Forewords

I am delighted to see the publishing of a book on a totally new subject, *Rocks for Crops: Agrominerals of sub-Saharan Africa*. It is seldom that geologists and agricultural scientists get together in such an effort. Sub-Sahara Africa is the only remaining region in the world where hundreds of millions of people go to bed hungry every night because of insufficient food production. Soil fertility depletion has been identified as the fundamental biophysical root cause for hunger in Africa. One of the most sensible ways of replenishing soil fertility is the use of available natural resources, and phosphate rocks are one attractive alternative for replenishing phosphorus in soils that have been depleted of this nutrient. Peter van Straaten's book, based on years of exploration and analysis, has identified a large number of small, indigenous phosphate deposits in 48 countries of sub-Sahara Africa. Many of these deposits are of sufficiently high quality to be used for direct application. The success of phosphate rock applications in the main farming areas of East Africa has helped increase crop yields by large amounts. When used in combination with leguminous tree fallows that fix atmospheric nitrogen, farmers are able to replenish the productivity of their soils using resources naturally available in Africa. This is a great contribution to overcoming hunger and opening the way for sustainable food production in Africa in ways that enhance their natural resource base.

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It gives me great pleasure to write this preface for Professor van Straaten's book, *Rocks for Crops: Agrominerals of sub-Saharan Africa.* Developing countries, particularly those of sub-Saharan Africa, are facing a crisis of enormous proportions – their population has doubled twice since 1960, and per capita food production has declined over the same period, in spite of all of the developmental efforts over this period. At least part of the problem is declining soil fertility; since we are not replacing many of the chemical constituents that are required for agriculture, we are essentially mining the soil. Worldwide, billions of people suffer from malnutrition. We hear of the global crisis of 'food security,' a problem that in many regions is growing because of climate change related to the fact that we have changed the atmosphere of our planet.

What factors determine food security, food quality? First come the natural factors – soil quality, climate stability, water quality and quantity – and to these we may add modern agri-technology (e.g. tillage cultivation). We have growing problems related to soil erosion, over-irrigation, nutrient deficiencies, etc.

I was born on a farm near the Southern Alps of New Zealand. Our soils were rich, being derived in large part from volcanic rocks that formed the Alps along their great fault systems. These young soils were full of unweathered minerals capable of slowly releasing nutrients over a long period of time as they were broken down. Later I worked with colleagues in Brazil in many warm regions with heavy rainfall and no

recent rock additives. These laterite soils were deficient in a host of components and have low bioproductivity. Such soils are common in many of the tropical and sub-tropical regions of the world, particularly those where food production is a problem. It is interesting to compare the low productivity of such regions with that of areas where the soils are derived from recent volcanism, such as Hawaii.

I remember the area of New Zealand where the sheep were dying for no obvious reasons – there was plenty of food. Then it was discovered that the soils were deficient in the element cobalt. It is well known that cobalt is needed for our immune systems. More recent data on this subject comes from a publication by W. Mertz, in *Science*, 1981, vol. 213, p. 1332, 'The Essential Trace Elements.' The list is very large. One need only look at recent vitamin pills (I, Cu, Mn, Cr, Mo, Zn....). Another example is provided by E.I. Steifel, *Science*, 996, vol. 272, where he showed that the process that accounts for much of natural nitrogen fixation in soils requires molybdenum. In many soils adding a trace of Mo would reduce the need for nitrogen fertilizers. And again, I return to Brazil where on a property in the hills near Rio de Janeiro, I once observed a region where trees had been planted several years before. Most of the soils came from granite but where there were basalts, the trees were ten times larger. All forms of life need a complex array of mineral nutrients and where the soils are poor and subsistence agriculture has been practiced for a long period of time, many of these nutrients are simply no longer in the soils.

This book provides a unique source of resource information on rocks and minerals that are available in sub-Saharan Africa for use in agriculture. This inventory is based on published and unpublished geological information of agrominerals from 48 countries in sub-Saharan Africa. The geological data base and the description of these vital resources is compiled in a systematic and thorough manner from a resource based point of view. But the author is not only a geologist. He provides us with valuable information on agricutural research conducted with some of the minerals and rocks locally available in sub-Saharan Africa. The book with its extensive and up-to-date references is an excellent starting point for integrated agricultural research and development work in sub-Saharan Africa, for soil scientists, geoscientists, engineers and extension officers. I congratulate Professor van Straaten, yes Rocks and Crops are related! The concept of agrogeology certainly needs more recognition and we must do more to foster trans-disciplinary research and development to tackle our environmental problems and address issues of food security. Soil remediation is critical to the global problem of food security.

There is a great and urgent need to quantify the relations between rocks, climate, soils and food security. And we need new approaches for soil remediation, not just the use of chemical fertilizers, which we know are often unavailable to the subsistence farmers of the developing world and which were designed as nutrient inputs for the highly-mechanized agriculture and soils of the developed world. And finally we must all ask ourselves the question, will we leave the planet in good order for those who will follow?

I very much liked a recent book published for schools by the British journal, *The Ecologist*. The book *Go M.A.D., Go Make a Difference*, is concerned with daily ways to save the planet. We must! And using the right 'rocks' on the right 'crops' certainly has the potential to make a real difference to food production where it is most needed – in the poorer countries of the developing world.

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