

Volume 2 consists of 11 chapters in which the distribution, land-use and management of red and lateritic soils of India, Sri Lanka, Bangladesh, Nepal, The Philippines, Vietnam, Kenya, Argentina and Bulgaria are described. There is some overlap with information on the Indian soils presented in volume 1, but the soil information on the other countries is stimulating reading. The international soil classification schemes (FAO–Unesco, Soil Taxonomy) are used in most chapters in addition to national schemes. Apart from a chapter on Argentinean soils and some information in volume 1 in a chapter by A. van Wambeke, there is limited information on red soils in South America where they are of great importance and their management and constraints have been well-researched.

These two volumes bring together useful information on important soils in the tropics but there are some errors and shortcomings which obligate mentioning. In vol. 1, it is stated that Fe toxicity is a serious problem affecting plant growth in red soils. Iron toxicity rarely occurs, however, in upland soils. It is a problem in acid–sulphate soils and in flooded rice soils where excessive iron uptake may cause iron toxicity, so-called ‘bronzing’ resulting from oxidized polyphenols. Some chapters also mention that goethite is a mineral with a red colour. Although several chapters touch upon it, there is no in-depth review of genesis and common pedofeatures of the red soils nor a thorough synthesis of how they should be managed in order to sustain agricultural production. Some of the information is dated and the books are not indexed, contain some unreadable line drawings (e.g., pp. 96, 126, 316 in vol. 1; pp. 761, 75 vol. 2) and numerous misspellings. In conclusion, both volumes should have benefited from slightly more rigorous editing in which a slash-and-burn red pencil was combined with flawless checking. In my opinion, the books are not as significant to the literature of red soils as are the red soils to agriculture in the tropics. They are also a bit expensive. For less, one could buy a beautiful book of Gauguin.

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*Replenishing Soil Fertility in Africa*, edited by R.J. Buresh, P.A. Sanchez and F. Calhoun. SSSA-ASA Special Publication 51, Madison, WI, USA, 1997. Softcover, 251 pp., US\$22.00. ISBN 0-89118-829-0.

Readers of the international journal of soil science *Geoderma* probably also follow the world news and may thus have noticed an increased political interest of the USA in Africa. I am not qualified to comment on the political motives but it is pleasing to notice that it is accompanied by scientific interest in one of the

continents most important natural resources—the soil. The motives for that interest are limpid because the low levels of soil fertility in Africa are a major cause for the low food production per capita and it is also perceived to be related to the high levels of poverty and malnutrition.

The World Bank, currently the largest sponsor of CGIAR centres, in 1994 requested the centre directors to advise how investment in natural resources in Africa should be made. In response, a *Soil Fertility Initiative for Africa* was formulated by a group of international agencies including the FAO, ICRAF, IFDC, IFA and IFPRI. The initiative resulted in a special symposium at the annual *American Society of Agronomy* and *Soil Science Society of America* meeting in 1996 of which the current book are the proceedings. Although Africa is used in the title and throughout the 10 chapters in this book, it refers to sub-Saharan Africa only.

In 1892, Alford Nicholls wrote in his *Textbook on Tropical agriculture*, ‘‘The land must be regarded by the planter as a bank in which he has opened an account. If he continually draws cheques on the bank, and makes no fresh deposit to meet the drain, he will sooner or later come to the end of his capital, and the same argument applies to the soil.’’ This comparison fairly well illustrates what has happened to many soils in Africa. In the first chapter, the magnitude of the soil fertility problem and its socio-economic consequences are briefly reviewed. This is followed by a description of existing approaches for soil fertility management, including manure and inorganic fertilizer which for several reasons are not widely used in Africa. The authors then launch a new approach introducing economic principles and taking Nicholls comparison of the late 1900s a few steps further. In their view, the soil should be regarded as an environmental asset, part of the natural capital in which soil nutrient stocks are capital stocks and nutrient fluxes are equivalent to service flows in economics. The goal of this approach is to determine the minimal size of the nutrient stock that will maximize the service flow. In the remaining part of this chapter, these ideas are applied to nitrogen and phosphorus which are the main nutrients limiting crop production. The theory is put in practice in three interesting case studies from Western Kenya, Eastern Zambia and Central Burkina Faso.

Chapter 2 reviews the magnitude of soil fertility decline using the nutrient balance approach at the subcontinental, district and farm level. Although hard data are lacking for some of the nutrient outputs, such as leaching and gaseous losses, the nutrient balance approach consistently shows that soil fertility in Africa is at stake as the authors put it. Selected research trials with inorganic and organic fertilizers are summarized in Chapter 3. The chapter expands somewhat on recent reviews by Greenland, Traoré and Harris, Pieri, and Singh and Coma of the same subject. Chapter 4 is devoted to *Sasakawa-Global 2000*, an initiative named after a Japanese magnate. Launched in 1986, *Sasakawa-Global 2000* promotes a second stage of green revolution including hybrid grains, cheap fertilizers and pesticides. It has spurred controversy in a few African

countries but successes were reported in others although these are not always scientifically underpinned.

