

The **Comminutor**

Newsletter of the TSBF Institute of CIAT



TSBF



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Back cover: A farmer in his farm in West Africa.

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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 socio-economic processes that regulate soil fertility and optimize the use of organic and inorganic resources to the land users.

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TSBF-CIAT defines strategic direction for 2003–2007

A comprehensive review of the strategic direction of TSBF-CIAT was recently undertaken during two retreats, one in Kenya (9–12 June) and the other one in Colombia (17–20 June). The need for this review arose from the recommendations of an external programme and management review conducted in 2000, the strategic directions defined for TSBF, the outcome of a meeting of a panel of experts in Bellagio, Italy, in 2002, and TSBF's merger with CIAT. There was also the need to reflect on questions regularly asked by donors and other development partners, concerning:

- The impact at the farm level of TSBF-CIAT's soil fertility research
- TSBF-CIAT's capacity to manage and implement large projects
- How TSBF links good science with adaptive research

The purpose of the review was to determine if and how TSBF-CIAT should reposition its research strategies and goals given its merger with CIAT and the appointment of the new director, Dr Nteranya Sanginga.

The review suggested no radical change to our programme but it pointed the direction along which the institute should continue during 2003–2007. Some of the important highlights of the review are discussed in the following sections.

Research framework and strategy

TSBF began in 1984 dedicated to combating environmental degradation. Today, as an institute of CIAT, TSBF-CIAT is dedicated to translating scientific knowledge on soil biological processes into practical land-management strategies, and empowering farmers through participatory technology development. The knowledge generated by TSBF during the last two decades – including scientific principles, research methods, and land-use practices for sustaining tropical soil fertility through the management of biological processes and organic resources – has profoundly influenced scientific communities working throughout the tropics.

TSBF-CIAT is now a leader in the development of integrated soil fertility management (ISFM; see figure 1), whereby organic resources available to farmers are complemented with judicious use of mineral inputs and improved germplasm, to strengthen food security, improve rural livelihoods, strengthen local knowledge and protect soil resources. Identifying market opportunities for higher value crops such as vegetables, multipurpose legumes and fruit trees is important for income generation and for increasing the

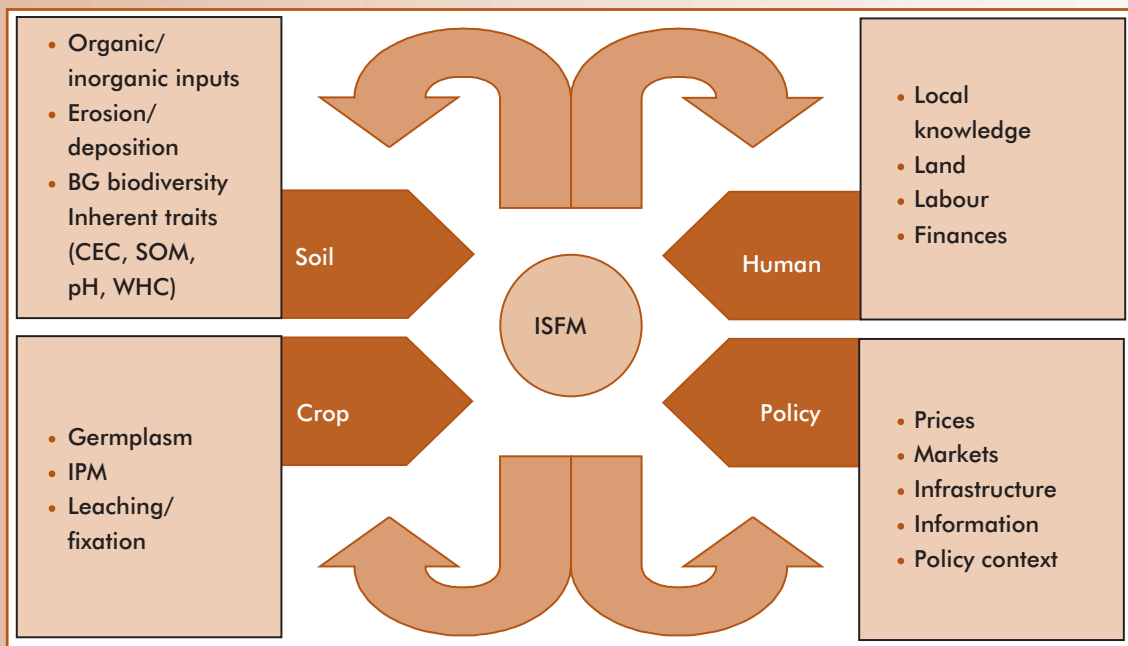


Figure 1. Processes and components of integrated soil fertility management. (BG = belowground, CEC = cation exchange capacity, SOM = soil organic matter, WHC = water holding capacity; IPM = integrated pest management).

sustainability and biodiversity of these farming systems.

Developing research products for and in partnership with smallholder farmers in the tropics underlies TSBF-CIAT’s research and development agenda for 2003–2007. The institute’s expected outputs and farming systems’ foci are shown in figure 2. Our process-based research comprises output 1, sustainable

and profitable ISFM practices; output 2, belowground biodiversity; and output 3, ecosystem services. These outputs generate components and information that are integrated in the adaptive research process in output 4 to scale up successful products and principles, and output 5 to empower stakeholders – especially smallholder farmers – to undertake collective ISFM action.

| TSBF Institute’s Research Outputs | | Worldwide applications | | | | |
|-----------------------------------|--|---------------------------------|--|------------------------------|---------------------------------------|-----------------------|
| Strategic | 1. Sustainable & profitable ISFM practices | Agroecozone | Drylands (Sahel) | Savannas | Forest margins | Hillsides |
| | 2. Below-ground biodiversity | Sample farming system(s) | Crop-livestock | Cereal-legume | Root/tuber; banana | Agroforestry |
| | 3. Ecosystem services | Key constraint | Water, nutrient deficiency | Nutrient deficiency | Organic inputs, pests | Water/tillage |
| Applied | 4. Scaling up and out | Sample products | Fertilizer micro-doses, Improved manure mgt. | Grain legumes, Arable layer? | Legume cover crops, Improved fallows? | Quesungual management |
| | 5. Research and training capacity | | | | | |

Figure 2. Worldwide integration and application of TSBF-CIAT’s research outputs.

