

## SOIL MANAGEMENT FOR SUSTAINABLE AGRICULTURE IN THE TROPICS - INTRODUCTORY REMARKS

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It would be valid to question whether in fact soil management for sustainable agriculture in the tropics is a proper subject for a soil congress and for a scientific commission on soil technology. In many respects, soil management is closely associated with other scientific disciplines such as agronomy and rural socioeconomy, since its aim is to produce crops and to deal with farmers. But at the same time, land cannot be properly managed without a good understanding of soils, of their distribution, and of their dynamics; so I would submit that soil management has an altogether integral place in a soil congress.

A further question arises regarding the particular commission under which soil management should be listed - the commission on soil technology, the commission on soil fertility and plant nutrition, or the commission on soil physics? Soil management is concerned with all of these subjects at one and the same time. The extended summaries of the oral and poster presentations of this symposium, 34 of them in all, are a clear indication that soil scientists take a holistic approach to the subject, and try to integrate all of the diverse components related to soil management in their research.

Again, we may ask whether tropical soils and their management for sustainable agriculture constitute a specific area of research. This symposium clearly gives an affirmative answer to this question. Soils in the tropics are much more diversified than those in temperate and cold areas. They have not been reworked and homogenized during the glacial period, and often have a long history going back to the early Tertiary period. This long history accounts for the deep weathering and the lack of nutrient reserves of upland soils, as well as for the chemical imbalance - a factor related to the concentration of salts and carbonates - of some of the lowland soils. It is also notable that the climatic variations between the arid, semiarid, and humid areas allow for a wide range of pedogenesis to take place, which means that tropical soils exhibit very considerable diversity.

However, these soils are mostly cultivated by farmers using low or no inputs, which means that their intrinsic qualities are much more valuable for crop production than they would be in temperate areas, where tillage, fertilizers, and pesticides are generously applied. Moreover, due to favourable temperature and rainfall conditions, they are often cropped two or sometimes even three times a year, and do not benefit from a winter season during which some of their chemical and physical properties can be regenerated and the pest cycles can be broken. Consequently soils in the tropics are more dynamic systems than those found in temperate soils, and can be extremely productive. At the same time, they are highly vulnerable to degradation by erosion, compaction, leaching of nutrients, salinization, pest infestation, and a number of other ailments.

In terms of management, the high diversity of soil conditions implies that technologies must be adapted to each situation. Farmers have understood this diversity by adapting their cropping systems to the local conditions, and have also learnt by experience that the climate is unreliable. Their most common answer to the element of risk is multiple cropping. To affect an improvement in the cropping systems, we must therefore meet two objectives - higher productivity and greater reliability on tropical soils. In the process of achieving these aims, we need to provide techniques which are acceptable to farmers and which will help to maintain or improve the soil capital and avoid land degradation. Only by doing so can we ensure the sustainability of the measures which are introduced.

It follows that one of the major concerns in any soil management endeavour in the tropics is to attend to long-term soil fertility changes. This challenge makes it a complicated and intriguing scientific subject, and one which, moreover, has very important implications for the future of mankind.

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