COVER NOTE

Project Title: "Conservation and Sustainable Management of Belowground Biodiversity" (Previous Title: Management of Agrobiodiversity for Sustainable Land Use and Global Environmental Benefits)
Date: September 5, 2000

	Work Program Inclusion per Project Review Criteria Draft 8	**Reference Paragraphs and Explanatory Notes:**
1. Country Ownership		
• Country Eligibility		
• Country Drivenness	Clear description of project's fit within: • National reports/communications to Conventions • National or sector development plans • Recommendations of appropriate regional intergovernmental meetings or agreements.	See paragraph 20-21, Annex H, Project Database Document, Section Three: National Policies
• Endorsement	• Endorsement by national operational focal point.	Annex D
2. Program & Policy Conformity		
• Program Designation & Conformity	Describe how project objectives are consistent with Operational Program objectives or operational criteria.	See paragraphs 16-18 and Annex L.
• Project Design	Describe: • sector issues, root causes, threats, barriers, etc, affecting global environment. • Project logical framework, including a consistent strategy, goals, objectives, outputs, inputs/activities, measurable performance indicators, risks and assumptions. • Detailed description of goals, objectives, outputs, and related assumptions, risks and performance indicators. • Brief description of proposed project activities, including an explanation how the activities would result in project outputs (in no more than 2 pages). [1]	▪ See Paragraphs 1-12 and Figure 1, page 2. ▪ See Annex B, paragraphs, 13-15, 36-43. ▪ See paragraphs 26-35, Annex B. ▪ See Annex B.

[1] A project/program could undertake detailed design (specification of project outputs) during the first phase of implementation, with clear benchmarks for approval of the subsequent phase. A project could also be an adaptable program loan with several phases, where achievement of the clear benchmarks at the end of each phase is a necessary condition for approval of the next phase. In such projects, describe in detail the project output for the first phase and describe briefly the project activities for that phase.

	Work Program Inclusion pe r Project Review Criteria Draft 8	Reference Paragraphs and Explanatory Notes:

	• Global environmental benefits of project.
	• Incremental Cost Estimation based on the project logical framework.
	  • Describe project outputs(and related activities and costs) that result in *global* environmental benefits
	  • Describe project outputs (and related activities and costs) that result in joint *global and national* environmental benefits.
	  • Describe project outputs (and related activities and costs) that result in *national* environmental benefits.
	  • Describe the process used to jointly estimate incremental cost with in-country project partner.
	  • Present the incremental cost estimate. If presented as a range, then a brief explanation of challenges and constraints and how these would be addressed by the time of CEO endorsement.
		▪ See Annex A.
		▪ See Annex A.
		• See Annex A.
		• See Annex A.
		• See Annex A.
		• See Annex A.

• Sustainability (including financial sustainability)	Describe proposed approach to address factors influencing sustainability, within and/or outside the project to deal with these factors.	▪ See paragraphs 36-43.
• Replicability	Describe the proposed approach to replication,(for e.g., dissemination of lessons, training workshops, information exchange, national and regional forum, etc) (could be within project description).	• See Outcome 1 paragraph 25 and Annex I, Outcome 2 paragraph 26-27, Outcome 3 paragraph 28, Outcome 4 paragraph 31,32 and Outcome 5 paragraphs 33-35.
• Stakeholder Involvement	• Describe how stakeholders have been involved in project development. • Describe the approach for stakeholder involvement in further project development and implementation.	• See Annex F and paragraphs 42-53. • See Annex F.

• Monitoring & Evaluation	• Describe how the project design has incorporated lessons from similar projects in the past.
	• Describe approach for project M&E system, based on the project logical framework, including the following elements:
	  • Specification of indicators for objectives and outputs, including intermediate benchmarks, and means of measurement.
	  • Outline organizational arrangement for implementing M&E.
		• See paragraphs 54-56.
		• See Annexes B and F and paragraphs 60-62.

	Work Program Inclusion pe r Project Review Criteria Draft 8	Reference Paragraphs and Explanatory Notes:
	• Indicative total cost of M&E (maybe reflected in total project cost).	
3. Financing		
• Financing Plan	• Estimate total project cost • Estimate contribution by financing partners. • Propose type of financing instrument	• See Brief Tables 1 and 2, and Annex A . • Cover page and Table 3
• Implementing Agency Fees	Propose IA fee	Standard Fee (US$ 382,000) plus premium of US$ 40,000 to cover added costs of supervision missions and monitoring and evaluation missions for a project that covers three continents, seven countries and 12 sites.
• Cost-effectiveness	• Estimate cost effectiveness, if feasible. • Describe alternate project approaches considered and discarded.	• Project has been in development for 5 years by the world's leading experts in soil biodiversity. During that time numerous project strategies and designs were considered. Eventual project design reflects a cost-effective and results oriented approach to conservation and sustainable management of agrobiodiversity. See also Annex A Section 5.
4. Institutional Coordination & Support		
<u>IA Coordination and Support</u> • Core commitments & Linkages	Describe how the proposed project is located within the IA's: • Country/regional/global/sector programs. • GEF activities with potential influence on the proposed project (design and implementation).	• See paragraph 54-55, Annex F and Annex J.
• Consultation, Coordination and Collaboration between IAs, and IAs and EAs, if appropriate.	• Describe how the proposed project relates to activities of other IAs (and 4 RDBs) in the country/region. • Describe planned/agreed coordination, collaboration between IAs in project implementation.	• See paragraph 54, Annex F and Annex J. • See paragraphs 54-56.

	Work Program Inclusion pe r Project Review Criteria Draft 8	Reference Paragraphs and Explanatory Notes:
5. Response to Reviews		
Council	Respond to Council Comments at pipeline entry.	NA
Convention Secretariat	Respond to comments from Convention Secretariats .	
GEF Secretariat	Respond to comments from GEFSEC on draft project brief.	See Annex J
Other IAs and 4 RDBs	Respond to comments from other IAs, 4RDBss on draft project brief.	See Annex J
STAP	Respond to comments by STAP at work program inclusion	NA
Review by expert from STAP Roster	Respond to review by expert from STAP roster.[2]	See Annex C 1

[2] STAP Roster Review, and IA response, is a required annex of the project brief.

PROJECT BRIEF

1. IDENTIFIERS:

PROJECT NUMBER:

PROJECT NAME: **Global: (Brazil, Côte d'Ivoire, Indonesia, India, Kenya, Mexico, Uganda): "Conservation and Sustainable Management of Below-Ground Biodiversity".** *(Previous Title: Management of Agrobiodiversity for Sustainable Land Use and Global Environmental Benefits: MAGLUS)*

DURATION: 5 years

IMPLEMENTING AGENCY: United Nations Environment Programme (UNEP)

EXECUTING AGENCY: **National Executing Agencies:**

Brazil:	Universidade Federal de Lavras
Côte d'Ivoire:	Université de Cocody (Abidjan)
India:	Jawaharlal Nehru University
Indonesia:	Universitas Lampung
Kenya:	National Museums of Kenya
Mexico:	Instituto de Ecologia, Xalapa
Uganda:	Makerere University

International Executing Agency
Tropical Soil Biology and Fertility Programme

REQUESTING COUNTRIES: Brazil, Côte d'Ivoire, Indonesia, India, Kenya, Mexico, Uganda.

ELIGIBILITY: Countries participating in this project have all ratified the Convention on Biological Diversity: Brazil-28 Feb 94; Côte d'Ivoire-29 Nov. 94; Indonesia-23 Aug. 94; India-5 June 92; Kenya-26 July 94; Mexico-11 March 93; Uganda-8 Sept. 93.

GEF FOCAL AREA(S): Biodiversity

GEF PROGRAMMING FRAMEWORK: Operational Progammes 13 and 3

Summary: The objective of this project is to enhance awareness, knowledge and understanding of below-ground biological diversity (BGBD) important to sustainable agricultural production in tropical landscapes by the demonstration of methods for conservation and sustainable management. The project will explore the hypothesis that, by appropriate management of above- and below-ground biota, optimal conservation of biodiversity for national and global benefits can be achieved in mosaics of land-uses at differing intensities of management and furthermore result in simultaneous gains in sustainable agricultural production. The primary outcomes of the project will be:

1. Internationally accepted standard methods for characterization and evaluation of BGBD, including a set of indicators for BGBD loss.
2a. Inventory and evaluation of BGBD in benchmark sites representing a range of globally significant ecosystems and land uses.
2b. A global information exchange network for BGBD.
3. Sustainable and replicable management practices for BGBD conservation identified and implemented in pilot demonstration sites in representative tropical forest landscapes in seven countries.
4. Recommendations of alternative land use practices and an advisory support system for policies that will enhance the conservation of BGBD.
5. Improved capacity of all relevant institutions and stakeholders to implement conservation management of BGBD in a sustainable and efficient manner.

3. COSTS AND FINANCING (MILLION US$)

GEF: Total Project : 9,029,770

Phase One: Years 1-2 : 5,022,646
Phase Two: Years 3-5 : 4,007,124

* Co-financing:

Country Baseline	:	8,023,676
Country Project	:	5,003,830
TSBF Baseline	:	1,170,000
TSBF Project	:	1,680,000
Project Cost	**:**	**24,907,276**

PDF

GEF PDF-A	:	25,000
GEF PDF-B	:	248,000
TSBF	:	36,000
Total PDF	*:*	*309,000*

Full Project Cost : 25,216,276

* Co-financing is from both national governments and external (international) donors. Details given in Table 3 and Annex A

4. OPERATIONAL FOCAL POINT ENDORSEMENTS:

- Brazil: endorsed 9 March 1999; Roberto Jaguaribe, Secretaria de Assuntos Internacionais, Ministério do Planejamento e Orçamento.
- **Côte d'Ivoire:** endorsed 4 April 2000; Kone Alimata Diaby, GEF Focal Point, Caisse Autonome d'Amortissement.
- **Indonesia:** endorsed 25 July 2000; Aca Sugandhy, Assistant Minister 1, MenNEG LH.
- **India:** endorsed 15 September 2000; R. Acharaya, Under Secretary, Ministry of Finance
- **Kenya**: endorsed 11 February 2000; D. N. Kinyanjui, D/Director, National Environment Secretariat.
- **Mexico:** endorsed 24 March 2000; Ricardo Ochoa, Dirección de Organismos Financieros Internacionales.
- **Uganda:** endorsed 11 February 2000; C M Kassami, Permanent Secretary, Ministry of Economic Development.

5. IA CONTACT: Ahmed Djoghlaf, UNEP/GEF Coordination Office, PO Box 30552, Nairobi, Kenya. Tel: 254 2 624166, Fax: 254 2 624041. Email: Ahmed.Djoghlaf@unep.org.

LIST OF ACRONYMS/ABBREVIATIONS USED

ASB: Alternatives to Slash and Burn Agriculture
ASEAN: Association of Southeast Asian Nations
BGBD: Below-Ground Biological Diversity
CBD: Convention on Biological Diversity
CGIAR: Consultative Group on International Agricultural Research
COP: Conference of the Parties
DANIDA: Danish International Development Assistance
EU: European Union
FAO: Food and Agricultural Organization
GCTE: Global Change in Terrestrial Ecosystems
GEF: Global Environment Facility
GIS: Geographical Information System
IFAD: International Fund for Agricultural Development
IGBP: International Geosphere-Biosphere Programme
IMF: International Monetary Fund
IUBS: International Union of Biological Sciences
IUCN: World Conservation Union
IRD: Institut de Recherche pour le Developpment
NARS: National Agricultural Research System
NEAP: National Environmental Action Plan
NGO: Non-Governmental Organization
PLEC: People, Land Management and Environmental Change Project
PRONABIO: Programa Nacional da Diversidade Biologica
SBSTTA: Subsidiary Body on Scientific, Technical and Technological Advice
STAP: Scientific and Technical Advisory Panel
TAG: Technical Advisory Group
TSBF: Tropical Soil Biology and Fertility Programme
UNEP: United Nations Environment Programme
UNESCO: United Nations Educational, Scientific and Cultural Organization

PROJECT DESCRIPTION

BACKGROUND AND CONTEXT

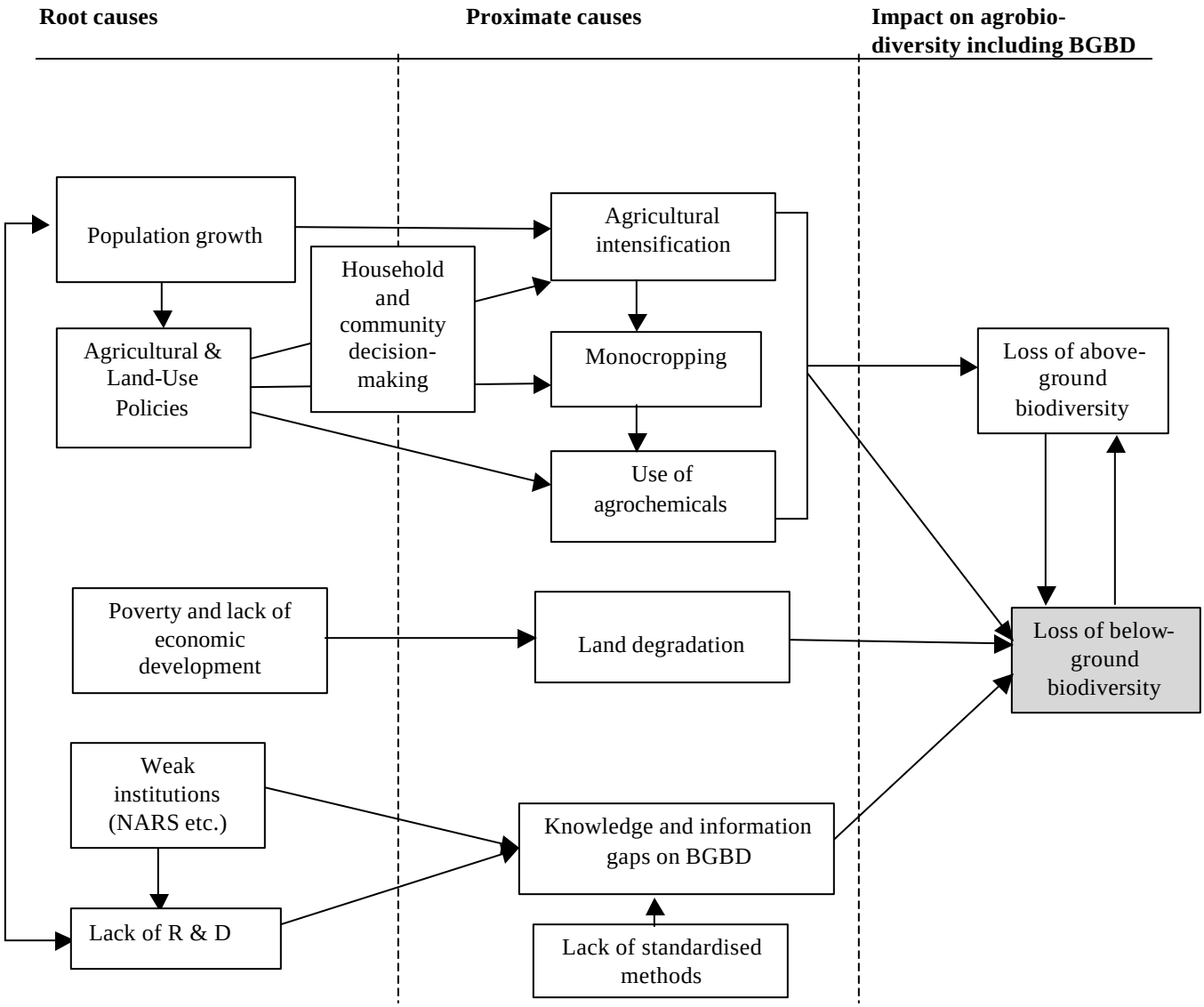
1. The Global Importance of Below-Ground Biodiversity (BGBD): The soil organism community, including bacteria, fungi, protozoa and invertebrate animals, is extremely diverse. Over 1000 species of invertebrates were identified in $1m^2$ of soil in temperate forests in Germany (Schaefer and Schauermann, 1990). The diversity of the microbial component may be even greater than that of the invertebrates yet is only just beginning to be realised by phylogenetic and ecological studies using molecular methods (Torsvik et al., 1996). Few data are available from tropical regions, where it is suspected that the highest levels of diversity may be found. Consequently, although the biological diversity of the community of organisms below-ground is probably higher in most cases than that above-ground, it has generally been ignored in surveys of ecosystem biodiversity.

2. Soil organisms contribute a wide range of essential services to the sustainable function of all ecosystems, by acting as the primary driving agents of nutrient cycling; regulating the dynamics of soil organic matter, soil carbon sequestration and greenhouse gas emission; modifying soil physical structure and water regimes; enhancing the amount and efficiency of nutrient acquisition by the vegetation through mycorrhiza and nitrogen fixing bacteria; and influencing plant health through the interaction of pathogens and pests with their natural predators and parasites. These services are not only essential to the functioning of natural ecosystems but constitute an important resource for the sustainable management of agricultural ecosystems.

3. Root and Proximate Causes of BGBD Loss: This project addresses the means by which BGBD may be adequately managed and conserved in tropical agricultural landscapes. The processes of land conversion and agricultural intensification are a significant cause of biodiversity loss, including that of BGBD, with consequent negative effects both on the environment and the sustainability of agricultural production. This loss of biodiversity is caused by a complex of reasons at both root and proximate levels (Figure 1). At the root level are a set of causes related to the processes controlling land use conversion and agricultural intensification including: population increase, national food-insufficiency, internal geographical imbalances in food production, progressive urbanization and a growing shortage of land suitable for conversion to agriculture. At the proximate level, loss of biodiversity is associated with decision making at the household and/or community levels about the crops and livestock to be produced, and the methods to be used for their production. These decisions are driven by economic needs and those of food sufficiency, the nature and efficiency of agricultural markets, the extent of public and private investment and the associated institutional support for agriculture, and policies for land use and management in both the agricultural and environmental sectors.

4. Threats to BGBD and the Functional Consequences of the Loss of BGBD: Changes in the below-ground biodiversity are often thought to track those of plants, although there is evidence that the soil community may be more functionally resilient than the above-ground biota (Giller et al 1997). As land conversion and agricultural intensification occur, the *planned* biodiversity above-ground is reduced (up to the extreme of monocultures) with the intention of increasing the economic efficiency of the system. This impacts the *associated* biodiversity of the ecosystem – eg., micro-organisms and invertebrate animals both above and below ground - lowering the biological capacity of the ecosystem for self-regulation and thence leading to further need for substitution of biological functions with agrochemical and

petro-energy inputs. The sustainability of these systems thus comes to depend on external and market-related factors rather than internal biological resources.



5. The assumption is often made that the consequent reduction in the diversity of the soil community, including cases of species extinction, may cause a catastrophic loss in function, reducing the ability of ecosystems to withstand periods of stress and leading to undesirable environmental effects. Scientists have begun to quantify the causal relationships between (i) the composition, diversity and abundance of soil organisms, (ii) sustained soil fertility and associated crop production, and, (iii) environmental effects including soil erosion, greenhouse gas emissions and soil carbon sequestration (Swift et al., 1996; Lavelle et al., 1997; Giller et al., 1997). Consequently, actions that directly target the joint conservation of both above- and below-ground components of biological diversity will have environmental benefits at ecosystem, landscape and global scales.

6. Knowledge base on BGBD: The failure to take such actions is partially attributable to the absence of agreement on standardised methods for the study of BGBD, and a lack of both knowledge and awareness of this key component of global biodiversity. Sustainable and profitable management of agricultural biodiversity, including BGBD, is dependent on information about the current status, the value perceived by the various sectors of society, and the factors which drive change in one direction or other. Despite its importance to ecosystem function the soil community has been almost totally ignored in considerations of biodiversity conservation and management even at the inventory level. The Global Biodiversity Assessment (UNEP, 1995) documents existing biodiversity information. The sections on agrobiodiversity, and in particular the below-ground component, are amongst the most incomplete and inadequate. This is reflective not only of gaps in knowledge but also of barriers and failures in information flow and access. Furthermore, the role of the soil biota, with the exception of a few groups, has been given relatively little attention in agricultural research.

7. Methodology to Analyse BGBD: The scarcity of information is in part due to lack of international consensus on standardized methods for the determination of BGBD, its functional significance and its present and future value. Furthermore, this methodology gap has limited the generalization and comparability of results from previous studies and their applicability to management of BGBD. In particular, the lack of rapid indicators of BGBD loss has hindered the inclusion of BGBD in biodiversity assessment protocols and inhibited conservation opportunities.

8. Impact of Agricultural Policy on BGBD: Governments have typically encouraged land conversion and agricultural intensification in response to the demand for higher levels of food production under conditions of increasing population growth. Support often comes in the form of set prices for products and/or subsidy for inputs, and for land conservation measures. Under current conditions however, agricultural support of this kind has been substantially abandoned in many countries under a variety of structural adjustment and market liberalization reforms. Moreover in the majority of tropical countries no alternative legislation, that will influence the path of agricultural development, has been put in place. Market forces, with often little concern for environmental externalities including the loss of above and below-ground biodiversity, are therefore even more dominant than previously, while food security has continued to decrease in many countries, particularly in Africa.

9. Amidst a policy and economic environment that does not acknowledge the importance of managing and conserving agrobiodiversity; farmers, rural communities, scientists, NGOs and the general public have become increasingly aware of the high environmental cost of many intensive high-input agricultural practices. Furthermore, it is now accepted that loss in biodiversity (including BGBD) is one of the major factors leading to degradation of ecosystem services and loss of ecosystem resilience. In many countries, however, conflicts have arisen between policies to support biodiversity conservation and ecosystem protection and those of agricultural development.

10. Linking knowledge to policies: Documentation of BGBD, including the biological populations conserved and managed across the spectrum of agricultural intensification, is an essential component of the information required for assessment of environment-agriculture interactions, as is the evaluation of the impact of agricultural management on the resource base, particularly that of the soil. Development of appropriate policy requires, in particular, reconciling the needs for meeting food-sufficiency by high levels of agricultural productivity with those for conserving biodiversity and environmental protection. A major barrier here has been the lack of data on changes in diversity within agricultural landscapes and the

assumption that there is necessarily a trade-off between biodiversity and agricultural productivity. There is now however growing evidence that farm landscapes can conserve significant levels of biodiversity (Swift et al 1996; van Noordwijk et al 1997).

11. Criteria for managing such landscapes or evaluating them in terms of biodiversity conservation or other features of interest to various sectors of society have yet to be developed. In some countries policies have been framed with the intention of achieving better integration and to explicitly avoid biodiversity and agriculture being seen as mutually incompatible or competitive. Progress in these respects has, however, been slow. Almost universally, attempts at integrated and sustainable agricultural development are frustrated by lack of an information base that rigorously demonstrates the environmental implications, whether beneficial or detrimental, of agricultural development, and the benefits or otherwise to be gained from conservation and management of agrobiodiversity, including BGBD. Policy formulation for BGBD conservation and management for local, national and global benefits is dependent on the availability of this information, which enables rigorous evaluation of the costs and benefits of different trajectories of development and the reconciliation between them.

12. Capacity for BGBD studies: The current inability to evaluate and manage BGBD is also hampered by a lack of capacity and a shortage of expertise in many countries to perform this task. The wide spectrum of stakeholders affected includes the scientific community with respect to training in the taxonomy, ecology, economic valuation and management of agrobiodiversity (particularly BGBD); and members of both the agricultural and environmental sectors from practitioner to national decision-maker with respect to awareness and access to knowledge.

RATIONALE AND OBJECTIVES

13. Agricultural intensification can take a variety of paths. The conventional 'green revolution' path of arable cultivation (and its equivalents in livestock and vegetable production), utilizing high yielding varieties and supported by high levels of input is only one of a number of trajectories. Among the alternatives are those which deliberately retain higher levels of biodiversity. Examples include agroforestry systems, inter-cropping, rotational farming, green cover-cropping and integrated arable-livestock systems. All of these approaches are more or less closely derived from traditional practices of agriculture in the tropical regions. The values perceived in this dependence on diversity as opposed to the homogeneity of modernized agriculture are multiple and extend beyond the market value. They include, in addition to product profitability, the desire for multiple products, the spreading of risk, the social and cultural value of certain products and perceptions of resource conservation and enhanced pest control.

14. The total biological diversity of such intermediate systems can be very high (Swift et al 1996). The deliberate maintenance of even a limited diversity of crops and other plants (particularly if trees are included), results in substantial multiplication of the associated diversity - for example of the above-ground insect population and of the below-ground invertebrates and micro-organisms. Landscapes which include such systems are more likely to conserve biodiversity in comparison with those restricted to high-input systems. There is evidence that mosaics of different systems, including those at different levels of intensification, maintain a higher diversity than monotypic landscapes of any kind including natural ecosystems on their own. A major issue to be examined in this project is that of whether there are additional benefits in integrating, as compared with segregating, different types of land-use (Van Noordwijk et al., 1997).

15. It remains a matter to be critically evaluated whether the maintenance of such diversity entails costs or benefits in terms of agricultural production and change in other ecosystem services. This requires investigations at both the farm and at the landscape scales. The conservation of agrobiodiversity and the associated BGBD is of particular interest because of the possibility of win-win situations where gains are achieved not only in biodiversity but also in agricultural production and resource conservation. Assessment of the above-ground component in isolation is unlikely to enable such evaluation to be made. Whilst some of the factors of both costs (e.g. loss of production through competition) and benefits (e.g. enhanced biological control of pests) of biodiversity are to be seen above ground, a substantial number are confined to the below-ground biota. These include: improvement in soil structure and water regimes through the activity of soil fauna; increased efficiency of nutrient cycling through microbial regulation; reduced greenhouse gas emissions and increased soil carbon sequestration due to improved regulation of decomposition processes; and increased effectiveness of biological control of soil-borne pests. This focus on the benefits of the below-ground biota is a completely unique aspect of this project.

