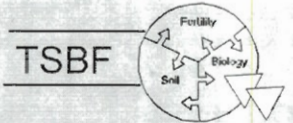


The **Comminutor**



Newsletter of the TSBF Institute of CIAT



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Juliet Ogola



CIAT scientist interacting with farmers in Latin America



Soybean production in Western Kenya

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Publisher:
Tropical Soil Biology and Fertility Institute of CIAT (TSBF-CIAT)

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Job Kihara and Juliet Ogola

TSBF-CIAT is a research programme whose main aim is to contribute to human welfare and environmental conservation in the tropics by developing adoptable and suitable soil management practices that integrate the biological, chemical and socioeconomic processes that regulate soil fertility and optimize the use of organic and inorganic resources to the land users.

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Preface

The Tropical Soil Biology and Fertility institute of the International Center for Tropical Agriculture (CIAT) has its main goal to contribute to human welfare and environmental conservation in the tropics by developing adoptable and suitable soil management practices that integrate the biological, chemical and socio-economic processes that regulate soil fertility and optimize the use of organic and inorganic resources available to the land-users. The research approach advocated by TSBF includes both process-level and system-level study of agroecosystems. Process scale research is focused on understanding the biophysical regulation of soil fertility by such mechanisms as decomposition, soil organic matter dynamics and soil biota activities. At the system level research is concerned with assessing the ways in which soil fertility is regulated by the farmer and by both the socio-economic and biophysical environment in which soil management is practiced. Apart from research in Africa, TSBF has extended its activities to farming communities in Latin America. This issue of the *The Comminutor* is dedicated to highlighting key research issues in the Latin America.

Telephone and Fax Numbers changed

Telephone numbers at the TSBF offices in Nairobi have changed from a 6 to 7 digit numbering plan following introduction of new digital telephone exchanges by Telkom Kenya. The initial 5 in all the numbers was dropped and replaced with 72. The new numbers are:

Tel: 254-20-722 4766 (Administration)
254-20-7224755 (AfNet)
254-20-722 4000 (Operator)

Fax: 254-20-7224763/4

Research for Development Strategy of Latin American team of TSBF-CIAT

I. Rao, E. Amézquita, M. Ayarza, E. Barrios, M. Rondon and Sanginga No. 4, 2006

Soil fertility degradation has been described as one of the major constraints to food security in developing countries. Despite proposals for a diversity of solutions and the investment of time and resources by a wide range of institutions, it continues to prove a substantially pervasive problem. The rural poor are often trapped in a vicious poverty cycle between land degradation, fuelled by the lack of relevant knowledge or appropriate technologies to generate adequate income and opportunities to overcome land degradation. Intensification and diversification of agricultural production on smallholdings is required to meet the food and income needs of the poor, and this cannot occur without investment in soil fertility. Investing in soil fertility management is necessary to help households mitigate many of the characteristics of poverty, for example by improving the quantity and quality of food, income, and resilience of soil productive capacity to environmental change.

The “integrated soil fertility management” (ISFM) paradigm, which forms an integral part of the “integrated natural resource management” research approach with a focus on appropriate management of the soil resource, is currently adopted by TSBF-CIAT. The ISFM strategy explicitly recognizes the important role of the social, cultural, and economic processes regulating soil fertility management strategies from farm to landscape levels. The ISFM strategy is also broader than “integrated nutrient management” (INM) strategy as it recognizes the need for an appropriate physical, chemical and biological environment for crops to grow optimally,

besides a sufficient and timely supply of available nutrients.