There is interaction between different farming systems i.e., between the cereal-legume and the livestock systems, between the banana- and the cassava-based systems, and between the Quesungual and other agroforestry systems. These systems have been selected based on their importance and opportunities they offer farmers located in the major agroecological zones (hillsides, savannas and forest margins) in both Africa and Latin America.

Moving from plot to landscape scale

Strategic and component research to date have been conducted largely at the plot or field scale, where interactions among various agricultural enterprises are seldom considered. Although TSBF-CIAT's strength remains at the plot level, the diversity of forces impinging on the plot naturally draws attention towards a hierarchical systems-based approach.

The next generation of work will be at wider scales, particularly the farm and landscape scales. The rationale for working at the farm scale is the need to improve nutrient use efficiency through better allocation of the limited organic and inorganic resources among different enterprises, taking into consideration inherent soil variability within the farming system. Inadequacies in supplies of both organic and inorganic nutrients have created strong fertility gradients even within the smallest farms.

Smallholder farmers typically remove harvest products and crop residues from their food producing 'outfields' and devote their scarce soil inputs to their smaller market 'infields', resulting in large differences in soil productivity over

time between these two field types. Understanding how to manage the limited nutrient supplies across such fertility gradients is a key component in raising productivity in staple crops' fields.

Environmental services, particularly hydrological response and soil erosion control, can be managed effectively only at larger landscape scales. Research at the watershed scale is just beginning in the region, and given that projections indicate that eastern and southern Africa will be critically short of water in the coming decades, extending TSBF-CIAT's research agenda into those regions is warranted. The new proposals submitted to the Water and Food Challenge Program for the Nile and Limpopo basins offer the opportunity to address constraints related to water and its interaction with soil fertility and other environmental challenges.

Belowground diversity research

TSBF-CIAT will continue research on belowground biodiversity as a means of beneficially managing soil biology. Integrated management of soil pests, diseases and nematodes will be of particular importance in ISFM practices. Belowground diversity research also complements the work on breeding of cereals and legumes tolerant to soil stresses, particularly drought and low soil fertility.

Decision tools as important components in research

Decision tools for improved soil, nutrient and water management are being

developed and disseminated for testing by researchers. Links are sought with other research institutions such as the Wageningen University, using the framework of NUANCES (nutrient use in animal and cropping systems – efficiency and scales). Other more established models and decision support systems that are being used in TSBF-CIAT research include NUTMON, QUEFT, APSIM, CENTURY and DSSAT.

ISFM agenda to include farm-level social dynamics

The key contribution of social science to ISFM often appears limited to identifying and understanding the social factors that limit ‘adoption’ or ‘appropriateness’ of given technologies. Other sociocultural phenomena such as ‘policy’ might be acknowledged as important to the fate of different innovations, but most teams, even multidisciplinary ones, lack the capacity to develop relevant policy-related questions, experiments or interventions.

The process of developing the TSBF-CIAT research agenda, which looked beyond the soil to the people, is described in the paper ‘Finding common ground for social and natural science in an interdisciplinary research organization – the TSBF experience’. The social science research agenda has moved from descriptive characterization of farming systems to more strategic study of social differentiation, power and networks as they relate to soil fertility management innovation. Interest in scaling up has broadened into investigation of social dynamics, farmer knowledge and farm-level decision making. The core activities relating to social science will retain an

anthropological focus, including research on indigenous soil ecological knowledge, farmer decision making, understanding innovation processes, and the role of social differentiation in ISFM practices.

Fertilizer research for practical land-management strategies

TSBF-CIAT is consistently asked about its policy on promotion and use of mineral fertilizers. From our perspective, mineral fertilizers are absolutely necessary but not completely sufficient for productive and sustainable management of tropical soils. Long-term trials show that nutrient use efficiency declines over time where mineral fertilizers are applied without organic inputs. The soil management strategy depends on getting both appropriate types of fertilizer and appropriate means of managing organic resources in the farming system, and as such on reducing the costs of both information and fertilizer. TSBF-CIAT has produced enough results supporting this strategy but will continue to research this topic, with emphasis on translating existing scientific knowledge into practical land-management strategies.

Developing fertilizer markets in Africa is a huge challenge, as it must operate within a heterogeneous smallholder setting. In the smallholder farm economy that dominates Africa, the costs of both information and inputs are too high. Reconciling this situation requires improved organizational efficiency at three levels: service delivery, fertilizer marketing and farmers’ collective action and organization. This work is done primarily in collaboration with the International Fertilizer Development

Corporation and through grants provided by the Rockefeller Foundation to study mineral fertilizer marketing, and policy. Our contribution is intended for quantifying the use efficiency of mineral fertilizer (even when applied at the high rates), and designing and evaluating the effects of different management options and technologies on improved nutrient use efficiency and recycling.

Crosscutting research themes between Latin America and Africa

In the short term, our Latin American and African regions will adopt a

collaborative approach to activities associated with 1) cross-method analysis of organic resource characterization, 2) application of TSBF-CIAT approaches at the landscape level, 3) dual-purpose live barriers, 4) CIAT germplasm in Africa (to be integrated with IPSFM), 5) arable layer concept dissemination through the African Tillage Network, and 6) student exchange. These activities are at different stages of progress and it is clear that we need funds set aside to support such initiatives to completion.

Network and regional highlights

TSBF-CIAT research is implemented mainly through collaboration with national scientists working in networks. The African Network for Soil Biology and Fertility (AfNet) now has about 200 members from universities and national agricultural research systems (NARS) in over 15 countries. The AfNet coordinator is based at TSBF-CIAT in Nairobi and has a major responsibility to work with network members to raise funds for research and capacity building. A smaller network in India, the South Asia Regional Network (SARNet), is coordinated from the Jawaharlal Nehru University in Delhi.

The MIS (Manejo Integral de Suelos) consortium operating in Central America is very active in Nicaragua and Honduras. Details on other networks such as the GEF/UNEP Below-Ground Biodiversity Project (BGBD) and its network in Uganda, Kenya, Cote d'Ivoire, India, Indonesia, Brazil and Mexico will feature in the next issue of this newsletter. TSBF-CIAT staff also participate in a number of systemwide and ecoregional programmes such as the Alternatives to Slash-and-Burn Programme (ASB), the African Highlands Initiative (AHI) and the Desert Margins Programme.