16. The project fully supports the objectives of GEF Operational Programme 3 on Forest Ecosystems. Consistent with the priorities of the Programme, the Project will support the conservation and sustainable use of biological diversity in environmentally vulnerable areas and the conservation and/or sustainable use of endemic species. In addition, the Project will combine biodiversity conservation, production and socio-economic goals (agricultural sector). The project also will incorporate a targeted research component; the results of which will provide global benefits well beyond the physical sites of the project. The project will develop priority outputs in the form of institutional strengthening (capacity building efforts that strengthen scientific and policy making capacity) and sectoral integration (integration of the conservation of BGBD into agricultural production). Other outputs (tools and methodologies and networks for information exchange) of the project will facilitate replication of results. Key project activities consistent with OP 3 include:
    - the preservation and maintenance of indigenous and local communities' knowledge, innovation and practices relevant to BGBD conservation;
    - assessment of the anthropogenic forces on the conversion or disturbance of natural systems;
    - identification of the processes which are likely to have significant adverse impacts on the conservation of biodiversity;
    - and the implementation of demonstrations and pilot activities that include management techniques that promote biodiversity conservation, in accord with national priorities.

17. The project is also consistent with the objectives and activities outlined in the Paper "A Framework for GEF Activities concerning Conservation and Sustainable Use of Biological Diversity Important to Agriculture" (GEF 2000). The Framework paper highlighted the following activities and objectives particular to agrobiodiversity conservation all of which are addressed by this project:
    - Training personnel and strengthening institutional capacities to promote win/win solutions in agrobiodiversity conservation;
    - Assessment of changes in the diversity and density of biocontrol agents, pollinators and soil microorganisms in relevant agroecosystems;

    These two concerns are direct targets of two of the proposed outcomes of this project.

18. The importance of the conservation and sustainable use of biodiversity important to agriculture is now increasingly recognized and has been detailed in the decisions adopted by the Conference of the Parties (COP) to the CBD. The project is aligned with Decisions made at COP4 in particular Decision III/6, Decision IV/6. This is detailed in Annex L.

19. Seven countries with significant expertise in soil biology (see Tables 1 and 2, Annex F) have joined together to participate in this project. This present capacity will be built upon, or provided when lacking by "South-South" exchanges and training. Full details of the country and site selection criteria are shown in Tables 1 and 2 of Annex H.

20. All participating countries have tropical forests, representing a wide range of types (humid to sub-humid, lowland and montane). Several of the participating countries are "mega-diversity" nations, and all the sites chosen within each country are regions of particular relevance for global biodiversity concerns (i.e. with Biosphere Reserves, Parks, Protected Areas). These sites (See Annex H) are currently under pressure for land conversion and agricultural intensification. They include a wide range of human population densities and land use intensities, from native forests to intensive monocultures and degraded land. At all sites, the interest of stakeholders, from government agencies to NGOs and farmers has been established in support of the project (See Annex F). At some locations, the project will be building upon existing (but incomplete) knowledge of BGBD and land use management (e.g., ASB sites in Indonesia). Considerable progress has been made in the course of the UNDP-GEF funded project on Alternatives to Slash and Burn Agriculture to develop rapid assessment methods for a limited range of functional groups of BGBD (Bignell et al 2000), but these now need to be extended, tested and validated in a wider range of environments and improved in relation to their quantitative replicability. In other locations, the project will be the first of its kind to deal with BGBD. The replicability as well as the variability of the chosen sites and situations will help this project produce a comprehensive list of alternative practices that cover a wide scope of environmental/economic/social conditions, giving the results wider application possibilities.

21. National Governments in the seven participating countries in this project (India, Indonesia, Brazil, Mexico, Ivory Coast, Uganda and Kenya) have all ratified the CBD, and established policies, action plans and practices (e.g., Biosphere Reserves, Parks and land management strategies in biodiversity sensitive areas) to conserve their biodiversity resources. Agricultural development policies in all countries have also been established to promote land use/management practices that are sustainable and productive, while simultaneously conserving the environment. The action plans and policies in both sectors however are generally deficient in relation to the conservation and management of BGBD, and sometimes of agrobiodiversity as a whole. One planned outcome of this project is to provide tools and services for easing the incorporation of information on agrobiodiversity and BGBD in particular into decision making at all scales.

22. Project Objective: The objective of this project is *"to enhance awareness, knowledge and understanding of below-ground biological diversity (BGBD) important to sustainable agricultural production in tropical landscapes by the demonstration of methods for conservation and sustainable management".* The project has a particular focus on tropical forests and on Below-Ground Bio-Diversity, the complex community of organisms which regulates soil fertility, greenhouse gas emissions and soil carbon sequestration, and which is routinely ignored in biodiversity conservation and assessment projects. The project will explore the hypothesis that, *by appropriate management of above- and below-ground biota, optimal conservation of biodiversity for national and global benefits can be achieved in*

mosaics of land-uses at differing intensities of management and furthermore result in simultaneous gains in sustainable agricultural production.

23. In order to achieve this goal the project will produce five primary outcomes:

    1. Internationally accepted standard methods for characterization and evaluation of BGBD, including a set of indicators for BGBD loss.
    2(a) Inventory and evaluation of BGBD in benchmark sites representing a range of globally significant ecosystems and land-uses.
    2(b) A global information exchange network for BGBD.
    3. Sustainable and replicable management practices for BGBD conservation identified and implemented in pilot demonstration sites in representative tropical forest landscapes in seven countries.
    4. Recommendations of alternative land use practices, and an advisory support system, for policies that will enhance the conservation of BGBD.
    5. Improved capacity of all relevant institutions and stakeholders to implement conservation and management of BGBD in a sustainable and efficient manner.

PROJECT ACTIVITIES AND EXPECTED RESULTS

24. The objectives and outcomes of the project will be achieved by the range of activities briefly described below and in Annex B. A timeline for these activities is given in Annex B, Table 2. The project will be executed in two phases. Taking into account the relative costs of the five outcomes (see Table One, page 17), the project timeline for the project activities (Annex B, Table 2), and the need for greater expenditure on equipment, field work, staffing and capacity building in the early stages of the project as compared to later, the work be scheduled as follows in Two Phases.

Phase One: Years One-Two		**Phase Two: Years Three-Five**	
Outcome 1: 100%:	$ 1,141,685	Outcome 1: 0%	
Outcome 2: 60%:	$ 1,693,466	Outcome 2: 40%	$ 1,128,977
Outcome 3: 50%:	$ 1,238,646	Outcome 3: 50%	$ 1,238,646
Outcome 4: 10%:	$ 86,332	Outcome 4: 90%	$ 776,984
Outcome 5: 50%	$ 862,517	Outcome 5: 50%	$ 862,517
TOTAL	**$ 5,022,646**	**TOTAL**	**$ 4,007,124**

Outcome1: Internationally accepted standard methods for characterization and evaluation of BGBD, including a set of indicators for BGBD loss.

25. This is a Targeted Research component which will provide the information, knowledge and tools that form the essential basis for the proper development of other operational components of the project. For further details on the objectives and activities within this outcome see Annex I: Targeted Research Annex. The testing of methods will take place at various scales, from the farm level to the landscape level. The benchmark areas have already been chosen (see Annex H), and the specific plots for this research will be carefully selected to represent a range of land use intensification levels characteristic of the area. Characterization of the benchmark sites with respect to the levels, functions and types of agricultural biodiversity will provide the first opportunity for testing of the methods adopted

by the project scientists. Innovations in method are expected; a substantial knowledge exchange between participating scientists and other stakeholders is imperative to the success of the project. At this point, key indicator (s) for widespread use will also be identified.

Outcome 2a) Inventory and evaluation of BGBD in benchmark sites representing a range of globally significant ecosystems and land uses.

26. The methods developed under Outcome 1 will be used to inventory and evaluate the baseline for agrobiodiversity status and management at the benchmark sites, with particular reference to BGBD. Land use maps of the benchmark areas, including the main agricultural and other ecosystems and the intensity of their use, will be developed. Current practices of agrobiodiversity management will be assessed in terms of the socioeconomic and biophysical conditions influencing the practices and the effects they have on BGBD at the sites. The benchmark sites will each constitute an area of the landscape within which there are land-use intensification gradients inclusive of systems with different degrees of agrobiodiversity conservation and use. The sites will be characterized with respect to agrobiodiversity, both above- and below-ground. Functions and processes associated with components of the BGBD, will also be evaluated using the methods agreed under outcome 1.

Outcome 2b) A global information exchange network for BGBD.

27. A common database format, the design for which has been initiated during the PDF-B (see Annex H), will be used at each of the country sites so that the data can be combined to construct an International Information System on BGBD Management and Conservation, accessible through the World Wide Web. This database site will be established and managed by TSBF on behalf of the consortium. The national databases in the participating countries (produced by the lead institutions and made available to the national stakeholders) will be linked and geo-referenced, and incorporated into the international database to facilitate cross-country analysis and synthesis of data. Additional data from other preceding and contemporary projects will also be added to the databases where appropriate. Of particular interest will be the IRD-TSBF database on soil macrofauna (Lavelle et al 1999), the UNDP-GEF ASB database (Bignell et al 2000), and the emerging information from the UNEP-GEF PLEC project. National and international soil, climate and socioeconomic databases will also be incorporated in order to explore the potential for extrapolation of the data from the benchmark sites. The data will be used to explore the relationships between land-use change (sensu agricultural intensification), BGBD and its management. Features of land-use that will be examined include cropping pattern and intensity, use of inputs, pest and soil management practices, labor schedules and intensity, etc. Over the period of the project the Information System will be updated and will be publicized in a freely accessible format which will provide a source of information that will assist decision makers in evaluating the potential impacts of different land-use strategies on biodiversity conservation and management.

Outcome 3. Sustainable and replicable management practices for BGBD conservation identified and implemented in pilot demonstration sites in representative tropical forest landscapes in seven countries.

28. The first two activities in Outcome 3 are the identification of, and agreement on, management practices that effectively conserve BGBD and at the same time show potential agronomic, social and economic benefits. The basis for initial choice will be the results of Outcome 2 and various consultations and workshops with the different stakeholders (NGO's, farmers and their community organizations, scientists, environment and land use planners).

29. The third activity is the establishment of plots at the benchmark sites at which the effects of different land-uses and management practices on agrobiodiversity will be demonstrated, monitored and evaluated. These plots will be selected by consultations and meetings with relevant stakeholders who will also help develop the design, implementation and monitoring plans for the specific sites. In all country benchmark areas, demonstrations will incorporate modifications of current practices that result in increases in agricultural biodiversity or improved management of present biodiversity. In some countries, other plots will be concerned with rehabilitation of unproductive lands through management of above- and below-ground biodiversity. Enhancement of BGBD may be accomplished by two routes: through *direct* manipulation (e.g. re-inoculation with desirable indigenous organisms, (such as N_2-fixing bacteria or agents for biological control of plant disease which have been lost as a result of intensification); and/or *indirectly* through manipulation of the cropping system (e.g. by choice of plants, the cropping pattern in time and space, or management of organic inputs). A major focus of this project is the utilization of the link between above- and below-ground biodiversity as a management approach with potential win-win gains in agroecosystem function and biodiversity conservation and enhancement.

30. Estimation of the costs and benefits of these practices for agrobiodiversity conservation and alternative land-use practices, as perceived both by farmers and stakeholders operating at other scales, is the fourth major activity in this component. These will be assessed using the methods agreed upon in Outcome 1. This will provide a better understanding of the means and incentives required to maintain and enhance agricultural biodiversity in the benchmark sites, and provide a basis for the development of recommendations for sustainable alternative land use practices which will simultaneously conserve BGBD and incorporate priorities of the local stakeholders. The data from these activities will be incorporated into the International Information System (see above) which will be used to mainstream the knowledge gained from the demonstration sites beyond the benchmark areas and participating countries.

Outcome 4. Recommendations of alternative land use practices, and an advisory support system, for policies that will enhance the conservation of BGBD.

31. Meetings, workshops and consultations will be held at the sites in each country to report and review the results of the Outcome 3, and the emerging picture of the effect of alternative land-use practices on BGBD, agricultural production and other ecosystem functions. All types of stakeholders, and particularly policy-makers and other decision-takers, will participate to formulate conclusions arising from the characterization of current status and plan for the development of alternatives. The obstacles, at various levels (local, regional, national and international), to BGBD conservation and management will also be identified. The results from the project and other data from the International Database will be utilised to construct advisory support systems. These will be digests of information structured to provide means of making informed choices between different options in the face of particular types of obstacle. Decision aids will be designed for different groups of stakeholders. This series of workshops, consultations and associated meetings will also constitute an important component of the capacity-building objectives of Outcome 5 (see below).

32. Project participants will work with decision-makers from all appropriate levels (e.g. from communities, local and district areas, national planning and policy agencies) to develop recommendations for the practices that integrate agricultural development priorities with concerns for biodiversity conservation and environmental protection (win-win). The concept of diversification rather than homogenization at the landscape scale is likely to be a major integrating feature. This has substantial implications for planning at scales both above (i.e.

national) and below (i.e. district and village) this scale; these implications and concerns will be built into the dialogue from the outset. The recommendations emerging from all this dialogue will be disseminated nationally through workshops and training sessions, and internationally through the International Information System.

Outcome 5. Improved capacity of all relevant institutions and stakeholders to implement conservation and management of BGBD in a sustainable and efficient manner.

33. This component will build capacity in all stakeholder groups, and mobilize the wider scientific communities in the participating countries. It will improve the skills and experience of various stakeholders in the participating countries in the field of agrobiodiversity research and evaluation in general and of BGBD in particular. Networking and "South-South" exchanges among stakeholder levels will constitute an important part of this component as will the integration of scientific and indigenous technical knowledge. Capacity building will also involve dialogue to achieve reconciliation of the objectives of the agricultural and environmental sectors overseeing the development of the project benchmark areas.

34. Training in methods for agrobiodiversity and BGBD measurement and evaluation will be conducted throughout the project, both individually (e.g. through the registration of students for higher degrees) and collectively (involving different stakeholder groups) to reach adequate levels for BGBD research in all the required areas in all the countries. Furthermore the scientific activities of the project require an interdisciplinary approaches. The development of these will be a particular feature of the capacity building activities of the project. The International Information System will provide a mechanism for knowledge-exchange between the participating scientists and the wider scientific community. This will result in a substantial enhancement of the capacity to undertake agrobiodiversity-related research in and beyond the participating countries. The participating researchers and other stakeholders will be encouraged to publish their results and recommendations in peer-reviewed journals as well as in other media appropriate to the whole range of stakeholders so as to disperse the knowledge gained as widely as possible.

35. An important aim of the project is to build awareness of BGBD and its roles among diverse groups of stakeholders. Farming communities commonly have sophisticated traditional methods for describing and classifying soil quality, which commonly include some biological reference points. Other stakeholder groups, more removed from the practice of farming are more likely to be ignorant of BGBD. Participation with farmers, extensionists and NGOs in on-farm characterisation and experimentation offers the opportunity for knowledge exchange between researchers and others. This interchange will also be enhanced by purpose designed ‘training’ activities like farmer-field schools, and through the wide range of workshops and field visits described above. The documentation of indigenous knowledge of BGBD, and traditional soil management practices, will be an important way of strengthening national capacity in biodiversity and agricultural sciences.

RISKS AND SUSTAINABILITY

36. A global project networking partners in seven countries stands to gain substantial added value from the replication of activities, but also contains risks stemming from the complexities of organization and management. Strong coordination and the commitment of all partners can contribute strongly to avoiding this.

37. The project aims to achieve win-win outcomes in terms of profitable levels of agricultural production (national benefit) with increased conservation and use of agricultural biodiversity (global benefit). Nonetheless trade-offs between biodiversity and maximization of production may be an option in some circumstances. The perceptions of the value of

agrobiodiversity are different for different sectors of society. It is assumed that the stakeholders representative of the different sectors will be prepared to cooperate and, if necessary, to accept trade-offs between costs they have to bear, or immediate benefits they may be required to forego on behalf of other sectors of society, in return for benefits which may only come in the future. Agreement on what practices can and should be widely adopted, depending on the costs and benefits at various scales to the multiple stakeholders is critical to the success of the project.

38. Ultimately, the widespread adoption of the alternative practices recommended for BGBD conservation and management depend not only on compliance and sustained commitment of stakeholders at the local level but also upon the reconciliation between policies for agricultural development and those for environmental protection - including biodiversity conservation. The outputs of the project should present strong arguments for the reconciling of these policies and engage the decision takers into investing in the gains to be made over a variety of scales, from agrobiodiversity.

39. The success of the project also depends on the ability of the participants to develop the methods for BGBD evaluation and come to an agreement on which are the most suitable, and furthermore to persuade participants and other stakeholders to accept a degree of standardization so that globally usable databases can be established. The methods that COP and SBSTTA recognize are by no means yet fully refined let alone universally accepted.

40. One major guarantee for the continuing sustainability of the benefits of this project will be invested in the International Information System that will be an output synthesizing the operational components of the project. For this to be the case depends first on establishing a shared data policy and the development of a World Wide Web site that contains the data presented in a user-friendly format. Next, it also depends on the willingness of decision-makers to utilize the information and turn the database into a useful policy tool. Interest and participation of the media and production of documentation, e.g. videos for greater visibility are also important. TSBF will be responsible for ensuring the maintenance of the information system on behalf of the international community after the completion of the project. The securing of funding to ensure sustainability of the IIS will depend on its acceptance by the international community.

41. In technical terms an assessment of 'sustainability' necessarily requires measurements to be made over the long-term. A five-year timeframe is the minimum to see many of these results (and may prove inadequate in some cases). This applies to the response of below-ground biodiversity to changes in agroecosystem management as well as to associated ecosystem properties. The achievement of the objectives and outputs within the timeframe of the project is thus dependent both on the degree of environmental 'stability' that is experienced at the sites and on the ability to manage the sites successfully. The demonstration sites will be maintained by the research systems after the end of the project to further refine, and test the sustainability, of the solutions.

42. In project objective terms sustainability of success will depend on persuading stakeholders that agrobiodiversity management, and in particular the relatively unfamiliar area of below-ground biodiversity, is technically feasible and economically worth investing in. This applies both to Government agencies and stakeholders in the farming communities. Another important player is the private sector which is increasingly dominant in agricultural research and in driving agricultural development. The project success and sustainability may therefore depend in some places on engaging this sector into its objectives.

43. The sustainability of the project is also dependent on proving that the results can be extrapolated outside the benchmark sites.

STAKEHOLDER PARTICIPATION AND IMPLEMENTATION ARRANGEMENTS

44. The project involves a wider range of stakeholders including farmers, extensionists and NGOs, scientists from Universities and National Agricultural and Forestry Research Institutions, and local, national and global decision-makers (see Annex F). There was extensive consultation across this spectrum during the PDF-B planning process so that the project has a wide ownership in all the countries.

45. At the most direct level farmers in the project benchmark areas will benefit from the advice and intervention of the project scientists, received either directly or through collaborating NGOs and Government extension services. It is anticipated that whatever the outcomes in terms of biodiversity benefits, the project will result in the adoption of improved practices for soil and crop management at the farm level. These same benefits should also be realized at the wider farming community level, including to the indigenous communities, through dissemination of the improved practices.

46. At a second level governments will benefit from the improved information on land-use design, biodiversity conservation, environmental protection and rehabilitation of degraded land, as will NGOs involved in the same sectors.

47. The project will be implemented by teams of technical experts, drawn from Universities, National Research Institutions and NGOs in the participating countries. The scientists in each national team cover a range of skills and disciplines (see Annex F) germane to the project, necessitating cross-institutional collaboration. Soil biology expertise for the project is largely drawn from the Universities, which constitute the majority of the lead institutions. Close collaboration has been established with National Agricultural Research institutions, extension services and NGOs in each of the countries, as well as a number of environmental institutes. Expertise in agronomy, agricultural economics and crop and pest management and land-use planning will largely come from these partners. This collaborative structure is regarded as a benefit that the project will provide at the national level. Collaboration between the environmental and agricultural sectors, and in many cases between Universities and NARS is infrequent in many countries. Despite the wide range of expertise however, few countries are able to cover completely the full range required in this interdisciplinary project, which also demands innovation in method. The project is supported by a Technical Advisory Group (TAG, see Annex F) which brings additional expertise and back-up for capacity building. The majority of the members of this group have been involved in the processes of preparation and planning for the project and are long-term collaborators with the national teams. The membership of the TAG will be widened during the project appraisal stage to ensure cover of necessary expertise and areas of interest. A substantial amount of within-project training and institutional capacity building will be conducted during the project. This will be implemented by cross-country and cross-continental ("S-S") exchange thus providing yet additional benefits in terms of development and globalization of expertise.

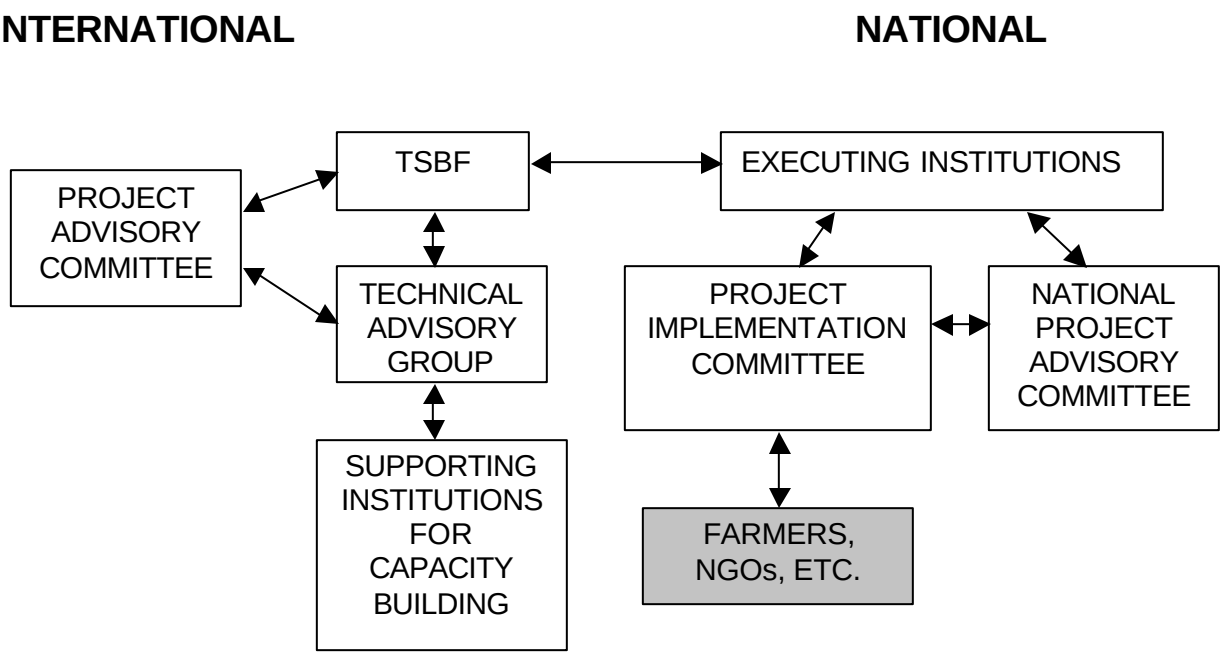
48. The project involves significant work on-farm in the benchmark sites. This will be conducted in a fully participatory way with the individual farm households and farmers' organizations and other community groups where appropriate, drawing on the past experience of these groups of researchers as described in the previous section.

49. Implementation of the project recommendations under Outcome 4 necessitates close collaboration with decision-makers representing a range of sectors of society. Linkages with these executing agencies are established through the involvement in the project of the national agricultural and environmental research and development institutions. Provision has been made within the Activities of the Project to engage decision-makers at various levels in the processes of review of results and planning of activities ultimately leading to joint ownership of the outcomes and recommendations of the project.

50. The project is to be implemented in seven countries. This global structure provides a mechanism for accelerating the rate of advance in the acquisition and interpretation of information. Such a structure requires strong coordination with the development of both central and decentralized databases linked by efficient information transfer systems. This will be the responsibility of the Executing Agency, the Tropical Soil Biology and Fertility Programme (TSBF) hosted by UNESCO in Nairobi, Kenya. TSBF has wide experience in coordinating and facilitating international networks as well as in many of the technical areas addressed by this project (e.g. soil biology, soil fertility management, carbon budgeting, participatory rural appraisal and other farming-system methodologies). Many of the participants in this project are members of the TSBF Soil Biodiversity Network.

51. Reporting and proper management will be guaranteed by the formation of two national committees; the Project Implementation Committee and the National Project Advisory Committee (see Figure 2). The National Advisory Committees will include representatives of ministries and other national/international organizations (governmental and NGOs) concerned with agricultural development and biodiversity conservation. This committee will oversee project activities and help make the links between stakeholders at the different levels, particularly with the decision takers at governmental level. The Project Implementation Committees, chaired by the hosting institution will include scientists, extensionists, NGOs and farmer groups with the specific responsibility of implementing project activities.

Figure 2. Project implementation structure



52. Members of the Technical Advisory Group (TAG) will be assigned responsibilities for advice, back-stopping and assistance with training needs for each of the countries. Both the Project Coordinator, to be appointed to TSBF, and the TAG members will make regular visits to the countries and their benchmark sites.