Some 10 years ago, Alan Wild stated that soil science had reached the point where transfer of its technology can be made from one region to another, provided the subject was properly understood. With that in mind, the inclusion of Chapter 5 can be justified in this book as it presents changes in soil properties under long-term, high-input agriculture on Mollisols and Ultisols in North America. Mollisols are found in Morocco and the coastal area of Algeria and Tunisia, but in sub-Saharan Africa, such soils are very scarce and are confined to the isothermic areas on base-rich materials. The information on the chemical alterations in Ultisols from North America could be of interest since they cover about 190 million ha in Africa. The Ultisol data are from biosequential soil samplings and such datasets could be generated in Africa where cultivated (smallholders) and fertilized (plantations) plots are compared to plots neither cultivated nor fertilized (forests).

Chapters 6 and 7 review how soil phosphorus and nitrogen capital can be built up and these scholarly chapters occupy one-third of the book. Phosphorus capital can be built up substantially by either small seasonal applications or a single large applications of P fertilizer, phosphate rock or a combination of the two. It is not likely that planted tree fallows, legume rotations or biomass transfer would sufficiently built up P capital. Africa has some phosphate rock deposits which can be used for direct application but partial acidulation is required for most phosphate rocks. Considerable amounts of imported P fertilizers are therefore deemed necessary to overcome the widespread P deficiency in large parts of the continent. The story for the build up of a nitrogen capital is somewhat different as N is much more dynamic and can be easily lost from the soil. The authors therefore called it vulnerable capital and strategies for N capital should focus on the maintenance and increase of soil organic matter. Large amounts of organic inputs are generally required to increase the SOM content and hence, the N capital. Under continuous cultivation, it may be impossible to build up N capital and intercrops with green manures, integration of crops and livestock, and inorganic fertilizers are required to maintain crop yields.

Chapter 8 reviews how organic and inorganic sources of nutrients could be combined for soil fertility maintenance. The principle has been advocated for sometime but determining the combination which optimizes plant nutrient availability depends on many factors. Not much is known on the nutrient content and quality of organic inputs which determines to a large extent its fertilizer equivalency. The authors present a decision tree model in which the application of the inorganic fertilizer is made dependent on the N, lignin and polyphenol content of the organic material.

The last two chapters focus on the socio-economic aspects of replenishing soil fertility in Africa and are a meritorious addition to the technical chapters.

Women do much of the food farming in Africa but they have limited access cash to buy inputs like inorganic fertilizers. Because women lack cash, low fertilizer application rates should be recommended and the authors give several other suggestions how gender issues could be tackled in Africa's soil fertility research. The last chapter adds economic principles to the soil fertility problem and reiterates that P and N are different types of natural capital since P is non-renewable and N is renewable. In addition to the economics, the authors also use thermodynamics to explain their viewpoint. The conclusions are nevertheless similar to those reached in the previous chapters: farmers should invest in soil organic matter with the applications of phosphate rock and N fertilizers, and the costs of implementation should be shared among the difference groups in society that benefit.

In conclusion, this is a book with a fine combination of pure and applied soil science aiming to bring to the ground a major agricultural problem in Africa: low crop yields. It is also a book with a message, and the message is: soil fertility cannot be increased without moderate levels of inputs in the form of inorganic fertilizers. It is not an entirely new message but the interesting point of view is that the required inputs should be regarded as a capital investment. This is a perspective the donor community will hopefully accept soon.

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*Causes and Consequences of Map Generalisation*, by Elsa Maria João. Taylor and Francis, London, xv + 266 pp., £24.95. ISBN 0-7484-0776-6.

*Causes and Consequences of Map Generalisation* is the first volume of what is turning out to be a valuable and interesting series of Research Monographs in Geographical Information Science edited by Peter Fisher and Jonathan Raper and published by Taylor and Francis. This work is the culmination of a four-year research project that also led to João's PhD, which was supervised by David Rhind and Jonathan Raper. This Monograph addresses the age-old, but rarely properly understood, problems of generalising maps from one scale to another. In the age of paper maps, generalisation was carried out behind closed doors by cartographers who had developed their own in-house rules. Today, in the era of digital maps and spatial databases, the problems of map generalisation face every user of a Geographical Information System (GIS) who wishes to combine digital data from several sources. And there are many sources of digital maps today. For instance, Roel Oddens Bookmarks (see <http://kartoserver.frw.ruu.nl/HTML/oddens.html>) is an inventory of more than 6000 lists of digital maps available on the web that may be obtained free or for a fee.