AfNet structure and focus to match network growth and regional needs

The steady growth of AfNet has made it necessary to form strategic country and regional multidisciplinary teams. These teams will develop models linking research on ISFM, agricultural production and markets in the three regions in Africa covered by the Association for Strengthening Agricultural Research and Training in East and Central Africa (ASARECA), the Conseil Ouest Africain pour la Recherche et le Developpement Agricole (CORAF) and the Southern Africa Centre for Agricultural Research and Training (SACCAR), and prepare the research and development agenda for the sub-Saharan challenge programme. AfNet will start with potential existing teams and foster the formation of new teams in regions where they do not exist. One way to do this will be to invite to the next AfNet meeting teams led by key AfNet members.

Human capital development will continue to be an integral part of AfNet, whereby the research agenda is achieved through MSc and PhD research conducted at African public universities and elsewhere, followed by research support for recent graduates on return to their home institutions. An innovative initiative between TSBF-CIAT and the International Foundation for Science (IFS) has helped young and bright MSc and PhD graduates throughout sub-Saharan Africa to develop project proposals for IFS funding along TSBF-CIAT's major research and development themes. AfNet is involved in ensuring

that such scientists are not alienated in isolated research settings due to lack of peer support, resources or recognition. This scheme also increases the research and development capacity of national systems and fosters complementary rather than redundant research.

Short-term specialized training on subjects such as NUTMON, resource flow maps and participatory approaches in ISFM is organized through AfNet on demand by members. TSBF-CIAT is assisting in soil science curriculum reform as part of a broader curriculum reform process under way in universities in eastern and southern Africa through the Rockefeller Foundation's Forum on Agricultural Resource Husbandry, which is designed to strengthen MSc training.

The role of social science in AfNet remains contentious, acknowledged as important but not backed by resources or strong champions within the network. As a result TSBF-CIAT is still perceived amongst partners as essentially a biology-based organization with minimal social science input. To counter this misconception, active recruitment of social scientists has begun through networking and proposal development.

African and Central American teams share experience

For the first time since the TSBF-CIAT merger in December 2001, this year our Latin American team shared experiences with some of their African counterparts during a trip to our field sites in Central America. This visit was an important step in our efforts to develop a common research agenda, and provided an

appropriate opportunity for discussion on key aspects of our new strategic approach. It included participation in the annual Manejo Integral de Suelos (MIS) meeting. This meeting gathers our key Central American collaborators from Honduras, Nicaragua and Guatemala.

The team visited the hillside areas in the Lempira department, Honduras, where we are conducting collaborative studies with the Food and Agriculture Organization of the United Nations (FAO) on the indigenous Quesungual slash-and-mulch system. This system provides an alternative to slash-and-burn land management, it incorporates annual crops (maize, sorghum and beans) and pastures in an

arrangement that manages natural plant regeneration and provides permanent soil cover. Besides its substantial contribution to food security, this indigenous system has shown considerable resilience to extreme water deficits and to excess water during natural catastrophes. Farmers practising Quesungual farming reported lower soil, water and crop losses from the El Niño drought event in 1997 and Hurricane Mitch in 1998. This slash-and-mulch system appears to not only conserve water but also improve its quality for downstream users. It has great potential for adoption by resource-poor farmers in similar hillside areas of Latin America, Africa and Asia.

AfNet steering committee meeting

On 15 December 2002, nine scientists in the AfNet steering committee came together in Naivasha, Kenya, to deliberate on issues pertaining to AfNet's progress, achievements and the way forward. Specifically the discussion focused on 2002 activities in different agroecological zones of Africa (figure 3), fund raising strategies, the training course on participatory research and scaling up and out, the ninth AfNet meeting, and geographical representation in the scientific committee.

The AfNet coordinator, Dr Andre Bationo, presented to the scientific committee the highlights of research, information and training activities in

2002. The coordinator indicated that more than 30 proposals had been developed by AfNet members and submitted to various donors.

Network trials

Outstanding results were reported from the past year's research in southern, eastern and western African regions. These trials addressed:

- Long-term soil fertility management
- Optimum management of low quality organic resources
- Optimum nitrogen and phosphorus management in legume-cereal rotations
- Optimum combination of organic and inorganic nutrient sources