53. Provision is made in the project plans for three global workshops: the first will include planning and standardization of activities to be undertaken, the second will review and verify activities performed up to year 23 and ensure that the objectives are being met with appropriately, and the final workshop will involve presentation and collation of the country results into a global framework. Each workshop will bring together representatives from each of the countries to share experience and ensure standardization of methods and reporting across the project.

54. Links have been established between this project and a number of others with similar objectives (see Annex F). The People Land Management and Environmental Change Project (PLEC) is concerned with indigenous approaches to above-ground agrobiodiversity and implemented in a number of the same countries. The focus of the present project on below-ground biodiversity and the dimension of functional relationship of the biota to agricultural sustainability and environmental protection are dimensions not covered in PLEC. The objectives of the two projects are convergent and mutual benefit will be gained from close cooperation. Arrangements have been made for joint membership of Technical

Advisory Groups (see Annex F). Advice from PLEC members has been sought during preparation of this project. Sites will also be shared with the Alternatives to Slash and Burn Agriculture (ASB) Project in Indonesia; TSBF and many of the national partners from these countries have participated in ASB from its inception with particular responsibility for BGBD, carbon stock and greenhouse gas assessments. Following completion of the second phase of the GEF-funded component of ASB the major focus has moved to agricultural intensification in relation to poverty alleviation and rural livelihoods rather than issues of biodiversity conservation and climate change. This project is thus able to build on, and take further forward, the outcomes of the ASB Programme in these areas, as well as adding further dimensions. Close links have also been established with a new project funded by the Darwin Initiative entitled "tools for monitoring soil biodiversity in the ASEAN region' with particular respect to the targeted research component. The project will also complement the recently approved UNDP/GEF agrobiodiversity project: "Conservation and Sustainable Use of Dry land Agrobiodiversity" which, as the title indicates, is a regional (Middle East) project concentrating on specific areas where various food crops of economic value originated. The present project complements these efforts by focusing on wetter areas, a wider selection of countries and ecological situations and putting particular emphasis on BGBD and its role in sustainable ecosystem function.

55. Linkages are also in place with relevant project areas in both the agricultural and environmental sectors (See Annex F). The CGIAR and FAO are both represented on the Project Advisory Committee. The Rockefeller Foundation has recently invited TSBF to take the lead in developing an initiative, in collaboration with CGIAR Centres, to explore the potential for profitable exploitation of the soil biota in tropical agriculture. The TSBF Soil Biodiversity Network is a recognized activity within the DIVERSITAS Programme of IUBS, UNESCO and UNEP. The work in this project will provide important inputs for a number of global programmes such as the Global Change in Terrestrial Ecosystems (GCTE) core project of the IGBP. As well as providing complementary strengthening of results, the linkages and participation of project members with these international programmes also offers avenues for additional co-funding of the activities envisaged in this project.

56. Finally, the project will also link with several nationally and internationally funded activities (mostly complementary, and not dealing specifically with the present project's objectives) taking place within the country and benchmark sites (see Annex F). The results of those projects and the present one will build upon each other and stakeholders involved in the projects will benefit from the sharing and exchange of information, particularly complementary project results.

INCREMENTAL COSTS AND PROJECT FINANCING

57. The five components of the project complement, rather than substitute, the baseline activities carried out by various governments and research institutions worldwide. The Incremental Costs and description of benefits are described in detail in Annex A.

Table 1: GEF Component Financing (Baseline and PDF not shown)

Component	**GEF**								
	Brazil	Cote d'Ivoire	India	Indonesia	Kenya	Mexico	Uganda	Global	**Total**
Outcome 1	105.000	103.490	105.000	105.000	106.686	104.900	110.000	401.609	1141.685
Outcome 2	306.500	296.995	306.250	306.000	311.168	304.700	310.000	680.830	2822.443
Outcome 3	262.500	254.990	262.500	262.000	266.715	263.6	255.000	649.986	2477.291
Outcome 4	70.000	68.000	70.000	72.000	71.124	70.100	70.000	372.093	863.317
Outcome 5	131.000	127.495	131.250	129.000	133.357	131.200	125.000	816.732	1725.034
Total	**875.000**	**850.970**	**875.000**	**874.000**	**889.050**	**874.500**	**870.000**	**2921.250**	**9029.770**

Table 1: Cofinancing Component Financing (Baseline and PDF not shown)

Components	**Co-Financing**									**GEF and Cofinancing Total**
	Brazil	Cote d'Ivoire	India	Indonesia	Kenya	Mexico	Uganda	Global	**Total**	
Outcome 1	140.000	64.999	81.000	95.000	122.640	169.900	105.000	240.000	1018.539	2160.224
Outcome 2	365.600	136.666	236.250	89.000	357.700	169.900	150.000	320.000	1825.116	4647.559
Outcome 3	341.400	130.000	202.500	172.000	306.600	113.200	120.000	400.000	1785.700	4262.991
Outcome 4	223.700	48.332	54.000	223.000	81.760	56.600	35.000	420.000	1142.392	2005.709
Outcome 5	162.600	38.333	101.250	40.000	153.300	56.600	60.000	300.000	912.083	2637.117
Total	**1233.300**	**418.330**	**675.000**	**619.000**	**1022.000**	**566.200**	**470.000**	**1680.000**	**6683.830**	**15713.600**

Table 2: Project Financing from GEF per expenditure category

Category	**GEF**								
	Brazil	Cote d'Ivoire	India	Indonesia	Kenya	Mexico	Uganda	Global	Total
Personnel:	147.500	116.830	341.250	217.000	147.050	304.100	155.000	1050.000	2478.730
Equipment:	148.500	211.495	170.000	149.000	155.000	104.800	155.000	10.000	1103.795
Subcontracts:	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Workshops &Training:	80.000	100.575	90.000	106.000	62.000	241.500	155.000	875.000	1710.075
Travel:	183.000	19.995	105.000	53.000	25.000	65.200	65.000	205.000	721.195
Operational Costs:	236.000	368.580	120.000	292.000	500.000	99.700	300.000	235.000	2151.280
EA Support Costs:	0.000	0.000	0.000	0.000	0.000	0.000	0.000	546.250	546.250
Monitoring & Evaluation:	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Misc.	80.000	33.495	48.750	57.000		59.200	40.000	0.000	318.445
Baseline	-	-	-	-	-	-	-	-	-
Project Costs:	**875.000**	**850.970**	**875.000**	**874.000**	**889.050**	**874.500**	**870.000**	**2921.250**	**9029.770**
PDF:	0.000	0.000	0.000	0.000	0.000	0.000	0.000	273.000	273.000
Full Project Cost	**875.000**	**850.970**	**875.000**	**874.000**	**889.050**	**874.500**	**870.000**	**3194.250**	**9302.770**

Table 2: Project Financing from Cofinancing per expenditure category

Category	**Co-Financing**									**GEF and Confinancing Total**
	Brazil	Cote d'Ivoire	India	Indonesia	Kenya	Mexico	Uganda	Global	Total	
Personnel:	864.200	359.999	185.000	154.000	637.000	193.000	110.000	880.000	3383.199	5861.929
Equipment:	156.200	51.665	20.000	104.000	285.000	291.000	75.000	0.000	982.865	2086.660
Subcontracts:	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Workshops &Training:	138.400	6.666	112.700	80.000	50.000	0.000	70.000	300.000	757.766	2467.841
Travel:	33.500	0.000	97.800	37.000	0.000	6.200	55.000	0.000	229.500	950.695
Operational Costs:	7.500	0.000	259.500	206.000	0.000	76.000	145.000	500.000	1194.000	3345.280
EA Support Costs:	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	546.250
Monitoring & Evaluation:	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Misc.	33.500	0.000	0.000	38.000	50.000		15.000		136.500	454.945
Baseline	2967.000	232.080	475.000	796.000	2567.596	831.000	155.000	1170.000	9193.676	9193.676
Project Costs:	**4200.300**	**650.410**	**1150.000**	**1415.000**	**3589.596**	**1397.200**	**625.000**	**2850.000**	**15877.506**	**24907.276**
PDF:	0.000	0.000	0.000	0.000	0.000	0.000	0.000	36.000	36.000	309.000
Full Project Cost	**4200.300**	**650.410**	**1150.000**	**1415.000**	**3589.596**	**1397.200**	**625.000**	**2886.000**	**15913.506**	**25216.276**

58. Budget Notes (Table 2):
- *Personnel Costs* are costs for additional staffing at each of the sites plus a Project Coordinator, Project Manager and Project Assistant at TSBF and costs for contribution of TSBF staff and/or TAG Members beyond the co-financed activities.
- *Operational Costs* are largely for on-farm field activities and laboratory support;
- *Workshops and Training* include most of the activities under Outcome 5 plus the global and national workshops needed for completion of all the other outcomes. This is the largest of the global components to enable flexible international movement during training opportunities and provide for international workshops.
- *Travel* includes travel to benchmark sites for scientists and other stakeholders in each country (in the Global Component) plus travel of the Coordinator and Members of the TAG for back-up and other support.
- *Executing Agency Support Costs* have been calculated as 23% overhead on the global component only, i.e. that which is directly managed by TSBF. This is equivalent to about 6.4% of the total Project Cost.

59. *Co-Financing* for the alternative (Table 3) largely originates from in-kind additional funding that will be made available by the participating institutions in addition to the current baseline investment of $9,193,676 resulting in a total investment of $15,877,506. The cash contribution to co-financing is low (13% of the total) for this neglected and unfashionable component of biodiversity research. There is however a substantial amount of associated funding, both national and international, targeted at the agronomic significance of soil biota. There is also high expectation of leveraging additional funds when the GEF project is financed.

Table 3: Alternative Co-Financing

Country	**Funding Source**	**Amount**		**Country Total**
		In-kind	**Cash**	
Brazil	Government, Institutional support*	1,080,100		
	Project de pesquisa Dirigida		75,200	
	Prodesas		18,000	
	Large Biosphere-Atmosphere Exp		60,000	1,233,300
Mexico	Government, Institutional support	566,200		566,200
Cote-d'Ivoire	Government, Institutional support	418,330		418,330
Kenya	Government, Institutional support	1,022,000		1,022,000
Uganda	Government, Institutional support	470,000		470,000
India	Government, Institutional support	435,000	240,000	675,000
Indonesia	Government, Institutional support	119,000		
	Ford Foundation		24,000	
	Von Humboldt Foundation		36,000	
	ICRAF	240,000	200,000	619,000
Global	TSBF	1,480,000	200,000	1,680,000
Total		5,830,630	853,200	**6,683,830**

* see list of institutions in Annex F.

MONITORING, EVALUATION AND DISSEMINATION

60. The National Advisory Committee and the Implementing Committee will prepare an annual workplan and budget for evaluation and approval by TAG. These workplans will contain intermediate milestones and activities designed to move the project towards the contracted outputs. The Implementing Committee will work closely together with the Site Committee to ensure proper development of project activities. Semi-annual and annual reports will be prepared and submitted against these workplans. These reports will form the primary basis of monitoring and evaluation. This will be supplemented by independent review after two years and at completion of the project.

61. More specifically:
    Monitoring will concentrate on the management and supervision of project activities, seeking to increase the efficiency and effectiveness of project implementation. It is a continuous process which will collect information about the execution of activities programmed in the annual workplan, advise on improvements in method and performance, and compare accomplishments with milestones.
    Ongoing evaluation will assess the project's success in producing each of the programmed outputs, both in quantity and quality. Internal assessment will be continuously provided by the Scientific Coordinators, and mid-term (two year) and final evaluation of outputs will be carried out by external consultants contracted by UNEP in consultation with TSBF and the TAG.
    Impact evaluation will assess the project's success in achieving its objectives. Success will be evaluated at mid-term and at the end by external consultants contracted by UNEP in consultation with TSBF and the TAG.
    Indicators (see logframe, Annex B) will be applied to the work-plan at the start of each year and utilized at each point of evaluation.

62. Project results will be regularly disseminated through project reports - semi-annual, annual and final reports at both national and international levels, the scientific results from which will be published in peer-reviewed journals. Documents for stakeholders other than scientists (eg. farmers, government agencies) will be prepared as needed. National databases and the Global Information System will be published both in hard copy, on diskette and on a World Wide Web Site, as will also the Manuals for BGBD assessment and valuation. Videos, televised and/or newspaper articles will also be utilised as needed.

REFERENCES

Bignell, D., Tondoh, J., Dibog, L., Huang, S.P., Moreira, F., Nwaga, D., Pashanasi, B., Swift, M.J. 2000. Developing a key-functional group approach for below-ground biodiversity assessment: the ASB experience. ASA Symposium (In press).

GEF 2000. Operational Program #13. Conservation and sustainable use of biological diversity important to agriculture. Global Environmental Facility, GEF/C.15/Inf.

Giller, K. E., Beare, M. H., Lavelle, P., Izac, A.-M. N., and Swift, M. J. 1997. Agricultural intensification, soil biodiversity and agroecosystem function. *Applied Soil Ecology* 6(1): 3-16.

Lavelle, P.A., Brussaard, L. and Hendrix, P. (Eds.) 1999. Earthworm *Management in Tropical Agroecosystems.* CAB International, Wallingford, UK.

Lavelle, P., Bignell, D., Lepage, M., Walters, V., Roger, P., Ineson, P., Heal, O.W. and Ghillion, S. 1997. Soil function in a changing world: The role of invertebrate ecosystem engineers. *European Journal of Soil Biology* **33**, 159-193.

Schaefer, M. and Schauermann, J. 1990. The soil fauna of beech forests: Comparison between a mull and a moder soil. *Pedobiologia* **34**, 299-314.

Swift, M. J., J. Vandermeer, P. S. Ramakrishnan, J. M. Anderson, C. K. Ong, and B. A. Hawkins. 1996. Biodiversity and agroecosystem function, pp. 261-298. In: H. A. Mooney, J. H. Cushman, E. Medina, O. E. Sala, and E. D. Schulze, (Eds.). *Functional roles of biodiversity: A global perspective*. John Wiley & Sons Ltd.

Torsvik, V., Sf rheim, R. and J. Goksf yr. 1996. Total bacterial diversity in soil and sediment communities – a review. *Journal of Industrial Microbiology* **17**, 170-178

UNEP. 1995. *Global Biodiversity Assessment.* Cambridge University Press, Cambridge.

Van Noordwijk, M., Tomich, T.P., de Foresta, H., Michon, G. 1997. To segregate – or to integrate: the question of balance between production and biodiversity conservation in complex agroforestry systems. *Agroforestry Today* **9(1)**, 6-9.

ANNEXES:

A	Incremental Cost Annex
B	Logical Framework Matrix
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ANNEX A. INCREMENTAL COST ANNEX

1. Broad Development Goals

Governments have typically encouraged land conversion and agricultural intensification in response to the demand for higher levels of food production under conditions of increasing population growth. Support often comes in the form of set prices for products and/or subsidy for inputs, and for land conservation measures. Under current conditions however, agricultural support of this kind has been substantially abandoned in many countries under a variety of structural adjustment and market liberalization reforms. Moreover in the majority of tropical countries no alternative legislation, that will influence the path of agricultural development, has been put in place. Market forces, with often little concern for environmental externalities including the loss of above and below-ground biodiversity, are therefore even more dominant than previously, while food security has continued to decrease in many countries, particularly in Africa.

Amidst a policy and economic environment that does not acknowledge the importance of managing and conserving agrobiodiversity; farmers, rural communities, scientists, NGOs and the general public have become increasingly aware of the high environmental cost of many intensive high-input agricultural practices. Furthermore, it is now accepted that loss in biodiversity is one of the major factors leading to degradation of ecosystem services and loss of ecosystem resilience. In many countries, however, conflicts have arisen between policies to support biodiversity conservation and ecosystem protection and those of agricultural development.

Development of appropriate policy requires, in particular, reconciling the needs for meeting food-sufficiency by high levels of agricultural productivity with those for conserving biodiversity and environmental protection. A major barrier here has been the lack of data on changes in diversity within agricultural landscapes and the assumption that there is necessarily a trade-off between biodiversity and agricultural productivity.

Criteria for managing farm landscapes or evaluating them in terms of biodiversity conservation or other features of interest to various sectors of society have yet to be developed. In some countries policies have been framed with the intention of achieving better integration and to explicitly avoid biodiversity and agriculture being seen as mutually incompatible or competitive. Progress in these respects has, however, been slow. Almost universally, attempts at integrated and sustainable agricultural development and policy formulation to support agrobiodiversity conservation and management are frustrated by lack of an information base that rigorously demonstrates the environmental implications, whether beneficial or detrimental, of agricultural development.

2. Baseline

The baseline activities globally and in the seven countries are limited in scope and are unsystematic. They include some activities devoted to other purposes that will provide information useful to the analysis of BGBD. By themselves, the baseline activities will be insufficient to allow a proper understanding of BGBD, its value and benefits, and how this information can be applied in conservation, land-use and policy decision-making. As a result, BGBD has been, and would continue to be, almost universally ignored, with adverse effects at both the national and global levels.

The baseline situation for the 5-year duration of the project is as follows:

i. Methods for characterization and evaluation of BGBD, including a set of indicators for BGBD loss, are not sufficiently developed to be universally applicable which has resulted in an information gap that has significantly reduced conservation opportunities. Current

estimated global allocations for methodology development is US$ 70,000 while cumulative investment for the project countries totals US$ 930,220.

ii. Inventory and evaluation of BGBD globally and in the benchmark sites is insufficient to provide adequate information to decision-makers and land managers to implement conservation actions that target both above-ground and below-ground biodiversity. Existing global networks to exchange information on BGBD are weakly developed. Current estimated global allocations for inventory and evaluation of BGBD and the development of a BGBD global information exchange network is US$ 100,000 while cumulative investment for the project countries totals US$ 819,936.

iii. Application of sustainable management practices targeted to conserve BGBD is nominal globally and at the national/local levels resulting in limited opportunities to conserve BGBD and secure essential services provided by BGBD to the sustainable functioning of ecosystems. Current estimated global allocations for the development and implementation of sustainable management of BGBD is US$ 300,000 while cumulative investment for the project countries totals US$ 1,980,498.

iv. Alternative land-use practices for BGBD conservation and an advisory support system for policies that will enhance the conservation of BGBD is non-existent at global and national levels. Current estimated global allocations for linking land-use practices to conservation and policy formulation that favors BGBD conservation is US$ 600,000 while cumulative investment for the project countries totals US$ 2,232,018.

v. The capacity of relevant institutions and stakeholders to implement conservation and management of BGBD in a sustainable and efficient manner is extremely limited at both national and global levels. Training opportunities in this area are rare. Current estimated global allocations for capacity development to conduct BGBD assessments and incorporate this information in the formulation of best-practice for BGBD management and conservation is US$ 100,000 while cumulative investment for the project countries totals US$ 873,282.

3. Global Environmental Objective

The global benefits of the project will include the reduction in loss of BGBD in the benchmark sites. The selected benchmark sites represent a variety of levels of agricultural intensification and agricultural practice, and will therefore serve as examples and provide valuable experience, which can be extended to other countries. The benchmark sites in themselves also represent areas of valuable agricultural biodiversity (Annex H). National actions in agricultural development leading to conservation of BGBD, particularly in high biodiversity areas have therefore not only national benefits but also significant global benefits. Furthermore, the benefits extend beyond biodiversity conservation per se to influences on the environment, such as primary and secondary productivity, landscape degradation and climate change due to BGBD effects on important soil processes that reflect themselves at the ecosystem level (e.g. soil erosion, greenhouse gas emission, soil fertility, C sequestration).

Further global benefits of the project include the extrapolation of these mitigating actions to limit BGBD loss to other sites with similar agroecological conditions; increased international capacity to prepare action plans for managing and conserving BGBD in other operational areas and agroecological zones; development of universal, rapid and standardized methods for BGBD assessment, including indicators and predictors of BGBD loss; development of an internationally accessible BGBD database useful for research and planning in biodiversity conservation. The tools and recommendations developed by the project will also be valuable to future GEF operations in the field of agricultural biodiversity as they will greatly facilitate the development of projects aiming at conserving and managing BGBD.

The development of standardized methods for below-ground agrobiodiversity characterization and evaluation will enable a more precise assessment of the status and services provided by one of the least known parts of the Earth's biological diversity, the soil biota. Of particular use will be the identification and use of rapid indicators of BGBD loss. These actions will be a benefit which will facilitate other projects and development actions beyond the participating countries and ecozones.

Capacity building, focused on country, site and stakeholders needs, will accrue in a significantly enhanced ability of national scientists and other participants, locally, nationally and internationally to characterize and evaluate BGBD, and apply the standardized methodologies in their countries for effective conservation and management in the targeted areas. The benefits of building national capacity will also be reflected at international scales, such as with "S-S" exchanges, facilitating the performance of future BGBD-related research projects/activities.

4. GEF Alternative

Without the proposed GEF alternative, the capacity at global and national levels to conserve and sustainably manage BGBD and the knowledge base required to support effective BGBD conservation and management for both global benefits (conservation of globally significant biodiversity and agroecosystems, ecosystem functioning) and national/local benefits (soil fertility enhancement, sustainable land-use) would remain weak and largely undeveloped.

The project will substantially enhance the understanding of BGBD through a targeted research component and the use of this knowledge to implement sustainable and replicable BGBD conservation activities at the 12 pilot sites in 7 countries. These pilot sites will then serve as platforms for extension of best practice.

i. Methods for characterization and evaluation of BGBD. This component will build on upon existing work in the field to develop internationally accepted standard methods for characterization and evaluation of BGBD, including a set of indicators for BGBD loss. Because these tools and data are global public goods, it would not be in the nation's interest to develop them nor would data collected on a purely national basis be internationally comparable. GEF will provide slightly more than half (53%) of the total cost of the increment with donors and in-kind contributions accounting for the other half.

ii. Inventory and evaluation of BGBD. The methods developed in the targeted research component will used to inventory and evaluate the baseline for agrobiodiversity status and management at the benchmark sites with particular reference to BGBD. A common database format will be used so that the data can be combined to construct an Information System on BGBD Management and Conservation accessible through the World Wide Web. The development of the database and conducting an inventory and evaluation would not happen without the GEF intervention and will provide both global and national benefits. GEF will provide about 61% of the total cost of the increment with donors and in-kind contributions accounting for the other half.

iii. Application of sustainable management practices targeted to conserve BGBD. This component will include the identification of, and agreement on, management practices that effectively conserve BGBD and at the same time show potential agronomic, social and economic benefits. Plots at the benchmark sites will demonstrate the effects of different land-uses and management practices on agrobiodiversity. The development, monitoring and evaluation of sustainable management practices targeted at BGBD would not occur without the GEF intervention. This component will provide a global benefit in that the best practices will provide examples of BGBD conservation that can be extended to similar agroecological conditions. Substantial national benefits should accrue through sustainable

soil fertility management. GEF will provide slightly 58%) of the total cost of the increment with donors and in-kind contributions accounting for the other half.

iv. Alternative land-use practices for BGBD conservation and an advisory support system for policies that will enhance the conservation of BGBD. This component is designed to report and review the results of Component 3, and the emerging picture of the effect of alternative land-use practices on BGBD, agricultural production and other ecosystem functions. The results from the project and other data from the International Database will be utilised to construct advisory support systems (digests of information structured to provide means of making informed choices between different options in the face of particular types of obstacle.) Project participants will work with decision-makers from all appropriate levels (e.g. from communities, local and district areas, national planning and policy agencies) to develop recommendations for the practices that integrate agricultural development priorities with concerns for biodiversity conservation and environmental protection (win-win). The recommendations emerging from all this dialogue will be disseminated nationally through workshops and training sessions, and internationally through the International Information System. The development of this tool would not occur without the GEF intervention. Given that this component will have significant national and local benefits, GEF will provide somewhat less than half (43%) of the total cost of the increment with donors and in-kind contributions accounting for the remaining portion.

v. Capacity building of relevant institutions and stakeholders to implement conservation and management of BGBD in a sustainable and efficient manner. This component will build capacity in all stakeholder groups, and mobilize the wider scientific communities in the participating countries in the field of agrobiodiversity research and evaluation in general and of BGBD in particular. The International Information System will provide a mechanism for knowledge-exchange between the participating scientists and the wider scientific community. This will result in a substantial enhancement of the capacity to undertake agrobiodiversity-related research in and beyond the participating countries. The strengthening of national and global capacity would not occur without the GEF intervention. GEF will provide about two-thirds (66%) of the total cost of the increment with donors and in-kind contributions accounting for the other half.

5. Process and Scope of Analysis

The systems boundary covers the 12 benchmark sites in the seven countries (see Annex H). At the global level it also includes the body of knowledge and experience gained to date in the characterization and evaluation of BGBD. The principles for incremental cost analysis were agreed among the participating countries at the series of three global workshops held during the PDF-A and PDF-B activities on the basis of a discussion document prepared by consultants to the project. Following the second global meeting (May 1999) the issues were discussed within each country at the National Consultative Workshops. The methodology was finalised at the third global workshop in January 2000 and the calculations of baseline and alternative carried out within each country and at TSBF for the global component. The analysis includes a range of activities, aggregated into the 5 components/outcomes at the global and national levels. Costs have been estimated for 5 years—the duration of the planned GEF Alternative. The baseline captures investments at the global level and within the seven countries including at the site level. The Alternative captures the additional actions required to secure BGBD conservation objectives at both global and site-specific levels. Co-financing consists of funds and in-kind contributions leveraged in order to fulfil the objectives laid out in the Alternative.

