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of tropical legumes for feed and soil improvements; with IP-1 (beans) on the application of molecular tools to study soil microbial biodiversity in our efforts to combine ISFM and "integrated pest management" (IPM) research approaches; and with PE-4 (land management) to improve the relevance of scientific information in hillside environments through understanding of local soil management. TSBF-Latin America team will play a key role in the integration of the three major developmental challenges of CIAT (Improving management of agroecosystems in the tropics; Enhancing rural innovation; and Enhancing and sharing the benefits of agrobiodiversity) in Latin America.

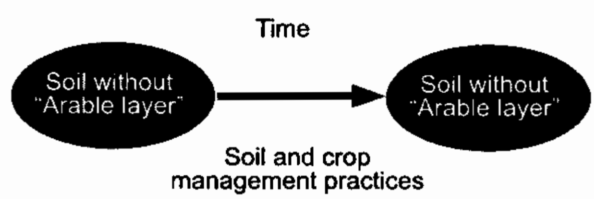
A few highlights from recent work of the Latin American team of TSBF-CIAT are presented.

Development of an arable layer: A key concept to improve infertile tropical savanna soils

E. Amézquita, I. Rao, E. Barrios, M. Rondon, P. Hoyos, D. Molina, I. Corrales, L. Chavez, M. Rivera and J. Bernal

Many soils from the tropics, even under natural conditions lack appropriate conditions to support sustainable agricultural production. Constraints could be of chemical, biological or physical nature. These conditions get exacerbated when the soils become degraded. A concept that is highly relevant for the better management of infertile tropical soils is that of the "buildup of an arable layer". Improved soil quality is a prerequisite for implementing no-tillage systems on infertile tropical soils. The application of this concept will depend on the prevailing soil constraints and current land use, for example soil compaction and loss of soil structure versus depletion of soil nutrients and the type of crops to be cultivated.

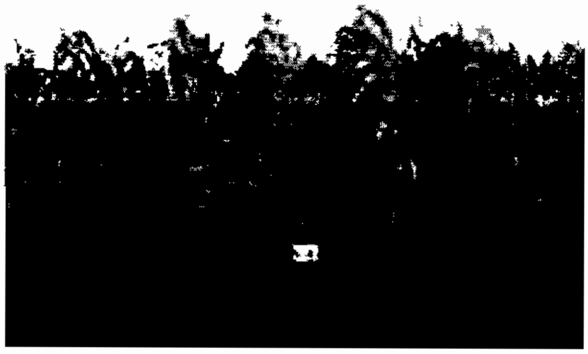
The concept includes tillage practices to overcome physical constraints, an efficient use of amendments and fertilizers to correct chemical constraints and imbalances, and the use of improved tropical forage grasses, green manures and other organic matter inputs such as crop residues, to improve the soil "bio-structure" and biological activity. The use of deep-rooting plants in rotational systems to recover water and nutrients from subsoil is also envisaged in this scheme. The practice of building an arable layer requires a diagnostic phase with identification of major soil constraints and then the implementation of



The construction of an "Arable layer" over time using vertical tillage, chemicalinputs and adapted tropical forage germplasmtillage,chemic alinputs and adapted appropriate management practices to overcome limitations.

Research conducted in close collaboration with CORPOICA and other partners in the Llanos of Colombia indicate that building up an arable layer in tropical savannas is not only technically feasible but also economically attractive to farmers who are increasingly adopting the strategy. The arable layer concept and practice is an important component of ISFM approach to restore degraded lands. It contributes to an effective use of the belowground biodiversity and enhances the provision of several environmental services from the soil such as improved water quality and carbon sequestration. This concept builds on earlier strategies for the better management of tropical soils. To be functional, however, more attention needs to be given to the driving forces behind farmer decision making and the existing policies for intensifying agriculture on infertile savanna lands.

The combination of factors like the use of genetically adapted materials with high yield potential along with the improvement of the physical, chemical and biological conditions of the soil, results in superior yields of rice, maize and soybean compared with the savanna soil where the concept of arable layer is not applied.