Research for development efforts of the Latin American Soils team, since its inception in 1997, have focused on identification of strategic principles, concepts and methods for protecting and improving soil quality through the efficient and sustainable use of soil, water and nutrient resources in crop-pasture-fallow systems in tropical savannas and hillsides agroecosystems. The team has made significant contributions to the mission of CIAT through:

- a concept on the need for building-up an arable layer in savannas to adopt no-till systems;
- a concept of on-farm nutrient recycling to reduce soil erosion and improved food security in hillsides;
- an approach to quantify the potential of arbuscular mycorrhizal fungi to recuperate soil structure;
- an approach for linking soil organic matter fraction to soil phosphorus (P) fraction related to plant available P in the soil;
- options for improved fallow management;
- a decision tree for targeting production systems based on soil texture, slope and depth;
- a tool (GEOSOIL) that allows decision making on land use at different scales (plot, farm, community, municipality, department, country);

- a guide to link local and scientific knowledge about indicators of soil quality;
- three books (Agropastoral Systems; Land management; and Soil Biota);
- publication of research results in over 50 journal articles and 22 book chapters;
- capacity building in soils research through training of over 40 undergraduate and 20 postgraduate and graduate students; and
- an award from CGIAR in 2001 for Outstanding Partnership.

The current TSBF-CIAT (Latin America) team has research for development activities in two major agroecosystems (Tropical Savannas and Hillsides). The reference (benchmark) sites for the team are Colombian Llanos for the savannas, and for the hillsides: Cauca in Colombia, San Dionisio in Nicaragua, and Yoro and Lempira in Honduras. The priority production systems for the team are cereal-legumes-livestock in savannas and Quesungual slash/mulch agroforestry system and cereal-legume-high value cropping systems in hillsides. The team works closely with a consortium on integrated management of soils (MIS) in Central America and is actively contributing to the objectives of CONDESAN in the Andean region and PROCITROPICOS in the savannas, and a BGBD (belowground biodiversity) global network. The integration with these regional and global networks is aimed towards improving rural livelihoods in the tropics through dissemination of soil management tools and technologies, increase in agroecosystem goods and services, capacity building and institutional strengthening.

The main objectives of the TSBF-CIAT team are: (i) to support the livelihoods of people reliant on agriculture by developing profitable, socially-acceptable and resilient

agricultural production systems based on ISFM; (ii) to develop sustainable land management in tropical areas through the restoration of degraded lands; and (iii) to build the human and social capital of all TSBF-CIAT stakeholders for research and management on the sustainable use of tropical soils.

The main outcomes of this research for development efforts are: (i) biophysical and socioeconomic processes understood, principles and concepts developed for protecting and improving the health and fertility of soils; (ii) sustainable soil, water, and nutrient management practices developed and tested by applying and integrating local and scientific knowledge of biophysical and social processes; (iii) partnerships built and capacity for improving the health and fertility of soils of all stakeholders enhanced; (iv) improved rural livelihoods through profitable, diverse and intensive agricultural production systems; and (v) sustainable land management for social profitability, with special emphasis on land degradation, developed.

An increased integration with TSBF-Africa team is expected through MIS-AfNet south-south collaboration. Special efforts will be made to increase integration with other CIAT projects IP-5 (forages), IP-1 (beans), PE-3 (communities and watersheds), PE-4 (land management), SN-3 (participatory research), and SN-1 (rural agroenterprises development) in order to integrate soils and production systems research at the plot, farm and landscape scales, and to develop better soil and crop management options and decision support tools for the hillside and savanna farmers to reverse land degradation. Joint activities are in progress with IP-5 (forages) on the potential of tropical grasses to inhibit nitrification and reduce nitrous oxide emission, and the integration of methodologies for simultaneous evaluation

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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.

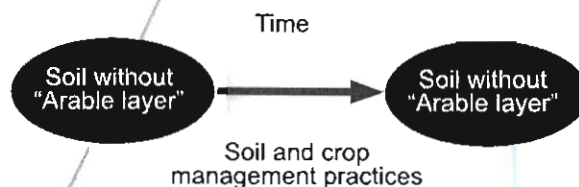
A few highlights from recent work of the Latin American team of TSBF-CIAT are presented.

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, chemical inputs and adapted tropical forage germplasm tillage, chemical inputs and adapted