6. Costs and the Incremental Cost Matrix

The incremental costs and benefits of the proposed project are summarized in the following incremental cost matrix. Baseline expenditures amount to US$ 9,193,676; the alternative has been costed at US$ 24,907,276. The incremental cost of the project, $ 15.7 million, is required to achieve the project's global environmental objectives. Of this amount, $ 9.029 million (or, $ 9.302 including PDF A and B resources) is requested for GEF support, or roughly 36% of the total cost of implementing the Alternative. The remaining 64% of the cost of the alternative will be coming from other donors and includes in-kind contributions.

Incremental Costs:

<table>
<tr><td>Outcome 1. Internationally accepted standard methods for characterization and evaluation of BGBD, including a set of indicators for BGBD loss.</td><td>Baseline</td><td colspan="2">Alternative</td><td>Increment (alternative-baseline)</td></tr>
<tr><td>Domestic Benefits</td><td>Inability to efficiently assess BGBD reduces country capacity for sustainable soil fertility management, and increases risk of land degradation.</td><td colspan="2">Rigorous assessments of BGBD enable improved evaluations of soil fertility and land degradation risks and opportunities.</td><td></td></tr>
<tr><td>Global Benefits</td><td>Inability to conduct global comparisons of the status and value of BGBD in relation to land use change results in exclusion of this component of agro-biodiversty from CBD discussions.</td><td colspan="2">Universal rapid methods, including indicators and predictors available to GEF and elsewhere enable proper consideration of BGBD status and value.</td><td></td></tr>
<tr><td>Costs:</td><td>COUNTRY</td><td>Alternative</td><td>GEF</td><td rowspan="10">Increment

GEF:
1,141,685
Co-finance
<u>1,018,539</u>
Total
2,160,224

Total cost
<u>3,124,124</u></td></tr>
<tr><td>Brazil: 378,920</td><td>140,000</td><td>105,000</td></tr>
<tr><td>Côte d’Ivoire 0</td><td>64,999</td><td>103,490</td></tr>
<tr><td>India 50,000</td><td>81,000</td><td>105000</td></tr>
<tr><td>Indonesia 30,000</td><td>95,000</td><td>105,000</td></tr>
<tr><td>Kenya 185,880</td><td>122,640</td><td>106,686</td></tr>
<tr><td>Mexico 249,100</td><td>169,900</td><td>104,900</td></tr>
<tr><td>Uganda 0</td><td>105,000</td><td>110,000</td></tr>
<tr><td>Global 70,000</td><td>240,000</td><td>401,609</td></tr>
<tr><td>Total 963,900</td><td>1,018,539</td><td>1,141,685</td></tr>
</table>

<table>
<tr><td>Outcome 2a) Inventory and evaluation of BGBD in benchmark sites representing a range of globally significant ecosystems and land uses.

Outcome 2b)
A global information exchange network for BGBD.</td><td>Baseline</td><td>Alternative</td><td>Increment (alternative-baseline)</td></tr>
<tr><td>Domestic Benefits</td><td>Incomplete information on linkage between land use change and BGBD impairs decisions on sustainable soil management.</td><td>Greatly improved knowledge base assists soil fertility and land management practices throughout the country</td><td></td></tr>
<tr><td>Global Benefits</td><td>Lack of information and impaired information exchange on status of BGBD in globally significant biodiversity areas inhibits development of conservation strategies for agroecosystems.</td><td>a) Increased BGBD information available from areas of high global biodiversity significance.
BGBD information accessible internationally and applicable to global biodiversity conservation planning.</td><td></td></tr>
<tr><td>Costs:</td><td colspan="3"><table>
<tr><td>COUNTRY</td><td></td><td>Alternative</td><td>GEF</td></tr>
<tr><td>Brazil:</td><td>896,960</td><td>365,600</td><td>306,500</td></tr>
<tr><td>Côte d’Ivoire</td><td>177,082</td><td>136,666</td><td>296,995</td></tr>
<tr><td>India:</td><td>150,000</td><td>236,250</td><td>306,250</td></tr>
<tr><td>Indonesia:</td><td>80,000</td><td>89,000</td><td>306,000</td></tr>
<tr><td>Kenya:</td><td>430,336</td><td>357,700</td><td>311,168</td></tr>
<tr><td>Mexico:</td><td>249,600</td><td>169,900</td><td>304,700</td></tr>
<tr><td>Uganda:</td><td>60,000</td><td>150,000</td><td>310,000</td></tr>
<tr><td>Global:</td><td>100,000</td><td>320,000</td><td>680,830</td></tr>
<tr><td>Total:</td><td>2,143,978</td><td>1,825,116</td><td>2,822,443</td></tr>
</table></td><td>Increment

GEF: 2,822,443
Co-finance 1,825,116
Total 4,647,559

Total cost 6,791,537</td></tr>
</table>

Outcome 3. Sustainable and replicable management practices for BGBD conservation identified and implemented in pilot demonstration sites in representative tropical landscapes in the seven countries.	**Baseline**	**Alternative**	**Increment (alternative - baseline)**
Domestic Benefits	Under-utilization of soil biota in land management practices results in unintentional loss of in-country biodiversity and utilization of sub-optimal practices for sustainable soil management.	Improved BGBD conservation, with sustainable land management, in demonstration sites.	
Global Benefits	Present and future loss of both known and undescribed BGBD and diminished ecosystem services in globally significant biodiversity regions of seven countries.	BGBD conservation managed in selected landscapes in globally significant biodiversity areas and available for future global economic benefit	

Costs:

COUNTRY		Alternative	GEF
Brazil:	780,160	341,400	262,500
Côte d'Ivoire	30,000	130,000	254,990
India:	175,000	202,500	262,500
Indonesia:	500,000	172,000	262,000
Kenya:	329,038	306,600	266,715
Mexico:	166,300	113,200	263,600
Uganda:	0	120,000	255,000
Global:	300,000	400,000	649986
Total:	**2,280,498**	**1,785,700**	**2,477,291**

Increment

GEF:	2,477,291
Co-finance	1,785,700
Total	4,262,991
Total cost	6,543,489

Outcome 4. Recommendations of alternative land use practices and an advisory support system for policies that will enhance the conservation of BGBD.	**Baseline**	**Alternative**	**Increment (alternative - baseline)**
Domestic Benefits	BGBD not considered in land use planning, resulting in sub-optimal land use and soil fertility management at national scale.	Increased information and enhanced capacity for effective land use decision-making. Potential for extension of sustainable land management practices.	
Global Benefits	Absence of recommendations for policy makers and other stakeholders to inform them of best practices for BGBD conservation.	Information on policy options for more effective interventions to conserve and manage BGBD globally available.	

Costs:

COUNTRY		Alternative	GEF
Brazil:	502,430	223,700	70,000
Côte d'Ivoire	6,666	48,332	68,000
India:	25,000	54,000	70,000
Indonesia:	86,000	223,000	72,000
Kenya:	1,498,922	81,760	71,124
Mexico:	83,000	56,600	70,100
Uganda:	30,000	35,000	70,000
Global:	600,000	420,000	372,093
Total:	**2,832,018**	**1,142,392**	**863,317**

Increment

GEF:	863,317
Co-finance	1,142,392
Total	2,000,709
Total cost	4,837,727

Outcome 5. Improved capacity of all relevant institutions and stakeholders to implement conservation and management of BGBD in a sustainable and efficient manner.	**Baseline**		**Alternative**		**Increment (alternative - baseline)**
Domestic Benefits	Limited capacity to conduct BGBD assessments and effectively incorporate information in recommendations for improved land management practices.		National competence to conserve and manage BGBD developed to international standards.		
Global Benefits	Large disparity in capacity at national level hampers regional and global conservation and land management efforts.		Increased awareness of BGBD over a full range of stakeholders providing worldwide ability to respond to potential BGBD loss with best practices and policies.		
Costs:	**COUNTRY**		Alternative	GEF	**Increment**
	Brazil:	408,530	162,600	131,000	GEF: 1,725,034
	Côte d'Ivoire	18,332	40,000	127,495	Co-finance 912,083
	India:	75,000	101,250	131,250	Total 2,637,117
	Indonesia:	100,000	36,000	129,000	
	Kenya:	123,420	153,300	133,357	Total cost 3,610,399
	Mexico:	83,000	56,600	131,200	
	Uganda:	65,000	60,000	125,000	
	Global:	100,000	300,000	816,732	
	Total:	**973,282**	**912,083**	**1,725,034**	

Total Costs	Baseline:		Alternative:		**GEF**	**Increment**	
			In-kind	Cash			
	Outcome 1	963,900	888,521	130,018	1,141,685	GEF:	9,029,770
	Outcome 2	2,143,978	1,592,137	232,979	2,822,443	Co-finance	6,683,830
	Outcome 3	2,280,498	1,557,753	227,947	2,477,291	Total	15,713,600
	Outcome 4	2,832,018	996,564	145,828	863,317	Total cost	24,907,276
	Outcome 5	973,282	795,654	116,429	1,725,034		
	TOTAL	9,193,676	5,830,630	853,200	9,029,770		

Total Costs	Country	Baseline:	Alternative:		**GEF**	**Increment**	
			In-kind	Cash			
	Brazil	2,967,000	1,080,100	153,200	875,000	GEF:	9,029,770
	Mexico	831,000	566,200	0	874,500	Co-finance	6,683,830
	Cote d'Ivoire	232,080	418,330	0	850,970	Total	15,713,600
	Kenya	2,567,596	1,022,000	0	889,050	Total cost	24,907,276
	Uganda	155,000	470,000	0	870,000		
	India	475,000	435,000	240,000	875,000		
	Indonesia	796,000	359,000	260,000	874,000		
	Global	1,170,000	1,480,000	200,000	2,921,250		
	TOTAL	9,193,676	5,830,630	853,200	9,029,770		

ANNEX B: TABLE 1. LOGICAL FRAMEWORK MATRIX

Intervention Logic	Indicators of Performance	Means of Verification	Risks and Assumptions
Development Objective: Conservation and sustainable management of below-ground biodiversity is enhanced.	• By the end of the project, BGBD conservation practices identified, tested and implemented. • Capacity to manage and conserve BGBD improved	Reports of successful implementation of methods ie.: documents, website, videos. Local, national and international media BGBD awareness, knowledge and actions documented by and for the full range of stakeholder groups.	• Government stability • Natural catastrophe
Purpose: BGBD conserved and sustainably managed in globally significant forest ecosystems in seven tropical countries.	• BGBD conservation practices implemented in benchmark areas. • Increased BGBD and improved ecosystem functions demonstrated in sites under improved management. • Alternative strategies for land management promoted and/or adopted by stakeholders across a range of scales from the farm to the nation. • Global methodology and database for BGBD developed and utilised.	• Demonstration sites in place • Farmers practice alternative management • BGBD inventories published • Database internationally accessed on WWW • International use of methods	• Political will and support maintained • Economic stability
Outcome 1. Internationally accepted standard methods for characterization and evaluation of BGBD, including a set of indicators for BGBD loss.	• Methods for evaluation and indicators for BGBD loss are utilized nationally and internationally	• Memorandums, Institutional agreements, letters of endorsement • Manuals published after peer review • Use of methods quoted in independent publications	• Agreement on suitable methods can be reached • Willingness to standardise methods.

Intervention Logic	Indicators of Performance	Means of Verification	Risks and Assumptions
Activity 1.1 Select, standardize and test methods for characterizing BGBD at landscape and farm level a. Workshop to review and select methods b. testing of selected methods in subsets of sites. c. agree standard for methods d. produce method manuals	• Sampling & BGBD evaluation methods tested on 2 contrasting sites in 7 countries • Methods agreed & manual written	• Shared reports • Manual published and distributed	• Agreement can be reached
Activity 1.2 Identify and test key indicator (s) of BGBD loss	• Experimental results demonstrating importance of BGBD for different functions (e.g., decomposition , pest status) • Indicators tested across all countries	• Experimental reports • Scientific papers • Protocols for indicators published	• Data sharing commitment adhered to by participants
Activity 1.3 Identify, develop and agree methods for evaluating the economic, environmental and other benefits of BGBD and its functions for stakeholders at local, national and global scales	• Guidelines for valuation of BGBD and its functions agreed. • Estimates of the value of BGBD under different conditions made at selected sites • Valuation manual written	• Project reports • Peer-reviewed papers • Manual	• Economic stability • Stakeholders willing to participate
Outcome 2a) Inventory and evaluation of BGBD in benchmark sites representing a range of globally significant ecosystems and land uses. **Outcome 2b) A global information exchange network for BGBD.**	• Inventory and evaluation of BGBD in the benchmark sites added to existing databases. • Databases and information systems utilised by stakeholders and others nationally and internationally.	• Reports and publications from project participants and other stakeholders • Website with database information • Secondary documents utilising project data.	• Sites remain accessible and conditions favourable over time required for inventory. • Databases are accessed and used by stakeholders.

Intervention Logic	Indicators of Performance	Means of Verification	Risks and Assumptions
Activity 2.1 Land-use mapping of benchmark areas	• Satellite imagery and aerial photographs interpreted • Ground truthing of land-use categories • Digital database developed for each benchmark area • Land-use intensities calculated • Sampling locations agreed in each benchmark area	• Land-use maps and reports • Digital databases made freely available • Diagnostic tool for calculation for land-use intensity • Geo-referenced locations for sampling sites	• Remote-sensing data available and accessible • Landholders allow access
Activity 2.2 Apply agreed methods for BGBD characterization to full range of land-use intensities in each of the benchmark areas	• Planned sample collection completed and characterized Samples analyzed using agreed methods	• Catalogued collections • Voucher specimens • National database of BGBD by land-use intensification	• Equipment maintained
Activity 2.3 Development of internationally accessible database	• Design of internationally agreed database for BGBD in relation to land-use completed • Integration of national data sets into global database	• Database format shared and used by project participants in all countries. • International database available on WWW	• Compatible computer systems available globally • Participants adhere to data sharing commitment
Outcome 3. Sustainable and replicable management practices for BGBD conservation identified and implemented in pilot demonstration sites in representative tropical landscapes in the seven countries.	• Demonstrations of practices for BGBD management and conservation established in benchmark sites in all participating countries	• Documentation of the practices in project reports, articles & by media	• Stakeholders and media participation
Activity 3.1 Workshops and consultations with stakeholders for site selection and project planning	• Demonstration sites selected • Project plan elaborated	• Reports and project plans	

Intervention Logic	Indicators of Performance	Means of Verification	Risks and Assumptions
Activity 3.2 Select and evaluate management practices for BGBD conservation	• Selected management practices documented. • Management practices agreed by stakeholders for benchmark sites	• Reports with documentary evidence of success of management practices	• Agreement on practices is reached
Activity 3.3 Implement practices for BGBD management and conservation in pilot demonstration sites.	• Demonstration sites established in benchmark areas • Teams for managing BGBD operating in benchmark sites • Field days and stakeholder meeting held	• Management committee • Implementation plans • Field visits to sites • Media reports	• Stakeholders' commitment • Effective communication between stakeholders • Media interest
Activity 3.4 Evaluate environmental benefits of BGBD conservation and sustainable land-use management	• Assessment of economic, social and environmental cost and benefits completed across scales for different stakeholders. • Synthesis of national analyses to assess global perspective (s)	• National reports • High impact journal article(s)	• Economic and social stability • Referee's acceptance
Outcome 4. Recommendations of alternative land use practices and an advisory support system for policies that will enhance the conservation of BGBD.	• Recommendations that support BGBD conservation are used by land-use policy decision makers in participating countries	• Reports, memorandums, land management guidelines and gazettes.	• Stakeholder groups and agencies (e.g., government) respond to recommendations
Activity 4.1 Identify obstacles to BGBD conservation with stakeholders	• Within country consultations with planners and decision makers identify major policy barriers to BGBD conservation at scales from farm to nation. • Global analysis to determine generality of barriers	• Joint reports of project and decision makers • Global synthesis published	• Willingness of planners and decision makers to participate

Intervention Logic	Indicators of Performance	Means of Verification	Risks and Assumptions
Activity 4.2 Negotiate alternative strategies for BGBD conservation and sustainable land-use management	• Within country consultative and advisory meetings held with decision makers at scales ranging from farm community to national government • Agreement reached for implementation of alternative management practices	• Adoption of practices by landholders	• Stakeholders' participation
Activity 4.3 Propose actions and policies at local, national and global scales	• Define framework for decision making • Formulate national action plans	• Framework established • Action plans	• Agreement can be reached
Outcome 5. Improved capacity of all relevant institutions and stakeholders to implement conservation and management of BGBD in a sustainable and efficient manner.	• BGBD research and management capacity institutionalized in scientific institutions in participating countries. • Farmer, extensionists and NGO trainees apply and transfer BGBD knowledge to other stakeholders. • Decision makers utilise soil biology information	• Staffing levels for soil biology and related disciplines • Survey data for dissemination of BGBD methods beyond immediate target farmers. • Policy documents utilising BGBD information.	• Institutional structures conducive to new approaches • Interest in acquiring new skills and knowledge to manage BGBD
Activity 5.1 Train scientists and other stakeholders in disciplines identified as lacking in cooperating countries	• Specialist training activities in soil biology held (south-south and north-south) • Post-graduates trained	• Course certificate • Research thesis	
Activity 5.2 Enhance stakeholders' awareness and knowledge of BGBD and its functions.	• Knowledge of soil biota and its management disseminated to farmers, extensionists and NGOs • Decision-makers utilise soil biodiversity information.	• Surveys of dissemination rates • Posters and leaflets • Utilisation of decision support tools • Policy documents	• Stakeholders' interest

TABLE 2: PROJECT TIMELINE

PROJECT PHASES	PHASE ONE YEARS ONE-TWO								PHASE TWO YEARS THREE-FIVE											
	Year 1: 2002				Year 2: 2003				Year 3: 2004				Year 4: 2005				Year 5: 2006			
COMPONENTS/ACTIVITIES	**Mar**	**Jun**	**Sep**	**Dec**	**Mar**	**Jun**	**Sep**	Dec	**Mar**	**Jun**	**Sep**	**Dec**	**Mar**	**Jun**	**Sep**	**Dec**	**Mar**	**Jun**	**Sep**	**Dec**
1. Standardised Methods																				
1.1 Select/Test/Publish Methods																				
1.2 Select/Test/Indicators																				
1.3 Agree Evaluation Methods																				
2a. Inventory of BGBD																				
2.1 Land-Use Mapping																				
2.2 Inventory																				
2b. Global Information Network																				
2.3 Database Established																				
3. BGBD Management Practices																				
3.1 Site selected																				
3.2 Management practices evaluated																				
3.3 Management practices employed																				
3.4 Benefits evaluated																				
4. Policies Advisory Systems																				
4.1 Policy obstacles identified																				
4.2 Policy negotiations																				
5. Capacity Building																				
5.1 Scientific Training																				
5.2 Awareness of BGBD																				

ANNEX C: STAP REVIEW

Project: Conservation and Sustainable Management of Below-Ground Biodiversity

Key issues
a) Scientific and technical soundness of the project

1. I am glad to report that this is an excellent project that will contribute significantly to the sustainable use of tropical regions of the world. The following sections describe the project and highlight the strengths and potential weaknesses following the Terms of Reference for Technical Review of Project Proposals. This review assesses the proposal's global priority with emphasis on the adequacy, cost-effectiveness, and feasibility.

2. Agriculture has intensified dramatically in the last three decades as the amount of labor, pesticides, and fertilizers increased exponentially. Currently, an array of agriculture options is available from minimum to maximum human interventions, which involves crop rotation, agroforestry, inter cropping, green-cover cropping up to monospecific crops with high levels of inputs and yield. The path of intensification has been led solely by the desire of increasing yields. Now, scientists recognize that agroecosystems provide other goods and services besides food or fiber and that some of these alternative goods and services may be equally or more valuable than the traditional products. The other goods and services that agroecosystems provide are, for example, the maintenance of biodiversity, detoxification of harmful substances, provision of clean water, and erosion control (Costanza et al. 1997, Daily 1997). Assessment of agricultural options solely from one viewpoint, that of maximizing yields, has been misleading for decision-makers at all levels from farmers to local, provincial, and national institutions. This tendency resulted mainly from the difficulty of assessing the effects of different agricultural practices on below-ground biodiversity. Goods and services with no current market-value have not been recognized until recently and their quantification and their relationship with different agricultural practices has been challenging for science in general.

3. This project proposes to assess the effects on below-ground biodiversity of different agricultural practices using studies replicated in seven countries of the tropics. Results of the assessment will suggest the best practices that will maintain both yield and biodiversity in a sustainable fashion. The project hypothesizes that appropriate management may result in optimal conservation of biodiversity and in maximum yields. Even if this hypothesis turns out to be rejected, a better understanding of the trade-offs between yield and biodiversity will assist in making the most appropriate decision for each nation, region, or farmer.

4. The impact of the different agricultural practices on biodiversity (particularly below-ground) is currently not known. Similarly, we do not know adequately how changes in biodiversity resulting from the different agricultural practices will affect nutrient cycling and the retention of water. The ecological implications of the different agricultural paths are not clear and consequently the integrated economic cost and benefits of the current alternatives are not known. The poor understanding of the costs and benefits of the alternative paths for agriculture intensification hampers the ability of policy makers to develop the best economic incentives. The study proposed in this proposal will attempt to assess the effects of agricultural intensification on below-ground biodiversity and will provide economic assessments of the costs and benefits of the different alternatives. The objective of this proposal is currently of paramount importance for our understanding of the functioning of ecosystems as well as for the development of sound policy for sustainable land use.

5. I suggest that the objective of the project needs to be modified to reflect the nature of this project and its limitations. Currently it states "The objective of this project is to enhance the conservation and management of below-ground biological diversity (BGBD) important to sustainable agricultural production in tropical landscapes undergoing land conversion and/or intensification". This project certainly will enhance our understanding and will develop tools to use tropical ecosystems in a sustainable fashion. However, the status of conservation and sustainability is a broad phenomenon that recognizes social, economic, as well as ecological limitations. This project will contribute to ameliorate the latter and therefore it will be unfair in the future to judge its success by the status of conservation in tropical regions of the world. I suggest that a more appropriate objective would emphasize the achievements in terms of understanding, development of new practices, and capacity building.

6. The success of the entire project will be tightly determined by Outcome 1 which will develop standard methods for characterization and evaluation of below-ground biodiversity. The question of biodiversity change can be very simple or immensely complicated depending on the level of aggregation chosen. A study solely at the functional level can be relatively easy but not able to address the project's objective in terms of identifying practices that foster sustainability. It is very likely that major functional groups will be present in all the agricultural options except the most extreme. Therefore, the success of the project will depend on evaluating biodiversity beyond the functional groups at more detailed levels. The methodology is not yet defined for the study since defining the methodology will be the first step of the project. Consequently, there are still opportunities to influence the method chosen that will yield satisfactory answers.

7. Experiments dealing with the effects of different factors on biodiversity and those assessing the effects on the functioning of ecosystems are very current as is demonstrated by the large number of publications in the most reputable scientific journals as well as by several books devoted to these issues. Experiments ranged from field studies documenting changes in biodiversity along fertility gradients up to complex manipulative experiments (For some examples see (Naeem et al. 1994, Tilman 1994, Tilman et al. 1996)). Although there is a great interest in this topic, major methodological problems remain to be solved (Huston 1997).

8. Some of the hypotheses presented on Annex I address the current diversity-functioning issues just described in the previous paragraph. However, I suggest that this section will benefit from some further refinement of the hypotheses. Specifically:

   Hypothesis 1 (Annex I part I Scientific and Technical Merit) states "That sustainable agricultural production and the maintenance of environmental service functions are impaired by loss in BGBD". This hypothesis as it is stated here has been tested and is widely accepted as correct. The current debate however, is located around the shape of the relationship between biodiversity and ecosystem functioning. The current question is related to the level of diversity needed to sustain functioning. Current hypotheses suggest differences among ecosystem processes and regions.

   Hypothesis 3: " That the diversity *within* functional groups has global rather than local value" may be difficult to test. I suggest to reword the hypothesis in a way that can be testable.

   Hypothesis 4: " That patterns in the impacts of land-use change on BGBD will be similar across the globe". I suggest a discussion of how the project expects to test this hypothesis.

The exercise may vary from being very useful to be irrelevant according to the level of detail chosen to test the hypothesis.

