

The evidence collected by the Indigenous Fallow Management (IFM) Network (see p.5) and the Consortium for Tropical Soil Cover and Organic Resources Exchange (TropSCORE) (see Box 2 on p.6) makes clear that it is time to change our scientific understanding of soil fertility management in the humid tropics.

Conventional scientific thinking is that if farmers apply enough chemical fertiliser and the soil has sufficient capacity to bank accessible nutrients, their land will be fertile and productive. In practice, these fertilisers are often not very effective and between 40 and 70% of the nitrogen applied is lost to the environment (FAO, 1990). On sloping and acid soils worked by shifting cultivators, these losses are probably even higher and make chemical fertilisers uneconomical.



Nutrient banks or nutrient access

Rolando Bunch

Building up a large stock of nutrients in the soil is often of little value in the tropics. Rather, what is important and often done by farmers, is to maintain a constant, well-balanced supply of a minimum amount of nutrients and ensure that crop roots have unobstructed access to them. This will ensure that even if farmers have very poor soils and the flow of nutrients at any moment is very low (this can be even less than 20% of recommended fertiliser rates), they can still produce good yields.

Farmers' strategies to enhance soil productivity can be described as follows:

- **Maximum organic matter production.** Frequently farmers can increase the amount of organic matter they produce in their fields while maintaining or even improving their yields. There may be a slight increase in cost but not necessarily. In fact many gm/cc and agroforestry systems increase over-all organic matter production while reducing the amount of labour required for controlling weeds.
- **Use of natural processes** like nutrient mobilisation and accumulation, N-fixation, nutrient cycling and species succession. These processes make nature (e.g. soil micro-organisms, plant roots, predator insects, and micro-climate creators) work for farmers and provide free inputs.
- **Soil cover.** Soil exposed to the tropical sun produces more weeds. These reduce yield and increase the farmers' workload. Unprotected soil also

becomes very hot making it difficult for soil life and plant roots to function well. Mulching and shade can provide soil cover.

- **Zero tillage.** If there is little organic matter, zero tillage systems rapidly become unproductive. But if there is plenty of organic matter, these systems can remain productive for decades saving farmers both expense and work. By using zero tillage instead of ploughing, soil structure and soil life can be maintained and enhanced. The use of herbicides in zero tillage systems should be avoided as it affects soil life. If a sufficient layer of mulch is provided herbicides are unnecessary.
- **Maximum biodiversity** is important because it helps reduce the number of diseases and insects attacking crops and will, over the years, help maintain a good balance of available nutrients.
- **Multifunctionality.** If farm organisms used for the above practices combine different functions, for example, soil productivity management with soil and water conservation and production for home consumption and market, the system will become more resilient and farmers will accept these organisms more easily.
- **Fertilisation through the litter layer.** If farmers apply enough organic matter and use zero tillage, they will have a litter layer in their fields similar to that found in a forest. This layer will supply nutrients to the crops. In very acidic soils that have too much aluminium and very hard layers, the litter layer

is particularly important. Roots have a hard time growing in these soils and therefore it is better for the plants to get their nutrients from the litter. Crop plants, like forest trees, can form a very closely woven root mat just under the litter layer to access nutrients and humidity. If phosphate fertiliser is required, it can be applied most effectively to the litter layer. If further intensification is needed than can be obtained through ecological strategies alone, organic or small amounts of appropriate chemical fertiliser can be applied through the litter layer.

The documented experiences of shifting cultivators and other smallholder farmers in the humid tropics suggest that if their colleagues were to follow their example and adopt the nutrient access approach, their situation would be far less hopeless. ■

Rolando Bunch, COSECHA, Apartado 3586, Tegucigalpa, Honduras. Phone: +504 766 2580; Fax: +504 766 2354; rolando@cosecha.sdnhon.org.hn

After: Bunch R, 2000. **Changing our understanding of the fertility of tropical soils: Nutrient banks or nutrient access.** IIRR Resource Book (see p. 30)

Further reading

- Monegat C, 1997. *Plantas de cobertura del suelo: características y manejo en pequeñas propiedades.* CIDICCO, Apartado Postal 4443, Tegucigalpa MDC, Honduras. Now also available in English.
- Primavesi A, 1987. *Manejo Ecológico do solo: a agricultura em regiões tropicais.* Nobel, São Paulo, ISBN 85-213-0004-2. Available in Spanish as well.