lunar highlands.

Special interest attached to the "Breccias" that are fragment-laden melt samples formed in the lunar basin-forming impact events and the study of their petrology, major and trace element chemistry and the newer ^{39}Ar - ^{40}Ar dating that provides information on the thermal history of the samples (pp. 773-959).

The concluding section of Vol. I (pp. 977-1437) is devoted to the study of meteorites, which are the earliest bodies of the solar system, and in particular, the 'Allende' meteorite. Detailed studies of major and trace element chemistry, isotopic anomalies, ion-microprobe studies, etc., of these samples that appear to have recorded some of the earliest events of the solar system formation, 4.6 billion years ago, are presented.

The second volume starts with a systematic study of the lunar 'regolith' or top surface. A characteristic feature is the presence of glossy droplets of all sizes, and they are studied in detail to establish their formation, e.g., as spray melts splashed by meteorite impact (pp. 1449-1551). The effects of the 'solar wind', i.e., particles emitted from the solar plasma are prominent on the lunar regolith and have been studied by mass-spectrometric and also the 'particle track' techniques where the tracks are enlarged by suitable etching and observed on a microscope. The possible effects of sputtering and associated fractionation effects is also discussed (pp. 1571-1765). Drill cores from the regolith have also been analysed. The results from the cores in the Descartes region provide information obtained on *in-situ* reworking and lateral transport on the surface. The study of dynamic mixing processes (Sun-tan ages as referred to by Prof. Lal and co-workers) by the use of cosmic ray produced radionuclides, and the application of such studies to soil maturation and agglutination processes have also been studied in great detail. Volatiles in lunar rocks and soils also provide related information while $^{39}\text{Ar}/^{40}\text{Ar}$ yield the chronologies. Possible effects of solar flares have also been investigated.

In the last section of this volume (pp. 2469-2805), the various aspects of impact phenomena on the lunar and terrestrial surfaces have been studied. The shapes of impact microcraters, composition variations in shocked glasses and other materials have been studied. On the terrestrial scale, the investigations relate to known craters and impact structures—the special features of structures, trace element contents, etc.

Volume III begins with remote sensing studies mainly in optical and infra-red but also in the X- and γ -ray ranges (pp. 2825-3057). Reflectance of plagioclase feldspars and pyroxenes, measurement of *u*-concentrations, Mg-Al ratios and other possibilities

have been examined. Lunar and martian magnetic fields, their interactions with the solar wind, and dynamo-type core-motion origins and related questions are covered in the next section (pp. 3057-3165).

The geological processes, so thoroughly investigated under terrestrial conditions, are next considered in the lunar and martian context. The morphology of the martian channels, topography of volcanism and rock emplacement, and the volcanic features of telescopically-known formations on moon and mars belong to this category (pp. 3181-3459). This leads on to the tectonic-structure relationships observed for the lunar graben systems, and mare-ridge orientations and the 'mascons' related to the subsidence of mare basins and exhibiting themselves by gravity anomalies. Seismology has made important contributions to our knowledge of lunar structure (a well-known author referred to the identity of seismic velocities in the upper lunar surface and the acoustic velocities in green cheese!), and a review of the seismic structure, the current status of the passive seismic experiments, and related topics are given next (pp. 3575-3651).

Craters have been a well-recognized feature of the moon, and the conditions, physical properties, morphology and related parameters of these impact-created structures are investigated in detail in the last section (pp. 3651-3935). Models of impact cratering lead to evaluation of crater volumes, size-distribution, crater-shapes, energy-inputs, etc. Computer-simulations are also made.

The volumes clearly illustrate how the availability of such a wealth of precise quantitative data on actual samples have supplanted pure speculations in this field that has been the subject of interest for such a long time. The criterion of success of models in such a multi-disciplinary field, *viz.*, the convergence of results obtained from different disciplines has also been amply illustrated.

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