9. This project will prove to be very cost-efficient for two reasons: (1) the project matches GEF objectives as it is described in item "C", and (2) the project and the nations involved in the project will contribute important resources. Therefore, the project will advance the GEF objectives with a relatively small cost.

b) Global environmental benefits of the project

10. The project will have large direct global environmental benefits. The assessment will be replicated in seven tropical countries which encompass a broad range of ecological and socio-economic conditions. Consequently, conclusions resulting from this project will be able to be extrapolated to the tropical world in general. Results from this project will assist in the development of policy at the local and global levels.

c) Agreement with GEF goals

11. The project fits well within the context of the goals of GEF which emphasizes the need to balance production and conservation objectives. This balance is at the core of the concept of sustainability. There is an urgent need to satisfy the needs of expanding populations and production has to be sustained to be able to continue satisfying food, fiber, and shelter needs in the long run. Agriculture intensification aims at increasing production while conservation provides the biological insurance that guarantees the sustainability of production in the long run. GEF Operational Programme 2 is even more specific when states the need to support conservation and sustainable use in environmentally vulnerable areas and the conservation and sustainable use of endemic species. The project perfectly addresses GEF OP2.

d) Regional Context

12. The project has a broad regional context. Replicated experiments are planned in seven tropical countries of Africa, Asia, and the Americas. The project proposes to assess the consequences for biodiversity of agriculture intensification in Brazil, Côte d'Ivoire, Indonesia, India, Kenya, Mexico, and Uganda. As mentioned above, these seven countries encompass a broad range of ecological, cultural, social, and economic conditions. Therefore, comparison of the results among sites will shed light on the determinants of the changes of below-ground biodiversity at the regional level.

e) Replicability

13. The broad range of ecological and social conditions covered by the seven countries ensures that the results and conclusions of this project will go beyond the experimental sites. The results from this project will not be applicable only to those sites or countries where the experiments will be carried out but also to other countries throughout the tropics. The new understanding of the effects of the different agriculture intensification pathways on below-ground biodiversity will be useful in drafting innovative policy for resource management across the tropics.

f) Sustainability of the project

14. The proposal has a thorough analysis of the risks associated with the completion of its objectives and a set of thoughtful strategies designed to minimize these risks. For example, the involvement of seven countries has important advantages as they have been described in items "d" and "e". However, there are some risks associated with the complexity of organization and management. In that sense, the structure of the project is designed to

maximize coordination and commitment of the partners. The proposed structure has a total of 23 different committees. At each country, there are three kinds of committees, the site committee, the national project implementation committee, and the national project advisory committee, in addition to two project-level committees, the project advisory committee and the technical advisory committee. I suggest this structure be simplified in a fashion such that results flow easily among sites, researchers and the different stakeholders.

15. The project has gathered an outstanding set of minds to work in the different committees. The project has concentrated great expertise in the different groups of below-ground biodiversity from termites to fungi and bacteria. I would like to suggest that this group could be strengthened by the addition of scientists that work in other types of ecosystems and therefore can assist in evaluating the generalities of the results yielded by the project and in assessing its contribution to the general theory of ecology, economics, and resource management.

g) Contribution to the implementation of GEF strategies and policies

16. The project will contribute to effective international technical collaboration. The project proposes south-south collaboration among the participating countries. Scientists, policy makers, farmers, and managers will interact in the effort of evaluating different options and in the drafting of natural resource management plans.

Secondary issues

Capacity building

17. The project emphasizes the issue of capacity building. The number of people who will be trained within the framework of the project will be an important benefit that will last far more than the project itself. Different training procedures are planned within the framework of the project. Outcome 5 on page 11 describes the different approaches to achieve the capacity-building objective of the project. The project plans to build capacity within all the stakeholders groups from farmers and managers to policy makers and graduate students. The learning process will merge indigenous technical knowledge with conventional scientific methods.

18. I suggest that it will be important to emphasize formal ways of capacity building which have an easy way of verification. In addition to the all-stakeholders approach, I suggest to focus on graduate degrees. The number of students that obtained masters, PhD, or who did their undergraduate senior project within the framework of the project will be a major result of the project. I suggest that the proposal should include an estimate of the number of students that will obtain degrees within the framework of the project and a description of how these students will be distributed among the different participating institutions. This project may gain considerably if it contributes to capacity building through the formal channels instead of ad hoc pathways. The research focus that the project may contribute along with the good programs offered by the Universities of the region or abroad may yield excellent results in capacity building.

References

Costanza, R., R. d'Arge, R. de Groot, S. Farber, M. Grasso, B. Hannon, K. Limburg, S. Naeem, R. O'Neill, J. Paruelo, R. G. Raskin, P. Sutton, and M. van den Belt. 1997. The value of the world's ecosystem services and natural capital. Nature **387**:253-260.

Daily, G. C., editor. 1997. Nature´s Services. Societal Dependence on Natural Ecosystems. Island Press, Washington DC.

Huston, M. A. 1997. Hidden treatments in ecological experiments: re-evaluating the ecosystem function of biodiversity. Oecologia **110**:449-460.
Naeem, S., L. J. Thompson, S. P. Lawler, J. H. Lawton, and R. M. Woodfin. 1994. Declining biodiversity can alter the performance of ecosystems. Nature **368**:734-737.
Tilman, D. 1994. Competition and Biodiversity in Spatially Structured Habitats. Ecology **75(1)**:2-16.
Tilman, D., D. Wedin, and J. Knops. 1996. Productivity and sustainability influenced by biodiversity in grassland ecosystems. Nature **379**:718-720.

Osvaldo E. Sala
Professor
27 June 2000

ANNEX C1: RESPONSE TO STAP REVIEW:

The review confirms the importance of the project purpose and reaffirms the context in which it has been designed i.e. to serve an area of biodiversity investigation that is currently unsupported both nationally and internationally. The Reviewer has made a number of very useful specific suggestions for improvement which are addressed below and by modification to the text of the Brief and/or Annexes.

Paragraph 5:
Issue: The reviewer suggests that the original objective **"to enhance the conservation and management of below-ground biological diversity (BGBD) important to sustainable agricultural production in tropical landscapes undergoing land conversion and/or intensification"** was overly ambitious and should focus more on the provision of tools, capacity and understanding than on the achievement of improvements in conservation and land management within the five-year time frame of the project.

Response: This criticism is accepted: as the reviewer points out, BGBD is largely ignored in current debates on biodiversity and ecosystem services. The project will provide an important service in raising awareness, in improving the methods for BGBD studies that are at present inadequate and lack international standards, and in developing the capacity for these studies from its current limited base. The major impact of the project should indeed be in addressing these three issues. Furthermore it is clear that a five-year time-span is far too short to expect to have achieved significant changes on land-use practice and thence in agrobiodiversity conservation, beyond those in the demonstration sites. The objective in para 22 has therefore been modified to read "**to enhance awareness, knowledge and understanding of below-ground biological diversity (BGBD) important to sustainable agricultural production in tropical landscapes by the demonstration of methods for conservation and sustainable management"**

Nonetheless it is important to emphasise that the intention of the project participants does extend beyond understanding, tools and capacity. The policy initiative proposed under Outcome 4 seeks to effect some action at national levels with regard to land-use, although it may be expected that the impact of such actions will only be substantially felt after the project period.

Paragraph 8
Issue: The reviewer suggests revision and clarification of some of the Hypotheses in the Targeted Research annex.

Response:
Hypothesis 4: (That patterns in the impacts of land-use change on BGBD will be similar across the globe). The design of the project requires that similar patterns of land-use intensification be investigated in all the sites. The intention of this hypothesis is to test whether similar land-use and management changes have the same impacts on BGBD irrespective of differences in the environmental and biogeographic conditions at the different sites across the zone.

Hypothesis 3 (That the diversity within functional groups has global rather than local significance) has been deleted. We agree with the reviewer that this proposition should probably not be formulated as a testable hypothesis. It can in fact be regarded as a subset of Hypothesis 4. It is expected that the study will reveal differences between agroecological zones (countries) in the diversity among and within functional groups. The main issue is whether these differences have significant functional impacts. The global patterns will reflect the overlay of land-use

impacts on biogeographic distributions of diversity and will enable analysis of whether differences in within-group diversity between different biogeographic zones should be regarded as an important factor to take into account when recommending measures for conservation and management..

Paragraph 11
This comment should read as Operational Program 3 (Forest Ecosystems) rather than 2.

Paragraph 14
Issue: The reviewer suggests simplifying the committee structure of the project in order to enhance the flow of information.

Response: This is a valid point. The original proposal for structure was unnecessarily cumbersome and implied high transaction costs. We have modified the original structure by reducing the number of standing committees within country from three to two (see Figure 2 and para 51). The Project Implementation Committee will be the committee of action and will meet in full or in part as often as needed. It will have the responsibility for all levels of implementation including those at the sites. The National Advisory Committee has an oversight function and will probably not meet more than once a year.

Paragraph 15
Issue: The reviewer proposes that the extrapolative power of the project be strengthened by adding scientists from other ecosystem types.

Response: This is an excellent suggestion and actions will be taken to add members to both the national and global advisory committees with the responsibility of providing links to agrobiodiversity studies in other ecosystem types and GEF Operational Programmes.

Paragraph 18
Issue: The reviewer suggests that the capacity building activities concentrate on formal training (eg. postgraduate students) rather than through 'ad hoc pathways'.

Response: The training of a cadre of postgraduate students who will gain not only expertise in specific disciplines addressed in the project, but also in the more holistic approaches needed for studies of agrobiodiversity evaluation and management, is an important priority of the project. A substantial part of the funds set aside in the global component of the funding will be used for this purpose with an emphasis on South-South training activities. We expect to provide opportunities for from five to ten higher degree students in each country.

Nonetheless we also believe that capacity building with other groups of stakeholders is extremely important. This ranges from the interchange of formal scientific and traditional indigenous knowledge between scientists and farmers to awareness building with decision makers at the national and global scales.

D Letters of Endorsement

ANNEX F: PUBLIC INVOLVEMENT PLAN SUMMARY

1. STAKEHOLDER IDENTIFICATION AND INVOLVEMENT

A list of the key stakeholders is presented below. Several are major beneficiaries while others will benefit to a lesser amount from participation. In each country, during the PDF-A and -B periods, the commitment of all the major stakeholders to and/or endorsement of, the project was secured through a series of consultations, meetings with farmer groups, scientists from other institutions, government and NGO representatives. This process was completed for each country by a National Workshop that brought together representatives of each stakeholder group to discuss the project objectives and outcomes, and plan their involvement.

I. Executing Agency and Advisory Committees

The Executing Agency for the project is the Tropical Soil Biology and Fertility Programme (TSBF), Nairobi, Kenya. TSBF is a small international research programme, independent of the UN, CGIAR or other international bodies but hosted by UNESCO at the UNON Complex, Nairobi. TSBF is the leading agency for soil biology as related to agriculture in the tropical regions. It is maintained by project funds from a range of investors of which the Rockefeller Foundation is the leading contributor. TSBF's main role is to catalyse, facilitate and coordinate research in soil biology by scientists in tropical countries. TSBF has taken a co-ordinative role in the preparation of this proposal on behalf of the seven countries. The Scientific Coordinator for the project is Prof. Mike Swift, the TSBF Director. A Project Coordinator will be appointed.

There will be two advisory committees:

The Project Advisory Committee (PAC)
This is an independent oversight committee of eminent scientists representative of the participating countries and other interests. The membership of this committee is yet to be finalised but currently includes the following:

Prof Daniel Mukunya	:	Principal College of Agriculture, Nairobi
Prof Joseph Opio-Odongo	:	UNDP, Uganda
Mrs Fortunate Sewankambo		Director, Policy Planning, NEMA, Uganda
Prof Setijati Sastrapradja	:	National Biodiversity Foundation, Indonesia
Dr Herbert Schubart	:	(former Director INPA), Brazil
Dr Arturo Gomez-Pompa	:	University of California, Riverside
Dr GB Singh	:	ICAR, India
Dr Gustavo de Fonseca	:	Conservation International
Dr Parvis Koohafkan	:	FAO, Italy
Prof Michael Stocking	:	University of East Anglia, UK : PLEC representative
Dr Tom Tomich	:	ASB Project Coordinator, ICRAF, Kenya

The Technical Advisory Group (TAG)
The TAG will review methods and approaches proposed in the project, provide technical advice and back-stopping and assume a particular responsibility for promoting the capacity building activities associated with Outcome 5. A number of the group have been involved in the planning and preparation of the project.

Prof Jo Anderson, Exeter University, UK	:	Ecology (Convenor)
Dr David Bignell, University of London	:	Termite biology
Dr Elvira Cuevas, IVIC, Venezuela	:	Rhizobiology
Prof. MC Dash, Orissa, India	:	Soil ecology
Dr Avilio Franco, EMBRAPA, Brazil	:	Agro-ecology
Prof Ken Giller, University of Zimbabwe	:	Nitrogen fixation
Dr Narpat Jodha, ICIMOD, Nepal	:	Resource Economics
Prof Patrick Lavelle, IRD, France	:	Macrofauna
Dr Stephen Nandwa, KARI, Kenya	:	Soil Fertility
Dr D Nwaga, U Yaounde, Cameroon	:	Microsymbionts
Dr Diane Osgood (Consultant, UK)	:	Resource Economics
Dr N Sanginga, IITA, Nigeria	:	N-fixation, Agronomy
Dr Sarah Simons, CABI, Kenya	:	Plant Pathology

II. Country Executing Teams

The main collaborating institutions and lead personnel for the teams at collaborating institutions are given below. Disciplines covered include soil biology, soil science, agronomy, economics, anthropology and land-use planning. Many of the lead institutions and country coordinators have collaborated with the TSBF Programme in nationally and/or internationally-funded projects. These and the collaborating national institutions cover, for the most part, the major disciplines required in this inter-disciplinary project. Nevertheless, there are capacity building needs, some topics which are not adequately covered at present within the country's capacity. These needs are further elaborated in Tables 1 and 2.

BRAZIL

Executing institution : Universidade Federal de Lavras
Coordinator : Dr Fatima Moreira

Other Participants in Executing Institution:
Contact: José Oswaldo Siquiera : Mycorrhizae
Ludwig Pfenning : Fungi

Co-Executing Institution: *Instituto Nacional de Pesquisas da Amazonia (INPA)*

Regional Coordinator: Dr Regina Luizão : Microbial Biomass

Other Participants in Co- Executing Institution
Contact: Flavio Luizão : Decomposition
Heraldo Vasconcelos : Mesofauna
Jose Wellington de Morais : Mesofauna
Eleusa Barros : Macrofauna
Luiz Augusto G. de Souza : N fixation
Elizabeth Franklin : Mesofauna
Sonia Alfaia : Soil Fertility
Antonio Nobre : Remote sensing
Hiroshi Noda : Agronomy
Marlene F. Silva : Botany

Collaborating Institutions

Universidade do Amazonas

Contact: Neliton Marques da Silva : Biological Control
Sandra Noda : Economics
Henrique S. Pereira : Agricultural Ecology

EMBRAPA-CNPS

Contact: Maria de Lourdes Mendonça : Satellite Imagery, Remote Sensing

Universidade Federal de Santa Catarina

Contact: Sidney L. Strürner : Mycorrhizae

SACI (NGO)

Contact: Sandra Noda : ??

Fundação Vitória Amazônica (NGO)

Contact : Rita Mesquita

Centro de Energía Nuclear na Agricultura (CENA)

Contact: Brigite Feigl : Microbial Biomass
Carlos Cerri : Organic Matter, C & N cycles

EMBRAPA-CPAA

Contact: Elisa V. Wandelli : Botany
José Pereira da Silva Junior : Mycorrhizae
Gladys F. de Souza : Soil Fertility

Universidade Nacional de Brasilia

Contact: Juvenil Cares : Nematology
Reginaldo Constantino : Termites
Shiou P. Huang : Nematology

INDIA

Executing Institution : Jawaharlal Nehru University (TSBF Coordination Unit)
Coordinator : Dr Krishna G. Saxena

Other Participants in Executing Institution

Contact: Prof P.S. Ramakrishnan: Ecology
Dr K.K. Sen : Soil Science

Collaborating Institutions

G.B. Pant Institute of Himalayan Environment and Development

Contact: Dr K.S. Rao : Ecology and biodiversity management
Dr R.K. Maikhuri : Agroecology
Dr Subrat Sharma : Indigenous knowledge

Vivekananda Parvatiya Krishi Anusandhan Shala (ICAR)

Contact: Dr R.D. Singh : Soil Science

Kumaon University

Contact: Dr B.R. Kaushal : Macrofauna

Gurukul Kangri University
Contact: Dr R.C. Dube : Microbiology

H.N.B. Garhwal University
Contact: Dr H.C. Pkhriyal : Economics
Dr M.C. Sati : Economics

Society for Himalayan Agriculture and Rural Development (NGO)
Contact: Dr R.C. Bhatt

University of Agricultural Sciences, Bangalore
Contact: Prof D.J. Bagyaraj : Mycorrhizae
Dr N.G. Kumar : Termites, Ants
Prof Rhada Kale : Earthworms
Dr Balakrishma Gowda : Ecology
Dr N.A. Khan : Plant Pathology
Dr B.V. Chinnappa Reddy: Economics
Dr Ramakrishna Parama : Soil Science
Dr Virakthamath : Pest Management

Regional Remote Sensing Service Centre
Contact: Dr B.K. Ranganath : Remote Sensing

French Institute
Contact: Dr B.R. Ramesh : Ecology

Karnataka State Department of Forestry
Contact: Dr M. Damodar Shittigor : Forestry

Karnataka State Department of Agriculture
Contact: Mr Hamaumantha Reddy : Director

Kerala Forest Research Institute
Contact: Dr J.K. Sharma : Plant Pathology
Dr Chandrashekhar : Ecology

Sambalpur University
Contact: Dr B.K. Senapati : Macrofauna/Earthworms

INDONESIA

Executing Institution : Universitas Lampung
Coordinator : Prof Dr Muhajir Utomo

Other Participants in Executing Institution
Contact: Dr Francis X. Susilo : Entomology (Termites)
Dr Pitojo Budiono : Anthropology/Sociology
Dr Zainal Abidin : Environmental Economics
Dr Bustanil Arifin : Macroeconomics
Dr Afandi : Soil Physics
Dr I. Gede Swibawa : Nematology
Dr Sri Murwani : Earthworms
Dr Abdul Gafur : Plant Pathology
Dr Jamalam Lumbanraja : Nutrient Cycling

Collaborating Institutions

Universitas Gadjah Mada
Contact: Dr Suryo Hardiwinoto : Macroinvertebrates

BIOTROP/GCTE Impacts Centre
Contact: Dr Daniel Murdiyarso : Greenhouse Gases

Bogor Agricultural University
Contact: Dr Iswandi Anas : Microbial Biomass

AARD, Biotechnology Research Center
Contact: Dr Robert Simanungkalit : Nitrogen fixation

Universitas Brawijaya
Contact: Dr. Kurniatun Hairiah : Carbon Stocks

ICRAF – SE Asian Regional Centre
Contact: Dr Meine van Noordwijik : Modeling

Indigenous Fallow Management (NGO)
Contact: Dede William

CôTE D'IVOIRE

Executing institution : Université de Cocody (Abidjan)
Coordinator : Prof Yao Tano

Other Participants in Executing Institution

Contact: Dr Philippe Kouassi : Soil Ecology
Dr Séri Dedy : Anthropology/Sociology
Dr Kangah Ogni : Anthropology/Sociology
Dr Placide Zoungrana : Microeconomics
Dr Ahoua Yapi : Termites
Dr Daouda Koné : Plant Pathology
Dr Sévérin Ake : Plant Pathology

Collaborating Institutions

Centre Ivorien de Recherches Economiques et Sociales (CIRES)
Contact: Dr Placide Zoungrana : Agricultural economics
Dr Arsène Konan: Natural Resource Management and Environmental Economics
Dr Patrice Kla Koe: Natural Resource Management and Environmental Economics
Dr José N'Guessan : Microeconomics

Centre Nacional de Recherche Agronomique
Contact: Dr Amoncho Adiko : Nematology
Dr Kouman Kobenan : Phytopathology
Dr Martin Kehe : Entomology
Dr Philippe Gnonhouri : Nematology
Dr Nicodème Zakra : Rhizobia

Université de Abobo-Adjamé
Contact: Dr Jerome Tondoh : Macrofauna (Earthworms)
Dr Pascal Angui : Pedology
Dr Tamia Ama : Soil science
Dr Souleymane Konate : Soil Ecology
Dr Mamadou Doumbia : Pest management/entomology

Agence National de Dévelopment Rurale
Contact: Dr M. Beda : Agronomy

Institute Nationale Polytechnique Houphouët-Boigny de Yamoussoukro
Contact: Dr Akomian Kimou : Mycorrhizae
Dr M. Abo Kouabenan : Rhizobia
Dr Jean Pohé : Mycorrhizae

S.O.S Forêts (NGO)
Contact: Dr Edouard K. N'Guessan : Botany

MEXICO

Executing Institution : Instituto de Ecología, Xalapa
Coordinators : Dr Isabelle Barois, Dr Carlos Fragoso

Other Participants in Executing Institution
Contact: Dr Dan Bennack : Participatory Research for Conservation
Dr Gabriela Heredia : Micro-Fungi
Dr Julian Bueno : Myriapods
Dr Roger Guevara : Plant-insect interactions
Dr Vinicio Sosa : Ecosystem models
Dr Miguel Equihua : Statistics/Modelling
Dr Patricia Rojas : Ants
Dr Javier Laborde : Mapping/GIS
Dr Rosario Landgrave : Mapping/GIS
Dr Gonzalo Castillo Plant : Biodiversity
Dr Adolfo Campos : Pedology

Collaborating Institutions
INAH (Instituto Nacional de Antropología e Historia)
Contact: Dr Eckart Boege : Social Anthropology

UNAM (Universidad Nacional Autónoma de México)
Contact: Dr Victor Toledo (Instituto de Ecología) : Human Ecology
Dr Luisa Paré : Antropology
Dr Javier Álvarez : Decomposition, Mycorrhizae
Dr Esperanza Martínez : N-fixation
Dr Silke Cram : Physical geography, erosion

BUAP (Benemérita Universidad Autónoma de Puebla)
Contact: Dr José Cinco Patrón : Plant Growth Promoting Bacteria

Universidad Autónoma Veracruzana
Contact: Dr Dora Trejo : Mycorrhizae

CP (Colegio de Postgraduados Montecillos)
Contact: Dr Victor Ordaz : Soil Science
Dr Maria del Pilar Rodríguez : Phytopathology
Dr Armando Equihua : Termites
Dr Tulio Mendes : Termites

Instituto Politecnico Nacional
Contact: Dr Lucía Varela : Mycorrhizae

INIFAP (Instituto Nacional de Investigaciones Forestales y Agropecuarias)
Contact: Dr Eduardo Canudas : Pastures and cattle husbandry (*Campus Veracruz*)
Dr Sergio Uribe : Land conservation (*Campus Los Tuxtlas*)

National Project Advisory Committee
Dr Arturo Gomez-Pompa, University of California
Dr Victor Toledo, UNAM
Dr Jose Sarukhan, UNAM, Diversitas. CONABIO
Lic. Rodriguez Capetillo, ROLAC, UNEP
Dr Jorge Soberon, CONABIO

KENYA

Executing Institution : National Museums of Kenya
Coordinator : Dr Rashid Aman

Other Participants in Executing Institution
Contact: Dr Joyce Jefwa : Mycorrhizae
Dr Patrick Maundu : Indigenous Knowledge/Ethnobiology

Collaborating Institutions:
Environmental Economists Network for Eastern and Southern Africa (EENESA)
Contact: Dr Mohamud Jama : Environmental Economics

University of Nairobi
Contact: Prof. Agnes Mwangombe : Plant Pathology
Prof. Richard Mibey : Mycology
Dr. James Kahindi : Nitrogen Fixation
Dr. Sheila Okoth : Mycology

Kenya Agricultural Research Institute (KARI)
Contact: Dr Stephen Nandwa: Agronomy, Soil Science
Ms Catherine Kibunja : Soil Science

Kenya Forestry Research Institute (KEFRI)
Contact: Dr David Ode : Agroforestry/N-fixation

Regional Centre for Remote Sensing, Survey and Mapping (RCRSSM)
Contact: Mr Luka Isavwa : Remote Sensing/GIS

UGANDA

Executing Institution : Makerere University
Coordinator : Prof Mary JN Okwakol

Other Participants in Executing Institution

Contact: Dr Geoffrey Lamtoo : Land Use Planning
Dr Joy Tumuhairwe : Soil Science
Dr Oryem Origa : Botany
Dr Mary Rwakaikara-Silver : N_2-Fixation
Prof. J.Zake : Soil Scientist
Prof W.Banage : Nematologist
Prof. DSO Osiru : Agronomist
Mrs C. Kisamba-Mugerwa : Sociologist
I. Hinyakwa : Resource Economist
B. Sekamatte : Pest Management

Collaborating Institutions

National Agricultural Research Organization (NARO)
Contact: Dr Ben Sekamatte : Pest Management

National Environment Management Authority (NEMA)
Contact: Robert Ogwanga : Biodiversity

Department of Land Resources Management
Contact: Dr J.B. Kalule Sewali : Land Management

Forest Department
Contact : Dr David Hafashimana : Forest Ecology

Table 1. Identified in-country expertise in different disciplines, i.e., capacity for multidisciplinary research within the project participants.

CRITERIA	COUNTRIES						
	Brazil	Mexico	Côte d'Ivoire	Uganda	Kenya	India	Indonesia
Agronomist	Y	Y	Y	Y	Y	Y	Y
Soil scientist	Y	Y	Y	Y	Y	Y	Y
Plant pathologist	Y	Y*	Y	Y	Y	Y	Y
Pest management/entomologist	Y	Y*	Y	Y	Y	Y	Y
Anthropologist/sociologist	Y	Y	Y	Y	Y	Y	Y
Natural resource management and environmental economist	Y	Y*	Y	Y	?	Y	Y
Micro-economist	Y	Y	Y	Y	Y	Y	Y
Functional groups:							
Termites	Y	Y	Y	Y	Y	Y	Y
Ants	Y	Y	Y	N	Y	Y	Y
Earthworms	Y	Y	Y	N	Y	Y	Y
Nematodes	Y	N	Y	Y	Y	Y	Y
Mycorrhizae	Y	Y	Y	N	Y	Y	Y
Rhizobia	Y	Y	Y	Y	Y	Y	Y
Other microbiota	Y	Y	Y*	?	Y	Y	Y

Notes: * collaborating scientist not yet identified

Table 2. Capacities of participating researchers within each country to perform various process measurements (functional significance of BGBD).