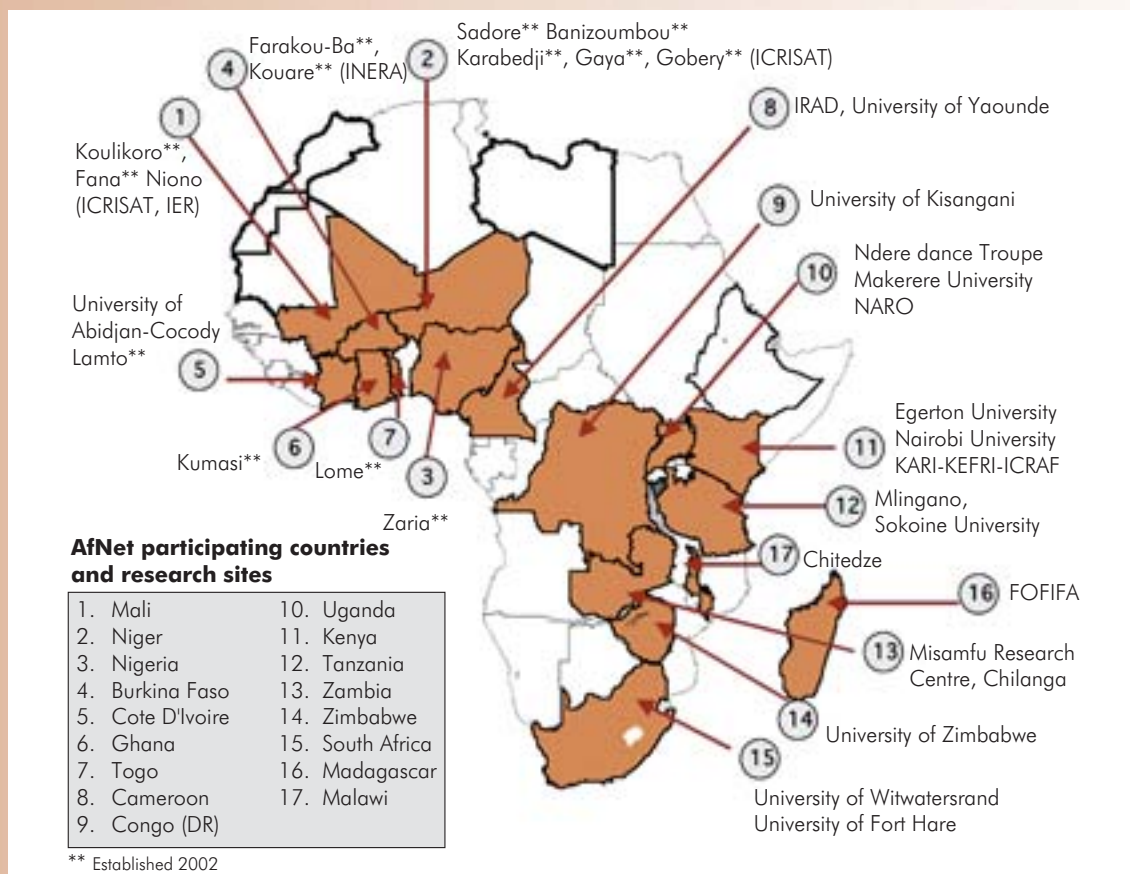


Figure 3. AfNet's participating countries and research sites.

- Scaling up and out of soil fertility-restoration technologies
- Improving manure management
- Farmer empowerment to combat land degradation
- Belowground biodiversity
- Conservation tillage
- Biological nitrogen fixation
- Use of phosphate rock as a capital investment to replenish soil fertility

Future activities

As coordinator of AfNet since the end of 2000, Dr Bationo's main goal has been to see the restructuring of the network to act as a cornerstone of soil research in Africa, and its strengthening to pursue its role in process research in soil biology and fertility. For the last few months, the AfNet coordination unit has invested

much time in developing proposals and selling them to donors.

All members of the committee appreciated the excellent work the AfNet coordinator has done in the short period he has been in office.

Working in partnerships to solve problems

MIS and CRSP-USAID Consortia join efforts to test and improve capability of the NUMaSS expert system for soils of Central America

The MIS consortium is working in collaboration with the CRSP-USAID

consortium on the validation of the Nutrient Management Support System (NuMaSS) software. This system allows users to make recommendations on nitrogen, phosphorus and lime fertilizer based on soil and crop type, previous management and fertilizer availability. The system also includes a module for economic evaluation of recommended rates based on the source fertilizer (organic and inorganic) and expected crop yields.

During the initial visit to MIS on 3–11 August 2002, Alfredo Alvarado (University Costa Rica), and Deanna Osmond and Jot Smith (North Carolina State University) conducted a the-day training workshop on the NuMaSS software and visited two of the reference sites of the consortium in Honduras and Nicaragua. Representatives of 11 institutions participated in the workshop.

The workshop identified three major areas that needed modification to improve the recommendations the software makes –

- Incorporation of regional data into the NuMaSS database – this includes the extensive soil pedon database of CIAT, regional legume cover crop coefficients and images of nutrient deficiencies
- Correlation of soil/plant analytical methods and results among



Dr Jot Smith introduces the NuMaSS expert system to MIS participants in a workshop in August 2002.

laboratories – there are eight laboratories distributed among MIS member institutions in Honduras, Nicaragua and Guatemala. This group will survey and compile information among laboratories relating to analytical methods, services provided and diagnostic and predictive criteria used for nutrient recommendations based on soil tests and plant analyses

- Field testing and validation of NuMaSS, and comparing existing field trial data with software predictions.

Alfredo Alvarado, Miguel Ayarza and Marco Trejo are organizing a workshop with MIS partners working on soil–plant analysis, to develop soil–plant correlation coefficients that will be introduced into the software to improve its phosphorus recommendations.

New projects

Participatory approaches to research and scaling up: an African Soil Biology and Fertility Network (AfNet) training workshop

(coordinator: André Bationo)

Objectives

- To sensitize and familiarize AfNet scientists with the concepts and practice of farmer participatory research (FPR) and scaling up
- To build capacity through providing knowledge and enhancing skill levels of the network's scientists in FPR approaches
- To build and support teams at the benchmark sites in West Africa and East and Central Africa, to improve soil management, food production and incomes of poor farmers by bringing together the many elements at the level of farmers as decision makers

Target area

Sub-Saharan Africa

Collaborators

All AfNet members, CIAT Rural Innovations Institute

Donor

Technical Centre for Agricultural and Rural Cooperation (CTA)

Contributing to human welfare and environmental conservation through integrated soil fertility management

(coordinator: André Bationo)

Objectives

- To expose network members to external views through presentation by invited keynote speakers of papers on the specific themes of the symposium
- To promote interaction and synergy among AfNet members and to update them on research development in the African continent
- To develop a strategic plan for collaborative research within Africa for the next three years
- To review capacity building, information and documentation aspects
- To develop a strategy for improving information and communication management capacity within AfNet

Target area

Sub-Saharan Africa

Collaborators

All AfNet members

Donor

Technical Centre for Agricultural and Rural Cooperation (CTA)

Increasing efficiency of legume cover crops' (LCCs) use in selected benchmark sites of Africa

(coordinator: **André Bationo**)

Objectives

The general objective of the network study is to foster strategic research on issues that increase efficiency of legume cover crops for enhancing and sustaining soil fertility, and hence crop yields, in smallholder farms in sub-Saharan Africa. The derived specific objectives are:

- To review and document current information on the use of LCCs for soil fertility improvement in the eastern Africa region
- To determine the contribution of above- and belowground biomass from LCCs to the subsequent food crops
- To determine the relationship between the source and the quantity of nitrogen from cover crops and its recovery in the subsequent crop
- To evaluate tradeoffs in gains and losses in food production, land availability, labour constraints and capital that may affect adoption of LCCs
- To develop a decision-support guide for dissemination of LCC technologies

Target area

Sub-Saharan Africa

Collaborators

Uganda, Ethiopia, Tanzania and Kenya

Donor

Organization of Petroleum Exporting Countries (OPEC)

Linking scientific research in Africa with the International Foundation for Science (IFS)

(coordinator: **André Bationo**)

Twenty-two research proposals developed by AfNet members were presented together to IFS for funding. The proposals centered on integrated soil fertility management, soil biota and socioeconomics.

