

### 3. Agrogeology, an emerging trans-disciplinary science.

The use of rocks and minerals as low-cost, locally available geological nutrient resources for agricultural development is not new. It has been tested over centuries. Agricultural research with finely ground and chemically unprocessed rocks and minerals, based on the concept of 'bread from stones,' started in the 19th century by Missoux (1853/54), Hensel (1890, 1894) and others. A period of conceptual and practical work on rocks for agricultural development re-started with Keller (1948), Keller *et al.* (1963) followed by the research of Fyfe and co-workers (Fyfe 1981, 1987, 1989, 2000; Fyfe *et al.* 1983; Leonardos *et al.* 1987, 2000) and Chesworth and co-workers (Chesworth 1982, 1987, 1993; Chesworth *et al.* 1983, 1985; van Straaten 1987; van Straaten and Chesworth 1985; van Straaten and Pride 1993). In the early 1980s the first trans-disciplinary 'agrogeology' project receiving major funding was the Tanzania-Canada agrogeology project, financed by the International Development Research Centre (Chesworth *et al.* 1985, 1989).

Agrogeology is broadly defined as 'geology in the service of agriculture,' a study of geological processes that influence the distribution and formation of soils, and the application of geological materials in farming and forestry systems as means of maintaining and enhancing soil productivity for increased social, economic and environmental benefits (Chesworth and van Straaten 1993; van Straaten and Fernandes 1995). This trans-disciplinary approach combines the knowledge of soil scientists and farmers with that of geologists and process engineers. Soil scientists define the soil limitations and needs, geologists find, delineate and characterize the geological raw materials that address those needs and process engineers contribute by concentrating the agrominerals and transforming them into more plant available forms. Processing technology is to be kept at an appropriate level to reflect the size, grade, location and end use of the raw material. A close liaison between geologists, process engineers and soil scientists must be kept throughout the exploration, development process and testing, as is the active participation of extension officers and farmers. In the agrogeological approach, communication, consultations and interactions between the different stakeholders are crucial. Farmers and other beneficiaries should be closely involved in agromineral utilization projects from the early phases of design to implementation, to modification and finally to the enjoyment of the benefits. They will utilize these agromineral materials to sustain food and fibre production for the benefit of their families, their communities and society as a whole.

Farmers have adapted their production systems over periods of time lasting much longer than a scientific experiment, and have often preserved indigenous knowledge of soils. This knowledge of soil productivity is often passed on from generation to generation orally. Traditional management systems often exhibit considerable elements of sustainability. These agricultural management systems are commonly adapted to their specific environment and climate, they rely on local resources, they are small-scale and decentralized, and in many cases they tend to conserve the natural resource base. To improve on the effectiveness of these systems, the option of using locally available geological nutrient resources needs to be tested. The option to use locally available geological materials must fit into the existing socio-cultural system to be successful.