CRITERIA	COUNTRIES						
	Brazil	Mexico	Côte d'Ivoire	Uganda	Kenya	India	Indonesia
Gas exchanges (CO_2, CH_4, N_2O)	Y	Y	Y	Y	Y	Y	Y
Decomposition rates	Y	Y	Y	Y	Y	Y	Y
N_2 fixation	Y	Y	Y	Y	Y	Y	Y
Nutrient pools and transformations (N, P, S)	Y	Y	Y	Y	Y	Y	Y
Enhanced bio-availability of nutrients via soil fauna/flora activity	Y	Y	Y	Y	Y	Y	Y
Nutrient and OM translocations	Y	Y	Y	Y	?	Y	Y
C sequestration	Y	Y	Y	N	Y*	Y	Y
Soil porosity and aggregate stability	Y	Y	Y	Y	Y	Y	Y
Biological factors affecting soil erosion (plant-fauna interactions)	Y	?	Y	?	?	Y	Y
Incidence of pests and diseases	Y	Y*	Y	Y	Y	Y	Y
Bio-accumulation/ biodegradation of pollutants & biocides	Y*	Y	Y*	N	Y	Y	?

Notes: * collaborating scientist not yet identified

III. Farmers

Members of the farming community will participate in the project, particularly in the identification of the best-bet practices for biodiversity conservation, and in planning and implementing the pilot/demonstration plots. Their continued support for and interest in the project is critical, and its maintenance will be secured through participatory meetings and consultations. Representatives of the farming communities will be members of the Project Implementation Committees. Training in managing BGBD for its conservation and farming benefits will involve farmers and their communities in several steps of the project development process.

IV. NGO's

The project objectives also conform to the vision and practices of many NGO's, and they will benefit from its implementation. Representatives of these organizations will commonly be members of both levels of the country committees. They will have a particular role in the dissemination of project results and provide stronger links between scientists and the local farming communities. Furthermore, the strength of NGO's working with local, national and international governments will help bring the project recommendations to policy level discussions. NGO representatives will participate in training courses for BGBD management, and in the various workshops, meetings and consultations, both locally and nationally.

V. Indigenous communities

At many benchmark sites, indigenous communities will be directly involved with the project, as members of the farmer groups or because of their direct and indirect effects on the conservation of biodiversity in and around the benchmark areas. The development of sustainable agricultural practices that conserve biodiversity will benefit the communities living there by maintaining the resource base on which their livelihood depends. In many cases these communities are already conserving above-ground biodiversity through traditional agricultural practices, although intensification pressures and lack of capacity to manage BGBD are hindering conservation efforts. Capacity building for this activity will be provided through local training activities with indigenous community groups.

VI. National Government Agencies

Representatives of the Ministries and Departments of Agriculture, Environment and Natural Resources and their research and extension institutions are involved in the project at various levels. Some will serve as members of country committees, while others are in the many Institutions participating in the project. These agencies will be major beneficiaries of the improved information base on land-use design and management, biodiversity conservation and environmental protection. Other agencies such as those concerned with Science and Technology, Community Development, Finance, Planning and Economic Development will also be participating either directly or indirectly with the project. The economic costs or benefits accrued from the wide-spread implementation of the proposed alternative management practices are of particular concern for the government agencies. The activities of the project will engage representatives of these decision-making agencies at various levels in the processes of review of results and planning of activities, to promote the "ownership" of the outcomes and recommendations of the project and facilitate their translation into policies.

VII. Local Governments

Representatives of local governments will participate in the same manner as those of national governments except that these agencies will also be interacting at a more direct level with the farmers/communities and scientists working at the sites. Mechanisms to promote their interest, participation and support for the project have been allowed for in project activities to facilitate the transfer of information and experience gained in the project to wider-spread actions.

VIII. TSBF

As the Executing Agency, TSBF is a major beneficiary and will be helping to coordinate the project activities including: organisation of global workshops, management of the global database and information system, publication of results, facilitating the reporting and transferring of funds from the implementing agency to the participating countries, providing the basis for capacity building both at the "S-S" level and with developed country institutions. Back-stopping through the TAG, supervision of the project coordinator and financial management of the project will also be responsibility of TSBF.

IX. National and International Research Institutions

Scientists and students have much to benefit from this project. The development of standardized methodologies, the experience gained in working together with the different stakeholders, the consultations, workshops and meetings with them, the capacity building of scientists and students in areas of lacking expertise, the research component itself and the ability to perform similar tasks over 7 countries are long term benefits to all the researchers involved and their institutions. The research institutions will be the ones implementing the

project nationally, and coordinate the project through the three national committees and the links with other stakeholders. They will also be responsible for reporting back to TSBF.

2. STAKEHOLDER SUPPORT

The list below includes the institutions and organizations that have endorsed, committed themselves to, or are officially supporting the project, its implementation and the achievement of its objectives.

India:
- Jawaharlal Nehru University
- G.B. Pant Institute of Himalayan Environment and Development
- Vivekananda Parvatiya Krishi Anusandhan Shala (Indian Council for Agricultural Research)
- H.N.B. Garhwal University
- University of Agricultural Sciences, Bangalore
- Kerala Forest Research Institute
- NGO's and village councils and communities have strongly supported th e proposal

Brazil:
- Ministério do Meio Ambiente
- Ministério da Ciência e Tecnologia – (Programa PPG7)
- Instituto de Proteção Ambiental do Amazonas (Governo do Estado do Amazonas)-IPAAM
- Universidade Federal de Lavras (UFLA)
- Universidade de Brasilia (UnB)
- Instituto Nacional e Pesquisas da Amazonia (INPA)
- Funadação Universidade do Amazonas (FUA)
- Empresa Brasileira de Pesquisa Agropecuária (EMBRAPA)
- Centro de Energia Nuclear na Agricultura (CENA/USP)
- Village councils/communities in Alto Solimões have strongly supported the proposal through the NGO SACI
- Sindicato dos Produtores Rurais de Presidente Figueiredo
- NGO Vitória Amazônica

Mexico:
- Instituto Nacional de Investigaciones Forestales y Agropecuarias (INIFAP)
- Universidad Nacional Autónoma de México
- Universidad Veracruzana
- Sociedad Cooperativa *Mok Cinti*
- Desarrollo Comunitario de Los Tuxtlas, A.C. (NGO)
- Benemérita Universidad Autónoma de Puebla
- Colegio de Postgraduados
- Desarrollo Comunitario de Los Tuxtlas, A.C. (NGO)
- SAGAR (Dirección de Cooperación técnica)
- Instituto Politecnico Nacional
- SEMARNAP: (Unidad Coordinadora de Asuntos Internacionales -Los Tuxtlas Biosphere Reserve)
- Pronatura Yucatan (NGO)
- Unión de Promotores Campesinos, Asesores y Conservacionistas de la Región de Calakmul (NGO)
- Consejo Regional de Xpujil (Campeche)

Kenya:
- District Commissioner, Taita-Tateva District

Uganda:
- Ministry of Lands, Water and Environment
- Makerere University
- Ministry of Agriculture, Animal Industries and Fisheries

Indonesia:
- Agency for Agricultural Research and Development (Ministry of Agriculture)
- Ministry of Forestry and Estate Crops
- IFM Network (International NGO)

Ivory Coast
- Université de Cocody-Abidjan
- Centre de Recherche en Ecologie (Université d'Abobo-Adjamé)
- Institut National Polytechnique Houphouët-Boigny de Yamoussoukro (ESA/INP-HB)
- Centre National de Recherche Scientifique (CNRA)
- Centre Ivoirien de Recherche Economique et Sociale (CIRES)
- S.O.S-Forêts (NGO)

3. LINKAGES WITH OTHER PROJECTS AT BENCHMARK SITES

Links have been established with other projects working in the benchmark areas that are complementary, and will add useful data and experience to the present one.

Brazil:
- PRODESAS (Project for the Sustainable Development of the Alto Solimões)
- LBA (Large-Scale Biosphere Atmosphere Project)
- ECOCARBON (Balanço de Carbono na Floresta Amazonica)
- PELD (Long Term Ecological Studies)
- ASB (Alternatives to Slash and Burn)

Mexico
WB-GEF-FANP: Protected Areas Program ()
WB-GEF PDF Block B: Mesoamerican Biological Corredor
UNDP-GEF PDF B: Biodiversity conservation and Sustainable Use in Priority Areas
INIFAP (SAGAR): Cercos vivos
PRODERS (SEMARNAP) ; Abandonment of shifting agriculture in favor of sedentary subsistence-farming practices
DECOTUX ; Rural participatory research; Work with women in the adoption of sustainable farming technologies
RED DE GESTION DE RECURSOS NATURALES (Rockefeller Foundation); Alliance of peasant farmers, academic institutions, government agencies and NGOs looking to identify and compare appropriate models of local farm technology
MOK-CINTI: Green manure
CENTRO DE CAPACITACION CAMPESINO: Capacity-building for rural peasant farmers
INE/SEMARNAP: Administration and management of the Los Tuxtlas Biosphere Reserve
HOMSHUK SOCIEDAD: Preservation of the indigenous Popoluca agricultural and social traditions; Botanical garden
PRONATURA VERACRUZ: Environmental education
ROCKEFELLER FOUNDATION: Long-term commitment to food security issues in México and the Los Tuxtlas area

CONSEJO REGIONAL DE X´PUJIL: Co-ordination of matters of economic importance to local peasant farmers
BOSQUE MODELO (Canada): Agroforestry projects
ICRAF: Agroforestry projects
CONSEJO INDIGENA: Green manure; Agroforestry; Apiculture
PRONATURA YUCATÁN: Crop rotation and fallow periods; Green manure; Family gardens managed by local women; Environmental education; Apiculture
PRODERS (SEMARNAP): Abandonment of shifting agriculture in favor of sedentary subsistence -farming practices
PROMOTORES CONSERVACIONISTAS DE LA REGION DE X´PUJIL; Capacity-building for peasant farmers
INE/SEMARNAP : Administration and management of the Calakmul Biosphere Reserve
MACARTHUR FOUNDATION; Environmental education programs
FORD FOUNDATION : Reforestation
WORLD WIDE FUND FOR NATURE (WWF): Nature conservation programs
THE NATURE CONSERVANCY: Regional conservation planning

India:
- Inventory and commercial utilization and conservation of agrobiodiversity for sustainable development of the buffer zone villages of Nanda Devi Biosphere Reserve.
- Critical analysis of plant diversity with special reference to medicinal flora in the buffer zones areas of NDBR.
- Management Information System for land use and land cover change analysis in relation to conservation oriented land use practices in NDBR buffer zone.
- An ecological study of entomofauna of Nanda Devi Biosphere Reserve.
- Agricultural land use intensification in Garhwal and its ecological implication.
- Forest ecosystem structure and function in and around Sacred forests.

Indonesia:
- ASB (Alternatives to Slash and Burn) Project*
- Erosion Control Project (ICRAF)*
- Red Acid Soils Project*
- Empowerment of Local People Around Forest Margin Project*
- Long-term No Tillage Research Project*
- Community Development in Sub-Tuland Bawang Watershed Project*
- Black Pepper Foot-rot Disease Control Project*
- Landcare Project
- Tropical Animal Biodiversity Project

Ivory Coast
- Projet Jachère en Afrique de l'Ouest (Project for improvement of fallows in west Africa)
- Projet CAMPUS-Termites (Project for sustainable land-use by termites management) *

Kenya :
- Taita Hills Biodiversity Project*
- Reducing Biodiversity Loss at Cross-Border Sites in East Africa
- Taita-Tateva Agricultural Project
- Monitoring Forest Conditions, Fragmentation and Land Conversion in The Eastern Arc Mountains of Tanzania and Kenya*

Uganda:
- The Lake Victoria Environment Management Project
- Reducing Biodiversity Loss at Cross-Border Sites in East Africa

ANNEX G. AVAILABLE REFERENCE DOCUMENTS

National Consultative Reports

Each country produced a report on the PDF-B activities, resulting from national workshops and consultations held with the various stakeholders in the country and benchmark site areas. The reports contain much of the descriptive information on policies, environmental and land use, social conditions, and BGBD (if any previous work had been done) status of the chosen sites, as well as the institutional framework for implementing project activities. These documents are available from TSBF for consultation. These data form the basis for the project database (see Annex H).

Brazil
"Management of Agrobiodiversity for Sustainable Land Use Management and Global Environmental Benefits (MAGLUS)." Brazilian Workshop Report. Report of the national workshop held in Manaus, 22-23 November, 1999.

India
"Indian activity proposed from Tropical Soil Biology and Fertility Programme – South Asian Regional Network (TSBF-SARNET) for the project 'Management of Agrobiodiversity for Sustainable Land Use Management and Global Environmental Benefits' and the background material." Report of two regional workshops (Bangalore and Almora), one dedicated to each benchmark site and the National Workshop, New Delhi, January, 2000.

Indonesia
As a result of the national workshop two reports were published: The first as a book entitled "Proceedings of the Workshop Management of Agrobiodiversity in Indonesia for Sustainable Land Use Management and Global Environmental Benefits," held in Bogor, 19-20 August, 1999. The other is the final PDF-B report entitled "Indonesian National Workshop on Management of Agrobiodiversity for Sustainable Land-Use and Global Environmental Benefits (MAGLUS)".

Côte d'Ivoire
Report of the National workshop "Management of Agrobiodiversity for Sustainable Land Use Management and Global Environmental Benefits (MAGLUS)," held in Oumé, 17-20 November, 1999.

Kenya
"Management of Agrobiodiversity for Sustainable Land Use Management and Global Environmental Benefits (MAGLUS)." Kenya Country Report, "Proceedings of a National Workshop held at the Ngerenyi Farmers Training Centre, Wundanyi, Taita Taveta District on December 2, 1999" and a series of planning meetings and consultations.

Mexico
Report of the workshop on the "Management of Agrobiodiversity for Sustainable Land Use Management and Global Environmental Benefits (MAGLUS)," held in Xalapa, January, 2000.

Uganda
Two reports were produced, the first "Management of Agrobiodiversity for Sustainable Land Use Management and Global Environmental Benefits (MAGLUS): Report of the National Workshop" was the report of the national workshop held at Jinja, 25-27 October, 1999, and the other the project database for Uganda entitled "Management of agrobiodiversity for sustainable land use and global environmental benefits: The Project Database for Uganda".

National Biodiversity Reviews. As part of the PDF-B activities, it was agreed that each country produce a biodiversity review, detailing the state-of-the-art knowledge on issues pertaining to the project, particularly BGBD, and focusing as much as possible on the benchmark areas. One review is already published (Indonesia, ASB-Indonesia Report #9) others are in the review process, while others are still being written up for publication in special issues of peer-reviewed journals or books. The following are the content lists for National Biodiversity Review for each country:

Brazil: Title still to be decided.
Editors: F. Moreira & J.O. Siqueira

i. Land Use History and Soil Survey (S. Alfaia; M.L. Mendonça; A. Nobre; & Glady Souza)
ii. Agriculture Ecology (S. Noda & H. Pereira)
iii. Plant diversity (E. Wandelli ; H. Noda; M.F. Silva & R. Mesquita)
iv. Litter production and decomposition (F. Luizão)
v. Soil microbial biomass (C. Cerri; B. Feigl & R. Luizão)
vi. Mycorrhizae (J.O. Siqueira, J. Pereira Jr. & S. Sturmer)
vii. Symbiotic N_2 Fixation (Rhizobia) (F. Moreira & L.A. Souza)
viii. Fungi (L. Pfenning)
ix. Nematodes (J. Cares & S. Huang)
x. Entomopathogens (N. Marques)
xi. Soil mesofauna (E. Franklin & J.W. Morais)
xii. Macrofauna: Earthworms (E. Barros); Termites (R. Constantino); Ants (H. Vasconcelos)

India: Title and editors to be decided.

i. Earthworms (R. Kale et al.)
ii. Termites and Ants (N.G. Kumar et al.)
iii. Decomposing Microorganisms (A.N. Balakrishnan et al.)
iv. Symbiotic N_2 fixation (Rhizobia) (K.V.B.R. Tilak et al.)
v. Mycorrhizae (D.J. Bagyaraj et al.)
vi. Soil Borne Insect Pests (to be decided)
vii. Soil Borne Plant Pathogens (J.K. Sharma et al.)
viii. Agrobiodiversity management practices: Trends and environmental implications (R.K. Maikhuri et al.)
ix. Alternative land use practices for enhancing global environmental benefits (K.S. Rao et al.)

Indonesia: Proceedings of the Workshop "Management of Agrobiodiversity in Indonesia for Sustainable Land Use Management and Global Environmental Benefits".
Editors: A. Gafur, F.X. Susilo, M. Utomo & M. van Noordwijk

i. Conservation of resource agrobiota: Evaluation of current agricultural management practices in Lampung (F.X. Susilo et al.)
ii. Below-ground biodiversity and sustainability of complex agroecosystems (M. van Noordwijk)
iii. Diversity, population, and biomass of soil macrofauna in several land use systems in Jambi, central part of Sumatra (S. Hardiwinoto & A. Prijono)
iv. Alteration of interactions between macrofauna, soil structures, and infiltration processes for soil conservation of agricultural lands on slope (D. Suprayogo)
v. Decomposition process and activity of soil engineers when forests are converted to agricultural use (K. Hairiah)
vi. Functional relationship between macrofauna and the regeneration of sediment filter among events in soil environment (Afandi)
vii. Diversity of rhizobia in agricultural lands and the need for inoculation (R.D.M. Simanungkalit)

viii. Mycorrhiza for diversified tree establishment in *Imperata* grassland (Y. Setiadi)
ix. Impacts of different land use systems on the abundance of soil-borne pathogens (A. Gafur & T.W. Darmono)
x. Indigenous fallow management and biodiversity: In line with nature? (P. Burgers)
xi. Knowledge-based systems (KBS) approach to access farmers' local knowledge about ecology and biodiversity (L. Joshi)
xii. Methods to assess economic and environmental benefits of management of agrobiodiversity for sustainable land use (B. Arifin)
xiii. Increasing production of upland rice by sustainable no-tillage practices in Rantau Minyak Village, Sidomulyo, South Lampung (H.R. Singgih)
xiv. Conservation of biodiversity through more productive and sustainable agroecosystems (A.M. Fagi)
xv. National policies on biodiversity in forestry and estate aspects (A.S. Mukhtar)
xvi. Conservation and sustainable utilization of agrobiodiversity to support food and environmental resilience (A. Sugandhy)
xvii. Evolution of land use types in Indonesia and selection of Lampung (Tulang Bawang) and Jambi (Batang Hari) transects (M. van Noordwijk)
xviii. Baseline biophysical information about the Tulang Bawang watershed area, North Lampung (Afandi et al.)

Côte d'Ivoire : Below-ground Biodiversity in Côte-d'Ivoire

Editors : Y. Tano et al.
i. Earthworms (J.E. Tondoh)
ii. Macrofauna (Termites, Ants) (P. K. Kouassi & A. Yapi)
iii. Nematodes (P. Gnonhouri & A. Adiko)
iv. Mycorrhizae (A. Kimou et al.)
v. Symbiotic N_2 fixation (N. Zakra)

Kenya : Title, editors and authors still to be decided upon.
i. General Introduction on BGBD
ii. Earthworms
iii. Termites
iv. Ants
v. Decomposing Soil Microorganisms
vi. Symbiotic Soil Nitrogen fixers
vii. Mycorrhiza
viii. Soil Borne Plant Pathogens and Pests
ix. Indigenous Knowledge Systems Pertaining to BGBD
x. Agrobiodiversity and Agricultural Systems

Mexico: Special Issue of the Journal *Acta Zoologica Mexicana*
Editors: C. Fragoso & P. Reyes-Castillo
i. Earthworms (C. Fragoso)
ii. Termites (T. Mendes & A. Equihua)
iii. Ants (P. Rojas)
iv. Mycorrhizae (L. Varela & D. Trejo)
v. Symbiotic N_2 fixation (Rhizobia) (E. Martínez-Romero)
vi. Diversity and functional role of the edaphic macrofauna in Mexican tropical ecosystems (G.G. Brown et al.)
vii. Decomposition and nutrient cycling (J. Álvarez-Sánchez)
viii. Soil Coleoptera larvae (M.A. Morón)
ix. Soil pathogenic fungi (P. Rodríguez Guzmán)

Uganda: The present knowledge on below ground biodiversity in Uganda.
Edited by M.J.N. Okwakol & G. Lamtoo.

i. Introduction (M.J.N. Okwakol & G. Lamtoo)
ii. Soil Macrofauna (M.J.N. Okwakol & C. Lufafa)
iii. Decomposers (M. Rwakaikara-Silver & C. Nkwiine)
iv. Rhizosphere (M. Rwakaikara -Silver &C. Nkwiine)
v. Soil Microsymbionts (C. Nkwiine & M. Rwakaikara-Silver)
vi. Soil Pests and Pathogens (M.B. Sekamatte & M.J.N. Okwakol)

ANNEX H: PDF-B MAGLUS PROJECT DATABASE AND BENCHMARK SITE SELECTION/DESCRIPTION

1. PDF-B MAGLUS PROJECT DATABASE

An initial database for the project was designed during the PDF-B phase. Many of the required initial characterisation data are given or referenced in the national workshop reports (See Annex G). This information will be collated into a global database at the commencement of the project. This database will be made available to all participants and other stakeholders and will be updated during the project to form the basis of the International Information System. The proposed content of the database include:

1. Site selection

Justification for selection of study area (regional level) and benchmark sites (local level), and criteria including:

1.1 representativeness of the study area at regional and national scales

1.2 significance of this site in the global/national biodiversity scenario (e.g., habitat for rare/endangered species, is it a national park region, Biosphere reserve, etc.);

1.3 gradients of land use intensity from natural ecosystems through mixed species (polycultures) agroecosystems to crop monocultures;

1.4 any important attributes of these sites related to the loss of indigenous biodiversity and ecosystem function.

2. Baseline data

2.1 Checklist on location, availability and accessibility to maps (at the broader and the finest level possible, e.g., national, regional and local) for the proposed benchmark sites on:

a) climate (mean monthly and annual rainfall & temperatures)
b) soil types (national classifications and correlation with FAO or USDA)
c) geology
d) water resources (surface and ground water)
e) vegetation classes
f) dominant land uses of various ages (i.e., to obtain historic changes, such as conversion of forest to permanent agriculture)
g) human population densities
h) topographic

2.2 Availability and access to aerial photographs and satellite images

2.3 Biodiversity

Where available summarize the data, otherwise, give broad indication of biodiversity information for:

a) scale and components of landscape mosaic (i.e., approximate number and area of different ecosystems)
b) scale and components of farm mosaic (size of fields, field margins, tree plots, etc.)
c) species diversity of main component of the above ground vegetation
d) crop species and cultivars (landraces and traditional or high yielding varieties)
e) species composition of weeds and field margin plants
f) published or other literature (reviews) on below-ground diversity of key functional groups, i.e., number of species, populations of major taxa or functional groups as appropriate

2.4 Cropping/farming systems

Where there have been studies on the following issues summarize the data, otherwise, give broad indication of:

a) Extent and type of different cropping systems in each case specifying the amount and type of external inputs (Table)

Scale/Type Household/Community	**Agroforestry**	**Agropastoral**	**Arable**
Communal			
Commercial			

b) Cropping practices (e.g., tillage methods, cropping cycles, rotations)

c) Community use of ecosystem types within the landscape (fuel, supplementary food & non-timber products)

2.5 Rural community organizations and their structures (e.g., tribal councils, elected government, farmer's and self-help groups)

2.6 Summary (with reference to sources) of information on indigenous knowledge of soil and soil-related biodiversity (e.g., indigenous soil type, fertility and organism classifications)

3. National policies

3.1 Annotated bibliography of national policies and action plans and implementation procedures for agricultural development and biodiversity conservation

3.2 Summary (with references) of national policies on Intellectual Property Rights (IPR) pertaining to soil and biological materials

3.3 Summary (with references) of plans by the National Agricultural Research Organizations' (NAR's) for agricultural development (soil fertility, conservation, extensification, intensification, erosion controls, etc.) in study areas (e.g., details on local activities and policy implementation at these sites)

3.4 Documentation of the mechanisms of information transfer from policy makers to extension officers and from extension officers to farmers and vice-versa.

4. Local/national/international organizations

4.1 Identify the local/national/international organizations operating at agricultural development, natural resources, food security and other population needs in the study areas (e.g., NGO's, Farmer/Community Groups, WWF, Conservation International)

4.2 Summarize the perceptions of these different organizations regarding biodiversity, conservation and agricultural development, (e.g., attitudes to land use change, settlement, shifting agriculture, agricultural intensification and modernization) and their long term plans and objectives in the study areas/regions

4.3 Endorsement by these organizations of the Project

2. BENCHMARK SITE SELECTION

The benchmark areas were selected using the criteria shown in Tables 1 and 2. Twelve key, globally important biodiversity areas were thus selected in the participating countries. A brief description of each area, its location and major features is given below. Further information on the sites can be obtained from the Workshop Reports and Biodiversity Reviews (See Annex G).