Target area

Africa

Collaborators

AfNet members

Donor

IFS

Integrated soil fertility management strategies to enhance food security in the central highlands of Kenya (2003–2007)

(coordinator: **Bernard Vanlauwe**)

Objectives

- To enhance the knowledgebase required to fine-tune ISFM strategies to farmers' resource endowments and the prevailing socioeconomic and biophysical environment

- To improve food security for smallholder farmers in the central highlands of Kenya through implementation of ISFM strategies
- To enhance the scientific capacity of research partners to develop, test, adapt and implement ISFM strategies together with all stakeholders

Target area

Central Kenya highlands, specifically Meru South and Mbeere districts

Collaborators

Kenyatta University, Kenya (contact: Daniel Mugendi); Catholic University of Leuven, Belgium (contact: Roel Merckx)

Valuing within-farm soil fertility gradients to enhance agricultural production and environmental service functions in smallholder farms in East Africa (2003–2005)

(coordinator: Bernard Vanlauwe)

Objectives

- To quantify the range of within-farm soil fertility gradients and identify the major biophysical and socioeconomic factors driving their generation
- To develop a common framework among farmers, extension workers and soil fertility specialists for evaluating soil fertility status,

appreciating within-farm soil fertility gradients, and including these in ISFM practices

- To assess the impact of existing within-farm soil fertility gradients on the most relevant soil processes governing ISFM practices and ecosystem services, and evaluate their economic impact on the returns to resources applied and labour invested for specific cropping systems and targeted ISFM practices
- To determine the optimum allocation of resources (mineral inputs, organic resources, labour) in terms of use efficiency, productivity and profitability, through targeting plots and niches at the farm scale and by scenario and trade-off analyses
- To fine-tune decision aids for organic and mineral input management with site-specific information related to the governing of processes underlying ISFM practices, based upon appreciation of local soil quality indicators
- To build the required capacity of all relevant stakeholders to include site-specific information in recommendations regarding ISFM practices

Target area

Western Kenya, eastern Uganda

Collaborators

National Agricultural Research Organisation, Kampala, Uganda (contact: Crammer Kaizzi); Kenya Agricultural Research Institute, Nairobi, Kenya (contact: Anne Muriuki); World Agroforestry Centre, Nairobi, Kenya (contact: Louis Verchot)

Integrated pest and soil management to combat striga, stem borers and declining soil fertility in the Lake Victoria basin (2002–2005)

(coordinator: Bernard Vanlauwe)

Objectives

- To provide better understanding of the relative contribution of the target pests and low soil fertility to the observed maize yield gap, and of farmers' indigenous coping strategies to overcome these constraints in the target areas, as affected by the biophysical and socioeconomic environments
- To identify, develop and adapt best-bet integrated pest and soil fertility management (IPSFM) strategies for suppression of striga and stem borers, and for improved soil fertility management — including 'push-pull', herbicide-resistant and stress-resistant maize — and test them in farmer-participatory trials, taking into account the overall biophysical and socioeconomic factors driving farmers' decision-making processes
- To identify institutional channels and define the conducive policy environment for the dissemination phase of best-bet IPSFM strategies
- To help build of capacity of farmers, research and extension systems, and other stakeholders to conduct biological, ecological and socioeconomic research on integrated management of striga, stem borers and soil fertility
- To put in place a monitoring and

evaluation system to evaluate the new technologies and options at every stage, analyse their adoption and estimate their impact

Target area

Zone around Lake Victoria — eastern Uganda, western Kenya, northern Tanzania

Collaborators

International Centre of Insect Physiology and Ecology, Mbita Point, Kenya (contact: Zeyaur Khan); International Centre for the Improvement of Maize and Wheat, Nairobi, Kenya (contact: Hugo De Groote); Kenya Agricultural Research Institute, Kibos, (contact: George Odhiambo); National Agricultural Research Organisation, Namulonge, Uganda (contact: Joseph Kikafunda); Lake Zone Agricultural Research and Development Institute, Ukiriguru, Tanzania (contact: Ignath Rwiza); Rothamsted Experimental Station, Harpenden, UK (contact: Lester Wadhams)

Extension to LWR2/1999/03, integrated nutrient management in tropical cropping systems: improved capabilities in modelling and recommendations (2003–2005)

(coordinator: Rob Delve)

Objectives

- Further testing of the nitrogen and phosphorus capabilities of the APSIM

manure and soil phosphorus modules against existing datasets, in Latin America and Southeast Asia

- As part of the testing activities, researchers from Latin America and Southeast Asia would be exposed to the use of the APSIM model and how it might be applied in their research activities and in extending the results from their research to the farming community. Training for the partners in the use of APSIM would be a component of this activity
- Refine and publish the data collection protocols for manure characterization so future researchers collect relevant data for use with the manure module. Also update the minimum dataset protocols for APSIM

Target area

Southeast Asia, Africa, Latin America

Collaborators

Commonwealth Scientific and Industrial Research Organization (CSIRO)/APSRU (contact: Merv Probert); CIAT-Latin America (contact: Idupulapati Rao); ICRISAT (contact: John Dimes); National Institute for Soils and Fertilizers (contact: Nguyen Cong Vinh); Center for Soils and Agroclimate Research (contact: Djoko Santoso and Putu Wigena); NARS in Asia, Africa and Latin America

Integrated Soil Productivity Initiative through Research and Education (INSPIRE). Phase two: scaling up and out INSPIRE (2003–2005)

(coordinator: Rob Delve)

Objectives

- To enhance capacity of INSPIRE consortium members to coordinate and implement sustainable soil fertility management activities
- To develop capacity of farmers to experiment, innovate and identify new technologies and information sources for addressing food security and market opportunities
- To develop a strategy for coordinating information exchange and partnership within eastern Uganda and with the western Kenya consortium
- To empower policy makers at the local district level with decision-support tools for integrated soil fertility management

Location

Tororo, Busia, Pallisa and Mbale districts, eastern Uganda

Collaborators

World Agroforestry Centre; Africa2000 Network; AT Uganda Ltd.; Faculty of Agriculture, Makerere University; Kawanda Agricultural Research Institute (KARI), a part of the National Agricultural Research Organisation (NARO); district farmers' association and district departments of agriculture in Tororo, Busia, Mbale and Pallisa

New initiatives

Promiscuous soybeans

In the effort to garner policy maker support for soybean promotion in Kenya, we welcomed on 4 July 2003 Dr B. Khalwale, a member of Kenya's parliament, to our soybean experimental and developmental fields in Vihiga District, western Kenya. Dr Khalwale saw firsthand the contribution that soybeans could make in the lives of farmers not only in Vihiga but also in the rest of the country. He promised to support our work on this project by convincing his colleagues in parliament and the government of the importance of this crop and the potential benefits to Kenyans from its promotion.