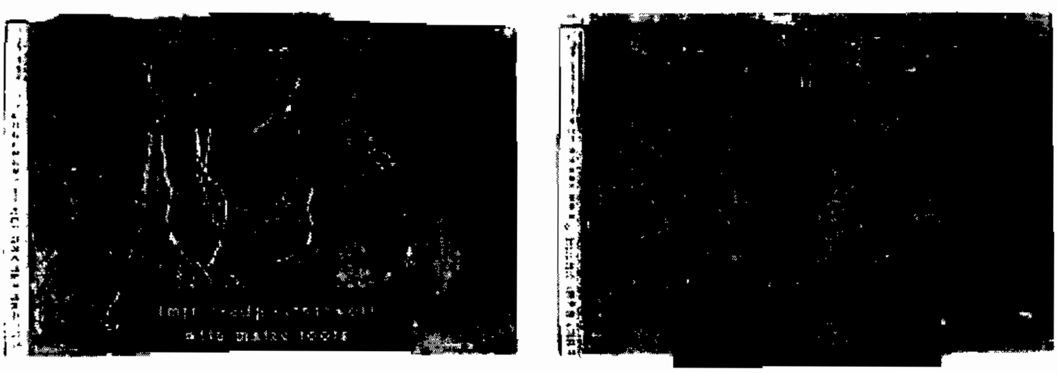


With acid soil adapted varieties and hybrids using the concept of building an "arable layer" it is possible to reach maize yields higher than 5 Mg/ha in Colombian savanna soils

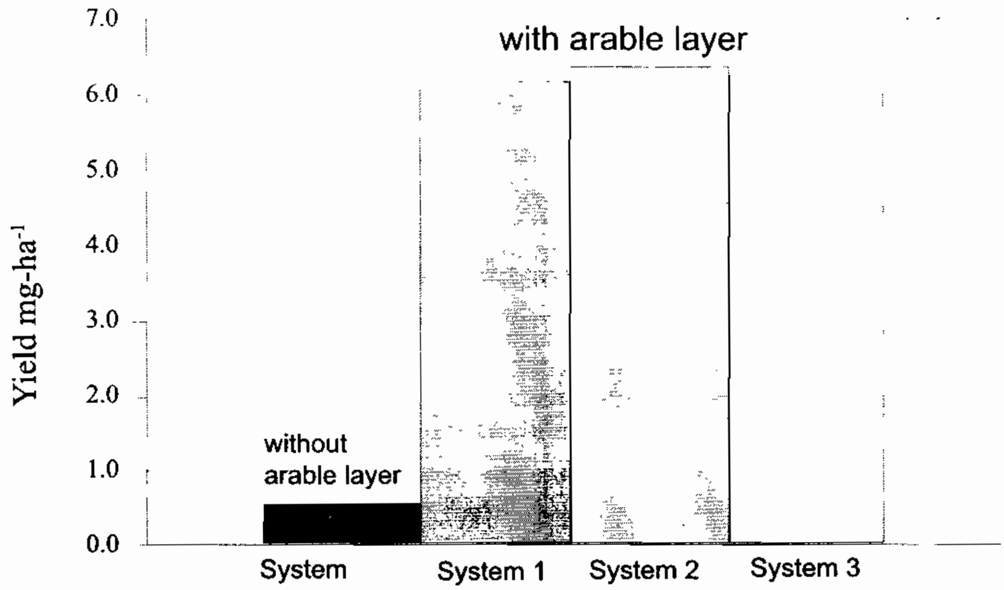
Soybean in rotation with maize during the process of building-up of an "arable layer" with seed yield of more that 2 Mg/ha

The improvement of the physical, chemicals and biological conditions of the soil, in the process of building-up an arable layer, facilitated a better maize root growth which in turn increased yields and help in the maintenance of good soil conditions. Positive correlation was found between root development (root depth) and maize yields. Maximum grain yields occurred at root depths higher than 25 cm.

Higher grain yields were found with cropping systems where the concept of building-up an enable layer was applied. Maize yields varied from 0.25 Mg/ha under



Influence of build up of an arable layer through a Panicum maximum pasture on subsoil root development of maize compared with savanna soil conditions



Cropping systems to build-up an arable layer: System 1: Year 1 (Rice/Rice) + Year 2 (Maize/ millet + legumes) Year 3 (Maize); System 2: Year 1 (Rice/Pasture) + Year 2 (Maize/soybean) Year 3 (Maize); System 3: Year 1 (Rice + Pasture + Legume) + Year 2 (Maize/millet + legumes) + Year 3 (Maize)

native savanna without the arable layer versus 6 Mg/ha under different cropping systems with the build up of arable layer.

Productivity gains constitute the principal benefit perceived by those using soil management practices in the well-drained savannas of the Llanos. It is considered that for rapid adoption of arable layer soil management technologies, investment by the Colombian government in improving infrastructure (e.g., roads) is critical.