Table 1. Criteria for country selection

CRITERIA	COUNTRIES						
	Brazil	Mexico	Ivory Coast	Uganda	Kenya	India	Indonesia
Include all continents; major biogeographic regions of tropical zones	South American (Amazon) Humid tropical rain forest	Central American Humid tropical rain/deciduous forest	West African Humid tropical forest	Central African Humid tropical forest	East African forest	West Ghats and Himalayan Mountain forests	Asian Equatorial Humid tropical rain forest
Countries that include full spectrum of land-use intensification from natural to intensive agriculture and degraded lands	Y	Y	Y	Y	Y	Y	Y
Range of population densities / pressure on representative of the continent (nos. km^{-2})	5 - 10	30 – 2000	50 – 100	300	54	50 - 100	100 - 300
Local expertise available as starting point for further capacity building and south-south exchange / cooperation	Y	Y	Y	Y	Y	Y	Y
Synergy built on existing expertise and past / on-going activities	Y	Y	Y	Y	Y	Y	Y
National support for biodiversity conservation and stakeholders' interest exist	Y	Y	Y	Y	Y	Y	Y

Table 2. Criteria for site within country selection

CRITERIA	COUNTRIES						
	Brazil	Mexico	Ivory Coast	Uganda	Kenya	India	Indonesia
Relevance for global biodiversity concerns	Y	Y	Y	Y	Y	Y	Y
Representative of ecological / biogeographic zones	Y	Y	Y	Y	Y	Y	Y
Range of land-use intensity gradients	Site						
	A B	A B	A B			A B	A B
• natural forest	Y Y	Y Y	Y Y	Y	Y	Y Y	Y Y
• managed forest	N Y	N Y	Y Y	Y	Y	Y Y	Y Y
• agroforest	Y Y	Y Y	Y ?	Y	Y	Y Y	Y Y
• crop / fallow rotation	Y Y	Y Y	Y Y	N	Y	Y Y	Y Y
• intensive crop	N Y	Y Y	Y Y	Y	Y	Y Y	Y Y
• pastures	Y Y	Y Y	N N	N	N	Y Y	N N
• degraded lands	N Y	Y N	N Y	Y	Y	Y Y	Y Y
Gradient of intensities within major land-use classes	Crop/fallow Pastures	?	Crop/ fallow	Crop Agroforest	Crop Agroforest	Crop Agroforest	Mng forest Agroforest
Synergy on existing / developing database	Y	Y	Y	Y	Y	Y	Y
Spectrum of actors (indigenous / migrants/ large scale operators)	Y	Y	Y	Y	Y	Y	Y
Local stakeholders secured / no research fatigue	Y	Y	Y	Y	Y	Y	Y

Brazil

Agroecological Zone: Humid Forest

Location of benchmark site: 1. Presidente Figueiredo, Amazonas
2. Alto Solimões, Amazonas

The first benchmark site is about 100 km N of Manaus, and the site of several other large research projects. The study site is located close to several important conservation forests and research station, all within the Negro River basin. The land is used for logging, extraction of natural forest products, cattle ranching, agroforestry and agriculture. Shifting cultivation is also common. Agroforesters are organized into a rural association. The second site is about 1100 km W of Manaus, in the Municipality of Benjamin Constant, and no roads are available. The site can only be reached by boat or plane and is located within the Solimões River basin. Pressure on land use is lower, but shifting cultivation is also common. Indigenous communities are organized into associations, interacting with researchers, practicing small-scale agriculture, agroforestry, logging and forest extractivism. A few large-scale conventional cropping systems can be found in the region, managed and owned by corporations.

India

Agroecological Zone: Mountain Forest and Himalayan Forest

Location of benchmark sites: 1. Nanda Devi Biosphere Reserve, Himalayas
2. Nilgiri Biosphere Reserve, Western Ghats

These two highly unique systems conserve an important part of India's biodiversity and are also important catchment areas, prone to high erosion risk, that also have importance in regulating regional climate. Both are fragile systems, and under high pressure for conversion and intensification of land use. At the first site, agriculture is the backbone of the household economies of the region, despite the low percentage of land dedicated to agriculture. Furthermore the effects of agriculture on the environment, particularly the subsistence traditional practices, are critical. In the Nilgiri region, despite modern agricultural practices, crop production is decreasing. Several biologically based alternative management systems show particular potential for widespread application in the region.

Indonesia

Agroecological Zone: Humid Forest

Location of benchmark sites: 1. Lampung, S. Sumatra
2. Jambi, S. Sumatra

The benchmark sites are located in two areas of the forest zone in Sumatra. Agricultural development in this island has been less intense than in Java but is now proceeding with increased impetus. Particularly in the Lampung area, large areas of degraded *Imperata* grasslands have been created due to unsustainable agricultural development projects. In contrast indigenous rubber agroforests have proved both profitable and biodiverse.

Côte d'Ivoire

Agroecological Zone: Humid Forest

Location of benchmark site: 1. Täi Forest, S.W. Ivory Coast
2. Oumé, Marahoué Region

The regions of Oumé and Täi house two of the most important conservation forests in the country (Marahoué and Täi National Parks). Both are highly important for biodiversity conservation. The Täi Forest is a World Heritage Site. Population pressures on the land are primarily for farming. Different cropping intensities are present and are mainly related to the fallow period utilized when soil fertility and agricultural production decline.

Kenya

Agroecological Zone: Sub-Humid Forest (Sub-Montane)

Location of benchmark sites: Taita Hills, Taita Taveta

The benchmark area is part of the only Eastern Arc sub-montane forests in Kenya. The Eastern Arc Mountains are recognized by Conservation International as globally important "hot spots" for forest biodiversity and are major national, regional and local sources of hydropower, water, a wide array of forest products and agricultural production. The remaining endemic-species rich forest is under considerable threat. Intensification for tea

and other plantation crops with high inputs, as well as for food cropping, has proved profitable but sustainability and environmental degradation have become significant issues.

Mexico

Agroecological Zone:	Semi-deciduous & Humid Forest
Location of benchmark sites:	1. Calakmul Biosphere Reserve, Campeche 2. Los Tuxtlas Biosphere Reserve, Veracruz

Both sites have high importance culturally and ecologically. The first benchmark site is located in the Yucatan Peninsula and houses the largest continuous tract of forest in Mexico. The semi-deciduous forest is also the evolutionary center of origin of several agriculturally important plants, housing several endemic and endangered species. The second site is located in the humid forest zone of Veracruz, with very high diversity, and an important altitudinal gradient (0-1700m). Both zones are being converted to arable cropping (with maize predominating) and plantation crops. In Los Tuxtlas an additional pressure is that for pasture lands. Agricultural practices in both sites appear to be maintaining only low levels of biodiversity whilst resulting in the development of depleted soil fertility and environmental degradation.

Uganda

Agroecological Zone:	Sub-Humid Forest
Location of benchmark sites:	Mabira Central Forest Reserve Mukono District South Busoga CFR, Iganga District Gangu CFR, Mpigi District

The benchmark sites for Uganda are all in the Lake Victoria Crescent, an area of sub-humid forest with high endemicity. This zone is characterized by high intensification of agriculture particularly in respect to bananas and coffee. These systems are showing significant stagnation or decline in recent years.

ANNEX I. TARGETED RESEARCH

PART I. SCIENTIFIC AND TECHNICAL MERIT

1. Below-Ground Biodiversity (BGBD) is a neglected component of biodiversity inventories. One reason for this is the lack of internationally accepted standards for methods for BGBD analysis and valuation. The following Research Hypotheses will be investigated:
   - That sustainable agricultural production and the maintenance of environmental service functions are impaired by loss in BGBD.
   - That BGBD, and the impact of changes in land use on BGBD, can be adequately assessed by the sampling of selected biota in key functional groups.
   - That patterns in the impact of land-use change on BGBD will be similar across the globe.

2. The following issues of scientific/technical merit will derive from the research activities:
   - Generation of rapid but accurate methods for BGBD assessment.
   - Standardized and internationally accepted BGBD assessment protocols.
   - Creation of an international standard for the description and quantification of BGBD.
   - Uniform measurements of key environmental service functions across seven countries, testing the hypotheses of BGBD responses to land-use intensification.

   The approach that will be adopted is to concentrate on a selected number of groups of the soil biota which have quantitatively significant functional roles. These include N_2-fixing bacteria, mycorrhizal fungi, bacteria responsible for greenhouse gas emissions, fungal pathogens, pathogenic and detritivorous nematodes, earthworms, termites and a range of other fungi and animals that mediate decomposition processes. Process measurements (functions) include gas exchanges, nutrient and organic matter cycles, N fixation, C sequestration, physical structures, plant-fauna interactions, incidence of pests and diseases and bio-accumulation and biodegradation of biocides. Reviews and recommendations of the best and standardized methods for each group will be made at the first planning workshop for project implementation. The recommended methods, and alternatives, where thought necessary, will be tested for precision, accuracy and replicability at selected test sites. An expert panel will review the results and make recommendations of standardized methods to the project participants and oversee publication of the manual.

PART II. SUPPORT TO GEF OPERATIONAL STRATEGY/PROGRAMME

1. The following outputs from the targeted research activities on methods for inventory and valuation of BGBD will support the operational part of the project and be available to future GEF funded activities and other projects.
   - A manual of rapid assessment methods for BGBD.
   - Validated indicators of BGBD loss and functional deficiency.
   - A standardized format for a global database of BGBD.
   - A concerted global hypothesis/model for the impact of land-use change on BGBD.
   - Valuation methodology applicable to BGBD at local, national and global levels.

PART III. RESEARCH METHODOLOGY (including baseline description) AND INSTITUTIONAL INVOLVEMENT

1. Research Methodology and Plan

A suite of appropriate methods for the project, will be reviewed, improved and validated, including those for:

a) Plot selection and survey design;
b) Sampling of key functional groups of BGBD;
c) Measurement of key ecosystem processes;
d) Estimation of recolonization potentials;
e) Selection of the biota and ecosystem processes going forward for valuation;
f) Description and tabulation of BGBD;
g) Representation of food webs.

Additional activities will include:

h) The development of a protocol to identify indicators of BGBD loss from inventory data sets, once these are established;
i) Application of the valuation protocols to BGBD and ecosystem processes data to provide monetary estimates of the economic, environmental and social costs and benefits of BGBD conservation and management.

The above activities will be achieved through national and global workshops, bilateral and multilateral information exchanges, and by a limited amount of experimental fieldwork. The results will be disseminated by the production of manuals and papers.

a) **Plot selection and survey design**

Methods for plot selection, for survey design and for survey timing and coordination will be reviewed, improved and tested. There is a need to agree, standardize and document the criteria for survey site selection at both the landscape and plot levels and to recommend regimes of sampling replication both within landscapes and within plots. It is also necessary to establish land use descriptors and historical criteria which will permit comparisons between regions and countries with varying biogeographical and land use management practices, and to specify the necessary degree of description of physical features (for example, slope, aspect and soil type) that may have a cross-cutting influence on BGBD.

b) **Sampling of key functional groups**

Sampling procedures for representatives of the following functional groups of soil biota will be reviewed, improved and standardized:

- Macrofauna (including ants, earthworms, termites)
- Decomposers (including litter transformers, nematodes, fungi and bacteria)
- Microsymbionts (VA mycorrhizae and rhizobia)
- Invertebrate pests and fungal and bacterial pathogens
- Rhizosphere biota (including nematodes and bacteria).

The review and standardization process will draw on the protocols already established by TSBF and ASB, and on the experience gained recently by these programmes. There is however, a need to improve diversity resolution and recognition in at least three taxonomic groups (eg. earthworms, VA mycorrhizae and rhizobia), and to address particular technical issues (eg. number of soil monoliths, bulking and compositing of soil cores) where current practices differ widely and which impinge on the replication of sampling and the estimation of the variances associated with the measurement of diversity, abundance, and biomass in soil biota. The use of molecular methods for microbial characterisation, including for estimating

mycorrhizal and rhizobial diversities will also be evaluated. Where necessary pilot field trials will be conducted, to the extent of testing actual published techniques and not for devising new ones.

Other methods for consideration (in workshops or otherwise) include the utility of the measurement of total microbial biomass in BGBD assessment and the characterization of the biotic interactions (and possible other factors) involved in pathogenicity.

c) **Measurement of key ecosystem processes**

Methods for the measurement of the following ecosystem processes will be reviewed, improved and standardized:

- Exchanges of gases from the soil (CO_2, CH_4, N_2O)
- Decomposition rates
- N_2 fixation rates
- Status of nutrient pools and transformation rates (C, N, P, S)
- Bio-availability of nutrients via soil fauna activity (e.g., from earthworm casts, termite mounds)
- Nutrient and organic matter translocations
- C sequestration
- Soil porosity and aggregate stability
- Resistance to soil erosion
- Incidence of pests and diseases
- Bio-accumulation and biodegradation of biocides.

The review will again draw on TSBF and ASB methodology and experience, but for some measurements it may be necessary to take a wider range of recent and technical advances into account in selecting recommended procedures. For example the use of ^{15}N as tracer and the use of natural stable isotope ratios to indicate relative contributions to process pathways can be tested. In cases where technically complex assays are adopted it may be necessary to use one or two global laboratories for the processing of samples, but in general the emphasis will be on creating within-country competence in all methods. It is anticipated that new (i.e., previously unpublished) protocols may have to be developed for two of the listed process measurements: nutrient and organic matter translocations and bio-accumulation and biodegradation of biocides.

For both b) and c) above experimental validation of the methods chosen will take place in the field. This will involve pilot trials in one or two countries followed by more extensive comparative tests across all seven countries involving contrasting land uses and contributing to within-country training where this is necessary or appropriate.

d) **Estimation of recolonization potentials**

Methods for characterizing dispersal properties (ie. recolonization potentials of individual biota) will be devised based on a review of dispersal characteristics of the selected biota and its implications for patch dynamics. This will take the form of:

i) A protocol for assessing the availability of natural or semi-natural reservoirs of BGBD in mosaic landscapes (for example mature forests or long-term fallows) and their potency (for example distance from disturbed sites or food crop fields);
ii) An experimental trial of interventions designed to reintroduce lost elements of BGBD or to encourage the rapid re-growth of depleted biotic groups. In the latter case typical interventions would be re-inoculation of soil with microsymbionts, mulching or the transplantation of diversity-rich soil monoliths. However, the scale of such intervention experiments will be limited: only regions or countries in which degraded land formed a significant part of landscape mosaics would be considered and the choice of

interventions investigated would be dictated by the particular ecosystem functions found deficient by the measurement exercise in c) above.

e) **Selection of biota and ecosystem process for valuation**

Ground rules will be established for the identification and selection of the ecosystem processes most relevant to each land use and environment. This activity recognizes that the range of ecosystem processes nominated for measurement in c) above is wide, and that particular landscapes or land uses may be deficient in only a few processes which become rate-limiting, either for plant growth, or for the maintenance of above-ground biodiversity, and therefore critical. The protocol will lead to the nomination of specific biotic groups or set minimum process rates appropriate to generic land uses or landscape/site characteristics. The absence of such groups or the discovery of process rates below a value supporting ecosystem health therefore becomes an input into the BGBD valuation exercise described in (j) below. We anticipate that the cross cutting effects of site or landscape physical features (slope, aspect, soil type etc.) may need to be factored into the protocol to identify critical deficiencies in BG biota and/or process rates.

f) **Description and tabulation of BGBD**

Instructions for the description, interpretation and recording of BGBD data, including the diversity within, as well as between, functional groups will be standardised after review of concepts and available methods. This activity is closely related to the sampling of BGBD and the measurement of ecosystem processes described in b) and c) above, and to the creation of a global database of BGBD (objective 2, activity 2.3 described elsewhere in this document).

Much of the proposed work is straight forward, for example specifying the units in which BGBD and ecosystem processes (or process rates) will be reported, but there will also be emphasis on obtaining agreed functional group classifications within specified taxa. The question of whether clear functional group classifications between taxa can be created will also be investigated. The reporting protocols established will include the use of agreed diversity indices and parameters of functional group diversity (the number of functional groups represented in a soil biota) and functional groups' composition (the balance between functional groups in terms of relative species richness, abundance and biomass).

g) **Representations of food webs**

This activity will be co-funded by the Netherlands Science Foundation. Concepts will be reviewed and methods recommended for the representation of food webs (graphical and mathematical) and the interpretation of their stability. The proposed work recognizes that ecosystems may not necessarily be fully represented by the static tabulation of their component biotas and process rates, but have short-term, medium/term and long term dynamics in which the presence or absence of key functional groups may facilitate or jeopardize stability. It concomitantly recognizes that particular biota may have process-limiting roles out of proportion to their diversity, abundance or biomass.

h) **Identification of indicators of BGBD loss**

This work is listed as targeted research, although, necessarily, the recommendations for optimal biotic (or other) indicators of overall BGBD loss cannot emerge in a finalized form until BGBD inventory data sets are completed. However, based on existing results from BGBD surveys carried out under the projects of TSBF, ASB and other published research, certain biotic groups (for example, termites and nematodes) offer very high resolution of disturbance gradients in tropical forest-based ecosystems, including agroecosystems. There is therefore a case for examining whether trends in the diversity and functional group diversity of these biotic groups are surrogates of overall BGBD, and for the allocation of resources and specific expert analysis, to this possibility. Such analyses will focus on clade

representations (for termites) and on trophic dominance, the maturity index and plant parasitic index (for nematodes).

i) **Valuation of BGBD**

The data generated by the targeted research component will also be used to test and apply methods for valuing below ground biodiversity (BGBD). The valuation focus will be on assessing the economic benefits accruing from conservation and management of BGBD in individual fields and in agricultural landscapes, through its effects on productivity (short-term and long-term) and on services such as water infiltration, erosion, etc. Possible benefits such as those of bio-prospecting will also be examined; in this case IPR norms within the country will be carefully considered.

Economic techniques for valuing the costs and benefits of agrobiodiversity to farmers and other sectors of society remain a matter of controversy. An international workshop convened at the outset of the project will review available methods and approaches and recommend methods to be tested. Workshop membership will include economists, biologists, farmers and other holders of indigenous knowledge and decision-makers. The recommendations will be tested in one or more case-studies and the results reviewed by an expert panel on behalf of the project, which will make recommendations for the methods to be adopted, and on the methods manual to be made available to all participants.

Loss of BGBD can result in lower productivity or in higher costs if the use of other inputs (such as fertilizer) is increased to compensate. It can also restrict future land use choices. Isolating the effect of BGBD is difficult, however, because of the many factors that affect productivity. Experimental work carried out under the project will facilitate this task by allowing many of these factors to be controlled. The valuation work will rely primarily on data collected by other research activities.

By demonstrating the value of BGBD, these efforts will help land users, research institutions, extension services and policy makers to incorporate BGBD into their work and to prioritize efforts to improve the sustainability of land management.

2. Institutional Involvement

a) Collaborating institutions

Details on the participating institutions are given in Annex F. These are the institutions within the seven countries with experts in the different fields of soil biology. The other collaborating institutions of each country will provide complementary expertise to that in the lead institution.

b) Research capacity improvements

When expertise in a field is lacking within a country, capacity building will provide the necessary training, either through "South-South" international exchanges or through training in developed countries. The capacity within each country to perform the various tasks detailed above are shown in Annex F.

PART IV. BASELINE

As referenced above in the description of methodology development, the project will build on upon existing work in the field (see Annex A) to develop internationally accepted standard methods for characterization and evaluation of BGBD, including a set of indicators for BGBD loss. While methods exist for all the required studies, sufficiently rigorous comparisons of alternatives have not been made and there is little agreement as to the appropriate standards for their application in international projects.

ANNEX J: TARGETED RESEARCH REVIEW

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Subject: Re: Global (Brazil, Cote d'Ivoire, Indonesia, India, Kenya, Mexico, Uganda): Conservation and Sustainable Management of Below-Ground Biodiversity
Date sent: Thu, 20 Jul 2000 10:36:41-0700

Dear Dr. Mesa,

It has been a pleasure for me to review the Targeted Research Component of this proposal. The overall proposal addresses an important issue, namely, the role of below ground biodiversity (BGBD) in sustaining agricultural production and environmental service functions. This is especially pertinent to the newly designed OP on agrobiodiversity. The targeted research component addresses the development of methods and protocols for BGBD assessment, creation of standards for description and qualification of BGBD and standardised measurements of key environmental service functions. It will do so on the basis of investigations in selected sites in seven tropical forest countries. The research methodology suggested for this purpose has been developed with due care and rigour on the basis of systematically planned work in the project development phase. It should begin to generate for the first time a good understanding of the links between BGBD and agricultural productivity and other ecosystem services; a key requirement for successful pursuit of the other objectives of the project and of the overall programme.

I am also very happy that the TRP is so designed as to help build capacity in the developing countries and to promote south-south dialogue. I appreciate the fact that both the Project Advisory Committee and the Technical Advisory Group have strong representation from the developing world.

All in all, I believe this to be a very well designed and worthwhile targeted research project.

Best wishes, Madhav Gadgil

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----- Original Message -----
From: <rmesa@worldbank.org>
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Sent: Friday, July 14, 2000 9:23 AM
Subject: Global (Brazil, Cote d'Ivoire, Indonesia, India, Kenya, Mexico, Uganda): Conservation and Sustainable Management of Below-Ground Biodiversity

Dear Mr. Gadgil,

Following procedures for review of targeted research proposals, we are forwarding herewith a copy of the proposal submitted by UNDP entitled Global (Brazil, Cote d'Ivoire, Indonesia, India, Kenya, Mexico, Uganda): Conservation and Sustainable Management of Below-Ground Biodiversity for the Research Committee's ruling on the project's targeted research component for scientific merits.

We would appreciate it very much if we can have the Research Committee's comments by August 3, 2000.

With best regards.

Ramon C. de Mesa
Program Coordinator

Attachment:

1) Project Proposal
2) Procedures for Review of Targeted Research Proposals
(See attached file: Annexes A-I-June 1 (TRCMZ).doc)

(See attached file: Project Brief June 1 (TRCMZ).doc)(See attached file: Targeted Research Procedures.doc)

ANNEX K: RESPONSE TO PREVIOUS COMMENTS BY GEFSEC AND IAS ON DECEMBER 1, 1998 SUBMISSION OF PROJECT BRIEF

1. Conformity with GEF Program and Policies

a. Portfolio Balance

Conceptually this is a very interesting proposal and would have important operationally sound implications. It should be supported probably through a PDF B but with substantive modifications. The proposal seems to support the regular work program of the Tropical Soil Biology and Fertility Program under care of UNESCO.

Response: PDF B was implemented per recommendations by GEFSEC. The activities during the PDF-B specifically addressed most of the issues discussed below.

TSBF is an independent research Programme outside both the UN and the CGIAR, but hosted by UNESCO at UNON. The main (ie. 'regular') work programme of TSBF is targeted at sustainable improvement in agricultural productivity through the development of biologically-based soil management technologies. The work on soil biodiversity addressed in this project is a component of TSBF's longer-term goals which has been developing over the years since a workshop funded by UNEP in 1995. The participants in this project are largely drawn from the contributors to this development plan. Throughout this process, as well as In this project, TSBF acts as the coordinating agency for the network of national executing institutions in the participating countries.

b. Evidence of Country Ownership

Letters of endorsement so far, limited financial commitment at this stage. How institutions were selected? Criteria used for selection? The one I know fairly well in Mexico, deals with ecological research with limited work on agriculture. Additional Mexican institutions have been involved but the collaborative ties of institutions within the country is not clear. How issues would be coordinated nationally?

Response: All letters of endorsement included.
Financial commitments detailed in the Brief, Table 3 and Paragraph 59 and in Annex A, Section 6.

Descriptions of the variety of participating institutions and their capacities are given in Annex F, Section 2. The national workshops held during PDF-B extended and enhanced collaborative linkages as described in Para 51 and Figure 2 of the Brief.

The national convening institutions are all centres of expertise in below-ground biodiversity the main innovative component of the project. Consequently many of the lead institutions are Universities, but all the institutions have a strong background in agroecology. For example, in Mexico the Institute of Ecology at Xalapa University is internationally known as the home of the International Macrofauna Database. Institutions from National Agricultural Research Systems (NARS) are key partners in all the Countries (e.g. in Mexico INIFAP), providing the expertise in agricultural systems and the more production oriented and agricultural development issues. In their turn the NARS provide linkages with the national planning and policy agencies in the Ministries of Agriculture and Environment.

The convening institution in each country will in particular take the lead and responsibility for the Targeted Research activities in Outcome 1. Responsibilities for the other outcomes will be shared among the contributing partners as the project requires.

c. Potential Global Environmental Benefits of the Project

Specific site information is needed to judge this aspect of the project. The sites in Mexico are heavily degraded and little natural biodiversity remains, mostly at higher elevations in the Tuxtlas site. However, from the agrobiodiversity side this may be incomplete.

Response: Annex H Section 2 includes brief descriptions of all the sites together with the criteria used for the selection at both countrya and global scale. One of the main factors for site selection is the presence of a gradient of land-uses providing a baseline of relatively undisturbed ecosystems together with a gradient of land-use representing different intensities of agricultural use.

d. Baseline Course of Action

Very aggregated. Many of the proposed activities in the alternative course of action have substantive baseline implications and these are not disaggregated. This should be done.

Response: Greater detail at a finer degree of disaggregation has been provided in the revised brief. In particular see Annex A for an explanation of baseline and alternative course of action including a description of the Scope of the Analysis and the process used for computation.

e. Alternative Course of Action Supported by the Project

The following issues should be taken into account:

- *Supporting documentation is very weak and limited.*

  Response: Annex G lists the work products that came out of the PDF B and other documents. See also the references given in the Brief. Baseline reviews of previous BGBD studies in each of the countries were commissioned as part of the PDF-B and are nearing completion. The description of the Project Database given in Annex H, Section 1 is also indicative of the available documentation. All documents can be supplied to GEF on request.

- *The proposal would have benefitted from a PDF B which would have provided sufficient time, contracting of right personnel and resources to have a more fully prepared project.*

  Response: PDF B Implemented to prepare project.