Soybean activities to cover all Kenya

About 80%, or 65,000 metric tonnes, of Kenya's annual soybean requirement is imported. The major sectors utilizing soybeans are food aid, livestock feed and human health. Soybean production in Kenya is typically associated with large-scale farming, which is closely linked with large-scale processing and packaging of the products, since the traditional soybean varieties require capital-intensive inoculation and fertilizer inputs. Also these varieties do little to enhance soil fertility.

Since soybean is not a traditional crop in most of the small-scale cropping systems in Kenya, it will be essential to

foster the demand for its grains while attempting to enlarge the area grown with multipurpose varieties. Two routes have proved successful in fostering such demand: building the local processing capacity for the grains and linking producers with soybean processors.

TSBF-CIAT – through AfNet and in close association with Kenyatta University (KU), the Kenya Agricultural Research Institute (KARI), and the Ministry of Agriculture (MoA) – is starting a large project covering the whole of Kenya that intends to improve the livelihoods of small-scale farmers by increasing the area cropped with multipurpose soybeans. The ultimate goals are improvement of human health, especially of children, generation of cash income and improvement of the soil fertility. Activities in potential niches for enhancing the production of soybean will be implemented through the focal area approach established by KARI and MOA. A steering committee comprising representatives of KARI, MoA, KU, TSBF-CIAT, the private sector, meso-level policy makers, NGOs and farmer organizations will oversee the research and development activities.

Soil fertility management for banana production

'Exploration of integrated soil fertility management for banana production and marketing in Uganda and Kenya: arbuscular mycorrhizal fungi help

establishment and production of tissue culture banana' is a project designed to explore and support two initiatives being proposed to the Rockefeller Foundation for funding. The National Banana Research Programme of the National Agricultural Research Organisation (NARO) is proposing a initiative on 'the improvement of banana marketing and utilization in Uganda', while the Harvest Biotechnology Foundation and International and Techno Serve Inc. are proposing the initiative 'developing a propoor tissue culture banana industry in Kenya'. In intensifying banana farming systems, TSBF-CIAT and its partners in the two initiatives intend to focus on the interaction between marketable banana germplasm (either fruit or tissue culture banana) and more efficient soil fertility management practices.

Underlying this project are the hypotheses 1) that the establishment and survival of banana from tissue culture both depend on its effective symbiosis endophytes such as arbuscular mycorrhiza fungi (AMF) that colonize roots and mediate the availability of nutrients (phosphorus, potassium and calcium) at early stages of plant growth, and 2) that the quality and quantity of marketable fruits are both directly related to phosphorus and calcium, which are important factors for banana storage and quality depreciation.

The project has two objectives:

- To improve the quality and quantity of marketable banana products by developing and disseminating low-cost ISFM practices to support the intensification and commercialization of sustainable production systems
 - To increase the establishment and production of tissue culture banana on low fertility soils by exploring better utilization of AMF
- Five outputs are expected from this project:
- Characterization of the banana farming systems areas in the two marketing research proposals, and diagnosis of the causes of low productivity, inadequate profitability and environmental decline
 - Generation of new knowledge on ISFM practices, enhancing the production and quality of bananas
 - Enhancement of the growth of banana plants established through tissue culture tools for improved performance in poor soils by exploiting the growth-enhancement potential of AMF
 - Enhancement of the capacity of farmers to use ISFM technologies to produce marketable, high quality banana fruits and plantlets
 - Development of a full proposal to explore the potential for further soil biota-based interventions to improve soil fertility management of and foster links to other banana production and marketing projects
- Diversification of AMF will come with the introduction of dual-purpose grain legumes such as cowpea and promiscuous soybean that are highly dependent on AMF. Such diversification and/or legume associations will not only help build up a diverse population of AMF necessary for establishment and production of banana tissue culture material but also increase nutrition and income of smallholder farmers.

Training and workshops

Resource flow mapping training workshop, Nairobi, 13–19 April 2003

Resource flow mapping (RFM) was used as a tool to better understand farming systems and identify opportunities for improved soil management interventions in the framework of a project on ‘combating nutrient depletion’ (CND), funded by the Ministry of Foreign Affairs of Norway and implemented in Ethiopia, and a project on ‘improving integrated nutrient management practices on small-scale farms in Africa’, funded by BMZ, Germany, and implemented in five countries in East and West Africa. The training workshop was organized in the context of these projects with the specific objectives of

- Entering the data obtained during various RFM drawing exercises, using a common software tool, in this case the NUTMON toolbox
- Confronting the various approaches used to generate farmer typologies
- Reflecting on the approaches used to draw resource flow maps
- Evaluating the potential roles of a RFM exercise in soil fertility research and development activities
- Studying the approaches for combining understanding of social

and economic features of the farming enterprises with production and nutrient information

Seventeen people attended the workshop, representing the two projects, many of our sites and AfNet. The NUANCES framework, which aims at optimizing resource use at the farm level, linked well with the objectives of this workshop.

The workshop started with presentations from the sites on how resource flow maps had been drawn and the progress in analysing them. The sites represented were Ginchi, Mekelle, Areka and Alemaya in Ethiopia; Zouzouvou in Benin Republic; Sokode in Togo; Iganga in Uganda; and Vihiga in Kenya. The ‘real’ work started after the presentations, and focused on 1) introduction to NUTMON, 2) demonstration of the toolbox software, 3) conceptualization of farming systems, 4) data-entry inventory, 5) writing out of flows, 6) inventory and editing of background data, 7) data-entry monitoring, and 8) individual presentations on progress made on data entry and analysis.

The second session started with an introduction to the NUANCES conceptual framework by Ken Giller, and a resource allocation interactive exercise led by Ed Rowe. After a thought-provoking presentation by Joshua Ramisch on determination of farm typologies, working groups addressed

issues on farm typologies, targeting technologies to niches within a farm, and the use of RFM and NUTMON in future activities.

Paulos Dubale stressed that all work on the CND sites would be finalized before the end of 2003, and Isaac Ekise, who works with TSBF-CIAT in western Kenya, was identified as a target person to support data entry and analysis for the BMZ sites.

It was recommended that it was opportune to develop a document focusing on appropriate tools to identify farmer typologies and wealth ranking, to be led by TSBF-CIAT.