- *Key information that should be part of the main project brief is not there, or provided only in the annexes: including countries and sites selected, their baselines, the key stakeholders and the agencies and stakeholders to be involved, the costs and incremental costs associated with each country etc.*

  Response: Given a project with seven countries the page-limit of the project brief demands that much of this information be placed in Annexes. Site and country details are in Annex H, Section 2, Annex A details the baseline and ICA by country, Annex F and paragraphs 44-49 give information on stakeholders..

- *The methodology and approaches that are to be used are not mentioned (assuming that they must have been defined), a point raised by the STAP reviewer too, and it is not well addressed in the response. The proposal suggests to review and recommend them after the first planning workshop for project implementation. This should be done at the time*

of project brief submission. In relation to methodology development, there is a need to clarify the activities needed to device/improve on methodologies;

Response: The issue of method has been taken on as a mjor sector of the revised project design. The Targeted Research component (Outcome 1) specifically proposes activities to address the issues of improvement and standardisation of methods. The re-review by STAP indicates the issue of mehods is now adequately addressed.

- *A proposed global information database is suggested. How does this fit?*

  Response: The Database and International Infomration System are essential tools for transferring information beyond the project sites and countries and securing global benefits. The details are addressed in the description of Outcome 2b, para 27. See also thedescriptionof the database in Annex H Section 1.

- *Who will maintain it over the long-term? what is its sustainability? as the key issue is not start-up costs but long-term maintenance. This should be clarified*.

  Response: The database and information system will be an international public good which will be fully accessible to potential users. During the project these tools will be located at TSBF and TSBF will guarantee the sustainability of database after the projects. It is possible however that a a different location may be found desirable in the long-run.

- *It is recommended that the project includes a tabular summary of the proposed six country sites be inserted to highlight the cross-country and comparative nature of the evolving "alternatives to intensification" approach. In addition to the ecosystem characteristics it should include the nature of the agrobiodiversity and social policy.*

  Response:
  See Tables 1 and 2 and accompanying text in Annex H, Section 2.

- *STAP reviewer has highlighted some issues regarding the limited information about the project itself, the alternative agriculture intensification paths not described, etc, and considering the limited information regarding local community response to the proposed "diversification". Proposed activities related to cost/benefit analysis need to be carefully considered. This was one of the weakest points of the UNEP Country Studies Guidelines in the past. The issue is a difficult undertaking as the methods for economic valuation fail to capture the social dynamics of change associated with any shift from one production system to another. The cost to GEF for this component of the project is S3.00 m and the Secretariat wonders if it is worth the risk of coming out with numbers and values, when in reality, the alternatives may not be acceptable to the affected population. If this component goes on, which may be unlikely, project proponents should be encouraged to make use of a participatory technique to ensure that the economic options being proposed, based on the country sites, are locally acceptable, and that there is sufficient country "buy in" to the process. In addition, UNEP should explain the potential large contribution to this component, as the Contanza's study cited in the STAP review, made use of eight case studies and it costs only $0.843 m for a similar exercise.*

  Response: The level of detail about the project, and the pathways of change that comprise the possible alternatives has been increased and appears to meet with the STAP reviewer's satisfaction in the revised Brief. The response of local communities to any recommendations concerning alternative patterns of diversification or intensification in agricultural land-use are a key component of the activities of the project. These options may include rotational cropping, intercropping, agroforestry, mixed arable-

livestock, green mulching and similar systems in a variety of spatial and temporal combinations.

The project recognizes the difficulties of the cost-benefit analysis. One sector of the Targeted Research under Outcome 1 proposes selection, development and testing of appropriate methods. Criteria used will include full appreciation of opportunity costs of choosing between one land-use and another or of adopting any particular practice of land and biodiversity management. It is essential to the success of the project that the local community has ownership of what is proposed and assessment of costs and benefits will utilise both indigenous and formal economic methods for valuation.

The Costanza study was purely a desk exercise using published data, and a globally aggregate procedure. This project requires data collection and interpretation at the country and site levels and a much finer focus in terms of detail.

- *Many traditional agricultural management systems make use of above ground and below ground techniques to increase food production in limited areas throughg polyculure techniques. How would the project address some of these management systems that may not necessarily be developed in the proposed studies sites? In the case of Mexico, for example, the Lacandon milpa system documented in the earlier 80's was developed in the lowland sites in Chiapas, far away from the Veracruz sites.*

  Response:
  Methods of AG and BG BD management in traditional agricultural systems outside the study sites are a potential source of innovation for the sites and this information will be used wherever applicable.

- *Related to the preceding point, how would the project attempt to address issues related to property regimes, and government policies on agricultural subsidies, pricing of foodcrops and markets? How would the project address the technical, social and policy interface? The research institution in Mexico is not strongly connected to government policy-making structures, except on the science part.*

  Response:
  The revised Project Brief addresses policy issues more directly than previously through Outcome 4. The logic presented in Activities 4.1 to 4.3 (see Annex B) is to first conduct an analysis of the factors gverning present land-use and agrobiodiversity management and the barriers to alternative (eg diversified) land-use. The economic issues mentioned above will no doubt figure strongly in this. The second step is to promote a consultative process at the decision-making level to identify the factors which would support the introduction of alternative policies that would promote biodiversity conserving land-use practices. Such changes might include the introduction of approprite incentives. This study would also include analysis of the wider implications, in both economic and social terms, of any change in land-use or agricultural support policies. The final stage in Outcome 4 activities is to explore the means for implementation of the proposed policy change.

  It is certainly correct that not all the lead institutions have a comparative advantage for policy research or generation. Linkages with relevant policy-making bodies have been established during the PDF-B process and the project design allows for the strengthening and clarification of this during the project implementation. The willingness of policy makers to engage in this process is a key condition for success.

- *Regarding the scheduling of activities, para 32, page 10, indicates that demonstration sites will be established in year 3. As the project suggest it will be highly participatory, it may be important to start consultations on these demonstration sites as early as*

possible. The proposal includes substantive funding for process issues through workshops and meetings, when the actual contribution will come from the results of the research itself. The proposed workshops should be kept to a minimum and funds decreased accordingly;

Response: the timetable of activites has been substantially revised as a result of the PDF-B activites (see table 2,Annex B). The PDF-B has enabled a substantial extent of consultation to take place at the site level as well as the national level referred to in the previous paragraph. This has established ownership in the project across a side range of stakeholders. The process of establishment of the demonstration sites will be accelerated as a result and has been brought forward to year 1. Nonetheless the need remains to continue the process of consultation and provide means for the participation of all stakeholders throughout the various stages of the project. This process is described in paras 47 to 50 and Annex F.

- *The proposal includes rehabilitation of degraded lands through management of above- and below-ground biodiversity. How large would this component be?*

  Response: One result of the further planning during the PDF-B was the decision to exclude a specific set of activities on rehabilitation of degraded lands. Whilst the importance of this was recognised by the participants it was agreed that it was unrealistic to attempt to tackle this within the resources and time-scale of the project. Nonetheless aspects of the results of the project will be relevant to land-rehabilitation and should result in recommendations in this respect.

- *There is limited information about risks: given the global nature of the proposal, levels of actors and stakeholders, and complexity of the project, the section should be made more realistic and clear.*

  Response: Increased detail has been provided in paras 36-43 and the project logframe in Annex B.

f. Conformity with GEF Public Involvement Policy

Given the variety of stakeholders within, and among, countries, the project should identify the key stakeholders and make sure that village and tribal leaders are consulted, perhaps including a sample of tribal villagers in those areas where they exist. Gender issues should also be included as women play key roles in many agricultural activities including production, processing and marketing. The project should set up appropriate mechanisms to ensure broad-based consultation and a system for integrating into the project inputs from NGOs and local groups.

Response: These issues were directly addressed as a major component of the PDF-B consultative process culminating in the national workshops. See Annex F, and paras 44-49.

Aside from publications, as mentioned in paras 35, page 11, there is a need to look at other dissemination mechanisms that ensure translation to policy.

Response: This is addressed in paras 31 and 32 with reference to Outcome 4. The project findings will be disseminated by means of public meetings, stakeholder consultations, capacity building workshops and publications. The published material will range from technical papers to decision-support tools, advisory briefings and public awareness materials in a variety of media (seealso the logframe, Annex B). The Project Database and Information System will be a key resource for this process and user-

friendly access systems will be developed to ensure the easy availability of information for a range of different users.

3. Appropriateness of GEF Financing

a. Incremental Cost

The incremental costs is very aggregate and the costs associated with each country are not reflected, nor the co-financing: who and which agencies are contributing this? The Secretariat needs to know the institutions involved, their baselines, to which the increment will be added. Then there should be the regional component which pulls all project activities together. As sustainable agriculture is part of the national interest and benefit, the baseline should be higher than currently proposed.

Response: Disaggregation of the IC and baseline has been fully addressed in the revised Annex A. Details of the co-financing are given in the Brief in Table 3 and Para 59.

b. Financial Sustainability

Not guaranteed. Substantive funding to workshops, travel, recurrent costs. How would the international information system be maintained? The proposal suggests (para 31, page 10) that the demonstration sites will be a long-term investment and should continue to yield critical information beyond the life of the present project. Who will sustain these sites? for how long? The sustainability section of the proposal is poorly articulated.

Response: As already stated above TSBF will guarantee continuation of the Information System. Maintenance as a publicly accessible tool will not be expensive and its potential utility to a wide variety of stakeholders offers high potential for obtaining the necessary funding for this purpose and to enable up-dating with additional information. The Demonstration Sites will gain significant value for the countries and regions in which they are located and it is expected that costs for their maintenance and monitoring will be made available by the countries after the project period. International co-funding for this purpose will also be sought.

4. Coordination with other Institutions

a. Collaboration

The proposal suggests important collaboration with many stakeholders, but see comments above.

Response: Answered above and also in Annex F and paras 44-49.

b. Complementarity with ongoing activities

Specific projects are highlighted (e.g., Alternatives to Slash and Burn Agriculture and PLEC). Almost no other GEF projects in country are mentioned. There are projects in the Pipeline (e.g., Mexico Proder's which include the Tuxtlas site) which would need inclusion and coordination.

Response: See paras 54-56 and Annex F.

5. Responsiveness to Comments and Evaluation

a. Consistency with previous upstream consultations

The proposal apparently came for review in November last year. Apparently, no written comments were provided. India was included at that time, it is now excluded from the project. There are no records on file of the approval of the PDF A.

Response: These issues have now all been clarified (eg. see Annex J, Targeted research Review). India has endoresed the project and is included as a partner.

b. Monitoring and Evaluation

Not very clear at this stage. M&E and indicators listed in the logframe seem quite general. Further work is needed to define these.

Response: Greater detail on indicators and m&E methods has been provided in the logframe in Annex B and in paras 65-67.

c. Implementing Agencies Comments

The World Bank has provided comments. These focus on: (a) the main area of interest being on soil fertility and as a targeted research proposal; (b) should be referred to the Research Committee once deemed eligible; (c) activities financed by others (e..g., CGIAR), outside GEF or within GEF (e.g., Alternatives to Slash and Burn Project or PLEC). It also highlights the limited funding commitment at the national and IA levels; (d) role of Tropical Soil Biology and Fertility Program, UNESCO and UNEP; (e) long-term research efforts and financial sustainability; (f) incremental costs and the need to have a higher baseline given the national benefits of proposed activities; (g) how research results will be translated into policy decisions on land use. It raises the issue of what success has UNEP seen from its other research programs in changing policy and land-use decisions at the local, regional and national levels.

Response:
NB: These comments are in the order as presented in the WB commentary.

(a) **Potential overlaps with CIFOR and other CGIAR networks.** This project is concerned with below-ground agricultural biodiversity; CIFOR is a forestry institute that has done considerable work on forest biodiversity, a little on aboveground diversity in complex agricultural systems, but has no work on or remit or capacity for work on below-ground biodiversity. Among the CGIAR centres only CIAT has done work on below-ground biodiversity but not in any of the countries in this project.

(b) **Overlap with the Alternatives to Slash and Burn (ASB) Project.** A limited amount of belowground biodiversity characterization was conducted in Phase 2 of the ASB project but this work has been terminated. This project builds in part on the experience gained in the ASB project particularly in identifying methodological issues, as has been well explained in the UNDP review. Future work on soil biota in the ASB project is targeted at (i) management practices that promote agricultural productivity and (ii) rehabilitation of degraded land for sustainable agriculture. Strong linkages will however be maintained with the ASB Project and the coordinator will sit on the Project Advisory Committee.

(c) **Overlap with PLEC.** This project is concerned with belowground biodiversity and methods for its management, PLEC with indigenous management of aboveground

biodiversity. The two projects are highly complementary and strong links have been will be developed between them including co-membership of the project advisory committees.

(d) **Limited international co-financing.** Co-financing is addressed above and in the Brief. It is recognised that the level of co-financing is below that in many GEF projects but it should be noted that below-ground biodiversity is a topic that has attracted little attention in the biodiversity community. Whilst there is very substantial funding available for conventional soil fertility improvement research and development this is not the case for soil biodiversity characterisation or management. This project is intended to correct that position. Nonetheless the investment by the participating institutions is considerable.

(e) **Long-term results from demonstration plots.** It is anticipated that sufficient results will be available within the life of the project to ensure assessment of the initial impacts of land-use change on biodiversity. It is correct however that additional and different data will become available over the longer-term than the five year project period. The plots will be a valuable investment in this respect. As addressed in the comments to GEFSEC (see above) it is the intention of the country participants to seek national and international support for the maintenance of the demonstration plots but clearly this can not be properly sought until the first generation of results is available.

(f) **Main focus is soil fertility.** The main focus of the project is not soil fertility but on evaluation of below-ground biodiversity under the impact of land-use change for agriculture and the land management conditions that optimize its conservation. Impacts on ecosystem services (including soil fertility) that may accrue from such practices are an important component of the evaluation of the costs or benefits of particular land management practices. As remarked in the GESEC comments this is a difficult and unresolved area that is addressed in the project under the Targeted Research component.

(g) **Relationship to policy.** Whilst it is clearly correct to say that information is not the only influence on policy decisions, the topic addressed by this project is one where the information base is virtually non-existent so there is no means of predicting whether information is likely to influence policy or not.

UNDP provided the following comments:
The issue of below-ground biodiversity is an important one. but largely neglected, possibly due to the difficulty of isolating, and more particularly, of identifying components of that diversity. This, in turn, is largely due to the "traditionalists" approach of needing to identify and name components of biodiversity. New approaches, possibly adopting a "process-based" philosophy recently championed by researchers in several countries, or a function-based approach are very much needed. However, the present UNEP proposal, while promising to deliver such new methodologies, is very vague on the nature and modalities of such methodologies. In particular there is a repeated assumption that there is a strong positive correlation above-ground diversity and below-ground diversity. On many ocasions there is a reference to agrobidodiversity, with particular reference to below-ground components. This begs the questions: if there is such a strong correlation, why bother quatifying below-ground diversity? why not simply use above-ground diversity as a surrogate for below-ground diversity. In fact, a strong positive colleration has not yet been conclusively demonstrated. Therefore, a valuable goal of the project would be to test for/examine this correlation, but such as objective is not identified. The proposed methodology borows heavily from the ASB project (Alternatives to Slash and Burn agriculture), for example in "studying gradients" of increased intensification of land-use. Indeed, in many places, it could be concluded that

the current proposal is simply a continuation of the ASB project. Despite the fact that it is proposed to use experimental manipulation of test sites, starting in the third year of the project, a truly experimental approach to the issue under consideration is not possible. Rather, it will be necessary (as is mentioned) to adopt a modelling approach to supplement the national case studies in order to develop what may be generalizable conclusions. However, such modelling work has already been initiated under the ASB project, most notably the work of van Noordwijk and colleagues (ICRAF/Indonesia) on segregating or integrating conservation and productive activities. This work is not referenced. Although preliminary in nature, the models developed indicated scenarios under which segregation of production and conservation may make more or less economic sense. It would seem that much of the proposed work could be built on these preliminary models, but the implication is that work will start from scratch. It would have been useful to have been provided with at least some outline information on what innovative approaches to assessment and monitoring or below-ground biodiversity are being considered. To summarize, this proposal would seem to promise much, but several important technical issues are under-described, and the reasons why this is not simply a continuation of the ASB project are not clear.

Response:

Methods
These important methodological issue have been directly addressed in revised Brief particularly under Outcome 1, the Targeted research component. As pointed out the 'functional group' approach has indeed proved the most practicable and useful method for study of BGBD and is the one advocated in the project. Many of the scientists who pioneered these approaches are participants in the project in the national teams or the TAG. Greater detail on methods has been provided as a result of the PDF-B.

Correlation between Above- and Below- Ground Biodiversity
These comments are very apt and have been taken into account in the revision of the Brief. The linkages between above and below-ground diversity do indeed remain to be firmly established. One major result of the project should be to provide information to verify or invalidate the hypothesis. The project seeks to provide rapid indicators of BGBD change – and these could include above-ground surrogates. The project will also address the extent to which BGBD can be manipulated through management of AGBD.

Relationship to ASB
This is addressed above in the comments to the WB. Whilst modeling can be a useful substitute for experimentation by extrapolating short-term results into the longer-term the need for short-term validation still remains. The activities under Outcome 3 should provide this. Predictive modeling is not a substantive part of the activities of the project. Nonetheless the substantial dataset that will be generated by the project will be accessible for modelling purposes the results of which will be drawn on when needed. A modelling project supervised by Meine van Noordwijk who is an adviser to the project is a source of co-financing to the project.

Literature on belowground biodiversity.
Reviews of previous studies of BGBD in all the participating countries were commissioned as part of the PDF-B and are nearing completion (see Annex G). Increased reference to background literature has been included in both Brief and Annexes. The preparatory workshop funded by UNEP produced a Special Issue of the journal Applied Soil Ecology laying out many of the principles on which the project design is based.

The CBDSEC provided comments (Nov 11, 1998) on country eligibility (countries are eligible) and COP guidance. On technical suggestions, it recommended:

(a) *development of international methods for characterization and evaluation of agricultural biodiversity and agrobiodiversity management practices at the farm and lanscape scales, with particular reference to below-ground biodiversity. The technical reviwer's concerns appear to have been properly addressed;*

Dealt with as the Targeted Research component (Outcome 1, Annex I))

(b) *socio-economic context of the project. There is a summary analysis of root causes in annex IV. It appears that activities may be explicitly proposed to address these root causes. These activities, including an analysis of incentives/dis-incentive system would contribute to possible changes in relevant national policies desirable for alternative practices;*

Outcome 4, particularly Activity 4.1, addresses these specific concerns.

(c) *demonstration sites. Establishing and maintaining these sites may be considered as a major element in the proposal rather than as only a sub-element.*

The demonstration sites are a central activity in the revised proposal.

Other Technical Comments

Document too long, with a lack of clear focus. The introductory section should be brief and "crisp" leading to a clear baseline and alternative scenario. More information about national action is needed. What would the research components at the national level would be? how national institutional coordination would happen? how the policy recommendations be made to be effective? How national plans on agricultural development fit on proposed scenarions? Extensive literature on below-ground biodiversity already exists and it should be addressed during project preparation, so lessons learnt and best practice are used extensively on project preparation/implementation.

Response: These comments have been taken into account in preparing the revised Brief. Some are specifically addressed in the responses above.

FURTHER PROCESSING

The Program Manager is uncomfortable with this proposal. Although the issue is very important, the proposal is poorly focused, and needs substantive additional work. The Program Manager recommends that UNEP considers the possibility of developing a PDF B proposal which, based on comments provided in this PRF, may produce an acceptable project document which meets the quality standards required for inclusion in the Work Program. If UNEP agrees with this course of action, the resulting PDF B, once agreed with the Program Manager, should be passed to the Research Committee for views on technical/scientific grounds.

Response: PDF B was implemented. Project was submitted to Targeted Research Committee for review.

In considering the route of a PDF B, the following issues would need consideration: (a) transparency in the selection of countries and institutions to participate. Why the

proposed countries have been selected and not others? What criteria have been used for the selection of countries and institutions; (b) key information that should be part of the main project brief is not there, or provided only in the annexes: including countries and sites selected, their baselines, the key stakeholders and the agencies and stakeholders to be involved, the costs and incremental costs associated with each country etc.; (c) methodologies should be defined by the time of project brief submission; (d) in relation to methodology development, there is a need to clarify the activities needed to device/improve on methodologies; (e) clarify how does the global information database fit? where would it be based? who will maintain it over the long-term? what is its sustainability? as the key issue is not start-up costs but long-term maintenance; (f) clarify STAP reviewer comments regarding the limited information about the project itself, the alternative agriculture intensification paths not described, etc.; (g) considering the limited information regarding local community response to the proposed "diversification", the project should include a tabular summary of the proposed six country sites be inserted to highlight the cross-country and comparative nature of the evolving "alternatives to intensification" approach. In addition to the ecosystem characteristics, it should include the nature of the agrobiodiversity and social policy characteristics; (h) in relation to cost/benefit analysis, as the issue is a difficult undertaking, proposed methods should use methods that capture the social dynamics of change associated with any shift from one production system to another. The cost to GEF for this component should be revised and decreased to more realistic levels; (i) clarify how would the project address traditional management systems that may not necessarily be developed in the proposed studies sites; (j) related to the preceding point, the project document should clarify how would the project attempt to address issues related to property regimes, and government policies on agricultural subsidies, pricing of foodcrops and markets? How would the project address the technical, social and policy interface. As research results can only be expected at the end of the project, clarify how issues be translated to policy recommendations; (k) regarding the scheduling of activities, para 32, page 10, consultations on demonstration sites should start as early on implementation as possible; (l) the proposal includes substantive funding for process issues through workshops and meetings, when the actual contribution will come from the results of the research itself. The proposed workshops should be kept to a minimum and funds decreased accordingly; (m) in relation to rehabilitation of degraded lands the proposal should clarify how large would this component be; (n) regarding risks, the project section should be made more realistic and clear; (o) in relation to the number of actors/stakeholders at the national level, the proposal should clearly state how coordination at the national level would be conducted for the project to be effective; (p) in order to better assess the potential global environmental benefits in each country, detailed information about the project sites in each country, with information about their global significance, level of degradation, type of local communities, including indigenous groups, and agricultural practices in use, should be provided; (q) regarding alternative course of action, some activities have substantive baseline implications and these are not disaggregated in the resulting project. This should be done; (r) the project should identify the key stakeholders and make sure that village and tribal leaders are consulted, perhaps including a sample of tribal villagers in those areas where they exist. Gender issues should also be included. In addition, the project should set up appropriate mechanisms to ensure broad-based consultation and a system for integrating into the project inputs from NGOs and local groups; (s) aside from publications, the resulting project would need to look at other dissemination mechanisms that ensure translation to policy; (t) incremental costs should be disaggregate, reflecting baseline and incremental costs associated with each country clearly. The proposal may include a regional component which pulls all of this together estimating baseline and increments too; (u) regarding financial sustainability, who will sustain demonstration sites and for how long? The sustainability section of the proposal should be better articulated. What is the role of the TSBFP in financing the follow-up?, role of UNESCO?; (v) M&E indicators need further refining; (w) take fully into account STAP reviewer comments, IAs and technical

comments from the Convention secretariat; (y) clarify if the co-financing from national governments is in cash and/or in-kind. If both, indicate amounts/proportions.

Response:
All these issues were addressed in the PDF-B activites and have been covered in the responses to GEFSEC given above.

ANNEX L: PROJECT CONVERGENCE WITH COP 4 DECISIONS ON AGROBIODIVERSITY

At COP 4 the call was made for "efforts to identify and promote sustainable agricultural practices, integrated landscape management of mosaics of agricultural and natural areas as well as appropriate farming systems that will reduce possible negative effects of agricultural practices on biological diversity and enhance the ecological functions provided by biological diversity to agriculture". This is the explicit target of this project which at the plot and farm level seeks to demonstrate methods of managing agrobiodiversity, particularly that below-ground, that result in agroecosystems that combine high and sustainable levels of agricultural production with benefits of improved ecosystem services, including those of global significance such as conserved biodiversity, reduced greenhouse gas emissions and increased sequestration of carbon. The project will also promote the integration of diverse land-uses within agricultural landscapes at the forest margin as a means of optimising the trade-offs between the agricultural and environmental benefits. Decision IV/6 also emphasized the need to balance production and conservation objectives in such a way as to meet the needs of expanding populations while maintaining an ecological balance. This project addresses these concerns with particular respect to the below-ground component of agrobiodiversity in forest ecosystems.

This project examines the impact of agricultural development on a unique component of biodiversity – that of the soil biota, both microbial and invertebrate, in the tropical rain forest zone. At COP4 the decision was made to expand the focus in Annex 3 of Decision III/11 on soil organisms from that of merely the microbial component to include case studies of all groups of soil biota (Decision IV/6, paragraph 5).

Under Decision III/6, COP4 drew attention to the 'need to support capacity-building... (and)...to provide inputs for the development and application of methodologies for assessments of agricultural biological diversity and tools for monitoring, including: criteria and indicators for agricultural biological diversity, including those addressing farming systems and agricultural ecosystems; rapid assessment techniques; the identification of incentives to overcome constraints and enhance the conservation and sustainable use of agricultural biological diversity and the fair and equitable sharing of benefits'. The project fully supports this decision through the development of methods for the assessment of BGBD and rapid indicators for BGBD. Furthermore, the project will also develop a global information exchange network with a database freely accessible by the participants and other interested persons/institutions.