The workshop concluded with the drawing up of an action plan and individual evaluations. More than 90% of the participants rated the workshop as very good to excellent in terms of technical and logistic aspects. Nearly all participants acknowledged that their participation in the workshop would help them in their future research activities.

For more information contact Bernard Vanlauwe (b.vanlauwe@cgiar.org)

Nutrient monitoring

‘Monitoring nutrient flows and evaluating farm economic performance in tropical farming systems (NUTMON): an AfNet training workshop’ held in Nairobi, Kenya (14–25 April 2003)

AfNet scientists from Burkina Faso, Senegal, Mali, Ghana, Nigeria and Kenya attended the two-week workshop in Nairobi to learn about the nutrient monitoring methodology developed by Wageningen University and Research Center in the Netherlands. The workshop

goal was to develop the capacity of AfNet scientists to use on-farm nutrient monitoring methodologies as the basis for determining farm nutrient budgets and balances. The specific objectives were:

- To sensitize and familiarize AfNet scientists with the concepts and practice of nutrient monitoring
- To enhance the capacity of AfNet scientists to carry out on-farm participatory research with farmers on nutrient flows and monitoring, farm-level observations, nutrient data entry and nutrient data interpretation as the basis for determining the nutrient management options available to the farmer
- To strengthen on-farm research orientation among AfNet scientists, using NUTMON as a tool for aiding understanding of farmers’ production environment in order to increase farm productivity and rural food production

The major areas covered in the workshop were

- Nutrient flow concepts
- Farm-level (micro-level) nutrient flows
- Farm schematization
- Biophysical and socioeconomic farm inventory
- Farm inventory and monitoring scheme
- Data collection in a selected sample of farms
- Digital data entry of farm inventory, nutrient flows, and data manipulation, processing, debugging and interpretation
- Resource flow mapping in NUANCES and the role of soil fertility status and maximization of yields

- Definition and determination of farmer typologies
- Economic terminologies and their relevance in farming systems and nutrient monitoring studies

Training in Latin America

For more information on these activities, contact by Edgar Amézquita (e.amezquita@cgiar.org)



Participants at the AfNet NUTMON training workshop.

Concepts about soil erosion and soil conservation in hillside areas, held at ESNACIFOR, Siguatepeque, Honduras (14–15 July 2003)

Soil erosion and conservation practices based on the slope x fertility approach, held at the Universidad Nacional Agraria, Managua, Nicaragua (17–18 July 2003)

Recent publications

Soil fertility management in Africa: a regional perspective (2003), edited by M.P. Gichuru, A. Bationo, M.A. Bekunda, H.C. Goma, P.L. Mafongoya, D.N. Mugendi, H.M. Murwira, S.M. Nandwa, P. Nyathi and M.J. Swift. Nairobi: Academy Science Publishers in Association with TSBF-CIAT.

This book is written and edited by African members of AfNet and focuses on the integrated approach to soil fertility management, combining biological, physical and socioeconomic scientific

research with farmers' needs and opportunities. It presents agroecological reviews, where the focus is application of lessons from the integrated analysis to the particular problems of the agroecological zones.



Managing nutrient cycles to sustain soil fertility in Africa (2003), edited by A. Bationo. Nairobi: TSBF-CIAT.

This book presents the outcome of the eighth meeting of the African Network for Soil Biology and Fertility, held in Arusha, Tanzania in 2001. The main themes covered are integrated soil fertility management, soil biota and socioeconomic issues as they relate to soil fertility improvement.

New publications from Latin America

Barrios E. and Trejo M.T. (2003) Implications of local soil knowledge for integrated soil management in Latin America. *Geoderma* 111: 217–231.

Cobo J.G., Barrios E., Kass D.C.L., Thomas R.J. (2002) Decomposition and nutrient release by green manures in a

tropical hillside agroecosystem. *Plant and Soil* 240: 331–342.

Cobo J.G., Barrios E., Kass D.C.L., Thomas R.J. (2002) Nitrogen mineralization and crop uptake from surface-applied leaves of green manure species on a tropical volcanic-ash soil. *Biology and Fertility of Soils* 36: 87–92.

Decaens T., Asakawa N., Galvis J.H., Thomas R.J., Amézquita E. (2002) Surface activity of soil ecosystem engineers and soil structure in contrasted land use systems of Colombia. *European Journal of Soil Biology* 38:267–271.

Phiri S., Rao I.M., Barrios E., Singh B.R. (2003) Plant growth, mycorrhizal association, nutrient uptake and phosphorus dynamics in a volcanic-ash soil in Colombia as affected by the establishment of *Tithonia diversifolia*. *Journal of Sustainable Agriculture* 21(3): 43–61.

Staff movements at TSBF-CIAT

Farewell, Professor Mike Swift

After many years of service with TSBF-CIAT, Professor Mike Swift has decided to move on to new challenges. It is with sincere gratitude that I, on behalf of the TSBF-CIAT family, thank him for his dedicated service to the Institute.

Mike, as we popularly referred to him, served TSBF as a founding member, board



member, scientist and finally director. During 1988–2001, I was privileged to work for TSBF as a collaborator and the national coordinator of AfNET, liaison officer, a board member, board vice chair and board chair. These roles brought me into close association with Mike and enabled me to evaluate his contribution.

Mike, together with Jo Anderson, Bill Heal and Pedro Sanchez, played a catalytic role in the early 1980s in getting soil biology on the global agenda. This led to the establishment of TSBF in 1984 under the patronage of the Man and Biosphere Programme of UNESCO and the Decade of the Tropics initiative of the International Union of Biological Sciences. In later years, together with John Ingram, he oversaw TSBF as it spread and gave birth to AfNet and the South Asia Regional Network (SARNet). In the 1990s, TSBF made major advances and significant contributions to science under Mike's leadership, assisted by Cheryl Palm and the team of scientists. His relentless efforts — thanks to his diplomacy and patience — kept TSBF funded. He is known as an inspiring and innovative person. He worked very hard, at times under very trying conditions that were faced with a 'stiff upper lip' and sometimes with humour.

It is laudable that Mike stayed for years working in Africa, where he believed he could make a difference. TSBF's focus on eastern and southern Africa during Mike's directorship is a clear manifestation of his outstanding commitment to this vision. He has been instrumental in career development and professorial growth of many scientists and academicians on the African continent and beyond.

Mike led TSBF through major changes and finally into the Consultative Group

on International Agricultural Research system. In the last few years, it was strategically important for TSBF to enter into an alliance with another institution to ensure financial security and sustainability. He spearheaded the process that culminated in the merger between TSBF and CIAT.

Mike was committed to the principle that the fertility of tropical soils is controlled by biological processes and can be managed by the manipulation of these processes. In this regard, it would be appropriate for TSBF-CIAT to consider giving him a farewell present that befits his dedication to the promotion of sustainable biological management of soils. This can be by way of establishing a Mike Swift scholarship fund to benefit students of biological management of tropical soils.

We all wish Professor Mike Swift happy retirement and success in all his future endeavours.

*Professor Mary J.N. Okwakol
Makerere University*

Welcome to the new TSBF-CIAT director, Dr Nteranya Sanginga

I am delighted to announce the appointment of Dr Nteranya Sanginga as the new TSBF-CIAT director, although this is probably 'old news' for most of you.

Dr Sanginga, who is well known in the 'soil biology' research community in the tropics, did his PhD on nitrogen fixation by trees and their contribution to soil nitrogen using ¹⁵N techniques. Soon afterwards he worked at the University of Zimbabwe as a postdoctoral fellow together with Mike



Swift in the early days of the evolution of TSBF. After this he joined the International Atomic Energy Agency in Vienna and conducted research on nitrogen fixation in tropical agroforestry legumes, from where he joined the International Institute for Tropical Agriculture (IITA) in 1989. At IITA, which he left this January to join TSBF-CIAT, Dr Sanginga rose through the ranks to become a key person in soils research both at IITA and in broader Africa. He has been very active in the African Association of Biological Nitrogen Fixation (AABNF).

Dr Sanginga's research skills and expertise are broad, covering soil microbiology (particularly rhizobia), agronomy, breeding, agroforestry, farming systems — the list is long, as is his publication list!

He clearly came through as the preferred candidate during the selection and interview process, not only for his scientific understanding and vision for TSBF-CIAT but also for his charming and persuasive personality and his excellent leadership skills.

Since Dr Sanginga started with TSBF-CIAT in January, he has been very active, travelling extensively and establishing important links with donors in Europe and North America. He has also devoted considerable time to strengthen the links with the TSBF-CIAT researchers at CIAT headquarters in Colombia and more widely with their outreach programmes in Latin America. The development of the new challenge programme for Africa has also been high on his agenda.

Under his inspiring leadership, and with a growing team of researchers in the core team, I am sure that all is set for a bright future for TSBF-CIAT, to build on the foundations laid under Mike and to see the activities yield further impact on the difficult problems in soil fertility management.

*Ken Giller
Professor, Plant Production Systems,
Department of Plant Sciences
Wageningen University, Netherlands*

Welcome to Jeroen Huising, coordinator of the GEF/UNEP Below-Ground Biodiversity Project

TSBF-CIAT is pleased to introduce Dr Jeroen Huising who joined us in February as coordinator and global leader of the GEF/UNEP Below-Ground Biodiversity Project (BGBD). This project has the objective of enhancing awareness, knowledge and understanding of belowground biological diversity important for sustainable agricultural production in tropical landscapes by



demonstrating methods for conservation and sustainable management. The project also explores the hypothesis that, by appropriate management of above- and belowground biota, optimal conservation of biodiversity for national and global benefits can be achieved in mosaics of land uses at differing intensities of management, and result in simultaneous gains in sustainable agricultural production.

Jeroen obtained his MSc at Wageningen Agricultural University in 1984, specializing in tropical soil science, development economics and project appraisal. He did his PhD research at the Department of Surveying, Photogrammetry and Remote Sensing and the Department of Soil Science and Geology on secondment to the CATIE/WAU programme, Turrialba, Costa Rica, finishing in 1993. Jeroen has also taken other training in project management, planning and evaluation. His last appointment was with the International Institute of Geo-Information Science and

Earth Observation of the Dutch Government Ministry of Foreign Affairs, where he was mainly involved with object-based image interpretation, hyper-spectral remote sensing and developments in environmental modelling. Before this he held various positions in international organizations and academic institutions including as a senior lecturer and head of remote sensing and GIS lab at Makerere University.

He speaks English, German, Spanish, French and, of course, Dutch. Jeroen is married to Wilmer, and they are blessed with two children aged nine and six.



Job Kihara, who joined the AfNet coordination unit in April 2003, is assisting in the collection and analysis of data from field trials in West, East and southern Africa; in the use of decision-support systems, especially crop simulation models; and in supporting soil and plant analysis. Job has a bachelor's degree in environmental studies (planning and management) and a master's in environmental studies (agroforestry and rural development) both from Kenyatta University in Kenya.



Joseph Mutua Kimetu, who has been a student with TSBF-CIAT, has now joined the AfNet coordination unit as a research assistant. In addition to a bachelor of science degree in forestry from Moi University, Kenya, Joseph has a master's degree in environmental studies (agroforestry and rural development). He is assisting in preparing proposals and presenting them to donor agencies; searching literature for AfNet members and partners for book writing; developing a scientific literature database to be used by AfNet scientists and partners; organizing workshops and training; preparing the TSBF-CIAT newsletter, *The Communitator*; and preparing the AfNet brochure.

Caren Akech joined TSBF-CIAT in April 2003 to take up a secretarial position. She has a bachelor of arts degree from the University of Nairobi. She previously worked as an administrative assistant with various firms in Nairobi. Caren offers both secretarial and administrative support services within TSBF-CIAT.





Laban Nyambega has recently joined us to work as a field technician in the 'within-farm soil fertility gradient project'. He comes to us from the World Agroforestry Centre. Laban has a certificate in agriculture from Bukura Agricultural College, Kenya.

ANNOUNCEMENTS

Coming soon

- Participatory Approaches to Research and Scaling Up: an African Soil Biology and Fertility Network (AfNet) training workshop, Arusha, Tanzania, 28 September–10 October 2003. For more information contact André Bationo (a.bationo@cgiar.org)
- International symposium on 'Contributing to Human Welfare and Environmental Conservation through Integrated Soil Fertility Management', date and venue to be communicated later. For more information contact Andre Bationo (a.bationo@cgiar.org)
- An international course on the 'Application of Molecular Techniques in Soil Biodiversity Studies', CIAT Headquarters, Cali, Colombia, 27 September–3 October 2003. For more information contact course organizer: Edmundo Barrios (e.barrios@cgiar.org).

